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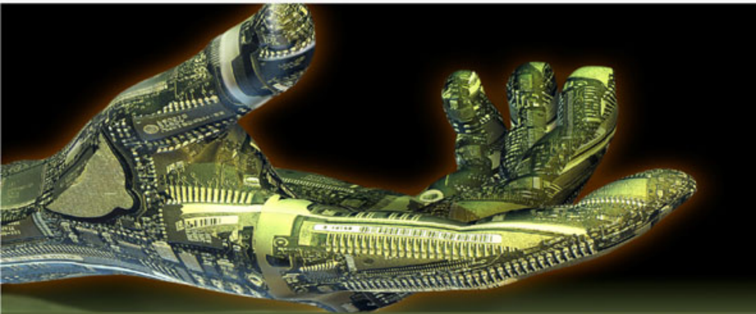

new waves in philosophy of technology

edited by

jan kyrre berg olsen,
evan selinger & søren riis

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New Waves in Philosophy of Technology

Edited by

Jan Kyrre Berg Olsen
University of Copenhagen

Evan Selinger
Rochester Institute of Technology

and

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Foreword

Philosophy of technology is a relative newcomer to the 'philosophies of…'. Its origins, with a few glimmers in the late nineteenth century, are largely associated with the twentieth and now twenty-first centuries. Here, as the title suggests with 'New Waves', a new generation of philosophers of technology are beginning to produce a new wave of thinking through, about and with technologies. If we pose the issue in terms of human generations, the first waves or generations of thinkers are almost all deceased. The most eminent of the historians of the philosophy of technology are in remarkable agreement about certain general characteristics of the 'first' waves or generations of philosophy of technology. They tended to treat technology as an overall phenomenon, often 'metaphysically'; most, particularly in Europe, tended towards dystopian assessments; and most usually saw technology as a threat to the older, traditional forms of culture. The exception was an American, John Dewey, who was much more optimistic and saw technologies as tools for the improvement of democracy and education.

As I have pointed out elsewhere, early 'philosophies of…', were largely inspired by Hegel who often wrote of philosophies of – history, religion, science and the like – and whose late nineteenth-century followers included both Ernst Kapp, whose *Grundlinien einer Philosophie der Technik* (1877) was the first book to use 'philosophy of technology' in its title, and Karl Marx, who advanced theories of production as determining factors in the form of society. Both were forerunners to the twentieth-century, wider spread first wave, and both Kapp and Marx were reacting to the powerful technologies just unleashed in the nineteenth century, which powered the Industrial Revolution. Interestingly, while Marx tended towards technological determinism and thus granted formative power to technology, and while Kapp saw technologies as extensions of human organs and bodily functions, neither could be called negative or dystopian concerning technology as such. Even 'alienation', so much a Marxian concept, was viewed as arising from a particular historical form of production. It was not essential to technology as such, and it was seen as eventually changeable under the right communist social formation. It was, rather, from the arts that early alarms began to be sounded. Mary Shelley, whose *Frankenstein* (1817) preceded both Kapp and Marx, was to become the icon of early 'autonomous technology' fears. But we should not ignore that others touted hopes of technological utopian dreams as well. Some poets even praised the sunsets produced by early industrial smog! All this took place before technology as a term became itself common. Historians of technology, such as Thomas Hughes and David

Nye, have pointed out that the very terms 'technology' and 'technologies' did not become prominent *until the twentieth century, and indeed, mostly after the First World War.* 'Industrial arts', 'machines' and 'technical apparatus' were more likely to characterize 'technologies', prior to the early twentieth century.

Yet, the early twentieth century did produce factories, assembly lines, Taylorism and the beginnings of Big Science (particularly in chemistry). Using the then equally new media technologies, the critical art community began to once again raise alarms. But if some artists were fearful of the new age of mega-machines, others found fascination in them. Filippo Tommaso, a writer helping give birth to Italian Futurism, was involved in the futurist manifesto of 1909 which also presaged fascism. Ernst Junger – read by and an influence upon Heidegger – glorified war as a spiritual experience. His *Storm of Steel* (1925) preceded the soon to follow openings to the twentieth-century philosophies of technology. On the dystopian side, Fritz Lang's masterpiece, *Metropolis*, was filmed in 1927, the very year that Friedrich Dessauer, again using the term 'philosophy of technology', published *Philosophie der Technik*, and Martin Heidegger in *Being and Time* began to take account of technology with his famous inversion in which science arises out of technology. But neither were dystopian in tone at this stage.

But one must not forget that the Great War introduced the horrors of an early military–industrial alliance which thrived on the new weaponry of mass destruction with chemical gas, machine gun and tank, submarine and air warfare. Industrial and military technologies had become too powerful to ignore and in response many of Europe's and some of America's leading philosophers rose to the challenge. Thus, in addition to Dessauer and Heidegger, in the interwar period, one could now add the names of Ortega y Gassett, Karl Jaspers and Nicolas Berdyaev in Europe, and John Dewey and Lewis Mumford in America. The output of this wave gained momentum between the wars, and continued into the Cold War to the eventual deaths of the principals.

Slightly younger, perhaps a 'second wave', but alongside the grand philosophers in publication times in the mid-to later twentieth century, were another related group of technology critical philosophers who tended to view technology as a political and cultural threat. The most prominent of these were associated with the Frankfurt School of critical theory: Theodor Adorno, Herbert Marcuse, Max Horkheimer and their younger colleague, Jürgen Habermas, many of whom were students of the previously mentioned philosophers. In my reading, the two dominant critical thrusts appeared to be against technocratic capitalism and its version of industrial technology, but equally against the rise of 'mass culture' and the threat to the older versions of European high culture. Theirs was a parallel philosophical version of Charlie Chaplin's *Modern Times* (1936), with both Chaplin and the critical theorists sceptical of machine technology and its association with capitalism.

One should add here as well, Jacques Ellul, Ivan Illich and Hans Jonas, whose concerns for the march of 'autonomous technology' were sometimes taken to threaten humanity or the human essence itself. If this rather diverse grouping could be considered the first waves, then, with the exception of Habermas, these waves have become *historical* in the sense that its members are no longer alive, although some lived into the late twentieth century. The picture I am painting includes, in addition to the characteristics mentioned above, an era in which extremes of utopian and dystopian views of technology often prevailed. The utopian trajectory itself was often embedded in the more radical political positions, communist socialism on one side, fascism and reactionary politics on the other.

Now we come to, possibly, the 'third wave', which is my own generation of philosophers of technology. As to whom should be included for mention here, there are a number of *lists* by contemporary historians of the philosophy of technology. Paul Durbin has published, electronically in *Techne,* a detailed history of the one North American organization of the philosophy of technology, the Society for Philosophy and Technology. He shows how, in the early days of the society, the influences of Heidegger, Ellul, Jonas and Dewey were dominant. Carl Mitcham, author of by far the most detailed and comprehensive history, published *Thinking through Technology* (Chicago, 1994). Mitcham there followed a distinction between 'humanities' and 'engineering' approaches to philosophy of technology with a sub-theme dividing the 'critical' philosophies as humanities, and the more positive philosophies as engineering approaches. These are, to my mind, echoes of the older utopian/dystopian tendencies of the early twentieth century. But my own favourite interpretation originates in the Netherlands, translated into English as *American Philosophy of Technology: the Empirical Turn* (Indiana, 2001). The editor, Hans Achterhuis, himself a major Dutch philosopher of technology, includes in my generation: Albert Borgmann, Hubert Dreyfus, Andrew Feenberg, Donna Haraway, Don Ihde and Langdon Winner. I asked the authors of this collection why these particular thinkers were chosen, and the answer was that these six were the most read in Holland. Perhaps had they been more situated in a North American context, others like Larry Hickman, Kristen Schrader-Frechette or Joseph Pitt might also have been included. This generation, some of whom are now approaching retirement, remain both highly productive and active. What is most interesting to me, however, is the way in which Achterhuis characterizes the difference between this now third generation and the earlier generations of philosophers of technology. This wave, he claimed, was less dystopian, more pragmatic, pro-democratic, and above all each had taken an 'empirical turn' or a turn to the analyses of concrete technologies. The technologies must 'speak for themselves'. With respect to periodicity, the publications of this wave fall primarily in the late twentieth century, from the 1980s on, and thus are also post-wars – world and cold. This also means that the technologies – often already those of the information and knowledge society age – are different from the early part of the century.

So, my historical frame now reaches the *new wave,* that is the younger and more recently publishing generation of philosophers of technology represented in this book. The editors, themselves represented here, have included summaries of this diverse group of philosophers; thus I shall not add my own specific reactions to theirs. Instead, I shall respond to patterns I see which distinguish the new wave: first, there is what appears to be a foreshortening of the past of philosophy of technology. With one exception, the now ghostly godfathers from the first two waves seem to have disappeared. Almost all the names listed in the first two waves do not occur here although Habermas, the still active voice of critical theory, does make stage appearances. The first wave exception is, of course, Martin Heidegger, whose ghost still looms – but in a very different sense than in the earlier generations. The more extreme, alarmist and fantasist tones of the past have been modulated. There is a sense here of balanced and critical thinking. The opening essays establish this balance by long views, with Lee calling into question the most ancestoral of all, the Aristotelian *episteme/techne* division which flaws Greek philosophy. And then Olsen proceeds to address the grand philosophical questions of becoming. The third wave, my generation, still retains presence with a number of the 'empirical turn' philosophers doing walk-ons in chapters here.

And, I would claim in an even stronger sense that the first 'empirical turn' in my generation, takes an even more pronounced role here with detailed and careful science-studies-like cases examined here. Imaging technologies (Rosenberger, Verbeek), technology transfers (Selinger), human enhancement technologies (Brey) – and, an old favourite of mine, navigational technologies (Jensen and Gad) – all make themselves present. There is a high sense of careful analysis and thus more concrete than the often abstract and high-altitude metaphysics of the past. New issues and new argumentative conversations have also shown up here. The 'posts' of postphenomenology, posthumanism and postmodernism all are on stage. And these pose deep questions for philosophy of technology. Yes, there are echoes here from older variants: does human history get surpassed by the newer technologies? Bostrom thinks so; others, Hale and Brey, worry. From the range of fashionable enhancement to virtual species manipulation, where do our nano-, bio- and medical technologies lead?

I detect here several other sensibilities less well developed in earlier philosophy of technology. One of these is an emphasis upon *materiality,* or upon a sensitivity to materiality. The latest surfers do not seem to take materiality to be simply plastic, rather there are unique aspects, resistances and capacities which, in the interaction with humans, must be taken into account. There is flirtation with those from science or technoscience studies who are called 'symmetrists' who are added to the conversation. Donna

Haraway already has been named in my generation, but here Bruno Latour and Andrew Pickering join the scene as well. Kaplan provides a novel notion that there ought to be a narrative history of things, drawing from Paul Ricoeur who is virtually never related to philosophy of technology. Jensen and Gad add yet another empirical dimension – they suggest that philosophers learn from the more empirical practices of anthropology and field studies, and I would say that since philosophy of technology is necessarily interdisciplinary, this, too, is a positive move. And, in one interesting twist, another new emphasis lies along normative lines, with arguments taking place concerning the possibility of an ethics of things, of extending agency to non-human actants. Verbeek takes morality to things; Hale stops short of that. All this is fresh. All this displays a very different tone than that of the earlier waves.

Of course, the background and the technological texture of this contemporary world are very different than those of the opening of the twentieth century. The rust belt, smokestack industrial technologies, then concentrated into the military and world engulfing wars with the Holocaust and following ethnic cleansings were times of horror on a global scale. And while industrial and military technologies have not disappeared and while they are still wreaking global havoc, particularly in environmental domains, an entire gestalt of new technologies lend a different texture to the contemporary. I have often joked that even the most romantic and nostalgic Heideggerian graduate students would be loath to give up notebooks, the Internet, cellphones and iPods! Both science and technology, now perhaps better termed 'technoscience', are radically differently shaped than a century ago. New waves must respond to new shorelines.

These shifts in sensibility, in problems, in phenomena analysed can even be seen in this volume with the remaining spectre, Heidegger. The still strong presence of Heidegger is here a *highly revisionist* Heidegger – none of the interpreters take him at his old face value. One, Harman, in an interesting parallel with the late Heidegger's fourfold, resurrects Marshall McLuhan as a better tetralogist, while also admitting that Heidegger's notion of technology is monochromatic and boring! Another, Riis, turns him on his head and sees the deepest type of thinking as itself craftlike and a tool – I would have added, this turns Heidegger into Dewey! Thomson, while closest to Heidegger, wants to make the saving power emerge. But now I have already said too much in that I cannot take this opportunity to comment upon each of the thinkers, even if I am proud of the several of my own students and others who were in the technoscience group in this mix. And, also, I must resist the temptation to launch into some few disagreements I have with several of the entrants.

Rather, I want to close by congratulating the editors and the contributors who show such promise for what hopefully will be a growing and maturing field of interest in technologies.

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DON IHDE

Series Preface

New Waves in Fhilosophy Series. The aim of this series is to gather the young and up-and-coming scholars in philosophy to give their view of the subject now and in the years to come, and to serve a documentary purpose, i.e. 'this is what they said then, and this is what happened'. It will also provide a snapshot of cutting-edge research that will be of vital interest to researchers and students working in all subject areas of philosophy.

The goal of the series is to have a New Waves volume in every one of the main areas of philosophy. We would like to thank Palgrave Macmillan for taking on this project in particular, and the entire *New Waves in Phi1osophy* series in general.

Vincent F. Hendricks
Duncan Pritchard

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The three editors are especially grateful that Vincent Hendricks and Duncan Pritchard had the vision to start this important series, and that they were willing to conceive of the philosophy of technology as having a crucial role within its structure. We also benefited from help provided by Peggy Noll at RIT, as well as Daniel Bunyard, formerly at Palgrave Macmillan, and Priyanka Pathak, currently their Commissioning Editor for Philosophy and Linguistics. Finally, we would like to convey our profound appreciation for the insights that Don Ihde conveyed. Without his Foreword, it would not be possible to articulate the significance of the 'new wave' that the present volume aspires to capture.

Notes on the Contributors

Jan Kyrre Berg Olsen teaches theory of science at the unit of Medical Philosophy and Clinical Theory, Faculty of Public Health, University of Copenhagen. He has co-edited (with Evan Selinger) *Five Questions in Philosophy of Technology* (2007). Berg Olsen is also editor of several volumes forthcoming in 2008, including *Technology and Science: Epistemological Paradigms and New Trends*, special edition of *Synthese*, and in 2009 *A Companion to Philosophy of Technology*.

Nick Bostrom is director of the Future of Humanity Institute at Oxford University. He previously taught at Yale University in the Department of Philosophy and in the Yale Institute for Social and Policy Studies. He is the author of more than 120 publications including in leading academic journals, and his writings have been translated into more than 16 different languages. He has published one monograph, *Anthropic Bias*, which developed the first mathematically explicit theory of observation selection effects, and he is the editor of two forthcoming books, one on global catastrophic risk and the other on the ethics of human enhancement.

Philip Brey is full Professor of Philosophy of Technology and chair of the Department of Philosophy, University of Twente, the Netherlands. He is also director of the Centre for Philosophy of Technology and Engineering Science (CEPTES) of the University of Twente and a member of the executive board of the Society for Philosophy of Technology and of the International Society for Ethics and Information Technology. Brey's research focuses on philosophy of technology, with special attention to the philosophy and ethics of information and communication technology (ICT) and the philosophy and ethics of converging technologies.

Casper Bruun Jensen is currently Assistant Professor at the Department of Organization at Copenhagen Business School. He has published in *Configurations*, *Qualitative Research*, *Science, Technology and Human Values* and *Social Studies of Science*. A volume co-edited with Kjetil Rödje and entitled *Deleuzian Intersections in Science, Technology and Anthropology* is forthcoming. Casper's current research focuses on organization and culture in development.

Christopher Gad is at the Centre for Science, Technology and Society Studies at the Department of Information and Media Studies, Aarhus University, Denmark. His theoretical and empirical interests include history of ideas, social anthropology, actor–network theory, feminist and cultural studies of science and technology, new reproductive technologies, ubiquitous/pervasive computing, and fishery inspection. He has published on feminist STS studies and post-actor–network theory.

Graham Harman is Associate Professor of Philosophy at the American University in Cairo. He is currently serving as Visiting Associate Professor of Metaphysics and the Philosophy of Science at the University of Amsterdam. He is the author of *Tool-Being: Heidegger and the Metaphysics of Objects* (2002), *Guerrilla Metaphysics: Phenomenology and the Carpentry of Things* (2005), *Heidegger Explained: From Phenomenon to Thing* (2007) and *Prince of Networks: Bruno Latour and Metaphysics* (forthcoming).

Benjamin Hale is Assistant Professor in the Environmental Studies Program and in the Philosophy Department at the University of Colorado, Boulder. For two years he was the director of the Center for Values and Social Policy, which is situated in the Philosophy Department, as well as a faculty affiliate of the Center for Science and Technology Policy Research, which is associated with CIRES, the Cooperative Institute for Research in Environmental Sciences. His primary area of research interest is environmental ethics, though he maintains active interests in a wide range of ethical topics. Currently he is working on an project on the ethical dimensions of remediation and restoration technologies.

Don Ihde is Distinguished Professor of Philosophy and the director of the Technoscience Research Group at Stony Brook University. He was one of the pioneers of North American philosophy of technology with *Technics and Praxis: a Philosophy of Technology* (1979) and has continued to publish a series of books in the field since. In more recent years, he has focused more on the relationships between technologies and the sciences with a special interest in instrumentation. These studies have included: *Instrumental Realism* (1991); *Expanding Hermeneutics: Visualism in Science* (1998) and *Bodies in Technology* (2002). His approach is today often termed 'postphenomenological' as evidenced in *Postphenomenology* (1993) and the Evan Selinger edited, *Postphenomenology: a Critical Companion to Ihde* (2006).

David M. Kaplan is Assistant Professor, Department of Philosophy and Religion Studies, University of North Texas. He is the editor of *Readings in the Philosophy of Technology,* 2nd edn (2009) and author of several articles on the moral and political dimensions of technology. He is also the author of *Ricoeur's Critical Theory* (2003) and *Reading Ricoeur* (2008). In addition, he publishes on the philosophy of food and is currently the director of 'The Philosophy of Food Project' at the University of North Texas.

Keekok Lee is currently Honorary Research Fellow in the School of Social Sciences, University of Manchester. Her interests over the years have covered a fairly wide range including social and legal philosophy, environmental philosophy, philosophy of biology and in particular of genetics, as well as philosophy of technology. Three of her more recent publications are: *The Natural and the Artefactual: the Implications of Deep Science and Deep Technology for Environmental Philosophy* (1999); *Philosophy and Revolutions in Genetics: Deep Science and Deep Technology* (2005, 2nd edn); *Zoos: a Philosophical Tour* (2006). Her current research project is in philosophy of medicine.

Søren Riis is Assistant Professor of Philosophy at University of Roskilde, Denmark. His research focus is on phenomenology and STS. His latest work includes a new interpretation of Bruno Latour, *The Symmetry between Bruno Latour and Martin Heidegger: the Technique of Turning a Police Officer into a Speed Bump* (2008), and a forthcoming monograph, *Towards a New Conception of Technology: a Critique of Martin Heidegger* (original title in German). Currently he holds a two-year research grant from the Carlsberg Foundation which he will use to do a series of phenomenological studies on contemporary architecture.

Robert Rosenberger, a visiting scholar at McGill University, works on the phenomenology of technology and also the philosophy of scientific debate. His publications include a series of articles on the roles of imaging technologies in scientific practice. He and his colleagues in the Group for Logic and Formal Semantics study prejudice reduction through game-theoretic modelling, and also the philosophy of computer simulation (see www.computationalphilosophy.org). He is currently editing *Five Questions in Philosophy of Science* (forthcoming).

Evan Selinger is an Assistant Professor at Rochester Institute of Technology. He has written many articles about issues raised in the philosophy of technology, philosophy of science, and phenomenology, and has also edited or co-edited several books on these topics. These books include: *Chasing Technoscience: Matrix for Materiality*, *Postphenomenology: a Critical Companion to Ihde*, *The Philosophy of Expertise*, *Five Questions: Philosophy of Technology*, and *Rethinking Theories and Practices of Imaging*. Presently, he is completing a monograph entitled *Embodying Technoscience*.

Iain Thomson is an Associate Professor of Philosophy at the University of New Mexico, where he received the Gunter Starkey Award for Teaching Excellence. He is the author of *Heidegger on Ontotheology: Technology and the Politics of Education* (2005), as well as numerous articles on Heidegger and other contemporary thinkers. He is currently working on a philosophical biography of Heidegger and a book explaining the impact of Heidegger's thinking about death on the subsequent continental tradition.

Peter-Paul Verbeek is Associate Professor of Philosophy at the Department of Philosophy, University of Twente, the Netherlands, and director of the international master's programme Philosophy of Science, Technology and Society. His research focuses on human–technology relations and the social and cultural roles of technology, with applications to technology design and human enhancement technologies. He recently published *What Things Do: Philosophical Reflections on Technology, Agency, and Design* (2005). Currently, he is completing a monograph on the moral significance of technologies and its implications for ethical theory and the ethics of design.

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Introduction

Jan Kyrre Berg Olsen, Evan Selinger and Søren Riis

Preliminaries

New Waves in Philosophy of Technology focuses on the immense challenges that technical artefacts, methods and systems pose to both philosophy and society. In so doing, it clarifies how technological complexity and ubiquity have transformed the very nature of philosophical inquiry. The guiding assumption that runs throughout the volume is that the long-standing divide between analytic and continental philosophy needs to be overcome. The wisdom found within the different traditions of philosophy itself needs to be integrated by principals who can clarify and assess multifaceted dimensions of technology in a thought-provoking and rigorous manner. Because we intend for the volume to advance research in the philosophy of technology, the contributions that follow are all composed by thinkers who have an acute sense of the epistemic, ontological and normative presuppositions that currently limit the field. Because we want the text to facilitate critical thought rather than advance a partisan agenda, emphasis is given to conflicting perspectives on a range of issues. Some contributors call for traditional conceptual resources to be replaced by new methods and concepts. Others advocate for long-standing ideas to be defended in order to make sense of and assess innovation.

Since all 'new waves' in philosophy draw from historical sources, the text has been organized around four easily recognizable designations: (1) history of philosophy, (2) epistemic and metaphysical concerns, (3) ethical and political issues, and (4) comparative philosophizing. The opening section of the book focuses on the challenge of linking the history of philosophy with present and future challenges to the field. The second section focuses on problems concerning technology and knowledge and technology and reality. The third section addresses issues related to technological enhancement, the future of humanity and the extent to which artefacts deserve normative consideration. The final section deals with comparative issues – issues concerning non-Western uses of technology, as well as challenges to philosophy expressed in science and technology studies.

What follows is a brief overview of the chapters. It provides a snapshot of the volume as a whole, and it offers a glimpse into some of the debates that divide the contributors as well as the broader field.

Part I History of philosophy and technology

The book opens with Keekok Lee's '*Homo faber*: the Unity of the History and Philosophy of Technology'. Lee argues for the unity of the history and the philosophy of technology. At first sight, there appears to be no underlying unity to these two domains, only divisive breaks and unbridgeable gaps – one may give a meaningful account of the one or of the other, but not of both within the same broad framework. Furthermore, certain philosophers deny that the philosophy of technology exists, much less a philosophy of technology which claims to make sense, on the one hand, of primitive technology in the dim and distant past such as bows and arrows, and of up-to-the-minute state-of-the-art technology based on contemporary science such as nanotechnology or biotechnology, on the other. One must also bear in mind that the history of Western philosophy itself has undergone so many revolutionary changes since ancient Greek philosophy, that it may be too far-fetched to argue that technology itself, primitive and contemporary, could be rendered intelligible within a common philosophical framework.

In spite of these unpromising claims, Lee attempts to give a coherent account of the history and the philosophy of technology to be generated by calling on certain well-known and undisputed philosophical insights in the 2500-year story of Western philosophy itself. She relies on the notion of *Homo faber* to provide the unifying skeletal framework within which such a coherent account of technology and its philosophy could be constructed.

In the second chapter, 'Becoming through Technology', Jan Kyrre Berg Olsen focuses on the challenge of linking the history of philosophy with present and future challenges to the theory of science by examining metaphysical aspects of the conceptual basis of classical physics (e.g. ancient Greek conceptions of time and reality – notably the conception of 'Platonic Parmenidian Reason' that arises as a consequence of Plato developing his notion of Forms based upon Parmenides' determinism, eternism and denial of becoming – and Galileo inventing the modern conception of universal law) and explaining how these metaphysical ideas not only survived, but were also strengthened by Albert Einstein's epistemological transformations of classical physics. Berg Olsen continues his essay by examining a representative array of modern thinkers within physics and related philosophies (e.g. Milic Capek, L. Sklar, M. Pauri and P.V. Christiansen) who do not endorse these classical and conventional scientific perspectives about physical reality and time. The inquiry thus proceeds from a critique of determinism to an analysis of temporality and entropy, and concludes by considering how local viewpoints can be extended globally through simple artefacts (e.g. water clocks, sandglasses, thermometers) and biological machines (e.g. processes that regulate pulse rate and heartbeat). On the basis of these considerations, Berg Olsen endorses the phenomenological claim that the embodied limits of perception and cognition constrain human debates about the nature of time.

Part II Technology: epistemic and metaphysical issues

Within the philosophy of technology, a perspective called 'postphenomenology' is emerging that include such principals as Don Ihde, Evan Selinger and Peter-Paul Verbeek, among others. In the third chapter, 'Quick-Freezing Philosophy: an Analysis of Imaging Technologies in Neurobiology', Robert Rosenberger claims that this budding viewpoint, which amalgamates phenomenology and pragmatism for the purposes of analysing the variety of ways that technologies mediate human experience of the world, enables fresh explorations of the roles that laboratory technologies play in scientific debates. Rosenberger advances this perspective by offering a general programmatic for the application of postphenomenological insights to a specific target of analysis: scientific debates which concern technologically produced images.

To concretize his analysis, Rosenberger turns to the field of neurobiology where a contemporary debate over the nature of synaptic vesicles – tiny, spherical organelles which play a central role in neurotransmission – is occurring. Central to this debate are concerns about the interpretation of images generated by a variety of techniques which freeze neurons. What Rosenberger contends is that an analysis of the technologies underlying this research will both develop the articulation of the postphenomenological perspective, and offer contributions to this neurobiological debate.

In the fourth chapter, 'How to Read Technology Critically', David M. Kaplan uses narrative theory to develop a model for interpreting technical artefacts. The premise of narrative theory is that everything has a story: everything comes from somewhere, has a history, and has relations to other things. So long as the genesis and evolution of something can be recounted, it can be explained in terms of a narrative and read like a text. According to Kaplan, stories of technology are no different. They too can be made the subject of a narrative. The only difference between the story of a technology and the story of a human affair is a shift in focus: artefacts are now placed in the foreground rather than the background and treated as protagonists rather than props. Kaplan thus examines what happens to our philosophical understanding of technology when we model the interpretation of technical things upon telling and reading stories. He contends that the result depends upon *how* we tell and read things, and argues that there is a meaningful difference between a critical reading and a conventional reading of technology. From Kaplan's perspective, the key to the distinction hinges on the relationship between the universal and the particular and the acontextual and the contextual in narrative theory and critical theory. Whereas a narrative theory without a strong theory of truth and moral right produces only conventional, contextualist readings, a narrative theory supplemented with a theory of argumentation can produce critical readings of things. According to Kaplan, technology should, therefore, not only be narrated but also read in relation to universalist concepts, such as truth, impartiality and equality. The *critical–narrative theory* of technology Kaplan proposes evaluates technical things and systems in terms of their role in achieving social justice and happiness.

In the fifth chapter, 'The McLuhans and Metaphysics', Graham Harman presents Marshall and Eric McLuhan's little-known concept of the 'tetrad', developed in their co-authored work *Laws of Media*. According this view, all human products display a fourfold structure of enhancement, obsolescence, retrieval and reversal. Harman's analysis clarifies each of these terms and emphasizes their importance for contemporary philosophy. He contends that while the McLuhans are usually celebrated as 'media theorists', the term 'media' points far beyond television and cyberspace. Instead of remaining confined to a narrow electrified province, what the McLuhans give us is a new vision of reality as a whole – that is, a new ontology.

While *Laws of Media* claims to speak of nothing but human products, Harman uses his ontological interpretation to demonstrate that the tetrads have a wider scope than is acknowledged. As he sees it, the term 'media' not only pertains to human artefacts, but its scope extends equally to animal products and inanimate objects. Objects per se are media and thereby display a tetrad structure. In so far as a medium is the site of a resonant interval between figure and ground in which the surface of an object always alludes to a concealed inner depth, no object escapes this resonance.

What the McLuhans give us, according to Harman, is thus a full-blown metaphysics of objects that rivals Martin Heidegger's ontology as the most advanced of our era. Since Harman is a highly regarded reader of Heidegger, this claim cannot be taken lightly. In order to more directly address lingering questions about Heidegger, the next two chapters examine his status as a foundational figure in the philosophy of technology. To inspire readers to think carefully about the complexity of Heidegger's legacy, differing outlooks are offered. In Part III, Heidegger's thought will be revisited again. The focus there, however, will be issues related to posthuman ethics.

In the sixth chapter, 'The Question Concerning Thinking', Søren Riis presents a new interpretation of Heidegger's groundbreaking essay, 'The Question Concerning Technology'. Riis offers a way to criticize this essay, drawing upon Heidegger's own insights on 'thinking' and the dual meaning of *Technik* in German where it designates both technology and technique.

Riis's critique posits a framework for assessing Heidegger's account of modern technology by connecting it to his analysis of *the end of philosophy*. Drawing from this link, Riis develops the argument that Heidegger's ideal of a non-philosophical kind of thinking leads thought into a dead end, one that negates anything that can meaningfully be called thought. In the last part of his chapter, Riis illustrates the discrepancy between Heidegger's technique of philosophizing and his ideal of proper thinking. By appealing to Heidegger's conception of great works of art, Riis shows how Heidegger argues in favour of a different view on thinking, one that insists on understanding thinking as a *craft* and makes it possible to appreciate philosophy and *great works of thought*.

In the seventh chapter, 'Understanding Technology Ontotheologically, or: the Danger and the Promise of Heidegger, an American Perspective', Iain Thomson offers a different take on Heidegger's ontological understanding of technology than the one Riis provides. What Thomson tries to show is that Heidegger's widely celebrated critique of technology follows from some of the most mysterious views at the core of his later thinking. He thus suggests that philosophers of technology will need to understand these difficult later views in order to appreciate Heidegger's continuing relevance to the philosophical field he helped inaugurate.

To help with this project, Thomson shows that Heidegger's critique of global 'technologization' – that is, our increasing reduction of all entities to the status of intrinsically meaningless resources standing by to be efficiently optimized – follows directly from his original understanding of metaphysics as 'ontotheology'. According to Heidegger's mature view, our reductive technological 'enframing' of reality is grounded in Nietzsche's ontotheological understanding of being as 'eternally recurring will-to-power', mere forces locked in an expanding cycle of 'self-overcoming'. For this reason, Heidegger came to believe that getting beyond our reductive technological understanding of being requires us to uncover, contest and transcend some of the deepest and most destructive metaphysical presuppositions; we need to supersede an ontotheology that continues to guide our historical age. But how exactly did Heidegger think we could transcend such technologization without abandoning our technological advances? And what are the prospects and limitations of Heidegger's views today? These are just two of the questions that Thomson helps us to think through.

Part III Technology: ethical and political issues

In transhumanist analysis, changes in personal identity resulting from human enhancement can only be for the good. Human enhancement makes for better people who have more self-esteem and are held in higher esteem by others, and these benefits for individuals add up to a benefit for society as a whole. In the eighth chapter, 'Human Enhancement and Personal Identity', Philip Brey argues that this analysis is an oversimplification, and that ensuing changes in personal identity can engender significant harms that will often outweigh such benefits, both at an individual and societal level.

Brey first analyses how human enhancement may negatively impact self-conceptions of agency and achievement, and therefore self-esteem. He then goes on to study how the large-scale use of certain human enhancements will change existing conceptions of normality and how this may negatively impact the social status and self-esteem of the unenhanced. Brey proceeds to analyse how the introduction of superhuman traits and traits that cross species boundaries produces new social identities and leads to new class systems. Human enhancement, Brey concludes, will likely introduce new, morally undesirable inequalities between individuals and groups, and will often undermine rather than enhance the self-esteem of persons and diminish rather than improve their quality of life.

As a contrast to Brey's scepticism about transhumanism, the next chapter contains reflections on the future of humanity from Nick Bostrom, a leading transhumanist advocate and spokesman. As Bostrom notes, our beliefs and assumptions about the future of humanity shape decisions in both our personal lives and public policy – decisions that have very real and sometimes unfortunate consequences. In the ninth chapter, 'The Future of Humanity', Bostrom sketches an overview of some recent attempts to develop a realistic mode of futuristic thought about big picture questions for humanity, and offers a brief discussion of four families of scenarios for humanity's future: extinction, recurrent collapse, plateau and posthumanity.

Bostrom posits that technology emerges as a central parameter that defines the human condition. The nature of technological development, therefore, becomes a key issue when thinking about the future of humanity. According to what Bostrom calls the Technological Completion Conjecture, all important basic capabilities that could be obtained through some possible technology will in fact be obtained, provided that scientific and technological development efforts do not effectively cease. This conjecture, if true, would significantly constrain the range of tenable views about the long-term prospects for humanity. Even so, it leaves room for a range of scenarios. Nevertheless, Bostrom contends that the longer the timescale considered, the greater the probability that humanity will either become extinct or reach some kind of 'posthuman' condition.

In the tenth chapter, 'Technology, the Environment and the Moral Considerability of Artefacts', Benjamin Hale argues that of the entities in the world that can be called 'morally considerable', technological artefacts are among the few that are not considerable. He reasons that technological artefacts are the product of a comprehensive process of justification, and for this reason maintain only an anthropogenic value. Hale's argument builds upon a deontological reinterpretation of the concept of moral status. He proposes first that moral language places undue weight on the *status* of entities and not on the *duties* that agents have to behave rightly. Consequently, Hale suggests inverting the problem of moral status, such that moral questions are framed not in terms of which entities are valuable, but in terms of what an agent has a duty to do. He then suggests that one has a duty to justify one's actions, to act with good reasons, to consider, in effect, others and the implications of one's actions. Thus, Hale believes, almost all entities in the world are morally considerable – worthy of consideration – with the exception of technological artefacts. He arrives at this counter-intuitive conclusion by reasoning that insofar as technological artefacts are the product of broad-reaching consideration, the moral work has already been done. By examining several cases – the supposed 'death' of the electric car, the use of Mondrian's painting as performance art, and the use of a stranger as a human canvas – Hale forges a case that appears to run contrary to the claims of Peter-Paul Verbeek.

In the eleventh chapter, 'Cultivating Humanity: toward a Non-Humanist Ethics of Technology', Verbeek examines how ethical theory can take into account the moral character of technology. He contends that ever since the Enlightenment, ethics has had a humanist character, taking the individual human being as the fountainhead of moral decisions and practices. From this orientation, it is highly problematic to attribute any form of morality to technological artefacts. Yet, virtually all human actions and decisions are technologically mediated. And since ethics is all about the questions 'how to act' and 'how to live', this central role of technologies in human actions and decisions justifies the claim that they are at least morally *relevant*.

Verbeek's contribution thus examines the ethical implications of this moral relevance of technologies by seeking a way to develop a non-humanist ethical framework. First, he examines the humanist character of ethics, by discussing and linking Heidegger's and Bruno Latour's modernity critiques. For both, modernity consists in the radical separation of subjects and objects. By making human 'subjects' and the 'objects' in reality absolute, Verbeek claims that modern thinking about humanity congealed into humanism and modern thinking about reality into realism. The intricate connections between both, which, according to Verbeek, actually cannot be had separately, disappear out of sight. This metaphysical orientation resulted in a 'humanist bias' in ethics, in which only human beings have moral relevance.

In a critical discussion with Peter Sloterdijk's 'posthumanist' position, Verbeek investigates how technologies can also get a central place in moral reflection. Sloterdijk holds that the humanist tradition has always tried to 'cultivate' the human being; to 'tame' it with the help of texts. But technological developments have now made it possible to cultivate human beings in quite a different way: by literally 'breeding' or 'growing' them. And rather than shying away 'humanistically' from the technological possibility to alter the biological constitution of the human being, Sloterdijk urges that we should take responsibility for these posthumanist 'anthropotechnologies'.

Verbeek reverses Sloterdijk's argument. Rather than associating the 'taming' of human beings with the texts of the humanities, and the 'breeding' of humans with technology, he elaborates that the most important cultural role of technology consists precisely in what Sloterdijk calls the taming of humans – helping to shape what it means to be human. Not only do interventions in the physical constitution of *Homo sapiens* change the human being, but so too do technological mediations of our actions and perceptions, which help to constitute humans and reality in their mutual relations. To explore the ethical implications of this moral relevance of technologies, Verbeek elaborates how the ethics of design can be expanded to also include anticipations of technological mediations of human existence. Moreover, in discussion with the ethical work of Michel Foucault, he investigates how ethical theory can incorporate the constitution of subjectivity involved in using technologies.

Part IV Comparative philosophy of technology

In the twelfth chapter, 'Technology Transfer and Globalization: a New Wave for Philosophy of Technology?', Evan Selinger agues that philosophers are paying insufficient attention to globalization, and that the analyses which do address them have occluded crucial issues related to technology and development, particularly dilemmas concerning technology transfer. After meta-philosophically identifying the bases for this occlusion, Selinger turns to recent debates about the Grameen Bank's microlending practices – debates which depict participating female borrowers as having fundamentally empowering or disempowering experiences. Concretizing his analysis through consideration of the Village Phone Programme, an initiative that enables Bangladeshi women to become 'entrepreneurs' who rent out mobile phone calling time, he argues that the existing discursive frameworks which have been used to appraise it may be too reductive. By appealing to postphenomenological considerations, Selinger demonstrates that such frameworks can conceal how technique and technology simultaneously facilitate relations of dependence and independence, and diminish our capacity to understand and assess innovative development initiatives.

In the thirteenth and final chapter, 'Philosophy of Technology as Empirical Philosophy: Comparing Technological Scales in Practice', Casper Bruun Jensen and Christopher Gad engage with philosophy in an interdisciplinary manner. They appeal to insights expressed in science and technology studies and attempt to further the theoretical trajectory of exploring the world as 'multiple'. Emphasizing issues related to 'multinaturalism', they develop the notion of 'empirical philosophy' and characterize it as the capacity to take seriously the multiple ways that actors deal with such philosophical concerns as what is good or right in practice. Through this intervention, Jensen and Gad try to demonstrate that empirical philosophy can function as an interface between philosophical and anthropological inquiry into technological scales, including the pervasive contrasts of 'good' vs 'bad' technologies and 'high tech' vs 'low tech'.

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Part I

History of Philosophy and Technology

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1

Homo faber: the Unity of the History and Philosophy of Technology

Keekok Lee

1.1 Introduction

This essay argues for the unity of the history and the philosophy of technology. At first sight, there appears to be no underlying unity to these two domains, only divisive breaks and unbridgeable gaps – one may give a meaningful account of the one or of the other, but not of both within the same broad framework. Furthermore, while many philosophers concede that technology has existed for as long as humankind has existed as a tool-using and tool-making species, others deny that the philosophy of technology exists, never mind a philosophy of technology which claims to make sense, on the one hand, of primitive technology in the dim and distant past such as bows and arrows, and of up-to-the-minute state-of-the-art technology based on contemporary science such as nanotechnology or biotechnology, on the other. One must also bear in mind that the history of Western philosophy itself has undergone so many revolutionary changes since ancient Greek philosophy, that it may be too far-fetched to argue that technology itself, primitive and contemporary, could be rendered intelligible within a common philosophical framework.

In spite of these unpromising claims, this essay attempts to give a coherent account of the history and the philosophy of technology to be generated by calling on certain well-known and undisputed philosophical insights in the 2500-year story of Western philosophy itself. It relies on the notion of *Homo faber* to provide the unifying skeletal framework within which such a coherent account of technology and its philosophy could be constructed. The essay touches upon the following concepts and themes:

1. *Homo faber* and its associated concept of artefact will be shown to be just as fundamental as the Cartesian notion of the cogito, to an understanding of *Homo sapiens*. Humankind, since its inception, used tools and materials both to ensure its survival as well as to express freedom/self-realization. The essence of *Homo faber* is to control and manipulate nature

to serve human ends – in this crucial sense, the instrumentalization of nature is built into the concept.

2. The means of *Homo faber* undoubtedly have altered over the millennia, from the found technology at its earliest beginnings, to the very extensive history of craft-based technology from Neolithic times to the middle of the nineteenth century CE when technology began to take the form it does today, as science-induced technology. Although the means to achieve the goal have changed unrecognizably and spectacularly through the ages, the goal of the manipulation and control of nature for human purposes remains steadfastly unchanged, whatever the changes in science and in philosophy themselves.
3. Aristotelian philosophy and science went hand in hand. Although ancient Greek philosophy did not celebrate *Homo faber* exclusively (if at all), neither did Aristotle ignore the notion altogether. In this regard, it is instructive to point out that the basic Aristotelian understanding of scientific explanation is in terms of the four causes which have been extrapolated from his analysis of the notion of an artefact, a notion which is intrinsically related to that of *Homo faber*.
4. Modern Western science which displaced Aristotelian science and philosophy is in turn embedded in modern Western philosophy, whose metaphysics and methodology may be summed up in terms of scientific naturalism. In this philosophical framework, the notion of *Homo faber* occupies centre stage; one of the key goals of this new philosophy remains the fundamental one of controlling and manipulating nature to advance human welfare and freedom/self-realization. The discoveries of the basic sciences (since roughly the 1850s) are used to generate increasingly more and more powerful technologies for the purpose of controlling and manipulating nature. Therefore, on this fundamental goal of science and its philosophy, there is indeed no basic disagreement between Bacon (empiricism) and Descartes (rationalism), as well as between them on the one hand and Heidegger or Jonas on the other.
5. The respective epistemological goals of technology and science may differ on the surface – to many philosophers the latter emphasizes truth (through truth, explanation and prediction) while the former utility (does it work, rather than is it true?), the one seeks to establish laws of nature while the other rules of efficiency. However, rules of efficiency are not free-floating but grounded ultimately in laws of nature, which grounding provides a more secure, more powerful platform from which to conduct the project of controlling/manipulating nature.
6. From the theses above, it is plausible to conclude that within the project of modern science and modern philosophy from the seventeenth century in Western Europe, in spite of the differing voices and commentaries on it, there may be a unity underlying the apparent disunity. More

specifically, it is to say that although modern science and its accompanying philosophy constitute a rupture with the past, from the point of view of the philosophy of technology, it is not so radically different from the age it superseded, as fundamental to any philosophy of technology must be the unifying notion of *Homo faber* and its related concept of artefact.

1.2 The concepts of *Homo faber* and artefact

To understand what kind of being is *Homo sapiens sapiens*, it is not enough simply to conceive the species as Descartes has done, essentially as thinking, symbol-using beings with its peculiar type of consciousness mediated through language. Such a conception tells only half the story. It leaves out two other significant features of humans: as bipeds, their hands, with opposable thumbs, have become extremely agile in manipulating things, and such manipulation is informed by input from their exceptionally large cortex. In other words, humans are not simplistically divided into brain workers (who are necessarily feeble with hand manipulation) and hand workers (who have low-grade intellectual capabilities), in spite of the enforced division of labour especially in modern times. In reality, the brain informs the hands in their manipulation of objects turning these objects into tools (the adze) and artefacts to serve various purposes, such as providing shelter, capturing/killing animals for food, etc. It is inevitable that humankind, like all other organisms, should make use of natural resources to further their own goals of survival, but furthermore, to carry out their own projects of self-realization such as shown by the cave paintings found in Lascaux, France, or Altamira, Spain, which can be dated to the Upper Palaeolithic, perhaps even as far back as 25,000 BCE.

In this sense, humans have always inescapably adopted an instrumental attitude towards nature. However, this must be distinguished from that of instrumentalism, an extreme anthropocentric world view which first emerged in a strident form in the modern era of human history, since the seventeenth century in Western Europe – nature exists only to serve human ends but is otherwise valueless.

Adzes as well as paintings are artefacts. A (human) artefact may be defined as the embodiment of human intentionality. Thus defined, it is a subcategory of the more general category of artefact; it does not necessarily deny that animals such as beavers build dams or birds nests. As human consciousness is unique, it follows that human intentionality may also be unique. For this reason, it would be misleading to argue that as humans are not the only type of tool-making being, one may dismiss the view that the concept of *Homo faber* is crucial to a proper understanding of *Homo sapiens sapiens* and its peculiar type of consciousness. The concept of *Homo faber* and its related concept of artefacts supremely bear out this claim.

To elucidate these key concepts, let us turn to Aristotle's discussion of the four causes. Aristotle meant to provide a complete explanation of a phenomenon in these terms. However, he had also elucidated the concept of artefacts, as he himself, for ease of exegesis, chose to use artefacts to illustrate the four causes. Take a statue. It is made of marble – its material cause. It is carved by a particular sculptor(s) – its efficient cause. It is sculpted as an image of Bucephalus – its formal cause. It was commissioned by Alexander the Great – its final cause. The formal, final and efficient causes involve human intentionality in this artefact. The sculptor intended to sculpt the horse's image because its master intended to pay homage to it, and the sculptor intended to make himself the efficient agent in carrying out the intention of his commissioner.

In this example, only the material cause, the marble, is 'given'; it, per se, has not come into existence because of prior human intention and manipulation. In that sense, the marble is a naturally occurring entity, although after it has been requisitioned by the commissioner and the sculptor and turned into a statue of Bucephalus itself, the worked-upon marble has become the material embodiment of human intentionality. In other words, an artefact made out of the marble has been created, although the original marble itself is not an artefactual entity.

However, the example may be misleading. In a society whose technology is craft-based, the material cause is usually (not invariably) 'given' or 'found'. But as societies and their technologies develop, the efficient agent was able even in ancient times to create an artefact out of matter, which is not found in nature. Instead of making a rocking horse from wood, one could make it out of bronze and, today, one can make it out of plastic. Neither bronze nor plastic as such is 'naturally' found. The former is an alloy, fabricated from two naturally occurring metals, copper and iron; the latter is derived from something, which is naturally given and found, namely oil. Bronze and plastic are both artefacts; however, their difference lies in the fact that the plastic rocking horse is an artefact with a much deeper degree of artefacticity than a wooden or indeed even a bronze one. In the case of the wooden horse, apart from chopping down the tree and letting the wood season itself, the artisan would not have manipulated and altered its character in any significant way. However, in the case of the plastic horse, without the developments in theoretical chemistry and the technology they induced, plastic would just not exist as a substitute material for wood in the production procedures.

Aristotle's elucidation of the four causes, which can in principle cover not only abiotic/exbiotic but also biotic artefacts, may also be said to constitute the notion of extrinsic/imposed teleology. *Ex hypothesi*, artefacts would, and could, not have come into existence or continue to exist, but for the fact that humans have designed them to serve specific purposes. Take samurai swords. Should humankind suddenly become extinct, there would no longer be samurai swords, whether to serve the historic purpose of killing one's enemies, or today's purely aesthetic purpose. There would only be bits of physical matter, which are subject to the laws of eventual decay. Their 'tele', so to speak, are bestowed on them by their human fabricators; herein lies the force of the thesis of extrinsic/imposed teleology. On the other hand, naturally occurring organisms (as opposed to biotic artefacts, such as transgenic organisms) have come into existence, would continue to exist, would go out of existence (in principle) independently of human purpose or design; their 'tele' are intrinsic to them as they reproduce, grow, mature and die according to their own laws of development; as such, they exemplify the thesis of intrinsic/immanent teleology. A fruit fly is not an oak; one is an animal, the other a plant. The male fruit fly copulates with the female, fertilizes her eggs, which are then laid; the eggs hatch to become larvae, moulting twice to become adult fruit flies. The lifespan of *Drosophila melanogaster* is 30 days at 29°C. The oak reproduces through acorns which it starts to produce when it is about twenty five years old, accelerating production till it reaches 100, after which its acorn production starts to decline. An oak can live for as long as 200 years.

One can see that the concepts of *Homo faber*, artefacts and technology are inextricably linked. One must next turn to the history of technology for further elucidation of this intimate link.

1.3 The word 'technology'

From the Greek word *techne* – delineating the domain of know-how, as opposed to that of knowledge or episteme – is derived the word 'technology'. In English, 'technology' was given its modern usage in 1706, and in German by 1728, through the distinction often made between science and technology, between theory on the one hand and its application in ultimately manufacturing products on the other.

'Technology' is derived not only from *techne* but also from *logos*. When Aristotle combined them as a single word, he used it in the context of rhetoric; hence, the Greek term 'technology' meant 'the study of grammar or rhetoric' and the term 'technologist' referred to the grammarian or rhetorician.

What could account for the dramatic change in denotation of the word between Aristotle's use and its modern usage? This is due to a deep ontological divide between the moderns on the one hand, and Aristotle (and Aristotelians) on the other, in their respective conceptions of nature and the world around them. According to Aristotle, *techne* involved *logos*, but *logos* had nothing to do with mathematical or quantitative concepts or reasoning. What could be grasped by *techne* through *logos* was merely the form or the 'whatness' of the thing that was being made or done. But the matter itself, out of which the thing was made, and the actual procedures of making it, fell outside of *logos*. In producing an artefact such as a table, the form is the idea in the head of the artisan.

Aristotle understood matter to be embodied in particulars. Hence the place of *logos* – the logical universal – was necessarily limited in knowledge about particulars. Knowledge of particulars is acquired essentially through imitation, practice and experience – one does not become a builder by reading manuals, but by building and thereby coming to know intimately the properties and propensities of the stone that one is building with.

This limitation of the role of *logos* in the case of *techne* would also explain why Aristotle produced a *logos* of the *techne* of persuasion, because language is a rarefied medium, and is not material in the way that blocks of stone are material particulars. Here, one can lay down a systematic discourse about the means and procedures involved in the art of persuasion – a recognition that words, even when divorced from reason, are a powerful means to get an audience to accept certain ends or do certain things. There is a logic of means – a set of general rules and devices – irrespective of the ends to which the means may be put, which could be laid down and learnt. Although Aristotle did claim that one could produce similar discourses about every other art, it remains true he never did, except in the case of the Rhetoric. As a result, the term ‘technology’, as noted earlier, comes to mean no more and no less than simply the study of grammar or rhetoric. Aristotle as good as conceded that as far as *techne* in general is concerned, apart from grasping form, there is no *logos* of the activity involved qua activity.

In contrast, modern technology is predicated on the assumption that there is a procedure of production which has nothing to do with the particular forms of things. Aristotelians regarded matter as taking on forms, and held that there was a desire on the part of matter to unfold itself in accordance with the forms the particulars involved. But with modernity, as it emerged under the influence of Galileo, Descartes, Newton and others, matter becomes inert, dead matter. According to the Cartesian view it is mere extension, which is devoid of form, potentiality or telos. Being deprived of any desire or aspiration of its own, it opens the way for what, as mentioned earlier, is called instrumentalism/strong anthropocentrism, which regards humans as the sole source and locus of intrinsic value, and nature as being of only instrumental value to humans.

As matter is considered to be uniformly inert under modernity, there can, then, be a general procedure of production, which consists ultimately of the rearrangement of the elements of such matter to serve human ends. So technology in modern terms is the study of the manipulation of nature. From the manipulation of words, it becomes the manipulation of matter. Such a drastic change in meaning reflects the revolution in world view, from the Aristotelian paradigm of living, organic matter to that of mechanism and its conception of dead, inert matter as well as of reductionism. Therein lies at least one very significant passage to modernity.

1.4 History of technology and its relation to modern science

There is more to technology than meets the eye; one must briefly look at technology in general and its history. For a start, technology – in the general sense of the manipulation of nature to suit human purposes – is not peculiar to modernity. Technology had always existed since the first adze made by our Stone Age ancestors. It should not be understood as merely coterminous with our contemporary variety rooted in modern science.

To do justice to all historical forms of technology and to provide a comprehensive framework for a philosophical analysis of technology, it is necessary to emphasize the similarities as well as the differences behind the changing character of technology itself throughout human history. Pre-modern technology primarily involves the will to survive and to satisfy basic biological needs as well as to meet, in so far as there is surplus in the economy, the need for self-realization, rather than the will to control and manipulate nature per se. However, technology in modernity is primarily about the will to control and manipulate nature per se, apart from pursuing the goal of ever improving the material well-being of humans, as well as advancing freedom and self-realization. In other words, the notion of *Homo faber* itself under pre-modernity and modernity has changed and evolved, with different world views standing behind its respective understanding in the two periods distinguished.

Scholars of (European) technological civilization have suggested dividing it up into various phases. Mumford proposed a threefold division (whose edges are meant to be overlapping) in terms of the type of energy and characteristic materials used. The eotechnic phase is a water–wind–wood complex; the palaeotechnic, a steam–coal–iron complex; the neotechnic, an electricity–alloy (as well as synthetic compounds) complex. The first, for him, stretches roughly from AD 1000 to 1750, the second, from 1750 to the 1850s, and the third, from the 1850s to the present.

Mumford's classification is heuristically enlightening in general but another equally appropriate may be proposed, namely, whether technology is craft- or science-based. In the case of the latter, it would be argued that what is significant is the relationship between the technology and the kind of science it might rely on. The suggested classification in the context of European technological history is as follows (with overlapping boundaries):

- *Phase I.* Includes 'found technology' which involves some degree of shaping and designing the found item to suit the purpose in hand – a 'prototechnology' which, today, is said to exist among certain primates, such as chimpanzees, but in the main, this phase covers relatively autonomous craft-based (though not necessarily guild-based) technology:

  A Roughly equivalent to Mumford's eotechnic phase.
  B Roughly equivalent to Mumford's palaeotechnic phase.

- *Phase II.* Science-theory-led technology:
  - A Roughly equivalent to Mumford's neotechnic phase, but ending by the 1940s.
  - B From the 1940s to the present.

Note that this division fails to superimpose neatly upon that which obtains in the history of science itself. There the radical cleavage is between pre-modern science (up to the seventeenth century) and the rise of modern science (from the seventeenth century onwards). Phase IA falls clearly into the pre-modern scientific era, but Phase IB (roughly up to the 1850s) falls clearly into the modern scientific period. In other words, the major cleavage has been drawn between the kind of technology which is theory led and inspired, in contrast to that which is relatively autonomous of basic scientific theories and discoveries themselves. Although Phase IB, in terms of temporal location, coincided with the rise of modern science, the technology it represented was, nevertheless, by and large, not a spin-off of theoretical advances.

On the contrary, during this period, it often happened that technology inspired theoretical research rather than that theoretical advances led the way to new technologies. This holds in the case of the steam engine, which first appeared in the form of the steam pump, invented as a response to the demands of the coal mining industry to mine seams at deeper levels where flooding occurred. It later made railway transportation possible as the steam locomotive, and replaced sailing ships on the high seas in the form of the steamer. Attempts to improve its efficiency eventually led to the establishment of the abstract, fundamental science of thermodynamics. Carnot, a French army officer and engineer, set out to understand how the steam engine worked, hoping thereby to improve its efficiency. The English had invented the machine enabling perfidious Albion to be superior both in war and industry. He studied the phenomenon of heat with the goal of recapturing that superiority for France, and in the process discovered the laws of thermodynamics. He found an intrinsic inefficiency in the conversion of heat to work. The steam engine works because parts of it are very hot and other parts very cold. Heat moves from the hot to the cold and in so doing, work is performed. But when the parts reach the same temperature, that is to say, a state of equilibrium, no further work can be performed. A difference in temperature between parts of the system – a difference in energy concentration – must obtain for work to occur. He also discovered that as energy moves from a higher to a lower level, less energy is available for work on the next round.

Even more remarkably, during Phase IB, technological discoveries, which formed the very basis of the Industrial Revolution, were made by people who knew no science, had no formal education and, indeed, in some cases, could not even read or write. The most famous of these apprentices and craft-based mechanics is George Stephenson, whose biography illustrates not merely the more humble origins of the inventors of many remarkable technological discoveries, but also the class-based difference at the time, at least in Britain, between technology and the practical (those who work with their hands) on the one hand, and science and the theoretical (those who work with their brains) on the other. The ancient universities of Britain, then, did not want to know either science or technology. The Royal Society was established to cater in the main for (pure) science, and was supported and patronized by gentlemen and members of the Establishment. Technology, instead, belonged to the mechanical societies, which grew up in the eighteenth century in the cities of Britain. It was nurtured and supported by the combined zeal of entrepreneurs, industrialists, engineers, unlettered and untutored mechanics; in other words, of people who dirtied their hands in one way or other with industry and manufacturing.

From this point of view, it is not unreasonable to argue that Phases IB and IA, in spite of differences between them, share the essential similarity of being craft-based and relatively autonomous of explicit scientific/theoretical input. Phase IA includes inventors like Leonardo da Vinci (1452–1519), but in spite of the ingenuity of his many inventions, he is not celebrated in history for his contribution to science, but as a Renaissance genius in the design and execution of artefacts, belonging to both the fine and practical arts. He considered himself to be a 'man without letters'. Other giants of the period, like Galileo, were hired by rulers, for instance, to improve their weapons of war which, in turn, led them to so-called pure scientific research and to establish new sciences. Yet others, like Sir Isaac Newton (1642–1727), often hailed as the greatest scientist of all times, concentrated on the theorizing, and did not dabble at all in technological inventions. (However, Newton dabbled a lot in alchemy, so much so that Keynes was moved to say that 'Cambridge's greatest son' was 'not the first of the age of reason' but 'the last of the magicians'.) In other words, both Phases IA and IB displayed a split between science and technology – either science was pursued relatively autonomously of technology or that technology led the way to scientific theorizing. The causal direction the other way round, of theory inducing technology, by and large did not occur until much later on.

One difference between the two substages of Phase I worth commenting on is this: IA is, on the whole, an era of creative syncretism. Western Europe collected unto itself the technological innovations of other civilizations, adapted and built upon them. To mention just a few – the watermills, already in place in the earlier part of the Christian era, could be traced back to the waterwheel of the Egyptians who used it to raise water. The windmill had probably come from Persia in the eighth century. Gunpowder, the magnetic needle and paper came from China, the last two via the Arabs. Europe by AD 1000 was ready to receive these and other discoveries (such as algebra from India, again via the Arabs). Glass technology (known as far back as the

Egyptians), improved and developed, laying the foundation for the development of astronomy, and of bacteriology by Leeuwenhoek in the mid seventeenth century. The former was made possible by the invention of the telescope – by a Dutch optician, Johann Lippersheim in 1605 – which Galileo perfected; the latter by that of the compound microscope (Zacharias Jansen, another Dutchman, in 1590).

Phase IA was largely based in Western (continental) Europe; in contrast, England became the main focus of Phase IB, based on the steam engine, the symbol of the Second Industrial Revolution. But even here, it could be said that the conception of the steam engine might ultimately be traced back to Hero of Alexandria, the translations of whose works in the sixteenth century, had made people turn to the steam engine as a possible source of power and energy. The relative backwardness of England, ironically, made it more ready to welcome and push through the developments associated with Phase IB.

It is clear that the history of science and the history of technology in modern Western Europe, at one level of understanding, are not neatly harnessed in tandem. While Phase I technology stood relatively autonomous of theoretical/scientific input, Phase II shows a marked difference – the major technological innovations are theory led or induced. Regarding Phase IIA, on the theoretical side, by 1830, most of the fundamental scientific discoveries had already been made. In electromagnetism, Faraday, in 1831, found that a conductor cutting the lines of force of a magnet created a difference in potential. This, together with the work done by Volta, Galvani, Oersted, Ohm, Ampere and Henry, provided the theoretical foundation for the conversion and distribution of energy as well as for such significant inventions like the electric cell, the storage cell, the dynamo, the motor and the electric lamp. From the 1870s, these were spectacularly translated into industrial terms in the form of the electric power station, the telephone and the radio telegraph. Augmenting these were the phonograph, the moving picture, the steam turbine and the aeroplane.

That was on the physics front. On the chemistry front, it was the isolation of benzene by Faraday in the 1830s (and later, the use of naphtha) which made the industrial use of rubber possible. Advances in organic chemistry permitted the industrial utilization of coal beyond using it as a direct source of energy. From one ton of coal, one could get 1500 pounds of coke, 111,360 cubic feet of gas, 12 gallons of tar, 25 pounds of ammonium phosphate and 4 gallons of light oils. From coal tar itself, the chemist produced new medicines, dyes, resins and perfumes. Metallurgy also took revolutionary steps forward; however, aluminium, discovered by Oersted as early as 1825, had to await the arrival of electricity, as the cheap source of energy, before its commercial exploitation became feasible in the last decade of the century. Rare metals were incorporated into the industrial procedures – for example, selenium, whose electrical resistance varies inversely with the intensity of light, was used in automatic counting devices and electric door-openers.

At this stage, something never seen before in the history of humankind emerged from Western Europe: (a) from a situation where technology solves a specific problem to one where deliberate and systematic inventions appear looking for a new use or uses for them; (b) the realization that a technological problem would only be satisfactorily solved when a theoretic formula is worked out which would permit the technological solution to be produced.

In other words, it was only roughly from 1850 onwards that modern society began to reap the material benefits promised by modern science and its method. That promise took more than two centuries to materialize when the paths of theoretical science and technology no longer diverged but began to be harnessed to work as joint forces. The team may be said to be led by pure science, the senior partner, while technology, in the main, follows. In Phase I when each was relatively autonomous, technology, sometimes, led the way to theoretical advance – witness the relationship between the steam engine and the fundamental science of thermodynamics. However, under the new settlement, technology has lost that causal initiative and now becomes, much more so than before, the executive arm, so to speak, of pure science.

1.5 Modern science and scientific naturalism

Modern science originated in Western Europe in the seventeenth century. But science, modern or pre-modern, is unintelligible without grasping that it can only take place within a certain philosophical framework, and in particular, a type of metaphysics and epistemology. The philosophy of modern science may be called empiricism-cum-positivism and its metaphysics, Scientific Naturalism, together with its revolutionary mechanistic paradigm and world view, brought to maturity primarily by Galileo (1564–1642) who replaced qualitative with quantitative measurements and mathematics. However, the efforts of others such as Kepler (1571–1630) must not be ignored. Kepler formulated the principle of inertia, that bodies tend to remain stationary wherever they might be, thereby challenging the Aristotelian conception of natural movements, namely, that each of the four elements has a natural home assigned to them; for earth and water it is the ground such that objects pertaining to them possess the natural tendency of gravity enabling them to strive to return to their natural abode if they were removed from it, while for fire and air, their natural abode is above the ground, such that objects pertaining to these possess the natural tendency to levity. Such a type of explanation is called teleological. (This sense of teleological refers to the final and formal causes of a phenomenon.) Furthermore, Kepler explained gravitation not in terms of the Aristotelian thesis of natural movements just outlined but in terms of mutual affection which draws a body towards neighbouring bodies – the stone falls to the ground because the ground attracts it. In the same way, the tides change because the moon attracts the water. To these innovations, he added a third – that, in physics, the word 'anima' be replaced by 'vis'. The former embodies the conception of a vital force or energy capable of producing qualitative changes, the latter that of a mechanical energy or force, which is itself quantitative, bringing about quantitative changes. In other words, Kepler, like Galileo, advocated the mathematization of nature, entailing not only a change in scientific method, but also a profound change in world view, from an organic to a mechanistic one.

Galileo saw mathematics and mathematical measurement as indispensable to the study and understanding of nature as well as a tool to make it disclose its secrets to us. The marriage of mathematics to physics constituted a radical departure from Plato's and Aristotle's views of the relationship between the two subjects. Plato disparaged the physical world as being transient and subject to decay – true knowledge is about objects which are immutable and eternal. Pure mathematical ideas seem to qualify for such a status. Plato thought the forms alone worth studying. Aristotle, on the contrary, inferred from the very abstract character of mathematical procedure that mathematics could have nothing to offer to physics, as the latter is concerned with the study of matter and its motion, which mathematics ignores.

For Galileo, mathematics enables one to make calculations, which could then be tested to see if they fit observation. If they do not, this should not be construed that either calculations are irrelevant (Aristotle) or that observation is not required (Plato). A bad fit could signal that the scientists have left something out of account and that they should go back to redo their homework. For Galileo, observations and measurements yield scientific facts, and if these conflict with existing philosophical beliefs, it is orthodox philosophy and not science that should give way. Careful observation of the moon's surface through the telescope has shown that it is not smooth, but has craters and mountains; dismissing such evidence in the name of Aristotelianism would amount to a mere dogmatic appeal to authority. This would be neither good philosophizing nor practising good science, but sterile mouthing of the philosophy of others. Galileo was hostile to the Aristotelians precisely because he was against the dogmatism they displayed.

Mathematical physics soon established itself as the queen of the new sciences. But whether Galileo and others anticipated or intended its implications is immaterial; its success definitively helped to usher in the mechanistic world view. The new science and its method imply a new philosophy and cosmology. The mathematization of nature meant that a new 'reality' emerged, one based on abstraction, isolation, measurement and quantification. Galileo gave expression to it in *The Assayer*, a work which may be read as his attempt to formulate a philosophy of science, albeit not in a systematic manner, which, when spelt out, consists of the following theses:

1. What is real and resides in (material) substances is what Locke later called 'the primary qualities', namely shapes, numbers and motions. These

alone would be sufficient to excite in us tastes, odours, sounds and colours, what Locke calls 'the secondary qualities'.
2. The elimination of secondary qualities, that is, of qualitative differences between things, is required because what is real and intelligible in nature is what is measurable and quantifiable. The ontology implied consists precisely of holding that what is real is what is measurable and quantifiable, and only what is measurable and quantifiable is real.
3. The elimination of secondary qualities permits the reduction of a complex whole (with its sensuous qualities) to the relatively simple matrix of what could be weighed, measured and counted.
4. Secondary qualities are not only derivative and dependent upon the primary ones but are also totally mind-dependent and hence are mere appearances with no objective existence. Galileo called them 'mere names' to which there are no referents in the 'objective real' world, but at best refer to mental phenomena residing in living, sensible (human) beings.
5. This means that the natural world studied by the new science is necessarily a world of pure quantity from which living and sensible beings have been excluded. In other words, it is a dead, inert nature that is being studied.
6. As such, the new science concentrates on the overt, the outer, the public, the impersonal, capturing their quantifiable features in laws of nature, which are meant to be universal in scope. By the same token, it ignores or downgrades immediate experience, the qualitative, the covert, the inner, the private, the personal or the particular.
7. Its epistemology consists of holding that what is knowable is what is measurable and quantifiable, and only what is measurable and quantifiable, is knowable.
8. Humans, as students of nature, therefore, stand outside nature.
9. The scientists become instruments for recording and analysing the real and the knowable. Apart from the processes of thinking which involve their intellectual/logical capabilities, their sensory and emotional reactions are neutralized or eliminated both in the design of the experiment and the analysis of its results. Scientific data are emotion- and value-free. Science becomes the most rational, if not the only, form of rational activity.

The above amounts to an outline of what is also sometimes called the metaphysics and epistemology of Scientific Naturalism. On this mechanistic view of scientific method and of nature, the behaviour of natural entities, their processes of change and maintaining dynamic stability are understood as regularities or uniformities, as mere movements, which are the result of the impact of one body on another, the attraction of one body towards another, or the repulsion of one body by another. Hume's analysis of the notion of cause later in the eighteenth century articulates this conception most forcefully indeed. Regularities – phenomena of kind A followed by phenomena of kind B – replaced tendencies which are the result of effort on the part of the beings which are studied. Why do plants lean towards light? Because the plants, in order to grow and develop in a way they are capable (or have the potential), require light and so strive to reach it. The new science and its philosophy render this kind of explanation both redundant and unintelligible, but would instead sanction a regularity type of explanation. Whenever plants are found to grow well, they have leant towards light; in the absence of light, plants have not been found to grow.

Indeed, to modern philosophy, the entire Aristotelian conceptual apparatus in terms of 'wants', 'desires', 'striving to fulfil', etc. is suspect and must be rejected. It is condemned as 'teleological' as it conceived changes and processes in nature to be directed or dictated by goals or ends in natural things which did not yet exist but which would be ultimately realized. As mentioned earlier, for the Aristotelians, a full and proper explanation has to be in terms of the four causes. But to the new science and the new philosophy, two of the four causes – the final and the formal – smack of the teleological. Only the material and the efficient causes, which lend themselves to measurement and quantification, are retained. To explain why a coastline is indented, one needs only to refer to the kind of rock or rocks the coast is made of, the strength and direction of the waves, the force with which the waves hit the shores, the temperature of the water, the direction and strength of the prevailing winds, etc. Final and formal causes are suspect because they appear to be tied up with essences. Essences are grasped through reason and given by definitions, according to Aristotelianism. Why does fire rise? Because it is of its essence or in its nature to do so. To Galileo and those who professed the new science and its philosophy, these are mere words, signifying and referring to nothing in reality. For them, only results obtained through calculation and measurement are to count as scientific knowledge. As essences are not amenable to such treatment, they do not form part of the province of science.

Even worse, in the hands of the Aristotelians, final causes even led to anthropomorphism. For instance, Galileo, as much as the Aristotelians, noticed that a falling object like a stone, falls faster and faster in its downward journey. The Aristotelian physicists would explain the phenomenon thus: a stone belongs to the element, earth, whose natural home is at ground level, the surface of the planet. Suppose you had been away for a long time from your loved ones. As you got nearer and nearer home on the return journey, you would get more and more excited and walk or ride your horse faster and faster. Similarly, a stone would fall faster and faster as it approached nearer and nearer its natural abode – the impetus being the joy of getting there. Galileo would regard such anthropomorphism to be singularly unhelpful. He preferred to observe and measure the rate of fall and to determine the law of acceleration in precise mathematical terms. The 'why' is of no concern to science. Only the fact that the object fell in the way it did, which could be measured, is of significance.

The new method and the mechanistic world view ushered in by Galileo, Kepler and others is necessarily empirical (using mathematics not merely as a tool, but also thereby mathematizing nature), anti-metaphysical (no essences in terms of hidden entities and mechanisms), anti-teleological (no final and formal causes, only material and efficient ones). As we saw, Galileo had complained that Aristotelian doctrines were upheld as dogmas at the expense of empirical evidence. This was because Aristotelianism believed in episteme, knowledge arrived at by means which, to Galileo and others, were obscurantist and 'metaphysical'. The spirit of modernity consists precisely in repudiating all such superstitions and 'idols' upheld by traditional authorities (including the Church) of one kind or other. The only authority in matters of science, which he would acknowledge, was the authority of those who practised the new scientific method, implicitly backed up by the new philosophy, and not that of Aristotelian science and philosophy. In other words, a new epistemological authority replaced the old.

We have discussed Galileo's contribution towards the articulation of the new philosophy to back up the new science, although Galileo was primarily a scientist, not a philosopher who set himself the task of systematically constructing such an account. That new philosophy, as mentioned earlier, may be labelled 'empiricism' or 'positivism-cum-empiricism', of which Hobbes is the earliest systematic pioneer. To prevent misunderstanding, perhaps, one should briefly distinguish between 'empirical' and 'empiricist'. Aristotelian science clearly relied on empirical observation, as must all science. But the new philosophy goes beyond merely using observation and indeed even measurement. It lays down that the world as ascertained by the senses is the only world we can come to know; it professes an empiricist epistemology. Furthermore, it holds that anything not grounded in sense experience is not real but is 'metaphysical'; it professes an empiricist ontology. Whatever is known by the senses is real and nothing is real unless known through sensory experience. This then involves the abusive sense of the term 'metaphysics', as the metaphysical realm, on the new understanding, came to be identified with what is beyond sensory experience and hence cannot be real. Pronouncements about such a domain would only amount to empty words, if not outright unintelligibility. The new philosophy, in being materialistic and mechanistic, is against the metaphysical mode of explanation – bodies which are real and exist and about which we can have knowledge are material, and motion is the efficient cause of all changes in such bodies. Explanations in terms of essences captured by the definitions of words are pseudo-explanations – to say that opium sends one to sleep because it possesses *virtus dormitiva* is to utter a tautology, namely, that opium sends one to sleep because it sends one to sleep.

1.6 Modern science and its goals

What are the goals of the new science in the light of the new philosophy? We commonly identify three such goals – prediction, explanation and control. The positivist methodology and philosophy of science uphold the unity of method thesis and, moreover, that the logic of predicting/explaining an event, as well as testing a theory or hypothesis, is symmetrical. On this conception, the ability of science to make predictions is crucial. To predict a phenomenon is to invoke a law (a regularity or uniformity of sequence) which licenses the prediction; in turn, a law is tested in terms of the prediction it licenses. Prediction, then, is the lynchpin of an epistemology which decrees that the scope of knowledge is delimited by the sensory given. A system of thought which does not lead to testable predictions, cannot count as knowledge. This entails a positivist exclusion from the scientific domain any theory which is incapable of leading to testable (precise) predictions; on this view, for instance, geology is in danger of not qualifying to be a science, as its principles or laws permit explanations, but not predictions precise enough to be testable.

Apart from the crucial role of prediction in epistemological terms, the possibility of prediction is also linked to the possibility of control. If one can successfully make predictions with the help of laws, then one can take steps to get out of the way of the event predicted, if it is considered to be undesirable (the weak sense of control). Or one could alter or modify the circumstances, so that certain desired results could be brought about and other undesired ones prevented from arising (the strong sense). Astronomical knowledge enables one, for instance, to predict an eclipse of the sun at a certain place and on a certain date. One can arrange to be there to observe it, if its observation can be used to further some other task, like Eddington's expedition in 1919 to test Einstein's theory. Alternatively, if an eclipse of the sun is considered to have undesirable effects – suppose observing one causes cancer of the eye – then one could take appropriate avoiding action. The second possibility allows slightly more room to cope with the workings of nature. According to the laws established about plant growth, a certain degree of warmth, and not merely exposure to light, encourages plant growth. If one wishes to encourage growth, then one puts the plants in a warm place – an arrangement which permits a degree of control in the strong sense.

The possibility of explicit direct intervention depends on the type of phenomenon studied as well as on the technology available; until recently astronomical phenomena are too large in scale and too far away for us to control (strong sense), whereas physiological phenomena are not, but today, there is talk about the possibility of terraformation or deflecting asteroids from crashing into earth's orbit. However, the possibility of control in both the weak and the strong senses provides the link between science and technology. In this way, the new science has always been connected up with utility (for humans) – a theme that Bacon had made familiar.

The weak form of control is not the real goal. It is *faute de mieux*, and at best, a prelude to the aspiration of controlling nature in the strong form. Being able to predict the onset of drought or rain is clearly better than not being able to do so at all. But it would be better if scientific theoretical understanding of meteorological phenomena ultimately enables one either to generate rain (when drought is undesired) or to hold rain at bay (when dry weather is desired). To Bacon's voice on this matter, Descartes also added his; he was as keen as Bacon to use science to further human well-being as well to make humankind 'the lords and masters of nature' through controlling it in the strong sense of the word.

Positivism is a philosophy of order and social reform, not of violent change. Order in the study of natural phenomena takes the form of systematically structuring sense experience into a coherent interconnected body of knowledge, so that knowledge about one phenomenon could ultimately be understood by being derived from knowledge about others within it. Not only does such an axiomatic structure allow explanation, prediction and theory testing to take place, but it also enables us ultimately to control nature (in the strong sense earlier identified). And this bears out the Baconian dictum that 'knowledge is power'.

It would be fair to conclude that built into the new scientific method and its accompanying philosophy from the seventeenth century onwards is the aspiration to control and manipulate (and in that way to dominate) nature. Bacon, Descartes and Hobbes all unhesitatingly declared it to be so. It does not look as if the ideal of knowledge for its own sake, what Einstein called 'the holy curiosity of inquiry', ever existed in its neat purity at the inception of modernity (or at any time later, for that matter). The philosophical as well as the ideological requirements of the new world view ensure that science, as technology and science, as theoretical knowledge, go hand in hand. While humans had used and controlled nature in the past, modern science makes it possible for them, more systematically than ever before, to control (to exploit) nature.

1.7 Philosophy of technology and philosophy of science

It is time now to explore the philosophy of technology in the context of both the philosophy of science and the history of technology outlined above. Let us begin by raising a terminological issue. The specific partnership between science and technology noted earlier, with (theoretical) science as the senior, leading partner and technology the junior partner following theory only emerged from the 1850s. One could conceivably distinguish between Phases I and II (of technological development) by proposing that the word 'technology' be confined only to the former, and that some other term, such as 'applied science', be used in connection with the latter. It follows from this proposed usage that (a) the relationship between science and technology in Phase I is a contingent one, while (b) the relationship between science and applied science in Phase II is more than contingent. However, this possible way of defining terms may not find favour as it produces too much of a discontinuity in the history of humankind in its attempts to modify nature for its own ends. The new technology is but a form of technology in the long history of that subject. It would be less misleading and distorting in recognizing it as such. So it would be clearer to say that science and technology are really two separate, though related, forms of activities. The very intimate relationship which has grown up between the two roughly since 1850 is, nevertheless, a contingent one, in spite of the avowed aim of modern science to produce a technology which can control nature in a thoroughly systematic manner, guided by theoretical understanding rather than crude empirical happenstance.

To prevent misunderstanding of what has just been said, one must return to two of the main points raised in the two preceding sections. There, it was argued that (a) modern science from its first beginnings was backed up by the new philosophy, in particular by its metaphysics of Scientific Naturalism, and (b) its ideological goal was the advancement of human well-being via its technology to control and manipulate nature. These two theses may be said to constitute the modern project of science and technology. The ideological goal to control and manipulate nature renders the modern project *au fond* a technologically oriented one. Under the modern project, modern science may be said to be really theoretical technology, a view associated with, for instance, Heidegger and Jonas. From this standpoint, the science and the technology appear to be inextricably linked – the linkage is more than an accidental one. As such, it is more than merely contingent. It is, then, not surprising that such science should eventually spawn successful technology, even though the modern project itself took over 200 years, since its inception, 'to deliver the goods'. So, perhaps, there is some justification in saying that modern science is theoretical technology. All the same, modern technology, nevertheless, is applied science. To see why this latter claim may be justified, one must distinguish the Modern Project itself embedded in a certain metaphysical and ideological framework from: (a) the formulation and the testing of specific scientific theories in the history and philosophy of science; (b) the relationship, if any, between a specific theory and a related specific technology; and (c) the epistemic goals of theory formulation and theory testing on the one hand, and the testing of technological hypotheses on the other. Here, as we have seen, the linkage in the case of any one specific theory and any one specific technology throughout the modern period, in particular during Phase IB, appears to be much looser than the postulated linkage between science and technology in the modern project itself. (However, in Phase II and especially IIB, the intensely intimate causal relationship between certain specific theories and the specific technologies they induce and render possible obtains to a greater extent.) Moreover, the epistemic goals of theory formulation and testing are perceived to be somewhat different and distinct from those of testing hypotheses in the technological domain even in Phase II. The recognition that their epistemic goals are distinct is reflected by the fact that while the philosophy of science has a recognized and well-established agenda, an analogous agenda for the philosophy of technology does not obviously exist. Indeed, while the former is an eminently respectable part of philosophical inquiry, the latter may be held at arm's length with a degree of suspicion, even if it does not draw a blank. The agenda of the one may be clear, that of the other is not.

However, in spite of such allegations, it may still be possible to make a case for an analogous philosophy of technology, while emphasizing both the differences as well as the similarities between their respective overarching epistemological goals. First their similarities under Phase II in two essential aspects:

(a) Methodologically, a technological research programme is no different from that of a scientific one. They include the following elements: identifying and articulating the problem, solving it with extant empirical or theoretical knowledge, and failing that, putting forward new hypotheses and ways to try to solve it, working out a solution within the new framework, testing the solution by experimentation and in the light of that, amending the hypothesis under test or even reformulating the original problem.
(b) Epistemologically and ontologically, technology and pure science (at least in one conspicuous tradition in the philosophy of science) share certain common assumptions: that an external world exists, that we can come to know it partially, though never totally, and that knowledge of such a world can be improved upon and increased, though again recognizing that the goal of complete and total knowledge can never be reached. In other words, they both subscribe to what may be called critical realism; technologists would realize, just as the pure scientists, that their theories cannot, literally, be pictures of reality but are symbolic oversimplified representations of a fairly abstract kind of 'the reality' that they are grappling with. (On this conception of the philosophy of science, in Phase I, technologists would have tended to be naive realists, if they had at all raised this philosophical issue.)

However, whether under Phase I or II, it is said that the overarching epistemological goal of technology differs from that of science. Even in the latter phase, the critical realism of the technologist is subordinated to the crucial requirement that the solution works – in other words, pragmatism is an overriding demand. Unlike pure scientists who often claim that in principle they are interested in knowledge for the sake of knowledge, technologists are primarily interested in scientific knowledge (if it exists) as a mere means to the end of providing a solution to the practical problem in hand. If scientific knowledge is non-existent or unhelpful, they will look elsewhere for assistance. Nor would they be unduly worried should the viable solution turn out for the moment to lack a proper complete scientific explanation.

To put it even more strongly, scientific knowledge per se seems neither to be a necessary nor a sufficient condition for what counts as a successful technological solution to a problem. An example illustrating the former is the success shown by the traditional methods of artificial selection in breeding plants and animals. Until the rediscovery of Mendelism in 1900, there was no adequate or proper explanation to account for their success. An example illustrating the latter is plate tectonic theory in geology and seismography which have not so far, at least, led to a technology of forming new mountains, or of controlling the movements of the earth's crust or, indeed, even of accurate predictions of earthquakes.

Technology's goal of getting practical results also affects its relationship with the concept of truth. The epistemological target of scientific theorizing is truth (or at least, approximation to truth) according to a dominant tradition in the philosophy of science, such as the Popperian one. When technology applies the findings of pure science – for instance, when a theory of flight is based on the theory of fluid dynamics – the epistemological target of such technological theories is efficiency, not truth. Indeed it may be said to adhere to the following methodological rule: only adopt as deep a scientific theory as is adequate for the problem in hand. In this sense, it is theoretically less sophisticated than pure science, although it makes up for this theoretical simplicity by being wholly opportunistic in using knowledge of any kind, from any domain (whether ordinary, older, less sophisticated or the latest sophisticated deep theory in science). For example, in constructing an optical instrument, technologists would rely, in the main, on ray optics, a theory of optics based on what was known about light round about the middle of the seventeenth century. They would ignore wave optics except to the extent of helping them to understand why certain effects occur, such as the appearance of colours near the edge of the lens which, to them, are considered to be undesirable.

Deeper, more complex and more accurate theories may not necessarily be the most economical to use – imagine using quantum theory to predict or explain car crashes. Efficiency demands that you use less deep theories with less operational costs, to get as much out of them with as little input as possible. From the standpoint of technology, a true scientific theory in principle can be successfully employed but in practice, technologists may have to decline its help, so long as an alternative exists which can do the job satisfactorily, but at less cost operationally and, therefore, usually, economically.

The alternative may indeed even be a false theory on the whole, but so long as it possesses an element of truth, which can be relied on by the technology in question, it would do fine.

To emphasize the distinction between scientific and technological knowledge, one may say that while the former attempts to formulate laws (about universal regularities), the latter aims at establishing rules. Laws are descriptive – when conditions x, y, z obtain, A obtains. Rules, on the other hand, are prescriptive. They are hypothetical imperatives – if one wishes to achieve A, then one ought to do x. Phase I technology primarily relied on pre-scientific rules (rules of thumb used in arts- and crafts-based procedures of production such as yeast fermentation in brewing and baking). In Phase II, technological rules are grounded in scientific laws. By this is meant that the laws must be capable of accounting for, or explaining, the efficacy of the rules. To prevent water from freezing in the car radiator in the winter, one ought to add antifreeze to it. The rule achieving the desired end is explained in terms of the differential freezing points of water and methanol or ethandiol (two commonly used antifreeze substances), which in turn could be accounted for by deeper theories such as the kinetic and atomic theories.

Phase I rules may be empirically very effective. But because they are not properly grounded in scientific laws, there is always the possibility that their efficacious outcome may be a mere coincidence. Suppose (in temperate climates) one adheres to the rule – do not plant in the depth of winter but in the springtime – one would indeed get a high degree of horticultural success. But one might mistakenly conclude from this that the plants grow so well because of the warmth that comes with the spring. But one would be wrong, though not totally wrong. The warmth is an important component of success, but only when it is accompanied by an increase of light in the spring and summer, which is vital to plant growth. Today the rule's efficacy is properly grounded in our theoretical understanding of the processes involved in photosynthesis and the conditions under which plant growth obtains.

The above would account for why Phase I rules, though empirically effective, provide one with less than optimal control over nature. Maybe most of the time they work, but there will be cases of failure. Within the framework of technological rules, the failure cannot be explained, just observed. However, it could later be explained in terms of scientific laws when these are discovered. If so, then the laws in turn could lead to the formulation of improved, more efficacious rules (that is under Phase II), whose scope of operation may transcend that of the original rule. Using the plant growth example again, the theoretical understanding of plant physiology, chemistry, etc., enables the technologist to devise the greenhouse. Such a technological innovation makes it possible for humans to overcome the constraints imposed by nature through the rhythm of its seasons. Now tomatoes in northerly climes will grow the whole year round under artificially produced conditions of appropriate degrees of warmth and light. Undoubtedly in this way, the scope has enormously increased one's control over nature.

It would be helpful to sum up the above as follows:

1. Phase I technology is, by and large, autonomous of science. It flourished in cultures which lacked explicit systematic scientific theorizing of any kind. It could flourish just as readily in cultures engaged in such theoretical activities, but underpinned by a metaphysics and using a methodology, which differ from the modern scientific one. Such technology can be empirically efficacious and, indeed, was so historically.
2. However, Phase II technology is a much more powerful tool in manipulating nature than its Phase I counterpart. Take the treatment of haemophilia in the history of medicine. Under Phase I, the only alleviation available would have been prevention at the most elementary level – the sufferer must take steps to reduce the chances of being bruised, cut or wounded. Under early Phase II technology, haemophiliacs were given whole blood transfusion. Further medical understanding advanced, and the precise nature of the condition became understood – there are two different forms of haemophilia. Haemophilia A in which the sufferer lacks a clotting chemical called factor VIII, and haemophilia B, in which the sufferer lacks factor IX. Of the two, the former is more common than the latter. In the light of this understanding, a new technology replaced whole blood transfusion. The missing clotting chemical is injected three times a week to counter the inherited condition. The technology is more specifically targeted than the one it replaces; as a result, it is scientifically more precise. Its emergence is predicated upon advances both in theoretical knowledge and technology, allowing the clotting chemical to be either extracted from human blood plasma, or manufactured by genetically engineered organisms. This may be said to constitute the middle stage of Phase II technology.

Today with the science of molecular genetics and its accompanying technology of genetic engineering in place, there is room to take the treatment of haemophilia to yet another stage of development. This is gene therapy. Indeed, it has been reported that this further stage has already been taken. According to *Science in China*, a team at the Institute of Genetics in Shanghai had performed it on two teenage haemophiliacs, both suffering from a lack of factor IX. In one of them, post-treatment, his blood starts to produce the clotting chemical. If this were really so, it would be a permanent cure. An inherited disability is now cured by gene replacement therapy. This admittedly is not as radical as germ-line gene therapy which, if carried out, could in principle eradicate haemophilia by ensuring that no sons would be born with the genetic disorder (not merely that males born with such an inherited condition would be permanently cured of it) or that no mother who is a haemophilia carrier would give birth to daughters who, in turn, will be carriers. This latter step has now been achieved since 2000.

3. Although it is true that more precise scientific theories are not necessarily always relied upon by technology, which seems to prefer the less precise and complex but still adequate alternative, such theories are, nevertheless, required to ground the efficacy of the rules, giving them the maximum epistemological support possible. Going back to the example of ray and wave optics in the construction of optical instruments, one can see why the former accounts for the instrument's overall success, and the latter, for its being less than totally perfect. As we have seen, while efficacious technological rules may lead to new theoretical understanding, their efficacy, on its own, is not synonymous with truth.

4. Phase II technology, although induced and led by pure scientific findings, is not entailed by them. In other words, theoretical advances and revolutions may be a necessary but not a sufficient condition for its emergence. However, to prevent misunderstanding about this claim, one has to distinguish between two contexts here: (a) pure theory providing the epistemological grounding and direction for the induced technology, and (b) a pure theory being actually used in a particular piece or type of technology. As we have seen, in context (b), there are two possibilities: (i) there could be an alternative, less accurate theory the technology could rely on, or (ii) social, economic and political considerations may be hostile to the emergence of a new technology. The discussion here is only confined to (i). As for context (a), when a theory-induced technology does emerge, the efficacy of its technological rules is grounded in, and accounted for, by the laws of the pure theory – in this sense, there is a very strong empirical, as well as epistemological, link between technological efficacy and scientific truth. Furthermore, they have certain concepts in common.

1.8 'Deep' theories, their power of control and sophisticated modern technology

We have, so far, looked at the differences between Phase I and II technology. One needs to say something about the distinction between a deeper, as opposed to a less deep, theory which underpins Phase II technology. 'Deep' may be understood in at least three ways:

1. A less deep theory is ultimately to be explained in terms of a deeper one – kinetic theory in terms of atomic theory, then quantum theory. Relatively speaking, the first is less deep than the second, and the second less than the third. Similarly, Mendelian genetics, less deep, is accounted for in terms of molecular genetics.

2. The deeper theory may also then be said to be more comprehensive in scope, explaining a wider range of data, accounting for more variables in their causal contribution to a particular phenomenon.
3. A less deep theory may contain laws about particles and their behaviour at the macro level of existence and observation, while a deeper theory postulates laws about particles and their behaviour at the micro level of existence and observation. Newtonian macro physics may then be said to be less deep than quantum physics.

All three senses are relevant to the discussion in hand. The Modern Project of science and technology is built on an ontology of atomistic materialism. Ever since its inception, its central aim has been to penetrate the nature and structure of matter. As earlier observed, macro properties of the natural world such as the secondary qualities are said not to reside in the object and, therefore, are not real. Objects are constituted by their primary qualities, which are real. Furthermore, matter at the macro level of existence is to be broken down analytically into its component parts at the micro level of existence. Hence the atomic theory of matter – all macro objects are made up of atoms, and molecules which are themselves combinations of atoms. Twentieth-century science has gone even beyond that to the subatomic theory of matter.

On this world view, matter then is ultimately uniform and homogeneous. Their diversities, in the form of different sorts of organisms, of minerals, that is, of different natural kinds, are no more than a difference in the arrangement of the primary qualities involved, of atomic particles which, in turn, are constituted of subatomic particles and their nuclei.

It has been the ideological goal of the Modern Project from its very beginning to use its theoretical advances to engender powerful technologies to control nature in order to serve human ends. This promise has been made good from the middle to the late nineteenth century onwards. And as its theoretical advances go deeper and deeper into the structure of matter, the theory-induced technologies become more and more powerful. Take biology. Biologists, on the whole, since the late 1970s, may, indeed, have resisted strident reductionism of the kind which says: 'what is true of *E. coli* is true of the elephant', a view prevalent in the 1950s and 1960s. But it remains true, they unanimously agree that molecular biology provides a deeper level of theoretical understanding than Mendelian genetics, leading to much more powerful technologies, such as biotechnology.

Phase II technology, in contrast to Phase I, illustrates paradigmatically the strong form of control. Each of its stages is an expression of a progressively greater degree of such control. These points may be displayed as follows using haemophilia again as an example:

1. The technological rule of Phase I, yielding only weak control, may be formulated thus: if unstoppable bleeding is to be avoided, the sufferer of

haemophilia ought to avoid being bruised or cut. Call this TRI. The scope of TRI's efficacy is not great, in the sense that it is useless, should the sufferer, unavoidably, become bruised. There are, unfortunately, many such situations arising in the lifetime of a sufferer. Its efficacy is no more impressive than its analogue in a hurricane context where one could, at best, only advise people to get out of the way of the hurricane, when the signs of its imminence are detected, there being no means of deflecting it or defusing its strength. This very minimal control is a reflection of the lack of theoretical understanding of the phenomenon in question (although, as noted earlier, from the epistemological point of view, theoretical understanding is only a necessary, not a sufficient condition for the emergence of a more powerful technology).

2(a). The technological rule of the first stage of Phase II may be formulated thus: to prevent unstoppable bleeding, the sufferer ought to be given a blood transfusion containing normal blood of the right type. Call this TRIIa. Undoubtedly, the scope of TRIIa's efficacy is greater than that of TRI, for it can cope, when the sufferer unavoidably has bruised or wounded himself (although it is beside the point when the appropriate type of normal blood is not available for transfusion). The increase in control reflects the theoretical understanding that the condition is caused by an inability of the sufferer's blood to clot, owing to its lack of a certain chemical, and that it is a genetic disability, not a functional one.

2(b). The technological rule of the second stage of Phase II may be formulated as follows: to prevent unstoppable bleeding, the sufferer ought to be given the clotting chemical (factor VIII or IX). Call this TRIIb. The scope of TRIIb's efficacy is greater than that of TRIIa, as it overcomes the scarcity in the supply of normal whole blood, especially when the clotting agent in question can be produced via genetically engineered organisms. Also, the clotting agent can be more conveniently introduced into the sufferer's body through injections, rather than the more cumbersome technology of full blood transfusion. This greater degree of control is a reflection of the more detailed theoretical understanding about the nature of blood in general, and the specific deficiency isolated in the blood of haemophiliacs.

2(c). The technological rule of the third stage of Phase II may be formulated as follows: to prevent unstoppable bleeding, the sufferer ought to be given gene replacement therapy. Call this TRIIc. The scope of TrIIc's efficacy is greater than that of TRIIb, as it renders repeated and tiresome injections of the clotting agent throughout the lifetime of the sufferer redundant. And even more tellingly, the sufferer, formerly identified as a haemophiliac, is transformed under such treatment into a non-haemophiliac. His status has spectacularly altered. His genetic disability has been removed once and for all (if the treatment is truly successful). This still greater degree of control reflects yet more advanced theoretical understanding of the nature of heredity via molecular genetics.

2(d). The technological rule of the fourth stage of Phase II may be formulated as follows: to prevent unstoppable bleeding in individual males from ever occurring, germ-line therapy ought to be given to the female carriers of the condition. This would yield male genotypes with the gene to produce factor VIII or IX. Call this TRIId. The scope of TRIId's efficacy is in turn greater than that of TRIIc, for it actually tackles the problem, at an earlier stage, by ensuring that no males would be born haemophiliac in the first place. This ultimate degree of control is a further reflection of knowledge in molecular genetics and of the nature of haemophilia as a genetic disability.

One caveat should be entered. The co-relations between the efficacy of technological rules, their corresponding degree of control on the one hand, and theoretical advances in the relevant pure sciences on the other, as set out above, are not meant to reflect actual historical co-relations. They are meant to bring out more clearly the epistemological linkage between technological rules and scientific laws, namely that laws ground the efficacy of rules. And in so doing, one is also laying bare the philosophical foundations for the ideological goal of modern science to control nature in the strongest form possible, to make it serve human ends, be it the alleviation of pain, the promotion of material well-being or of freedom and self-realization.

1.9 Conclusion

Homo faber and *Homo sapiens* are two sides of the same coin. The large cortex of the latter informs the hands of the former, of which the end products are artefacts. Initially, the primary goal of *Homo faber* was survival and reproduction, using 'found' technology, then craft-based technology. This period lasted a very long time, from early history to the 1850s, producing very sophisticated artefacts including the modern maize plant as pioneered by Mexican agriculturists, the Gothic cathedrals of medieval Europe, bronze ritual vessels of the ancient Chinese in the Shang Dynasty. However, in the mid nineteenth century, technology underwent a sea change, from craft-based to science-induced. Up to that point in history, technology had been autonomous of theoretical science (in Western Europe where modern science first emerged in the seventeenth century), but after that crucial moment, technology is regarded as applied science. From the seventeenth century, a new philosophy also emerged, that of extreme anthropocentrism which held that humankind is the unique source and locus of intrinsic value and that non-human nature has only instrumental value for humans. This philosophical strain of thought met up with the scientific/technological turning point in the 1850s to embody par excellence the spirit of modernity which construes *Homo faber* as constituting the essence of humanity.

This thesis may be understood in two ways: (a) it is not merely that humans only manufacture artefacts and never play, make love, eat outside of the activity of fabricating things. Rather, it is that even when people play, make love or eat, they are doing these things in the context of a fabricated, artefactual world. On the back of *Homo faber* rides *Homo ludens*; (b) as Bergson (1911) put it, intelligence 'is the faculty of manufacturing artificial objects, especially tools to make tools, and of indefinitely varying the manufacture'. In other words, human intelligence (under modernity) is to be understood primarily in terms of that type of intelligence embodied in instrumentation and manufacture of artefacts, and in the scientific reasoning which informs these activities. Other forms of intelligence displayed in activities such as joke-telling or painting are written off as marginal. It is the intelligence of instrumentation and manufacture, belonging to human consciousness alone, which ensures that 'man comes to occupy a privileged place'.

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2
Becoming through Technology

Jan Kyrre Berg Olsen

2.1 Introduction

The 'reality' of time is intertwined with cosmological notions. In general, the way we tend to think about the world, including our common-sense notions and the scientific ideas we are working on, are full of metaphysical background theory. This 'background' indirectly operates upon our cognitions of the world. For instance, we find that these 'ideas in the background' manifest themselves as commitments in our interpretations of phenomena. One such phenomenon is time. What is this 'background' that plays such a major role in committing the individual, scientists and philosophers to views that in some way or another become aspects of their theories about the world? It is evident that the further away our commitments about reality are from our experiences of it, the more indebted are our commitments to ideas and theories that claim to disclose reality without the aid of experience. These ideas and theories function not only to convince the protagonist of the legitimacy of his own endeavours, they also make him want to convince others of their truth. These ideas also function in the sense that they serve to give justification to these commitments.

One of the most influential ideas, within philosophy, concerning the nature of real time is the idea of 'Becoming'. Becoming describes a specific ontology of time. In this specific context, time is the very fabric of reality. To understand how time works, one must have an idea about how the world is working.

In this essay I want to follow up on some thinkers within physics and related philosophies that do not defer to conventional scientific postulations about a physical reality outside time, frozen in its making. The line of argument goes from a critique of deterministic rationality, to a discussion of experienced temporality and entropy. The last part of this essay focuses on ways to extend the local temporal viewpoint to a more global point of view, through the use of simple technology such as water clocks, sandglasses, thermometers, or even nature's own technology such as pulse and heartbeat. These are all real-world phenomena in which temporal direction is not hidden, which in fact is the case with mechanical clocks. Anyway, the debate about time always contains more than just postulations about the real nature of time. The debate about time goes to the core of the essential features of reality itself, the nature of time has to do with human cognition; more precisely it has to do with cognitions and experiences in which true reality is disclosed.

2.2 The deterministic 'world view'

The ideas that proponents of Becoming are struggling against, are the ideas found within the metaphysical doctrine of 'determinism'. It is the ideas of the Eleatics and of Plato which constitute the ideological core of modern natural science. It is within this metaphysical framework that time escapes everything we know about it from our everyday experience of it. And to escape everyday experience one must apply a quite different sort of reasoning. The ideological 'core' of determinism consists of a set of beliefs that is crucial to a style of scientific thinking that we, conventionally, label rational. In fact this belief in the 'rational'[1] has been instrumental in the development of modern ideas about a 'non-temporal universe' that simply is. It does not evolve or become.[2] We can say that the style of thinking we find within the physical sciences today, as it is presented through Einsteinian physics and quantum physics,[3] has its origins in the thinking of Parmenides and Plato. The style of thinking that obtained its modern features through the scientific ideas of Galileo Galilei. Before we can go ahead with the Eleatic–Galilean styled thinking within modern science and philosophy of time we have to take a look at the very first known tendencies to 'freeze' time.

The 'eternism' of Parmenides is the fundamental idea. He formulates the idea as follows. Whatever that can be said to be, or that which actually is, can have no beginning or end. If it had a beginning and an end, it would not be, and that is excluded according to Parmenides. In addition to 'Being' having no beginning, Parmenides formulates the following proof: 'What necessity would force it, sooner or later, to come to be, if it started from nothing? ... It neither was nor will be, since it is altogether now'.[4] To sum this up in the words of B. Williams: 'Here Parmenides gives the first expression to an idea of eternity' (Williams, 1988, p. 220).

Parmenides' denial of becoming was too radical for the atomists. The atomists retained the principle of the immutability of Being in a slightly different way, so as to make the principle of the immutability of Being fit experience. Democritus, Epicurus and Lucretius did not deny change and becoming, they reduced it 'to the displacement of the atoms, each of which was the Parmenidean plenum on a microscopic scale: uncreated, indestructible, immutable, impenetrable', as Capek (1976, p. xxvii) has put it. The universe of the Eleatics consisted of matter and void and there was no place for time. Time was, therefore, explained away as 'appearance' (Democritus), 'accident of accidents' (Epicurus), and that time has 'no being by itself' (Lucretius). Capek comments on these sayings by stating that time becomes 'a mere function of the changing configurations of the immutable particles'. And thus the relational theory of time was born.

With time as a relation between things, philosophers focused their attention on the regularity and periodicity of the celestial motions, as well as on day and night, the differing seasons throughout the year and all 'events' that could be measured. The significance of the metrical aspect of 'time' was growing, as was the notion of regularity and homogeneity of the motions. Furthermore, the cleavage between experience, which is fundamentally qualitative, and the mathematical perspective, became gradually more marked by the lack of corresponding properties between the two (Capek, 1976).

The Parmenidean conception of the universe was extreme; however, the influence of Parmenides' ideas has persisted throughout history as ontological background (beliefs about reality) in the theories of other influential thinkers. Actually, no temporalities apply at all in Parmenides' conception. We cannot separate between past, present and future in the realm of perpetual present; of Being which does not become or change. There is only that which is – that which is not is excluded. In Parmenides' point of view, Being is 'uniform, unchanging, has no divisions, is the same under any aspect…' (Williams, 1988, p. 221). This concept of eternal, unchanging and uncreated Being has, through Plato's thinking, had a particularly significant impact upon the course of modern philosophical and scientific development. Plato applied the idea of 'uncreated Being' in his characterization of the Forms. The Forms are to be understood as the fundamental forms of reality, which exist beyond the apprehension of our senses and experience.

Here we find what can be termed as 'Platonic–Parmenidean Reason', that is, 'Greek Reason' (Marcuse, 1965). There are some very specific implications of this concept of reason. First of all, and with particular reference to the above notion of a static and uncreated world, we find that in the context of Plato's thinking the true Being becomes ideal Being. This means simply that this is not the kind of being 'we experience immediately in the flux of our empirical, practical world', as Marcuse puts it (Marcuse, 1965, p. 281). This is, according to Capek, the same as asserting that we have a 'coeternity of truth and fact' (Capek, 1965, p. 443). This implies, as Marcuse points out, that the validity of reason is 'supra factual' and 'supra temporal'. The fundamental and real nature of reality can only be discovered, disclosed and defined by this kind of rational reason, and thus, as rational, it has the mandate to overrule, that is, to put itself up and against anything which is given to experience. Marcuse writes that: 'Reason establishes an authority and reality which is…antagonistic to the immediately given facts' (Marcuse, 1965, p. 281). The characteristic cleavage in modern temporal realism, between immediate experienced reality and the world as it 'is' in objective scientific truth, is as old as philosophy itself.

The set of beliefs we find within modern temporal realism is identical to the set of beliefs that are part and parcel of the modern realistic interpretation of physics. This realistic interpretation was, broadly speaking, developed in the seventeenth century. The goal of this interpretation was to pierce all our common-sense deceptions, to disclose the real mathematical structure of the universe; its deterministic and non-temporal nature, to open up a reality that is manifest in mathematics. Modern science starts by refusing to accept our common-sense experiences at face value (Gurwitsch, 1965, p. 293).[5] What is of concern here is, as Aron Gurwitsch says, 'the problem of the very existence and the sense of science… [which is] the conception of nature as in reality possessing a mathematical structure' (Gurwitsch, 1965, p. 294).

We can conceive of a nature that is disclosed as mathematical, without the aid of our immediate experiences, because experiences are taken to be deceptions or illusions. The world is not believed to be what it looks like. Only mathematical construction can discover the true condition of the world. This overlooked the fact that there are several mental operations involved in the performed conceptualizations. It also omitted mental processes such as, for instance, idealization, or formalization, which are crucial for the generalization of the conceptualized content. What happened was exactly the same as when our modern-day temporal realist attempts to hide subjectivity behind the product of his formalizations. Focusing on the formalized product, one can discard the producing activity or the originating qualities from which the products spring. It is natural that the failure to refer such products and results to the mental operations from which they derive makes oneself the captive of one's own creations (Gurwitsch, 1965, p. 300). It is not enough that we lose sight of our own creativity when we create, because, as Einstein has commented, we want to regard the products of our imagination as nature in itself, since they appear necessary and natural. We would also like others to regard them, accordingly, as given realities (Einstein, 1954, p. 270). Therefore 'a cloak of mathematical ideas and symbols, metaphysical ideas, is cast upon the world of experience so as to conceal it to the point of being substituted for it' (Gurwitsch, 1965, p. 300). Method becomes reality.[6] This means, in Husserl's context, that the ideas and symbols that are involved in the constitution of mathematical theories – ideas that thus facilitate the application of mathematics to the science of nature, become the 'whole thing'. This new mathematical science encompasses everything that represents the 'life-world', which is the world that is found in everyday experience. In fact 'it (mathematical science) dresses it up', as Husserl says, 'as "objectively actual and true" nature' (Husserl, 1970, p. 51). Through this complex of ideas we start to believe that it is true being – as opposed to a method. Thus, we arrive at the conception of reality as being a mathematical manifold (Gurwitsch, 1965, p. 300). Of special interest in the present context, temporality must be looked upon as one of the most important customs or habits of nature; time is a typical feature of natural behaviour.

This is not that kind of behaviour that we experience, but which we otherwise, i.e. by way of experimental science, know is fundamental to processes at the microscopic and, by implication, 'constitutive' level of nature. We have a 'theoretical' world of physics that works as a framework or ideal world picture for the thinker that operates with the given theory or ideas. Husserl writes that they (physicists) are 'constantly oriented in their work toward ideal poles, toward numerical magnitudes and general formulae' (Husserl, 1970, p. 48).

Historically speaking, this specialization of a narrow and restricting scientific thought began with Galileo Galilei and his invention of the universal law. Husserl states: 'The "a priori form" of the "true" (idealized and mathematized) world, the "law of exact lawfulness" according to which every occurrence in "nature" – idealized Nature – must come under exact laws' (Husserl, 1970, p. 53). The 'ideal poles' are at the centre of interest in all physical inquiry. What is discovered is discovered in the 'formula world', which thereafter is coordinated with nature (Husserl, 1970, p. 48).

The coordination with nature is, of course, coordination with the whole set of metaphysical–epistemological ideas making up the notion of nature as mathematically structured, or, one could say, with a suitable ontology.

For Galileo the course of action was to abstract from individually lived life, be it spiritual or mental; from cultural aspects as well as from those aspects of existence that are attached to things in human praxis (Husserl, 1970, p. 60). Along with the mathematization of nature, we also find the idea which is so crucial to the idea of a deterministic non-temporal universe. This is the idea that reawakens the Parmenidean notion of uncreated being and Democritean or atomistic self-enclosed natural causality. This is a causality in which every occurrence is predetermined, both necessarily and unequivocally. Thus we see that Galileo has opened the path for dualism to enter the arena of natural philosophy. The notion was to have a separation of reality in two worlds: nature and the psychic world. The first division was Platonic, the second one was Cartesian. It is important to understand that the consequence of the separation of the objective world from that of the subjective is that the latter, psychic world, does not achieve the status of an 'independent world'. On the contrary, the 'psychic world' is dependent upon the world of matter, as it was conceived in a scientific–theoretical construction. What is more, this separation led to a belief in an absolute distinction between the subjective and objective realms of being. The absolute line of demarcation was thought to 'exist' between them, which renders the two worlds apart. From the point of view of objectivism, this was necessary because the real mathematical world of science should not be linked to the mental and relative world of subjectivity. In any case, as Husserl points out, 'natural science possessed the highest rationality because it was guided by pure mathematics and achieved through inductions, mathematical results' (Husserl, 1970, p. 61).

The rational scientific world consists of bodies, a 'world' that exists in itself. As we have pointed out before, a world that exists in itself must be a strangely 'split' world. It is strange in comparison with our common-sense experiences of the world because this one is split into the realist notion of 'nature-in-itself' and a mode of being that is absolutely distinct or different from this, namely of what exists psychically. In the years after Descartes, subjectivity became more and more separated from the rational scientific sphere.

The amputation of the psychic from 'the scientific real' causes difficulties whenever we are trying to determine the true source of 'time'. The problem consists of the intuitive knowledge that the natural philosopher has of the source of his own knowledge, namely his own experiences and thoughts. These subjective manifestations clash against the nexus of assumptions and notions that constitute his rational scientific ontology. What legitimates, and thus removes the doubts that the natural philosopher might have about the independence of his 'objective and rational knowledge', is an escape into the new psychology facilitated by the division of nature and spirit. This is the subjective–objective distinction, which is a presupposition for the specialization of the sciences, and thus also the foundation of naturalistic psychology, which holds subjectivity to be a nest of illusions. The Cartesian doctrine states that bodily and psychic 'substances' are characterized by radically different attributes found to be fundamental to that kind of rationality which holds nature to be determined and non-temporal, since it is believed to be causally law-governed and mathematically representable. We see that Husserl, who claimed that 'the naturalization of the psychic comes down through John Locke to the whole modern period up to the present day', has pointed out the further historical development (Husserl, 1970, p. 62). As Capek points out, 'what was relatively new in Locke was his interest in the introspective basis of our awareness of time. From this time on, the distinction between subjective, psychological and objective, physical time gradually became common' (Capek, 1976, p. xxxv).

The project of scientific rationalism looked upon as a whole, which includes dualism, non-temporalism, determinism, naturalism and scientism/psychologism, is surely an attempt to extrapolate an epistemological–ontological model. It attempted 'to classify thought in particular cases or situations, to the whole of reality...' as the philosopher Owen St John writes (1974, p. 76). It was necessary for the concept of rationality that rationality was to be uniform and conventional, that there was no room left for subjective whims to enter the arena. However, as St John says, in arguing that some particular thoughts are universal while others are not is to pass over from science to metaphysics. He writes:

> We can never extrapolate from a deliberately restricted sphere to all possible spheres, to all aspects and levels of existence... We can never

> arrive in science at an unconditional generalization that everything, under all possible conditions, everything that is, or will be, or has been, is of such and such nature and behaves in such and such a way. (St John, 1974, p. 76)

If a deterministic, non-temporal universe is real, then we have a science that can transcend all possible experience. It can transcend experience because it can go beyond the temporal limits that are somehow put on experience. It can assert unconditional knowledge about a universe that does not conform to the conditional thinking that is based upon experience. The metaphysics behind this kind of science have no temporal limits to knowledge, and are, therefore, in deep disagreement with the empirical and temporal limits that we, the experiencing individuals of the world, have to obey in order to have coherent and corresponding knowledge. Or as Andrew Pickering writes:

> Atemporal knowledge is marked by the processes of its emergent becoming, but it cannot itself explicitly register the existence of truly emergent phenomena, nor can it thematize the shocks and the struggles that their emergence precipitates. Becoming is actively obscured in the way we use atemporal knowledge in the world. The price to pay for a metaphysics of becoming is recognition of this fact. (Pickering, 2003, pp. 102–3)

2.3 Becoming, dissipation and the temporal mind

The fundamental characteristic of becoming is transience. In the process of actualization of potentialities to a particular thing there is not one moment that can be singled out as the defining moment in this process. This is a moment that would, thus, be more real than the process itself. All the 'moments' that pass by are but 'phases' or 'fleeting' images of this something as it is changing continuously. From the observer's point of view, the present moment presents the real, since the process has evolved only so far as when it appears 'now' for the observer. All the other phases of this something have been leading up to this present 'moment'. Yet development does not halt, and it will always take place in a moment that, in principle, is present to someone. 'Phases' and 'stages' have succeeded each other, or followed straight after another, yet the substance in question retains its identity over time. The obvious temporal direction here is primitive, yet it is assumed 'it has some unknown causal source'. What can this unknown source be? The answer that many scientists have given to this question is 'entropy'.

The problems of reducing our experience of, say, direction, to the entropy gradient does not establish a link between internal time and external time; between the time of mind and physical time. The kind of reduction that we should object to is that we do not access the direction of time outside our immediate experience of it. This is to say that it is not by 'awareness of entropic or other causal processes that we know of events in our immediate experience what their time order is' (Sklar, 1995, p. 218). Since we have an immediate experience which is temporally structured we also have a direct access to temporal direction. The reduction that is wanted by those who wish to establish a link between physical time and temporal experience, is the reduction of temporal experience to a conceptual construct, such as entropic order. This entropic order is less fundamental than the temporal experience itself. This is, according to Sklar, a 'scientific reductionism' (Sklar, 1995, p. 219).[7] The claim is, Sklar points out, that we do not determine temporal order and direction by knowing about how the entropic order is working, but that we instead discover that temporal order is identical to entropic order (Sklar, 1995, p. 219).

I believe, in accordance with L. Sklar (1995) and P. V. C. Davies (1997), that Sir Arthur Eddington's illumination of this problem is to the point (Eddington, 1946, pp. 87–110). As Sklar says, 'there is something about time that makes a treatment of its relation to entropic asymmetry ... implausible' (Sklar, 1995, p. 223). What is implausible is not that entropy has an ordering of events that must obey the order of time, but that time has been 'reduced' to signify entropic order. Here we are again faced with a theoretical domain and its relation to human temporal experience. For Eddington it is evident that when we are talking about real time we have to differentiate between theory and experience. Meaning comes out differently for terms in the sense that in one aspect meaning is secured through identification through experience and in another aspect by location in theoretical structure. These are two separate things. Time seems to be a feature that we wish to attribute both to the realm of perception, or experience, and to the realm of the theoretically inferred. Sklar points out that 'it is just a confusion to think that the spatial relations visual percepts bear to one another are the same sort of relations that physical objects bear to one another' (Sklar, 1995, p. 224). First of all, we know from our experience what the former relation is like. Secondly, we can only talk about knowledge concerning the latter relations from what our theoretical structures say about them (Sklar, 1995, p. 224). But does this mean that we can dismiss entropic order as merely theoretical and not in any way as part of reality? This is to take things too far. Eddington was of the opinion that time is given to us twice, once in our immediate experience and secondly in our theoretical reflection about the irreversibility of external processes. It is the same time that is given in both of the modes. We should not, however, confuse them.[8]

We are not seeking the replacement of entropic order by experienced order, or the reduction of experienced order to entropic order. Rather, we are trying to see how the two spheres are attached to the same time. We will have to face the fundamental role of temporal experience, in the sense that it is our starting point in any theoretical construction of the world. In this sense it is important to admit that we have direct epistemic access to the relation of temporal succession of the world because, alternatively, what happens if we 'radically distinguish' between time in experience and the time of physics? The problem of not having any relation between the 'time-spheres' is equally as bad as the reductionistic claims pointed out above. This would mean that we do not have any grasp of the nature of the physical world itself, since, in the claim which separates physical and psychical domains too radically, there is absolutely no correspondence between the ways we perceive things and the nature of the objects as physical entities. 'We are left with merely the "instrumental" understanding of theory in that posits about nature bring with them predicted structural constraints upon the known world of experience', as Sklar writes (Sklar, 1995, p. 224). Furthermore, if we omit consciousness and experienced temporality as a necessary point of reference and instead attempt to render an objective (external) time that is mathematical, we will perhaps end up with infinite regress.

In order to understand this we need to study Eddington's thinking about time a little closer. He presents us with an interesting idea, suggesting that there is a necessary linkage of physical time to the world of experience.

Why is it, Eddington asks, that we cannot immediately identify the 'becoming' of temporal experience with the increasing 'disorder' of the universe called entropy? Entropy is a concept about unidirectional physical processes and, as such, it could also be symbolizing a type of 'unidirectionality' like the one we know of – meaning the temporal, or transient, one-way ordering of our experiences. There are, nevertheless, fundamental differences between the two approaches to the question of the nature of time, which have to be given some thought. The reason for this, Eddington states, is that a symbol is something (well, in this case at least) that only 'exists' – where this 'existence' is given its sole meaning through a theory.[9] It is 'an elaborate mathematical construct' (Eddington, 1946, p. 88). When we want to locate becoming within nature, a symbol is simply not good enough. What we would like to have is something of significance, something that allows recognition of a deep dynamic quality in nature that the symbol of the metrical type cannot disclose. We do not create sense by stipulating that one end is more chaotic; we need, according to Eddington, 'a genuine significance of "becoming"... not an artificial symbolic substitute' (Eddington, 1946, p. 88).

Now how do we proceed in order to come up with this genuine dynamical significance? Eddington provides support for the view that our most fundamental and primitive concept of time is identical to that time which is the most descriptive of all empirically accessible natural processes. He describes it as an ontological acknowledgement of primitive experience in the sense that 'we must regard the feeling of becoming as a true mental insight into the physical condition which determines it' (Eddington, 1946, p. 89).

When Eddington writes that 'insight into the physical condition [which] determines it' he is saying that the subjective mind can 'recognize' an objective condition which cannot only be an 'external' condition. This 'objective condition' must somehow also be an 'internal' property, a condition of mind. That is to say, a condition equally integrated into the mind as it is integrated into the rest of nature. Why should the human mind conceive of temporality in a form that is totally apart from the time of nature? Our conception of time which is based upon experience is as close as we get to a conceptualization of the physical condition which supports experience – as a condition for it. We simply lose hold of the connection between the 'physical' element and mental statement of the temporal element in the sense that we do not 'see' the physical element at all, but only the mental expression of it. We never have a grip on the physical aspect at all; we only infer it from the fact that our temporal experience is so fundamental that we cannot ourselves be the source of this breathtaking perspective of time. As Eddington claims, we will always be able to recognize 'becoming' because it is not 'image-building', but insight. It is insight because our elaborate nerve mechanisms do not intervene: 'That which consciousness is reading off when it feels the passing moments lies just outside its door' (Eddington, 1946, p. 89).

So then, we must simply come to terms with the idea that the mental insight into the time of physical nature is fundamental for any conceptualization about the objective nature of time. The realism of the objective concept of time depends on the mental insight into the flux that appears to us in experience; we simply 'see' it as it is, that is, in its 'pre-conceptualized purity'. This experience also brings with it the realization of the significance of the experience; that, for example, we cannot reverse what appears in transience. In this sense we also have an 'insight' into time's nature as 'a kind of one-way texture involved fundamentally in the structure of nature' (Eddington, 1946, p. 90). We can know about this 'texture' as we can also know about other properties of the external or physical world. We conceive of this transience as the passing of time, says Eddington, and furthermore, this is a 'fairly correct appreciation of its actual nature' (Eddington, 1946, p. 90). We have one way in which we experience time directly. In order to 'bridge the domains of experience belonging to the spiritual and physical sides of our nature', we need access to the world through our sense organs. We gain access to the temporal properties of external processes. We are able, through our sense organs, to relate time to other entities in the physical world. Eddington calls this 'time's dual entry into our consciousness' (Eddington, 1946, p. 91).

'Becoming' – with its transitory properties – will not easily fit into the overall scheme of nomological explanation which characterizes physics.

Physical time, at least as it is posited by Einstein in his Special Theory of Relativity, cannot be transient. In STR local time is necessarily represented in 'non-transient' modality as soon as it is objectified within the space-time description of physics. The transitory property of time soon gets lost when the nomological structure of physical explanation is applied to the matter. It is interesting to note, however, that entropy – as the only physical symbol – gives us a specified direction to external processes that no other physical theory is able to. The second law of thermodynamics is a 'law' that in fact presupposes transitory properties of external nature. This means that transience is an actual part of objective (external) time. That this is a presupposition hidden in the structure of this law does not make it any less physical than the other and more causal (deterministic) laws that 'presuppose' other non-empirical non-temporal 'properties'. Quite the opposite, the relatedness to experienced properties characteristic of time give the law an empirical basis that no other law can claim. We should, however, be careful not to claim too much.

We should state that, as Eddington writes, 'Entropy had secured a firm place in physics before it was discovered that it was a measure of the random element in arrangement' (Eddington, 1946, p. 104). Without it we are faced with a physical world that is, in Eddington's words, 'upside down'. It simply does not make any sense in relation to our understanding of time, to have our complete inventory of concepts discarded just because they do not correspond to those in physics. As Arthur Eddington writes, 'For that reason I am interested in entropy not only because it shortens calculations which can be made by other methods, but because it determines an orientation which cannot be found by other methods' (Eddington, 1946, p. 109). This still does not establish any identity between 'becoming' (experienced time order) and entropy, but it can be used as an indicator of orientation in external nature that corresponds symbolically with both the macroscopically perceived 'order' of things and events, as well as with the direction in our temporal experience. In order to experience nature's processes as asymmetrical and irreversible in time, asymmetrical processes and human observers must presuppose both the objective anisotropy and direction of time. In order to retain some 'realism' to the temporal framework that will always accompany questions about time's role in nature, in such a way that we truly are talking about a synthetic time, we always have to start with the foundation. This foundation is the experience of time, and it is the experience of real time.

2.4 The comparison of time and entropy deepened and some technology added

'I grasp the notion of becoming because I myself become' (Eddington, 1946, p. 96). What is fundamentally involved in this expression of becoming?

Clearly one aspect is that I have a body. In one respect we are acting in a world that is constantly changing, and thus corresponding to the flux of sense experiences. In another respect, I realize, sadly, that I myself am gradually becoming older. In my activity I produce 'something' that can just as well be called 'entropy'.[10] 'Entropy' is a construction based upon perceived facts about a world which change irreversibly. If I had a twin who travelled through space with high velocity, he would not travel in time but only through space. I would have aged considerably on his return 20 years later. On the other hand, my twin brother would not have had the time to produce so much entropy as I would have; he would not have aged as much as I would have. Hence, I have – through my activity in the world I live in – brought time out in the open through my activity. This time is local and irreversible. That I produce entropy through my activity and, consequently, spend my energy, is an objective measure for the transition of time. An objective time consists of local time in which the observers have dual access. As proposed by Eddington:

1. The experience of the irreversible direction after which other experiences are ordered;
2. The sense experiences containing information of the external world, i.e. of things changing, coming and going, of births and deaths, of fires and floods, of conversations and studies, of our own ageing, and of our expectations about life that are realized or not, through our actions. The time measured by the clock makes sense only because our experience of the world gives direction to the measure.

Time in this respect is local, and to achieve objectivity we need a 'field of simultaneity', something stretching beyond the here and now of my actual experience. In an important sense we already possess such a field, as the Danish physicist Peder Voetmann Christiansen has pointed out, in the capabilities of modern media technology, i.e. the Internet, all kinds of phones, television, radio, etc. What we could wish is for time in the local point of view to be related to other frames of reference. Einstein created an opportunity for invariant transformation of data, but what, in fact, is the relationship between local time and invariant data? First of all, local time, as a property of experience of external processes, yields asymmetry and unidirectionality. Unidirectionality and asymmetry are facts about every local point of view, so it is not these universal aspects about time that need to be transformed. What need to be transformed are the measurements, or relations, that is, the data about the external events obtained in the local point of view. The reason for this is that the measurement apparatus, the clock and the measuring rod, undergo changes locally. The behaviour of clocks and measuring rods corresponds to the presupposed asymmetric and unidirectional nature of what is being measured, but is itself a local 'behaviour', since it is not coordinated with the behaviour of what is being measured. These aspects are local particulars, since the behaviour of the measuring devices points out in which direction in time one is conducting one's measuring. Nevertheless, the opinion is that accurate measurements depend on the flawlessness of the measuring devices. In relation to our sense of the nature of real time this is clearly wrong, because even the very best of clocks are inaccurate. This is a fact because even if a known process like friction, which is energy that becomes chaotic or random, is eliminated as far as humanly possible, there will inevitably be heterogenic interruptions of the wanted homogeneity. This also means, as Eddington has pointed out, that 'the more perfect the instrument is as a measurer of time, the more completely does it conceal time's arrow' (Eddington, 1946, p. 99).

Einstein's many definitions of the clock show a gradually increasing emphasis on the ideal 'non-friction', which is a 'mass-less' clock where nothing should be left that could indicate the asymmetry and unidirectionality of real objects and things in the real world.[11] It is difficult to see what was to be obtained by this, except for a formulation of a pure theoretical entity, that is, an ideal and perfectly accurate time measure. From the point of view of theoretical physics one might assume that real-world clocks are imperfect, yet, from the point of view of the real world, they are actually perfect. Any global time is an expansion of local time through a communication of the results, data and methods of obtaining the data. In the case of time the transformations applied and the invariance achieved are not the objective aspects. Only the universal characteristics involved in every local point of view indicate or point to an objective foundation of time.

This 'objective' foundation is what is necessarily excluded in global transformations, where measurement data are invariant with respect to any local point of view. Here we have obtained epistemological objectivity of the measurements – they are invariant with respect to any local point of reference. The data are not about time; they are about a relation of light signals between objects, in other words, a relation of distance in time. This is what is measured. We cannot measure time, in the sense that physics applies it, as 'time' is the measure and not what is being measured. But since the measure has lost its direction – because as a measure it has become a 'particular' of some specific theoretical framework – one could, in order to account for its objective grounding in reality, introduce into the theoretical framework, as an explanation and justification of the measure and its real empirical context, the experiential characteristics of direction pertaining to what is being measured. To obtain such directional data one can implement the experience of the human observer, and in addition supplement it with external devices, such as, say, a thermometer.[12] Consciousness has no problem establishing an arrow since it is itself directed in its awareness of changing perceptions that appear ordered and irreversible. One wishes an arrow in the world – for the sake of having something external to the mind that can indicate the same irreversibility. This arrow, which has to be found in the world, must be a local phenomenon and analogous to the unidirectional arrow of the mind. The arrow will be found because it is an inextricable part of all external processes on the perceivable macroscopic level of reality. It is hidden in the 'messages from the outside', as Eddington says, but never in the messages from clocks. It is, however, found 'in messages from thermometers and the like, instruments, which do not ordinarily pretend to measure time' (Eddington, 1946, p. 100).

Global time is an extension of our local time perspective. As we understand it today, physical time, as the sole time concept within physics that symbolizes the irreversibility of processes in time, is in fact an extension of locally experienced irreversibility to the global or objective perspective on external matter.

Normally one thinks that objectivity is achieved when we remove ourselves from what is going to be explained – like when we ask ourselves: 'What would it look like if I was not present, if there were no people around to experience the phenomena in question?' The normal procedure is then to contemplate what we bring into the picture, and about those aspects, which, perhaps, do not belong to it in the sense of being subjective aspects, which is brought in with experience. It is, as argued, here – within the domain of 'subjectivity' that the mistakes come about, that is, we overemphasize the 'subjective character'[13] of what we bring into the picture of the world. In fact, in the context of traditional deterministic physics, epistemology and metaphysics have asserted the view that irreversibility is 'subjective'. The emergence of this new trend within philosophy, and science in particular, 'gave rise to a subtle transference of ideas from "randomness" to "lack of knowledge" and from there to "subjectivity"'.[14] This line of thought is highly biased, since the determination of what is to count as subjective or not has to be based on highly 'theory-laden' assumptions. These are assumptions that are always based on notions that operate tacitly as the 'background' of our everyday thinking, or awareness (which we talked about at the beginning of this essay). In this case the background is the ontological framework of classical physics. The point made here is that we do not know what the world would look like without the locally situated experiencing observer. We only know what it looks like if we add our local point of view.

There is nothing that points to locality as something fundamentally flawed or 'wrong', i.e. that our experiences should not be in accordance with reality. Time's irreversibility and unidirectionality are objective, in the sense that we can all agree upon these properties as aspects of the world at large. Time cannot be a solipsistic phenomenon. Neither can time have properties that cannot be experienced; otherwise we could not talk about time at all. The objectivity of time is not that it is independent of us human beings, but that we experience, internally and externally, certain properties that we all agree upon as being properties of time.

The true 'realist' would be one that could give an account of time based on the fact that we access temporal reality through temporal experiences and sense experiences of external phenomena of the world. Time's irreversibility must be explained both from the 'inside' and from the 'outside'. We begin with experience and proceed to the concept and then to the formalized symbol. But even this course of experience is partly conditioned by our present awareness of the world and the continuous 'production' of memory. Memory can only be produced by a subject that experiences things, objects, relations and phenomena, all which are 'objects' that are themselves under transformation by the 'fluctuation' and 'dissipation' of the world. As experiencing subjects we are thus confronted with the visible traces of increasing entropy (increasing order and disorder) that are somehow 'descriptive' for the flux presented to our senses. These traces are local changes. These are changes we experience. They are transformations of the external world, of the phenomena which can be experienced, as well as of the observer as an organism. This local 'entropy', these experienced changes that take place externally, provide an opportunity to extend our viewpoint from the internal to the external, though it is still a local perspective.

Physical time is, in some respect, a product that has its reference to the experiencing subject. Physics represent a form of conceptualizing or symbolizing things that dismembers 'head' from 'body' with regard to the phenomenon of time. Still, the concepts of time within physics are, in reality, mere extensions of the unavoidable local viewpoint on time. From the subjective point of view, the process of extending the applicability of time begins with the experience of time and continues with the intellectual endeavour towards still greater external applicability for the experience. The imaginative mind strives towards 'physical space' in an attempt to define an even more universal, global applicability of the conceptualization it has of time as an external aspect to itself.

2.5 The technological extension of local temporality without rejection of subjectivity

Now we have to consider something about clocks and measurement concerning the operational process of extending the local perspective on time to a global one, which does not deny its linkage to subjectivity. If we consider local time characteristics (for instance, one's own body, heartbeat, droplets dripping from the roof, the sundial), one has, together with other irreversible processes, an instrument for considering the amount of time elapsed. For example, Galileo had to resort to his own pulse as a clock when he discovered the laws which explained falling objects. Other processes are possibly more up to the task, for instance the diffusion when we add some colour to a liquid starting at t_0 and observe the diffusive spreading of the added colour (Christiansen, 1987, p. 38). Other technological phenomena that are based upon constant dissipation are easier to apply in this respect, for instance a clock that applies water (clepsydrae) or sand (sandglass). Indeed, all our mechanical clocks are also of this type. All clocks use or spend energy and thus produce or increase entropy, albeit as a hidden process, for, of itself, there is no trace of 'before' and 'after', of what is past.[15] These types of timepieces are called diffusion clocks, and the time these timepieces measure is, according to Norbert Wiener, called Bergson time as opposed to the Newtonian time of classical mechanics (Christiansen, 1987, p. 38). The linkage between diffusion time and experienced time is obvious. The phenomena are conditioned by the same conditions which we are ourselves conditioned by. The phenomena are in specific aspects perceptual phenomena that are natural elements in everyday (macroscopic) experience of the world. All these types of phenomena represent the kind of time that is local.

The linkage between phenomenology and physics – as in the linkage between processes ordered by temporal experience and processes studied and explained by thermodynamics – offers, in fact, a lucid perspective on the question on time in physics; one which has been stated most thoroughly by the physicist Peder Voetmann Christiansen (1987, 1988).[16] It is never a question of reducing temporal awareness to something less fundamental originating, say, in the processes explained by the concept of entropy as it is stated in the second law of thermodynamics. Rather than reduction, it is an attempt to see a more profound identity between the ways we experience and how macroscopic nature behaves.

In 1905 Einstein discovered the Brownian movements (Einstein, 1956). In this theory a connection between diffusion and dissipation was established. Later Callen and Welton named the connection 'the fluctuation–dissipation theorem' (Christiansen, 1987, p. 38). Christiansen explains that the purpose of the theorem is to secure the 'same time' whether we are using a diffusion clock or some other mechanism that dissipates. The connection expresses that random 'forces' or 'conditions', or some 'influence' – that are responsible for the diffusion and the Brownian movements of small particles – are the same as those that are responsible for the dissipation or friction of macroscopic movements. There will always be some degree of 'noise' involved in irreversible processes. The 'noise' is not something that we – in practice – have to consider, since our surroundings, and we ourselves, are not in a state of thermodynamic equilibrium. For instance, if dissipative forces make a macroscopic body (say, a pendulum) stop, i.e. reach equilibrium, it will not be at absolute rest but, rather, perform Brownian movements about the position of equilibrium (Christiansen, 1987, p. 38). According to Christiansen, the energy of these movements at normal temperature is approximately 4×10^{-21} joules. This is so little that it almost disappears in comparison to the energies we apprehend in the, far-from-equilibrium, condition of the universe. What if we start the movement of the pendulum at, say, 1 joule?

We can imagine that these Brownian movements, in themselves, could with time have enough energy produced to cause the pendulum to begin swinging 'on its own accord', or rather spontaneously at 1 joule. This is improbable. For a pendulum to begin its movements at the point where the energy of 1 joule is reached, we must conclude with certainty, says Christiansen, that someone pushed it in the past and that it will again stop in the future, unless someone pushes it again. This is a retarded response in macroscopic physical systems: these systems are retarded since the activity always is caused by past stimuli – never by future stimuli. And in this sense we find irreversibility as the most characteristic aspect in our surroundings.

This 'irreversibility' is to a very important degree a presupposition for our particular form of perceptions, cognition and thus for the experience of the world itself. It is so significant that without it we would lose our feeling of continuity; we would lose the 'wholeness' we find in our own world picture. In short, we would lose our minds. Therefore, all talk of 'advanced response' is idle talk (Christiansen, 1987)[17] – because what, in reality, forbids all talk of advanced response is precisely our temporal experiences and the 'thermodynamics' of our perceptual surroundings.

Christiansen states that if we are to talk about stimuli and response we have to refer to memory, which is the only instance that secures that the system was undisturbed in the past, that is, before we introduced our 'stimulus'. We can state – with Christiansen – that memory is a presupposition for physical irreversibility, in the sense that it leads us to the selection of the retarded response functions and the rejection of 'advanced' ones. On the other hand, we have to state that irreversibility must be understood to be a presupposition for memory (Christiansen, 1987).[18] Memory depends on the fact that external processes leave behind some traces and evidence of what has been taking place in the past, that there is a 'differentiation' or 'transformation' taking place in nature, which results in visible aspects, traces of past processes. Eddington said that we are not ignorant of the nature of organization in the external world. And this goes for the concept of 'becoming' as well. The quality of the external world is 'so welded into our consciousness that a moving on of time is a condition of consciousness' (Eddington, 1946, p. 97).

The next step on the route to a global time is to accept that 'thermodynamic', irreversible time, which is measured by local processes, is the fundamental perspective on time. And if this is so, then there should be no problem to proceed to mechanical time and from there on to astronomical time (Christiansen, 1987, p. 39). This means that we have to proceed from our use of sandglasses and other diffusion clocks, to the application of mechanical clocks that – although they dissipate – are more 'precise'.[19] This again means that we have already secured a fundamental identity for time in external nature, in nature's irreversible and unidirectional 'processes'. We have used these characteristics to establish a linkage[20] to the characteristic irreversibility and unidirectionality that are the essential characteristics of human temporal experience. It is from this point onwards that we have to worry about how we should proceed in order to create a measure that yields global invariant precision. As Richard Schlegel writes, 'Our concept of time is based on two kinds of natural processes: those with progressive, non-cyclic change and those which undergo cyclic change. The former define a directed, increasing property of time, the latter the quantified measure of time' (Schlegel, 1971, p. 27). It should be noted, however, that cyclic change is still irreversible change, that is, as a process it does not repeat itself because each time a new process develops – each process has its own uniqueness. There is nothing homogeneous about these 'cyclic' processes. Homogeneity is only obtained by abstracting from the differences in the processes and by isolating a generalized pattern of cycles.

All kinds of clocks need some kind of energy in order to tick. Clocks are either wound or driven by batteries or some other source of energy in order to function, and this specific function of clocks will again eventually create heat generated by friction or dissipation in the mechanical parts of the clock. The fundamental point to be made in this is that the time parameter *t* has to be defined by the fundamental irreversible time measure. It should not be a problem to apply mechanical clocks for precision.

The reason for this is that fundamental time is not precise, at least seen from a strictly mathematical point of view. Our fundamental time is never 'precise', certainly not in the same sense as in the function of the 'time' that we derive from it. The sole purpose of the derived 'time' concept is 'precision'. The precision of the symbolic time-measure is not something that can be found as a constituent property of the objective (external) world, but stems from the local point of view – as has been argued earlier. It stems from our local viewpoint because it is intimately connected to the interpretation and thus with subjectivity in its contemplative mode. It should be obvious that mechanical time is secondary; something that is merely derived from its primary, or more objective source. The objectivity of time measurements is evinced, according to Gonseth, only by 'the practical exploitation of the temporal solidarity of the phenomena' (Gonseth, 1971, p. 284). Still, according to Gonseth, this approach only presents us with one particular point of view because, he writes, 'from a certain level of technical capacity onward, this first aspect is apparently disguised and cloaked by another aspect, that of precision' (Gonseth, 1971, p. 284).

That precision and objectivity are 'connected' to each other stems from the demand found in our need to communicate and to make every little thought public. Where time is concerned we cannot do without the ideals to which we strive to adapt our practical–technical reality of time measurement.[21]

In this sense one almost becomes suspicious of science and human intellectual striving in relation to the importance of time. The suspicion is that science and abstract thinking do not disclose anything of the mystery of time. Human interaction and communication emphasize 'precision' in several respects, such as, for instance, precision in speech, so, in fact, it all comes down to intersubjectivity, to that which all humans share as innate nature and which, thus, is as given, say, as temporal structure, through experience. In some aspects, for the sake of precision and intersubjectivity, we sacrifice essential aspects of reality and no one doubts that technology and natural science have secured considerable 'gain' for us.

The role of experiential time and derived time has changed places in the ontological scheme of things. The absurdity goes even further in that it is argued that, since temporal experience is not precise, in the manner time is presented on our clocks, it must be an illusion. But one should not, at least in ontology, exchange temporal reality, which must be presupposed in whatever epistemological context, with the demand for global invariance in universally applicable formalisms. This 'invariance' only secures for us some kind of pragmatic utility. Or it gives something external to our related ideas of epistemological 'objectivity' for the concept. However, we are thus made to believe that we can state sane things about the 'real' nature of time simply by replacing the local with global 'invariance'.

The present is a characteristic of the observer (I am not stating that the present only belongs to the observer). The now of the observer can never be taken as something that can be isolated from its experiential context, that is, isolated from its necessary interconnectedness to the past. It is the wholeness or the totality of experience that yields something temporal, which we can recognize as corresponding to the temporality of the world at large; to the characteristic temporal properties related to real processes such as irreversibility, transience and unidirectionality. That these properties of time cannot be part of any existing physical theory does not mean that they are not global (real, objective), ontic features of time. Even if these properties cannot be 'measured', they are, nevertheless, global properties in the sense that they belong to every local frame of reference, with or without an observer present. The characteristics are global through the local. 'Globality' is strictly speaking a theoretical term which refers to an epistemological context based upon the necessity of 'intersubjectivity' for the sake of communication. The local or real world, on the other hand, refers to actual and real experiences of a real relation between experience and the properties belonging to the world.

Notes

1. 'Rational' comes from the Latin word *ratio* meaning 'thought' or 'of the mind'. But now, in our present day, the word means the same as 'being able to determine' which, however, must include, in order to be rational, that which is being determined as something entirely 'independent of mind'.
2. For a more extensive reading about determinism and its rationale consult the writing of Capek. See for instance his 'Introduction' to *The Concepts of Space and*

Time (Capek, 1976). Interesting is also Edmund Husserl's *The Crisis of European Sciences* (Husserl, 1970). In the following I will go into detail on aspects that I believe are of the utmost importance to our understanding of the development of today's concepts of 'objective' time, and which is devoid of any 'subjective' content. However, the following is not a question of the intrinsic validity of science; I am not dismissing science. I do not intend to question science itself but the non-dynamic, non-temporal 'realistic' interpretation of it.

3. At least according to Edmund Husserl's *Crisis*: see Gurwitsch (1965, p. 292).
4. Here Parmenides is quoted from Williams (1988, p. 220).
5. Others with similar viewpoints are Feyerabend (1993) and of course Husserl (1970).
6. Gurwitsch (1965, p. 300). See also Husserl (1970, p. 51).
7. We are thus fighting against tradition and the habits of thought that have become second nature to *most scientifically trained* persons of our time. The mathematization of secondary qualities marks the turning point in our thinking about reality in the sense that it defines how to define nature as an object of science. This new way of thinking about reality and how to get correct scientific knowledge about it can be called 'the programme of the scientific objectification of the experienced and non-experienced domains'. The 'programme' emphasizes the faculty of abstraction. Thus, it removes 'the phenomenal precept'; it suspends 'every *experiencing subject* and, simultaneously, of any transient modality of time experience', as it is expressed by the physicist Massimo Pauri (1997, p. 280). Pauri continues by stating 'this epochal transformation of the very conception of *subjectivity* soon became stabilized and shaped many general features of modern thinking' (Pauri, 1997, p. 280).
8. See also Sklar (1995, p. 226).
9. As in all cases where physics is trying to explore the 'ultimate significance of time' solely within the framework of physical theory, and where this particular framework is taken to be more fundamental – since it is *physics*? – than experience and primitive concepts are developed from real-life situations.
10. The following points of argument have been put forward by the Danish physicist Peder Voetmann Christiansen in two papers (1987, 1988).
11. See Kostro (2000, pp. 88–9).
12. As suggested by Eddington (1946, p. 100).
13. In the sense of being something 'private' either individually or as part of the cognitive apparatus of human beings.
14. Denbigh and Denbigh (1987, p. 1) write that 'there developed a marked tendency among the 19th century scientists to attribute any apparent randomness in natural phenomena to a lack of sufficient knowledge about those phenomena rather than to any real chance element in nature. And there remains at the present time a strongly entrenched view to the effect that entropy is a subjective concept precisely because it is taken as a measure of "missing information" – information which we *might* use but don't, due to thermodynamic systems being incompletely specified.'
15. For readers interested in the *development* of timekeeping, clocks and the measurement of time, see van Rossum (1947) and Landes (2000).
16. In the following I will try to give an account of Christiansen's thoughts.
17. *Advanced response* is connected to the notion of *time-reversible processes*, processes that are – in the metaphysical cosmology of static time – 'caused' by *future* events. What comes first in experience is illusion because 'in reality' it is – so it goes – only the effect.
18. Our experience of time must itself presuppose *time*.

19. Ferdinand Gonseth (1971, p. 277) has asked the following important question in his paper 'From the Measurement of Time to the Method of Research': 'Are we quite certain of what is exactly meant by the words *time* and *measurement* before a timepiece is constructed?' And his answer is as simple as it gets: 'Generally speaking, *a clock is simply a very observable phenomenon, the temporal law of which is known.*' However, this does not state that a 'clock' that measures real (heterogeneous) time is less precise because it is not a mechanical clock. This is to say, it does not measure the time or processes *homogeneously* (in this sense precise) as the mechanical clock does, because it corresponds with the rhythm of the process itself. Thus, Gonseth states that any kind of observable 'clock' or process will do as long as one agrees upon the use and application of it as a measure, that is, as a 'temporal law' of that which is perceived. Thus, we have to differentiate between (1) ontological 'precision', that is correspondence between the applied measurement and device and the heterogeneous rhythm of external process, and (2) scientific precision that aims at a result that is in all aspects homogeneous as a measure. The 'homogeneous' measure does not and cannot 'copy' the rhythm of the external process that is measured. Needless to say, it is this last measure – understood as a piece of information gained by applying, say, a mechanical clock – that is the type of measure convention that we have become accustomed to for the sake of quantifiable precision.
20. First by some 'analogy' based on experience, but also – perhaps more so – by the necessity of experience to be (somehow) grounded in nature, at least adapted to the characteristics of external nature perhaps through evolution. Just consider John Cohen's opening claim in his paper 'Time in Psychology': 'A scientific world picture with pretensions to comprehensiveness cannot refuse to reckon with human experience, which is itself part of nature, and, in particular, with the experience of time' (Cohen, 1971, p. 153). This is exactly what I have stated.
21. Gonseth (1971, p. 287) writes: 'Of course, to a certain and possibly essential extent, the progress of clock-making technology has been inspired and oriented by a theoretical ideal, by the abstract model of the isochronic oscillator. The word *abstract* should mean here that it is a question of a model of a mathematical character, conceived according to the principles of so-called rational mechanics. The efforts of technicians and practitioners have long tended, and still tend, to realize this model as perfectly as possible ... all research was oriented ... towards the realization of conditions, which, in the ideal model, ensured the correct functioning of the isochronous oscillator. The improvements and discoveries to be made on the technical level seemed to answer the need for a *guiding principle: that of seeking an ever-greater approximation of the theoretical model.*' To be more *precise*, the ideal in the clock-making industry is that of *sustained isochronic oscillation* (Gonseth, 1971, p. 289).

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Part II

Technology: Epistemic and Metaphysical Issues

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3
Quick-Freezing Philosophy: an Analysis of Imaging Technologies in Neurobiology

Robert Rosenberger

In what follows, I offer a general methodology for the analysis of the roles that technologically produced images play in scientific debate. This requires a review of insights into the philosophy of technology emerging from a budding perspective called 'postphenomenology'. This perspective, which amalgamates central aspects of the phenomenological and pragmatic traditions of philosophy and applies them to issues of technology, offers a rich collection of concepts for the project of articulating the ways that technologies mediate people's experience of the world. The methodology I provide below applies postphenomenological insights for both the purposes of understanding practices of image interpretation in science, and potentially offering novel research directions for contemporary scientific work.

To test this methodology, I use it to examine a debate from the field of neurobiology. Researchers in this field disagree about the nature of synaptic vesicles: tiny, spherical organelles which play an essential role in neurotransmission. Their debate occurs over images of neurons which have been frozen through contemporary imaging techniques, and magnified by the electron microscope. The following analysis of the complex roles such technologies play in this debate will be used to both advance postphenomenological thought, and offer contributions to neurobiological research.

3.1 A method for phenomenological analysis of scientific images

In the field of philosophy of technology, there is growing membership in a school of thought called 'postphenomenology'. This blend of phenomenology and pragmatism, advanced by Don Ihde and others, provides a perspective from which to analyse the ways humans interact with technologies. Several detailed explorations into a variety of technologies have recently emerged from this mode of investigation. For example, Cathrine Hasse conducts postphenomenologically informed anthropological investigations of training procedures in physics (e.g. 2006). Leandro Rodriguez-Medina analyses the material culture of politics, exploring differences in the ways politicians and the public conceptualize objects (forthcoming). Evan Selinger offers analysis of the effects that the technological transfer of cellular phones to an emerging sector of women in Bangladesh has had on their lives (2007, 2008, forthcoming). Peter-Paul Verbeek engages in postphenomenological analysis of ethics and aesthetics in engineering design, and their roles in consumer culture (e.g. 2005, 2006a, b). Ihde's current work locates patterns in a long trajectory of imaging technologies that have evolved in the tradition of the camera obscura, and the central role these technologies play in both abstract epistemological discussion and in concrete scientific practice (in preparation).[1] Here, I will review some of the central tenets of postphenomenology, and offer a general method for applying these insights towards the analysis of controversial images in scientific research.

The term 'postphenomenology' designates a specific movement in the philosophy of technology which attempts to articulate the relations that exist between people and the technologies which mediate our experience of the world. While the works listed above represent some contemporary efforts to apply postphenomenology, there are only a few texts which may qualify, so far, as foundations of this new perspective. Ihde's *Postphenomenology*, his article 'If Phenomenology is an Albatross, Is Post-Phenomenology Possible?', as well as Verbeek's *What Things Do*, could be considered the central theoretical works (Ihde, 1993, 2003a; Verbeek, 2005).[2,3] Phenomenology is a tradition in continental philosophy which attempts to describe reality through the context of human perception of, interactions with, and intentions towards, the things of the world. *Post*phenomenology, however, departs from this tradition in several specific respects. One important point of divergence is its pragmatic underpinnings. Postphenomenology is explicitly non-foundational; rather than make claims about the nature of reality as phenomenologists have, postphenomenology focuses upon relations *between* humans and the world.[4] A second important point of divergence, in tune with the first, is that the spotlight of analysis falls heavily upon the technologies which mediate our experience of the world. Verbeek explains, 'Things, therefore, are not neutral "intermediaries" between humans and the world, but *mediators*: they actively mediate this relation' (2005, p. 114). Postphenomenology seeks to identify the various specific ways that the world is shaped by our experience of it through those technologies that make experience possible.[5]

Though non-foundational and non-universalizing, postphenomenology does not slide into a relativist conception of reality. Verbeek (2005, p. 113) explains:

> The facts that technological artifacts can be conceived as constructions, always exist in context, and are interpreted by human beings in terms of

> their specific frameworks of reference do not erase the fact that systematic reflection can be undertaken of the role that these contextual and interpreted constructions play concretely in the experience and behavior of human beings.

One of the primary procedures through which postphenomenologists conduct investigations of the relations between humans, technology and the world, is a technique called *variational analysis*. With this procedure, the limited number of stable relationships that can exist between a person and a specific technology are explored. Ihde claims, 'bodily perception has a *structure*, but that very structure yields to a polymorphy of perception. It is *multi-stable*' (1993, p. 70). Understanding bodily relations to technologies to be multi-stable leads us to investigate what specific different stable variations are possible in relation to particular purposes. With such a pragmatic basis, the value of this perspective will be determined by its ability to reveal useful interpretations of the world. Or as Ihde puts it, 'The test, however, should lie in outcomes – what produces the relatively better analysis, interpretation, or critique?' (2003a, p. 136).

One area of the philosophy of technology which has received sustained attention from postphenomenologists is that of the analysis of imaging technologies. My intention here is to gather postphenomenological insights offered in regard to this topic, and organize them into a general methodology for examination of the processes of image interpretation that occur in scientific practice. I will focus specifically on controversial images in science, ones that constitute the central content of scientific debate. Such a methodology will provide two things: a system through which philosophers could potentially contribute to contemporary scientific debates which concern images, and a structure through which philosophers of technology could continue to articulate an applied philosophy of image interpretation.

A postphenomenological methodology for the interpretation of scientific debates over technical images, I suggest, should consist of three general steps: (1) conceptualization of the disputed images as multi-stable, (2) identification of the competing variations and (3) examination of the roles played by mediating technologies in the interpretive strategies which enable each variation. This method will highlight the practices through which images produced by laboratory technologies are interpreted, and make such practices – which may play crucial roles in scientific debate – explicit for analysis. While postphenomenology may not be the only philosophical perspective that underscores the larger contexts within which scientists interpret their data (e.g. Kuhnian or Quinian frameworks), it is ideal for our purposes here since it offers the richest set of concepts in regard to image interpretation and technological mediation. I will proceed by articulating this three-step methodology one step at a time.

1. The first step required for a postphenomenological analysis of disputed images in science, I claim, is to conceptualize the images at issue as multi-stable. In the case of a scientific debate over the interpretation of an image (e.g. an fMRI image, false-colour radio-telescope image, sonar topography image), it may be typical for participants to hold that the debate exists because one side (or more) interprets the image incorrectly. A productive alternative to this conception of debates over images in science is to understand images to themselves be open for multiple possible interpretations; in this postphenomenological view, the debate exists because each side offers a (more or less) stable interpretation of a multi-stable image. This understanding does not presuppose relativism about the *world* itself, but instead holds that *images*, as mediating technologies, are subject to a number of stable variations. A switch to an understanding of scientific images as multi-stable is productive in that it invites variational analysis of the practices of image interpretation.[6]

In theoretical work on the multi-stability of images, Ihde has investigated a series of visual illusions, such as the Necker cube and the duck/rabbit.[7] In these simple, instructive examples, Ihde analyses the experience of one observing an optical illusion. In the case of the Necker cube drawing, one sees a cube positioned one way if viewed from one perspective, and a cube positioned differently if viewed with an alternate perspective in mind; several interpretations are possible. Upon each different interpretation, a different version of the cube is experienced. Ihde explains that each different version of the cube should be understood as a different variation of a multi-stable image. Though it may only be possible to see one variation at first, specific stories offered by another person can help one to experience other possibilities. Following Ihde, let us give the name *hermeneutic strategies* to the stories that make the experience of different variations possible (1986, p. 88). He explains, 'The story creates a condition that immediately sediments the perceptual possibility' (Ihde, 1986, p. 88). Though the traditions of hermeneutics (with its focus upon interpretation) and phenomenology (with its focus upon immediate experience) may typically be seen as quite separate, postphenomenology highlights the relationships between the two; the interpretive frameworks that make possible the immediate perception of complicated objects (such as an image produced by technologies in an esoteric scientific context) are made the focus of study. A task for philosophers of technology, then, is to articulate the ways that the conceptual tools which Ihde uses to explore the simple examples of visual illusions can be used to investigate complex instances of disputed images generated by scientific technologies.

2. The second step is to identify the different variations which exist in regard to the specific multi-stable scientific images that are under debate. In a scientific debate which includes controversial images, competing theoretical positions will most likely inform the opposing interpretations of such

images. In these cases, the various sides of the scientific debate (each offering a different variation of the image under dispute) can be understood to contain the different hermeneutic strategies that provide the conditions for those variations. In other words, the various aspects of one side of a scientific debate, including the history of its claims and the particulars of its use of imaging instruments, constitute the hermeneutic strategy which makes possible one variation of a multi-stable scientific image.

In the next section, I will offer an example of a debate from the field of neurobiology which concerns the proper interpretation of images, and in which each side of the debate offers a different variation of the images under dispute. However, before exploring this example, it is necessary to review one more step of this methodology.

3. The rival camps of scientists that hold the theories that make up the competing variations of the images under debate may maintain modestly (though importantly) different relationships to the same imaging technologies. The third step of the methodology is the task of articulating the roles that such technologies play in the opposing interpretations of controversial images.

Verbeek explains, ‘Artifacts help to shape human interpretations of reality not only because they play a role in interpretive frameworks, but also because of their role in sensory perception, which determines the very possibilities human beings have for interpreting reality’ (2005, pp. 131–2). As such, the specific changes that imaging technologies make to the object of study, enabling that object to become visible, are inextricable aspects of such a study. And these changes that an object of study undergoes through the process of becoming visible may be significant to the content of the scientific debate over the resulting images. Postphenomenologists have offered detailed articulations of the complex roles that technologies play in scientific imaging. Ihde’s work *Expanding Hermeneutics: Visualism in Science* represents the most sustained analysis in this regard (1998).[8]

Ihde gives the name *transformations* to the changes that imaging technologies render to those otherwise invisible objects of study which become visible through the imaging procedure (1998, p. 92). Ihde offers two general categories of transformations. A *spatial transformation*, he explains, is one where an imaging technology changes the location or size of an object of study through the process of making that object visible. The magnification of an object too small or too far away to see, for example, may involve more transformations than simply the enlarging of the object of study to a visible size. The process may include ‘flattening’ the object into a two-dimensional image. It may include ‘reframing’ the object, that is, lifting it from its original context, and placing it into a literally framed picture. Such a reframing may involve dissecting, moving or in some other way significantly altering the object in the process of preparing it for visualization. A *temporal translation* is one where the action of the object under study is altered through the imaging process. This could include slowing down, or speeding up the object, or, as seems to be a typical case, creating a still image from a single moment of an action.

These transformations, Ihde explains, while playing essential roles in the imaging process, may still remain somewhat *transparent* to the trained scientist that views the image. That is, for the properly informed scientist, the transformations fade into the background of his or her experience. He or she focuses upon the content of the image. Indeed, for the imaging to be useful, it seems necessary for transformations to be transparent to at least *some* degree. However, the transformations will always still be present, 'echoing' within the image. It is not possible, Ihde claims, for complete transparency to be achieved (1998, p. 92). These general observations will hold true as well, though in slightly different ways, for non-isomorphic images. That is, those images which are purposefully altered in the imaging process, such as through the use of false colours to represent other data (e.g. the sea level of an area on a map, or the level of oxygen usage of a location of the brain), will also share issues of translation and transparency. With the third step of this methodology, the transformations important to the images at issue in a scientific debate are to be investigated, and their roles in the various hermeneutic strategies outlined.

I offer this general, three-step, postphenomenological methodology for analysing the roles of imaging technologies in scientific debate. But in true pragmatic spirit, it will be necessary to test such a methodology upon current research. Next we will consider an example of a contemporary, technologically embedded debate from the field of neurobiology.

3.2 The debate over synaptic vesicle exocytosis

In the field of neurobiology, there is a contemporary debate over the nature of tiny, spherical organelles called 'synaptic vesicles'. There is wide agreement that neurotransmission occurs through the mechanism of synaptic vesicles, filled with neurotransmitter, fusing with the terminal membrane. As these vesicles fuse with the membrane, their cargo of neurotransmitter is released out of the neuron and into the synapse (and thus neurotransmission is performed). The term 'exocytosis' refers to a vesicle fusing with a membrane to release its contents to the other side. Accordingly, the term 'synaptic vesicle exocytosis' refers to the release of neurotransmitter into the synapse between neurons as 'synaptic vesicles' within the terminal fuse with the cell membrane. 'Synaptic vesicle endocytosis' refers to the process through which vesicles are reinternalized into the cell. Despite strong agreement in this field upon the general features of neurotransmission, there has been a vociferous debate over the details of exocytosis and endocytosis which has raged for the last 30 years. I will refer to this disagreement here as the *synaptic vesicle debate*. At stake in this debate is our understanding of the mechanisms of neurotransmission, one of the basic components of nerve function. As such, work in this area has the potential to contribute to our understanding of the workings of neurological diseases such as muscular dystrophy.

The first of the two major positions of this debate has been advanced by John Heuser and his colleagues. In their understanding of synaptic vesicle exocytosis, which I will refer to as the *Heuser model*, a vesicle releases its contents into the synapse by fusing, and then collapsing completely into the cell membrane (e.g. Heuser and Reese, 1973, 1981; Heuser et al., 1979; Miller and Heuser, 1984; Heuser, 1989a).[9] In this model, endocytosis occurs separately, at a later time and at a different location on the membrane. That is, a new vesicle buds and pinches off of the membrane several seconds after neurotransmission, and at an area separate from the spot where transmitter is released. Over the years, the Heuser model has become the most commonly accepted theory.

The major alternative to Heuser's position is a model offered by Bruno Ceccarelli and his colleagues. In what I will refer to as the *Ceccarelli model*, synaptic vesicles are not understood to fuse and flatten out into the membrane, but are instead claimed to fuse temporarily and then to detach again from that same spatial location (e.g. Ceccarelli et al., 1973, 1979, 1988; Torri-Tarelli et al., 1985; Fesce et al., 1994). In this view, exocytosis and endocytosis are tightly coupled, occurring at the same time and area.[10]

Since the process of neurotransmission occurs in a small fraction of a second, imaging techniques have been developed to make the visualization of synaptic vesicle fusion possible. Throughout the 1980s and into the 1990s, the primary way that synaptic vesicles were studied was through imaging techniques which include freezing the sample, thus enabling a single moment of the process of neurotransmission to be studied. The central questions of the synaptic vesicle debate have concerned exactly how these images of synaptic vesicles fused to a frozen cell membrane should be interpreted.

A major advance in the history of this debate has been the invention of a technique called 'quick-freezing'. Quick-freezing is achieved through the use of a device called the 'cryopress', sometimes nicknamed the 'slam freezer'. Invented by Heuser and his colleagues, the cyropress enables a sample to be dropped, or 'slammed', upon a copper block which has been cooled by freezing liquid (see Figure 3.1). This technique freezes a sample almost instantaneously, making possible the careful examination of a single moment of the biological process occurring in the sample at the time of freezing.[11] The Ceccarelli school has responded with the invention of their own quick-freezing device.

The quick-freezing technique is used in conjunction with other imaging practices. For example, a technique called 'freeze-fracture' enables a view of the outside or inside surface of the cell membrane. This involves breaking,

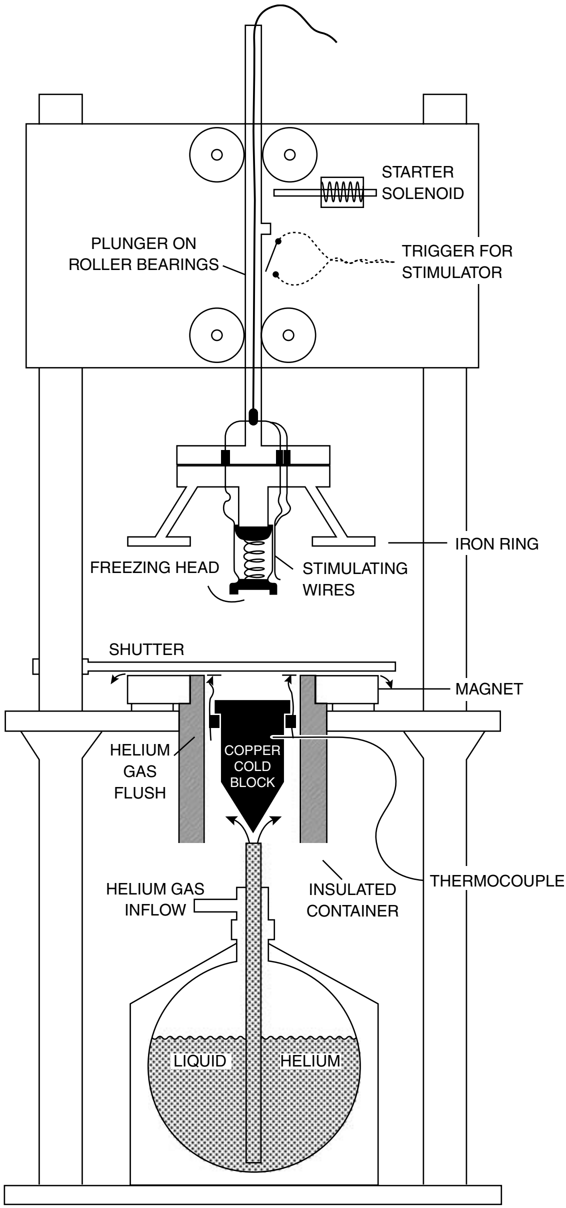

Figure 3.1 A diagram of the cryopress. Reproduced from the *Journal of Cell Biology*, 81 (1979): 275–300. Copyright 1979 Rockefeller University Press

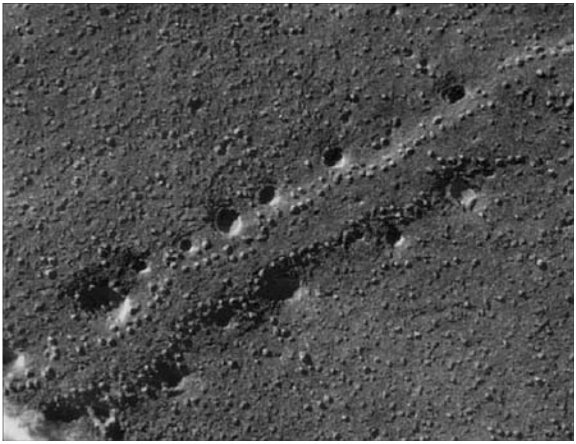

Figure 3.2 A freeze-fractured image of a portion of the outside surface of the terminal membrane. This sample was quick-frozen during neurotransmission. Permission received from John Heuser

or 'fracturing', a frozen membrane along a specific layer, enabling it to be laid out and studied. The frozen surface is then covered in a thin coating of metal, and the original sample is melted away. The metal cast is then studied under the electron microscope (Figure 3.2).

Images such as Figure 3.2 reveal the fact that crater-like structures, or 'dimples', appear on the outside surface of the terminal membrane when the sample is quick-frozen during neurotransmission. Such dimples are widely interpreted to be synaptic vesicles fused with the membrane. The fact that such dimples reliably appear in images of samples frozen just milliseconds after stimulation has provided strong support for the position that neurotransmission is caused by the action of synaptic vesicles.[12] However, such images have not settled what I have been referring to as the synaptic vesicle debate, the debate between the Heuser and Ceccarelli models; each model offers a different interpretation of the content of these images.

3.3 The multi-stability of quick-frozen images

To apply the insights of postphenomenology to a scientific debate that includes imaging technologies, I claimed above that one should first conceptualize the images in question as multi-stable. In the case of the synaptic vesicle debate, this requires one to understand images produced through the quick-freezing technique, such as Figure 3.2, to be open to more than one stable interpretation. While there may be one correct answer to the question concerning the true nature of synaptic vesicles, there may be multiple reasonable variations of a multi-stable picture of synaptic vesicles produced by imaging technologies.[13]

The second step of this method urges one to identify the competing variations of the images in question. In the case of the synaptic vesicle debate, the two variations are constituted by the two nodes of this scientific dispute: the Heuser model and the Ceccarelli model. Each of these theories can be analysed to determine how it provides the specific hermeneutic strategy that makes possible its respective variation of the quick-frozen images. In the case of the Heuser model, the dimples that appear in the quick-frozen, freeze-fractured images are claimed to be vesicle fusions that have been caught in the process of completely flattening out into the membrane as they each release their stock of neurotransmitter. The Ceccarelli model instead claims that the dimples in these images are vesicles temporarily fusing with the membrane, and then detaching there in the same location.

Many things go into the hermeneutic strategies that make possible the two variations of these images. These two theories of synaptic vesicle exocytosis have each been supported by many studies over the decades. For example, a strong source of confirmation for the Heuser model has come from the investigation of the reinternalization of new vesicles as a separate process occurring several seconds after transmission. Much evidence has been gathered in support of the notion that endocytosis occurs in this way (e.g. Miller and Heuser, 1984; Takei et al., 1995; De Camilli and Takei, 1996).[14] Many things, including much non-imaging data, play into the hermeneutic strategies that inform the two variations of quick-frozen images of synaptic vesicles.

The third step of this methodology suggests that the different roles that instrumentation plays in the hermeneutic strategies that make up the competing variations of the images be made explicit. In what specific ways are nerve samples transformed through the imaging process, thus making visualization possible? As we have seen above, a sample undergoes many dramatic changes in the process of making possible a view such as the image in Figure 3.2. In the freeze-fracture process, for example, changes such as the freezing of the nerve sample, the careful breaking of the cell wall, the creation of a metal cast, the removal of the original organic material, and the magnification of the specific area of the surface under study, all play a part in the spatial transformations that are required to make synaptic vesicle fusions something that we can see with our eyes.

However, the transformation that I would like to expand upon briefly here is a temporal transformation that occurs in these studies. The quick-freezing procedure makes it possible to view the action of vesicle fusion, which occurs at a speed much too fast to see (a small fraction of a second), by instantaneously freezing the nerve sample, and thus immediately halting whatever biological process is occurring in that sample at that instant in time. In this way, the imaging procedure transforms a *sample* which is undergoing the *process* of neurotransmission into an *image* of a *single moment* of that process. As such, moments of a process otherwise impossible to see now become possible to visualize.

Such a dramatic transformation, of course, comes with consequences. What is a dynamic process in the real world now becomes a fixed image. Only one moment at a time can be studied with these techniques. And, importantly, each moment studied will come from a different sample altogether, since each is destroyed in the process of image-making. The researchers of the synaptic vesicle debate, however, have found ways to work creatively within the parameters set by this technology.

The Heuser school has created a series of quick-frozen images, each taken at a different interval after the stimulation of a sample that causes neurotransmission. In so doing, they observe the *shape* of synaptic vesicle fusions *over time*. John Heuser and T. S. Reese report that vesicle fusions (the dimples in Figure 3.2) begin to appear in freeze-fractured images created 3 ms after stimulation, peak in number at 5–6 ms, and slowly decrease for the next 50–100 ms. And, relevant to the interpretation of these images, they observe that, while vesicle fusions of a variety of diameters can be seen at all times, vesicle fusions on average tend to widen as the milliseconds progress (Heuser and Reese, 1981, p. 570). They explain, 'A reasonable interpretation of this rise and fall in the number of vesicle openings, and their tendency to increase in size over time, was that each vesicle opening begins as a small pore in the surface membrane and enlarges until the synaptic vesicle membrane is entirely collapsed into the plasmalemma' (Heuser and Reese, 1981, p. 570). That is, these data, Heuser and Reese claim, support the postulation that exocytosis occurs through synaptic vesicles fusing with the terminal membrane, and then flattening out entirely into it. This evidence has provided much of the foundation of the hermeneutic strategy which enables the quick-frozen images to be interpreted in terms of the Heuser model.

The quick-freezing work offered by the Ceccarelli school has turned up similar evidence in terms of the appearance of vesicle fusions in the first few milliseconds. They find that the first fusions occur 2.5 ms after stimulation. In their study, they created quick-frozen images at the intervals of 2.5, 5 and 10 ms after stimulation, and did not find the quantity of vesicle fusions to decrease during that time (Torri-Tarelli et al., 1985). In later papers, the Ceccarelli school often refers back to this study when claiming that there is evidence that synaptic vesicles may fuse and then soon detach (as stipulated by the Ceccarelli model), at least in these first moments of neurotransmission (e.g. Valtora et al., 1989; Fesce et al., 1994, 1996).

With these things considered, it seems clear that the hermeneutic strategies offered by each side of the synaptic vesicle debate are deeply embedded within the nuances of the specific technologies that make visualization of the phenomena at issue possible. The context set by this postphenomenological analysis, I claim, invites specific new trajectories of research and discussion for this neurobiological debate. For example, one line of inquiry that may be suggested by the above account is the task of further articulating the specific ways that the technological transformations enacted by the quick-freezing technique inform the specific hermeneutic strategies offered by the competing models. The fact that the sequence of events of synaptic vesicle fusion must be inferred from a series of single moments is what makes possible the contention that these data can be used to support both models. A more refined quick-freezing analysis of the first few milliseconds of neurotransmission, it seems, could further challenge or substantiate the Ceccarelli model's version of events for those moments.

The move to reconceptualize controversial scientific images as multi-stable, I suggest, encourages a specific trajectory for further analysis and discussion: the interrogation of the hermeneutic strategies that make possible each variation of an image. While each hermeneutic strategy offered by rival bodies of scientific research may make possible a different way of interpreting an image, this does not imply that each strategy fits the image content equally well. In the case of the synaptic vesicle debate, taking up such a postphenomenological perspective may encourage researchers to more rigorously cross-analyse any claim that quick-frozen images should be understood to support each side of the debate equally. Further research and analysis could be productively directed towards testing the most crucial aspects of the hermeneutic strategies which buttress the two rival interpretations of these images.

3.4 A note on the kiss-and-run model

My claims above can be made more strongly and more concretely if the most current conceptual moves in the synaptic vesicle debate are considered. Here I would like to offer a brief note on the contemporary version of the Ceccarelli model, a theory known as 'kiss-and-run'.

Since the mid-1990s, the students of Bruno Ceccarelli have advanced a version of the Ceccarelli model which claims that synaptic vesicle exocytosis may occur through the mechanism of a 'fusion pore'. That is, a vesicle may temporarily fuse and then detach from the membrane by virtue of a specific chemical structure called a fusion pore. These researchers consider this possibility to be a theoretical advance over the former version of the Ceccarelli model, since it brings greater specificity to their claims (Fesce et al., 1994; Fesce and Meldolesi, 1999; Valtora et al., 2001). They dub their new version of the model 'kiss-and-run', and they rename the Heuser model 'the classical model', referring to its wide acceptance. As well, in the past decade and a half, research on the Heuser, or 'classical', model has continued to stampede forward, much due to greater and greater articulation of synaptic vesicle endocytosis, shown in this work to be a separate process occurring after transmission (e.g. Takei et al., 1995; De Camilli and Takei, 1996).

The large part of the evidence that the students of Ceccarelli have offered in support of the kiss-and-run model has come through arguments by analogy to work done on non-neuronal cells. They claim that indirect evidence (i.e. non-imaging evidence) has emerged which substantiates the kiss-and-run model in regard to cells that have structures similar to neurons (Alvarez de Toledo et al., 1993; Neher, 1993; Alés et al., 1999). Based upon this, while admitting that it does appear that synaptic vesicle exocytosis occurs through the classical mechanism, the kiss-and-run researchers argue that synaptic vesicles may *also* operate via kiss-and-run. As well, and important to our analysis here, the kiss-and-run researchers retrofit their fusion pore theory of exocytosis upon their own history of research on the Ceccarelli model. The quick-freezing research reviewed above, they claim, can also be interpreted to support the kiss-and-run model (Fesce et al., 1994; Valtora et al., 2001).

As well, very recent times have seen provocative new research which claims to provide indirect evidence showing synaptic vesicles to, in certain situations, operate via the kiss-and-run mechanism (e.g. Gandhi and Stevens, 2003; Aravanis et al., 2003; Rizzoli and Betz, 2003; Staal et al., 2004; Wightman and Haynes, 2004). This research, while still quite young, seems to indicate that exocytosis may occur differently across different *types* of synaptic vesicles. That is, this research may show that different types of neurons may primarily utilize different pathways of exocytosis.

An analysis of the kiss-and-run model from a postphenomenological perspective offers specific new research directions. I suggest that the kiss-and-run model can be seen to provide a *third* variation of the quick-frozen images debated over by the Heuser and Ceccarelli camps. This resituating of the kiss-and-run model with respect to quick-frozen images encourages one to attempt to articulate the specific hermeneutic strategy that is being implicitly offered. Several important and yet unanswered questions become foregrounded. How well does the fusion pore understanding of exocytosis map onto the 'dimples' revealed in quick-frozen, freeze-fractured images? Can one distinguish between kiss-and-run fusions and classical fusions in images of the early moments of neurotransmission? And does the contention that the pathway of exocytosis may be determined by a neuron's type challenge the kiss-and-run researchers' attempts to retrofit their model upon the history of images created by the Ceccarelli school?

3.5 Conclusion

A traditional understanding of the role of images in scientific debate might hold that an image presents the scientists with a view of reality, and that the debate exists because one side of the debate interprets the world correctly, and the other does not (or neither does). I claim that an understanding instead that images are multi-stable is helpful since it encourages concrete analysis of the specific arguments that support each rival interpretation. And I hope to have shown that postphenomenology offers the ideal context for such analyses since it provides a rich set of concepts for approaching such tasks.

With the above analysis of the synaptic vesicle debate, I have offered an example of the sort of examination of scientific practice that this perspective makes possible. In so doing, I offer a contribution to the project of articulating the postphenomenological perspective through this exploration of its practical potential. Of course, further case studies of contemporary scientific research are necessary for postphenomenologists to continue to develop systematic methods for the application of this body of thought. As well, through the analysis of the roles that imaging technologies have played in the synaptic vesicle debate, I hope to have highlighted specific points of discussion that could be helpful in guiding further research and cross-analysis in neural science.

Acknowledgements

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Notes

1. As well, a Festschrift which celebrates Don Ihde's contributions to philosophy has the title *Postphenomenology* (Selinger, 2006). Also, see my own postphenomenological analysis of the practices of image interpretation at work in a contemporary debate in space science over pictures of the surface of Mars (Rosenberger, 2008).
2. Other articles which advance the notion of postphenomenology include Ihde (2003b, c, 2005).
3. In *What Things Do*, Verbeek claims to be offering a more radical version of postphenomenology than does Ihde (Verbeek, 2005). Evan Selinger, however, in his review of Verbeek's book, argues that Verbeek's position is not more radical, but simply a different articulation and application of the same views that Ihde also holds (Selinger, 2005). In any case, for the purposes of this chapter, subtle differences between Verbeek's and Ihde's versions of postphenomenology will not be relevant. I will use works of both philosophers to articulate the general postphenomenological project.
4. The amalgamation of phenomenology and pragmatism may lead to some tensions which postphenomenologists have yet to explicitly engage in detail. One point of contention is postphenomenology's claim that it is non-foundational. Further work is required to articulate the way that, despite making claims about the nature of human perception and despite identifying patterns in human relationships with technology, postphenomenology is not establishing foundations. Robb Eason, in his article 'Hypertext: Rortean Links between Ihde and Haraway', offers a version of this criticism (2003; see also Scharff, 2006).
5. As well, it should be noted that the postphenomenological conception of experience is interrelational and non-subjectivistic, borrowing much from John Dewey's pragmatic philosophy of experience.

6. Of course, such an understanding does not in any way discourage the scientist's strategy of searching for more data to support his or her position, the standard option when an image is deemed to possibly support both sides of a debate.
7. Ihde's most sustained analysis of Necker cubes and other visual illusions occurs in *Experimental Phenomenology* (1986). His analysis of the duck/rabbit illusion, where he adds two more variations (the squid and the Martian), appears in his recent Festschrift response article entitled 'Forty Years in the Wilderness' (2006; see also Rosenberger, forthcoming).
8. When discussing the importance of taking a hermeneutical perspective on instrumentation in science, the pioneering work of Patrick Heelan should also be acknowledged (e.g. 1983a, b; see also Crease, 1993). Building upon this perspective, Nicolas Rasmussen offers an investigation of electron microscope practice, as is the topic here (Rasmussen, 1997).
9. While the term 'model' is one which gets used in a variety of ways, and which philosophers of science have struggled to define, I use it here since it is the term used by the neurobiologists themselves. Roughly, as its usage here, the term refers to a theory of a biological structure with many specific parts, mechanisms and relationships between those pieces.
10. In a summary of the synaptic vesicle debate which appeared in the introduction to a volume honouring the late Bruno Ceccarelli, Heuser (a contributor to the volume) was referred to as Ceccarelli's arch nemesis (Clementi and Meldolesi, 1989; Heuser, 1989b).
11. For articles discussing the details of the quick-freezing procedure see Heuser (1978, 1981) and Heuser et al. (1979). Important studies involving quick-freezing produced by the Heuser school include, for example, Heuser et al. (1979), Heuser and Reese (1981) and Miller and Heuser (1984). The Ceccarelli school's presentation of their own quick-freezing device occurs in Torri-Tarelli et al. (1985).
12. Another important technique in this field, along with freeze-fracture, is one called 'freeze-substitution'. This technique yields thin sections of the terminal membrane. Such thin sections reveal side-views of fused vesicles when a sample is quick-frozen during neurotransmission. As with freeze-fracture, such freeze-substituted images of vesicles fused with the terminal membrane have provided strong support for the understanding that synaptic vesicle fusion is responsible for neurotransmission. And also like freeze-fracture, such images have not provided a resolution to the debate between the Heuser and Ceccarelli models, since each offers a different interpretation of their content.
13. I first suggested that one may be able to use Ihde's philosophy of hermeneutics to analyse the synaptic vesicle debate in Rosenberger (2005). And I first offered a reading of the synaptic vesicle debate in terms of the notion of multi-stability in Rosenberger (forthcoming).
14. The Ceccarelli school has offered an alternative interpretation of early reports of new vesicles forming several seconds after neurotransmission. They suggest that such evidence actually presents temporary vesicle fusions occurring at areas separate from the usual location (e.g. Ceccarelli et al., 1979, 1988; Grohavaz et al., 1989; and for Heuser's response see 1989b).

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4
How to Read Technology Critically

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Narrative theory takes the 'story' or 'narrative' to be the basic unit of meaning for understanding and explaining human action. Philosophers such as Arthur Danto (1968), Alasdair MacIntyre (1982) and Paul Ricoeur (1984, 1986, 1988) claim that narratives capture the temporal, historical and contextual character of human experience better than shorter linguistic units of meaning, like the 'utterance' or the 'sentence'. A narrative creates the most comprehensive interpretation possible by synthesizing diverse plot elements into a meaningful story. Both non-fictional and fictional stories relate episodes of human experience, the former as they actually happened, the latter *as if* they happened. Yet traditional narrative theories are prejudiced in favour of persons over things.[1] They treat people as if only they deserve to have their stories told; non-humans, natural events and things are props or circumstances to be dealt with but never themselves the subject of their own stories. Mere things get explanations; persons get stories. As a result, the 'narrative turn' has had far less of an effect on the philosophy of technology as elsewhere in the humanities and social sciences. Philosophical frameworks prejudiced against things are not particularly helpful when it comes to understanding the philosophical dimensions of technologies.

Yet in spite of deeply entrenched Kantian prejudices, we tell stories about things all the time. Everything has a story: everything comes from somewhere, has a history, and has relations to other things. So long as the genesis and evolution of something can be recounted, it can be explained in terms of a narrative and read like a text. Stories of technology are not difficult to find in popular books, scholarly articles and television documentaries – typically about history-changing industrial technologies or war machinery. But even ordinary technologies can be made the subject of a narrative. The task here will be to examine what happens to our philosophical understanding of technology when we model the interpretation of technical things after telling and reading stories. This step from text to technology is quite short. Several philosophers of technology have taken a near-narrative turn (perhaps, a 'narrative veer') away from overarching, transcendental theories towards more con*text*ual interpretations of human–technology relationships. One task here will be to show that the presuppositions and methods of narrative theory apply to the interpretation of technology. Another task will be to argue that there is a meaningful difference between a critical reading and a conventional reading of technology. The key to the distinction hinges on the relationship between the universal and particular, acontextual and contextual in narrative theory and critical theory.

4.1 How to read technology

One of the most vexing questions for philosophers of technology over the last 25 years has been to make sense of how technologies can be seen as both technical and social, and what that might mean for actual design, use and practice. Any technology has a social meaning relative to its use and context, as well as technical properties that are non-contingent and acontextual. An automobile, to take a mundane example, can be both status symbol (in one social context) and a mechanical device (in any social context). Changes in the design of an automobile should be understood as reflecting both social imperatives (such as cost, safety and marketing) and technical imperatives (such as available materials, causal interactions and physical limitations). Some philosophers frame the issue in terms of the way that technologies simultaneously embody two conceptualizations of the world: one physical, one intentional. A technology has both physical properties that interact causally with other physical things in the natural world, and intentional properties that relate to the beliefs, desires and purposes of human designers and users. Physical structure and human design are integrated into what are often called 'functional' or 'technical' artefacts (see Kroes and Meijers, 2002). In some sense, technical artefacts belong to two ontological and methodological universes, while in another sense they belong to one. Precisely how we should understand the dual character of things is open to debate.

There are a number of ways to characterize the relationship between the social and technical. The influential recent philosophers of technology all grapple with the question and frame it somewhat differently:

- Albert Borgmann (1984) characterizes the relationship in terms of *engagement*, analysing the different ways that 'things' with 'devices' shape human involvements in the world.
- Don Ihde (1990) characterizes the relationship in terms of *mediation*, conducting phenomenological variations of our experience of technology to uncover patterns of the mediation of human life by technical artefacts.
- Bruno Latour (1999) characterizes the relationship in terms of *socio-technical collectives*, calling attention to the various ways that humans and technologies are never independent but always embroiled with one another.

- Andrew Feenberg (2002) characterizes the relationship in terms of a *technical code*, criticizing the way that social values are embedded into technical rules and procedures that function in support of a power structure.

At the risk of (further) oversimplification, some theorists *subsume* technical to the social (Bijker et al., 1989); some affirm the *autonomy* of the technical over the social (Winner, 1978); some the *domination* of the technical over the social (Foucault, 1979); some take the technical to be *derivative* of the social (Dreyfus, 1992), if not dangerously derivative (Habermas, 1987); others delight in the *confusion* between the technical and social (Haraway, 1991). For others still, such as the members of the faculty of the Department of Philosophy at Delft University, Netherlands, analysing the dual character of technical artefacts is a full-time research programme.

Engagement, mediation, socio-technical collectives, technical codes, subsumption, autonomy, domination, derivation and confusion. But what if we characterize the dual character of technical artefacts in terms of a narrative and we treat technology like a text? The premise would be that technologies are text-like things. That is to say, they are intentionally created, bearing meaning, structured by rules, technically explicable *and* contextually interpretable. The advantage of modelling our understanding of technology after reading texts is that it provides a broad framework that accounts for, well … everything.

The premise of narrative theory is bold: anything that can be understood can be recounted in the form of a narrative; anything that takes place in time unfolds in the manner of a narrative; anything that could or should be the case can be explained in terms of a narrative. As Hayden White (1987, p. 1) says, 'far from being one code among many that a culture may utilize for endowing experience with meaning, narrative is a meta-code, a human universal on the basis of which transcultural messages about the nature of a shared reality can be transmitted'. MacIntyre is no less unblushing. He claims (1982, p. 201) that 'man is in his actions and practice, as well as in his fictions, essentially a story-telling animal. … I can only answer the question "What am I to do?" if I can answer the prior question "Of what story or stories do I find myself a part?"' But Ricoeur's version is, perhaps, the most ambitious of them all. He claims that human experience, time and narration are inextricably bound together. 'Time becomes human time to the extent that it is organized after the manner of a narrative; narrative, in turn, is meaningful to the extent that it portrays the features of temporal experience' (Ricoeur, 1984, p. 3). There is nothing, it seems, narrative cannot do.

Ricoeur has done most of the conceptual labour to help us connect narrative and technology – ironic, considering how little he actually contributes to the philosophy of technology. His scattered remarks on the subject parrot late-Heidegger and Marcuse and take a typically dystopian view on technology's dehumanizing effects. Yet his works are surprisingly technology-friendly in spite of his own unoriginal views and mild allergies to anything that smacks of science and technology. The central feature in Ricoeur's work is his conviction that theories of interpretation (narrative and otherwise) must be counterbalanced by something non-interpretive in order to account for the limitations of contextualism. This holds for both his 1970s version of hermeneutics and his 1980s version of narrative theory. The latter retains the insights of hermeneutics but takes a broader, more historical view of the linguistic character of our experience.

Ricoeur very explicitly distinguishes his version of 'depth hermeneutics' or 'critical hermeneutics' from Gadamer's 'philosophical hermeneutics'. The difference rests on the nature of the relationship between language and reality. For Gadamer (1975), all understanding takes place through the universal medium of language, which is always affected by one's context, history and prejudices. Nothing is value-neutral or presuppositionless; instead, all meanings are public, linguistic and interpreted in light of practical expectations in a particular context. History and tradition, according to Gadamer, transmit understanding; truth is attained by reaching consensus in dialogue over the meaning of a text or an event. By contrast, depth hermeneutics attempts to transcend the contextual, historical situation of interpretation to identify non-hermeneutical forms of understanding that are capable of evaluating the very conditions of interpretive experience. Habermas famously argues that it is not good enough to criticize tradition on the basis of tradition, or a presupposition on the basis of a presupposition. There has to be a way to criticize – not merely interpret – the assumptions of an interpretation. A depth hermeneutics attempts what philosophical hermeneutics claims to be impossible: to see behind the back of language. If we cannot clarify the very medium of interpretive experience itself, we will not be able to distinguish between a true and false consensus, or genuine and systematically distorted communication.[2]

Habermas (1979) identifies the conditions for hermeneutics with theories of knowledge that are non-hermeneutical and non-contingent yet historical, such as a 'rational reconstruction' of learning and social interaction, or 'universal pragmatics' that structure all communication. Ricoeur (1976) parallels Habermas and incorporates various non-interpretive forms of knowledge, like objective, explanatory methods, or universal pragmatics into a general theory of interpretation. Understanding a text or event, on this model, is a dialectic of interpretation (in terms of a context) and argumentation (aiming at universal validity). Determining which interpretations are more plausible than others requires that we argue by offering relevant reasons in order to communicate the virtues of one interpretation over another. The criteria for a truth claim or normative claim are both interpretive and deliberative. Echoing Habermas, Ricoeur claims that 'the question of criteria belongs to a certain kind of interpretation itself, that is to say, to a coming to an agreement between arguments. So it presupposes a certain model of rationality where universality, verification, and so on are compelling' (Ricoeur, 1996a, pp. 104–5). Hermeneutics and argumentation are coextensive. Argumentation presupposes an interpretive context of meaning that determines the subject under discussion, while hermeneutics presupposes argumentative practices to establish the truth, appropriateness or moral rightness of an interpretation. A critical hermeneutics is both contextualist and universalist. Ricoeur explains that the 'entire question is then whether one can contextualize the universal while keeping it as a regulative idea' (Ricoeur, 1998, p. 61).

Narrative theory extends critical hermeneutics by placing interpretations and arguments within an even more comprehensive discourse. Narratives not only interpret and argue, they also express, portray, imagine, recount, suggest, set the scene, foreshadow, flash-forward, flashback, complicate, confuse, cobble together, resolve and more. A narrative is a particular kind of glue that configures the basic elements of human experience – characters, settings, episodes and interactions – into fictional and non-fictional stories. They create connections in the world as much as they mirror them. They create perspectives as much as they reflect them, and they hold together any number of different perspectives at once. According to MacIntyre (1982, pp. 190–209), the very intelligibility of actions and events takes place within a narratively constructed setting. Narratives constitute events in the Kantian sense; they transform occurrences into meaningful episodes.

The key to narrative for Ricoeur is the plot: it synthesizes and schematizes characters, actions and events into a unified whole by ordering and assigning significance to things that are otherwise unrelated. This structuring activity is what gives the story a meaning and what allows it to make its point. The meaning of each part of a story is relative to the plot. As Ricoeur (1996b, p. 5) puts it, an event occurs within 'a prior narrative organization that has already characterized events as contributing to the development of a plot'. Even causal explanations of the natural sciences presuppose the prior narrative organization of events into a meaningful, narrative setting. Explanations have no special epistemic status but function as interpretive devices that help us understand better. As a story unfolds, the experience of the reader or listener is influenced by the way events are configured by the plot. That is to say, the choice of plot affects the understanding of the reader. The practical consequences of writing and reading cannot be overstated: which stories are told, from what perspective, how events are organized and assigned significance, to whom and to what responsibility is attributed, and to whom stories are told determine what will be remembered, what will be judged and, above all, what will be taken as true.

The narrative turn guarantees only that the form of an interpretation is a story; it says nothing about the content. Fiction and non-fiction, for example, may share a common narrative form but differ with respect to the claims to truth they raise, and to the way that readers or listeners validate them. Fiction raises a kind of truth claim but only hypothetically – *as if* it were true. Fiction might 'ring true' but only non-fictional stories are potentially true. Non-fiction has to be plausible not only inside of the context of a narrative (i.e. coherent) but also outside of the context of the narrative (i.e. true). History is not a *species* of the *genus* storytelling. Ultimately readers determine if a narrative is true, morally right, appropriate and sincere, to use Habermasian categories (Habermas, 1984). Readers have to bring the right expectations to a story, understanding that different genres have different criteria of relevance. Writers and tellers of stories must also have similar expectations of relevance in constructing fictional or non-fictional stories of things. Different genres of narrative offer guidance for interpretation and help us pick out and assign significance to things differently.

Any claim raised by a narrative is open to argument and deliberation. In turn, argumentation and deliberation often rely on narration for illustration. Thurgood Marshall, for example, in arguing for *Brown* v. *Board of Education,* weaved together stories of the effects of segregation on the lives of African-American children coupled with appeals to justice and fairness. The result was a more forceful case than if he had appealed only to life histories or to principles. President Reagan started the (unfortunate) trend in American politics of using the stories of 'real people' in his speeches in support of his policy agenda. In these cases, a narrative–interpretive framework delimits a context of relevance, portrays situations and imagines consequences in defence of truth claims and normative claims. Stories and arguments are vital for one another. Both figure into the construction of non-fictional discourses, including legal deliberation and medical case histories where truth claims are intertwined with narrative criteria of coherence, consistency and congruity. The truth claim resides in a case history, while the proof of the truth claim resides in the entire network of narrative configurations, including theories, explanations and arguments.[3] We find this blending of story and evidence throughout the social sciences.[4] Anything that can be understood takes place in a narrative argument.

Technologies are no different. We tell stories that make arguments about things all of the time. The only difference between the story of a technology and the story of a human affair is a shift in focus: artefacts are now placed in the foreground rather than the background. They are treated less as props and plot devices than protagonists. Any question concerning technology, whether simple ('What is it?' 'How does it work?') or complex ('What are its effects?' 'Who is responsible for it?'), can be answered in the form of a narrative if the response is sufficiently detailed and comprehensive. For example, James Burke's 1979 BBC documentary, *Connections*, relies on narration to show how science, technology and seemingly disconnected historical events are in fact connected often in surprising ways. Consider these other stories:

- the determinist story of technology as a primary agent of social change told about the printing press, clock, steam engine and computer;
- the dystopian story of technology told about the atomic bomb, global warming and the disasters at Bhopal and Chernobyl;
- the story of unintended consequences such as helmets that lead to more head injuries, antibiotics that lead to resistance, the computerized office and carpal tunnel syndrome;
- the overlooked stories of mundane things, like the stirrup and medieval history, the cargo container and global commerce, and the chimney flue and domestic living;
- the documentary film about the development and evolution of a machine or device; the journalistic exposé about the political controversy surrounding a new technology;
- the story of communication technology as a vehicle of cross-cultural exchange told about telephones and the Internet; the story of entertainment technologies as vehicles for cultural imperialism;
- the mystery that hinges on a technological device, like the failed O-ring on the Space Shuttle Challenger;
- the plot problem that is resolved by a technological device, like the gadget introduced at the start of the film that saves James Bond's life;
- the conflicting stories about sudden technological innovation and gradual incrementalism;
- the cautionary, Frankenstein story about technological advances outpacing human wisdom;
- science fiction where technologies figure prominently in either utopian or (more typically) dystopian futures as an imaginative laboratory to conceive of possible worlds and possible forms of life.

These stories attest to the various ways that technology figures in our lives and the various stories we can tell about them. In each case, technology is the focus of attention – if not the star of the show then a co-star deserving equal billing as the humans.

The complete story (if such a thing were even possible) would recount everything about a technology. It would be a God-like perspective, unifying everything that goes into the life of a technology. That story is impossible even to imagine. There are as many stories about things as there are real and imaginary scenarios. But the impossibility of absolute truth does not diminish the importance of narrating technology. On the contrary, the practical consequence of how things are narrated, even if partial and incomplete, is enormously significant: how stories about technical artefacts are told, which aspects of things are assigned significance, in what setting things are placed, which perspectives and interests represented, to whom and to what responsibility is attributed, and to whom stories about things are told determine how we think about technology and what will be taken as the truth about it.

It might appear trivial (or pointless) to claim that technologies can be narrated when stories about technology unarguably exist. But to claim that technology can be narrated – not just explained – flies in the face of narrative theory, in particular phenomenologically informed versions of it. The premise of Ricoeur's narrative theory is that human life has pre-narrative qualities, already temporally and linguistically structured like a story. A narrative articulates the already story-like quality of our lives.[5] Human life and narrative share a similar temporal form and are, therefore, compatible with one another in a way objects and narrative are not. Citing Heidegger, Ricoeur claims that non-human things merely exist spatially and temporally, whereas our experience takes place 'in' time in the existential sense of involvement and concern. Only humans can be *in* love, *in* advertising, or *at* home. Objects are incapable of existential relations; they only have external or 'categorial' relations, to use Heidegger's language. They lack the 'within-time-ness' of human life and, consequently, they are not even candidates for narration (Heidegger, 1962, pp. 364–80). Persons get stories; things get explanations.

Ironically, the phenomenological grounding of narrative in human experience is undermined by close attention to the nature of human–technology relations. Everywhere we find humans we find relations to technologies; everywhere we find technologies we find relations to humans. Our involvements, in the Heideggerian sense, are bound up with technical artefacts and, consequently, so are the stories we tell about ourselves. The argument for the interdependence of humans and technologies has been made again and again and is not worth recounting. So long as we recognize that technology is capable of narration we have gone a long way towards applying insights of hermeneutics and narratology to the world of non-human technical things.

4.2 How to read technology somewhat critically

Connecting narrative theory and technology is the easy part; the hard part is determining which stories about technology are true or false; the harder part is determining the difference between kinds of true stories. A story might be banally true, partially true, or true in a way that merely reinforces existing values and world views, as opposed to a story that has real insight, imagination, and helps us to understand things more clearly. The difference hinges on a distinction between an interpretation of things according to accepted norms and conventions and an interpretation of things that is critical, discerning and evaluative. But is there a meaningful distinction to be made between a conventional and a critical reading of technology? Is there such thing as an *uncritical* reading of technology? Is it even possible to read technology in a way that, as Max Horkheimer (1982, p. 3) would say, 'helps to liberate human beings from the circumstances that enslave them'?

There is, indeed, a conventional reading of technology. In the United States it goes something like this:

- technology is nothing more than a tool;
- tools and devices are based on scientific principles;
- they are neutral, value-free and technical things;
- there are no good or bad technologies, only good or bad people;
- effective technology operates efficiently; ineffective technologies are inefficient;
- technological developments drive social change;
- technological innovations are inevitable, a sign of progress and generally a good thing.

When people do reflect on the broader social setting of technology, they typically accept a number of conventions:

- technologies are either created by inventors, engineers or others with technical expertise;
- technologies production is best left to entrepreneurs and large-scale industries within the context of the accumulation of private capital;
- they are best distributed by market mechanisms or by occasional public works projects;
- they are best managed by expert technical managers;
- the appropriate aims, goals and functions of technology are best left to the experts, who have the relevant scientific or technical know-how to make proper decisions for us.

The argument against the conventional view of technology is that it fails to take into account the contingency of technology. Far from being a natural, universal or technical affair, technology is a human, contextual and social affair. Technologies are socially constructed realities with meanings and functions intelligible in relation to human contexts, not ahistorical notions of scientific reason and technical efficiency. A simple phenomenology of our experience of things explodes the conventional story of technology; so does a more informed interpretation about how things are related to their environments. Once we identify overlooked relationships of a technology with humans and broader contexts, we are led beyond the technology-in-itself to consider the technology-in-the-world. Anyone who engages in the politics of technology has already stepped out of the conventional view, regardless of one's political convictions.

The first step towards reading things critically is reframing questions concerning technologies within a broader narrative setting. We can accomplish most of the aims of a critical theory of technology by retelling and rereading things, and by answering various 'who?' questions:

- questioning authority;
- challenging taken-for-granted attitudes;
- diagnosing and explaining current conditions;
- uncovering hidden origins, hidden actors, hidden consequences;
- uncovering overlooked or forgotten victims;
- exposing failures and omissions;
- identifying vested interests; placing things in relation to power and authority;
- attributing responsibility to crucial decision makers, exposing their histories, identities, and roles they play;
- revealing alternative possibilities;
- showing how seeming universals are in fact historical;
- imagining more desirable futures.

Any critical interpretation of technology first shows that the present state of affairs could be different by providing an alternative historical explanation of events. A critical theory is arguably nothing more than an interpretive theory. For example, a Marxist interpretation of history can be seen as a retelling of events, from a conventional story of kings, battles and treaties to a story about class struggle, oppressed workers and other previously invisible forces and actors. When we retell things in this way we are able to see through any number of conventional interpretations of the workings of markets and politics. What used to appear as legitimate 'free market societies' now appear as illegitimate 'capitalist modes of production' on a Marxist reading. Narrative theory accomplishes the aims of a critical theory by recontextualizing events in a way that lets us see things differently and imagine alternatives.

Feenberg's critical theory of technology is based on this strategy of identifying the ways that advanced industrialized societies systematically decontextualize the technical aspects of things in order to secure their illegitimate power and authority. The danger of the apparent neutrality of technical rationality is that it is often enlisted in support of a hegemony (i.e. a specific mode of social and political control). The technical aspects of a device or system are written into its technical code, which embodies social values and interests and takes the form of technical rules and procedures. These rules typically secure power and advantage for a hegemony over the interests of the public. Hegemony can *play the technical card* in order to give the illusion that the technological regimes it relies on are universally valid and necessary – and too far complex for ordinary people to understand. A critical understanding of technology endeavours to uncover the social horizon in which a device is produced, removes any illusion of its necessity, and exposes the relativity of technical choices. Feenberg maintains that we have to recognize the indeterminate, contextual character of technical things, as well as the social and political stakes of technical design, so that we can change the values designed into our technologies. Then we can we begin to criticize our society's technological–political practices and imagine alternatives that would foster a more democratic, meaningful and livable environment. 'The critical theory of technology exposes the obstacles to the release of technology's integrative potential and thus serves as the link between political and technical discourse' (Feenberg, 2002, p. 177). Technologies understood as abstract and acontextual serve existing capitalist power relations; technologies understood as concrete and contextual could serve a democratic–socialist society.

The problem with Feenberg's approach is that its critical purchase suffers the same limitations of any contextualist theory: it leaves the world as it is. The context of action, the form of life, the practice, the life world, the cultural background, the convention and the tradition, are merely facts of life. They have no special normative status. A context is simply the place where thought and action take place; it does not in itself validate or justify thought or action. As Habermas (1990, p. 11) puts it, 'the standards by which philosophy is being criticized are taken straight from the self-sufficient, routinized forms of life in which philosophy happens to survive for now'. Furthermore, cultures, contexts and traditions may bear meaning and enable understanding but they also may bear violence, bigotry and ignorance. Contextualist theories cannot answer problems of ideological distortions that make it difficult to know whether our interpretations are valid or if they in fact serve the illegitimate interests of others. It is not always clear whose interests an interpretive framework serves, or what makes one's contextual setting just or unjust. It cannot be simply the fact that it is the culture or context that we share. That only names the problem; it does not address it.

Ihde and Haraway deserve to be mentioned in this context. Ihde demonstrates how technical things can appear differently read in light of the broader cultural contexts in which things are embedded. A hermeneutic phenomenology of technical things reveals their ultimate ambiguity and 'multi-stability', challenging received notions of the technological neutrality or determinism (Ihde, 1990, pp. 124–61). Haraway famously uses cyborg imagery as an 'ironic model' that calls into question the dualistic ways we think about technology, politics and human identity. The myth of the cyborg helps us to see how the very distinction between what is natural and artificial is social, not essential or necessary, and therefore helps us to imagine more positive ways that technologies can mediate our bodies and our lives together.[6] Neither the hermeneutic nor the literary approaches of Ihde and Haraway are any more or less critical than Feenberg's contextualist approach. They each force us to rethink the nature of technology by challenging conventions in light of alternative interpretive frameworks. Yet, the discovery of hidden or overlooked contexts of technological design and use only tells half of the story. There is more to reading things critically.

In fairness to Feenberg, it is hard to find fault with his analyses of the political dimension of technological societies, or his plea for a 'democratic rationalization', in which citizens would be empowered to participate more in the technical decisions that affect us all. Feenberg's work is penetrating, insightful and original. What is questionable, however, is the theoretical basis for his critique of technology. History is a necessary but not sufficient basis for critique. He comes closer to providing a vantage point with teeth when he states that the 'goal of a good society should be to enable human beings to realize their potentialities to the fullest' (Feenberg, 2002, p. 19). His recourse to notions of 'human capacities', 'human fulfilment', and the 'intrinsic worth of a human' sounds promising, but is undermined by his hermeneutic humility. He states that in the 'absence of absolutes, the best we can hope for is to participate in a still unfinished history and to derive criteria of progress from reflection on its course and direction' (Feenberg, 2002, p. 19).

This historicist version of critical theory examines the roots of a society's problems, measuring a specific historic practice against a historic alternative, and aims at improving the human condition by realizing used, unused and abused human capacities. Like Marcuse, Feenberg relies on the notion of a 'substantive universal', concretely embodied, and progressively realized in action. Although he advocates the 'democratic potentiality' buried within existing socio-technical arrangements, we find no discussion of the fair procedures or universally valid criteria required for realizing such potentiality. Feenberg treats the transcendence of the universal – its virtue in criticizing a particular context – like a vice, favouring the historic character of human potentiality. Granted, human capacities are only realized or repressed in an actual historical situation, but the act of understanding what our capacities are is itself an act of interpretation, that is to say, an interplay of narration and argumentation. Neglect of the universal dimension imperils both our ability to read history critically and to argue for the conditions for the realization of human potentiality. A critical theory of technology without the universal is ultimately a conventional theory of technology.

4.3 How to read technology critically

Narratives, like their interpretive and contextualist cousins, do most of the work of a critical theory: they diagnose the present and show how things could be otherwise. These critical readings must not only be *possibly* more true or more preferable, they must be *potentially* more true or more preferable. It takes argumentation to evaluate and establish the implicit claims to truth and normativity we raise every time we speak (whether we intend to or not).

A validity claim is something claiming to hold for everyone and thus open to the give and take of reasons. Implied in this give and take is an implicit appeal to universal validity. That is to say, 'true' means true for everyone, just as 'ought' means that everyone ought. In choosing to reach understanding over these claims, speakers commit themselves to a universal perspective – not a 'view from nowhere' but a perspective on something that anyone could potentially adopt. There is a notion of impartiality and fairness implied in the point of view that seeks to determine objectivity and morality.

Habermas is helpful here. By contextualizing the process through which claims to universality are raised and redeemed, he shifts the question of universality away from a search for ultimate principles to a description of the unavoidable presuppositions of argumentation.[7] The objection, 'it is not possible to ground the universality of any norm', presupposes, in making this assertion, the universal validity of at least those norms of rationality that are necessary to understand the objection. Although ultimate principles might be an Enlightenment fantasy, the necessary presuppositions of argumentation are not; rather, they are unavoidable conditions for making truth and normative claims. What precisely these conditions are, and how precisely the universal judgement relates to the particular context of speech and action, are more difficult to ascertain. It is not at all clear if argumentation over the implicit claims raised in everyday speech is the same or different from everyday speech. If it is different, then what is the difference? If not, then what is the difference between interpretation and argumentation, hermeneutics and critical theory?

Ricoeur is once again helpful. He agrees with Habermas that the very process of justifying normative and truth claims presupposes that speakers have a shared understanding of what norms and reasons are and what they expect of us. Valid norms, like truth claims, are discursively redeemable, impartial, universal and rationally justifiable. But Ricoeur argues that argumentation itself is an interpretive practice that leads to a practical judgement in a particular situation. Argumentation is a particular, sometimes (but not always) formalized, practice in which participants clarify their convictions in order to resolve conflicts and reach understanding. Argumentation never stands above our convictions or conventions, but instead is the 'critical agency operating *at the heart* of convictions'.[8] On this model, argumentation can be seen as the critical agency at the heart of narration, informing both 'sides' of an interpretation: from the writer/teller's side (the act of making a case for something) and the reader/listener's side (understanding and evaluating a case). Raising and redeeming claims involves both interpretation-narration and argumentation-deliberation. Both are part of the communicative process of reading the world critically.

A *critical-narrative theory* of technology reads things in terms of their historic contexts, raising potentially universalizable claims in order to help liberate humanity from the unjust and undesirable conditions of the present.

Or, to put it in more recognizably liberal terms, a critical reading of technology evaluates technical things and systems in terms of their role in achieving social justice and happiness. Technology should, therefore, not only be contextualized but read in relation to universalist concepts, such as truth, impartiality and equality. Rachael Carson's *Silent Spring* (1962) and Ralph Nader's *Unsafe at Any Speed* (1965) are, perhaps, the best-known examples of the power of a story of technology, backed by evidence and raising moral claims to effect progressive social change. Here are some more recent examples:

- *Who Killed the Electric Car*? is a documentary that tells the story of the life and death of the General Motors EV1, a car that required no fuel and could be plugged in for recharging at home or at 'battery park' stations.[9] Told like a murder mystery, this film recounts the fate of the car and the roles played by automobile companies, the oil industry, wary consumers, batteries, hydrogen fuel cells, the obstructionist policies of the state and federal governments. The film not only attributes causal efficacy to the central actors but moral responsibility to the automobile and oil industries and the governmental bodies that fail to serve the public interest.
- *Fast Food Nation* explores the world of the fast food industry in the United States, made possible thanks to the increase in automobile travel and suburban developments, assembly-line cooking, single-process kitchen technologies, franchising, marketing and advertising to children, food-freezing and food-flavouring technologies, corporate tax cuts, cattle feed lots and slaughterhouses, immigrant labour and negligent regulatory agencies (Schlosser, 2001). The story of the fast food industry unfolds the web of actors, technologies and policies that have transformed not only diet, but the landscape, economy, workforce and culture.
- *The Travels of a T-Shirt in the Global Economy* chronicles the life of a T-shirt bought in the United States, from its origin in a subsidized cotton farm in Texas, to its manufacturing under abject working conditions in China, to its final destination in a second-hand clothing bazaar in Tanzania (Rivoli, 2006). *The Box* relates the history of the shipping container and explains why it is the central technology in the global economy, affecting workers, consumers and markets throughout the world (Levinson, 2006). Both focus on specific technologies to reveal the workings of the global political economy.

In each of these readings, technologies are both contextualized and criticized. The normative infuses the narrative, while the narrative expresses the normative.

The link between political discourse and technical discourse is not just, as Feenberg says, a matter of exposing the 'obstacles to the release of technology's integrative potential', but also of narrating things differently to create new ways of seeing the world so that we might imagine, argue for, and create new ways of being in the world. Our choice is not between bad/abstract or good/concrete interpretations of technology, but between conventional readings that leave everything as it is or critical readings that challenge unjust social practices and institutions. Critical narratives connect and relate just as much as they disconnect and interrupt our ordinary contexts of action. They invite us to step back, reflect and deliberate with each other about what it true, right and appropriate and, in so doing, establish the terms of social cooperation. Above all, stories of technology create a common world of meaning for the specialists with technical expertise and the rest of us who just like a good story.

Notes

1. Other important works in narratology include White (1975), Gallie (1964) and Mitchell (1982).
2. For Habermas's critique of hermeneutics, see Habermas (1988, pp. 143–75). For Gadamer's response, see Gadamer (1976, pp. 3–17).
3. For theoretical frameworks linking contextual interpretation with universalizing argumentation, see Bohman (1996), Schrag (1989) and Marsh (1995).
4. See, for example, Donald E. Polkinghorne, *Narrative Knowing and the Human Sciences* (Albany: SUNY Press, 1988); Emery Roe, *Narrative Policy Analysis: Theory and Practice* (Durham: Duke University Press, 1994); Jane Elliot, *Using Narratives in Social Research: Qualitative and Quantitative Approaches* (New York: Sage Publications, 2005).
5. For a similar account of the phenomenological grounding of narrative discourse, see Carr (1986). Carr shares Ricoeur's thesis that experience and narrative form a circle based on the pre-narrative quality of experience and the temporal structure of narrative. Carr states that a continuity exists between narrative and everydayness because a 'narrative structure pervades our very experience of time and social existence, independently of our contemplating the past as a historian' (p. 9).
6. Haraway, 'A Cyborg Manifesto: Science, Technology, and Socialist Feminism in the Late Twentieth Century', in *Simians, Cyborgs, and Women* (1991), pp. 149–181.
7. Habermas, 'Discourse Ethics: Notes on a Program of Philosophical Justification', in *Moral Consciousness and Communicative Action* (1990), pp. 43–115.
8. Ricoeur (1992, p. 287). Ricoeur maintains that argumentation is only one language game among many related to our ethical choices and moral judgements. Narratives, humour, irony, descriptions, explanations and other uses of language help us to understand ethical action, and to perform thought experiments that inform moral judgement. 'These language games constitute as many communicative practices in which humans learn what is meant by wanting to live together, on a level prior to any argumentative formulation. To be sure, argumentation is not a language game like others, precisely by reason of its requirement of universalization. But this requirement becomes operative only if it assumes the mediation of other language games that participate in the formation of options that are the stakes of the debates' (p. 288).
9. *Who Killed the Electric Car?* Sony Pictures Classics, 2006.

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5
The McLuhans and Metaphysics

Graham Harman

In his 1988 preface to *Laws of Media*, Eric McLuhan calls the tetrad 'the single biggest intellectual discovery not only of our time, but of at least the last couple of centuries' (pp. ix–x). He has not backed away from these claims in recent years, avowing that he '[does] not retract one iota of that statement about the importance of our laws'.[1] Yet there is an obvious disjunction between his devotion to the tetrads and the lack of intensity with which others have pursued them. His father's theories of technology reached their popular zenith during the 1960s, with a later resurgence during the Internet boom of the early 1990s. But in neither case did Marshall McLuhan attain a status in the intellectual canon befitting 'the single biggest intellectual discovery of... at least the last couple of centuries'. Even McLuhan's fans rarely devote much energy to the tetrad, despite his son's gripping narrative of how the tetrad was meant to summarize his father's work as a whole.

This essay is written in the conviction that Eric McLuhan is largely right about the tetrads, and the educated public mistaken to ignore them. Without deciding on the claim that the tetrads are the 'biggest' discovery of the past few centuries, a claim that invites stiff competition from such figures as Kant, Gauss, Riemann, Darwin, Maxwell, Cantor, Einstein, Bohr/Heisenberg, Freud and Heidegger, I am convinced that the tetrads at least belong in the same league as the discoveries linked with these names. It is quite possible to imagine a future in which the tetrads would enjoy the status of a world-historic breakthrough, giving a primitive feel to all that preceded them. Moreover, I hold that McLuhan *fils* is actually too modest in one respect: namely, he claims that the tetrads apply only to human inventions. They supposedly teach us 'nothing about animal products, such as webs or dams or nests' (McLuhan and McLuhan, 1988, p. x), and presumably less than nothing about inanimate causation. Against this basic modesty wrapped in apparently immodest claims, I contend that the tetrads transform not just the philosophy of technology, but metaphysics as a whole. If Darwin gains credit for shaking the stability of 'essence' in philosophy, thereby encouraging such figures as Bergson and Whitehead, the McLuhans deserve equal credit for redefining entities as *media*. In my view, the term 'media' is relevant not just to paper and electric technologies, but also to trees, reptiles, gases and stones, since every object is a medium transmitting the energies and broadcasts of others. The famous phrase 'the medium is the message' deserves a place not just in *TV Guide*, but on a short list of the basic principles of metaphysics. All entities are fourfold media, as the McLuhans have done even more than Heidegger to establish.

5.1 Fourfolds in general

According to *Laws of Media*, all technologies have a fourfold structure. As Eric McLuhan tells us: 'We found these four ... and no more. [My father] spent the rest of his life looking for a fifth, if there be one, and simultaneously trying to find a single case in which one of the first four doesn't apply' (McLuhan and McLuhan, 1988, p. viiii). Both efforts were unsuccessful. The McLuhans finally settled on their quadruple structure, and warmly challenged all comers to modify this number. The final pages of their book contain dozens of riveting tetrads analysing well-known human products. The four laws of media are as follows (ibid.):

- Enhancement: 'every technology extends or amplifies some organ or faculty of the user';
- Obsolescence: 'the attendant "closure"... when one area of experience is heightened or intensified, another is diminished or numbed';
- Reversal: 'every form, pushed to the limit of its potential, reverses its characteristics';
- Retrieval: 'the content of any medium is an older medium'.

Before giving a detailed account of how these four poles interact, we should note that quadruple structures recur repeatedly in human thought. Though the McLuhans find only a 'loose' relationship between their tetrads and the other 'Big Fours' in intellectual history, the nature of this looseness remains to be determined (ibid., p. x). Here are some examples of the Big Fours: the traditional four elements assembled by Empedocles (air, earth, fire, water); Plato's divided line (shadows, things, mathematical objects, perfect forms); Aristotle's four causes (material, formal, efficient, final); the medieval cosmology of Scotus Eriugena (based on the two dualities of created/uncreated and capable/incapable of creation); Bacon's four idols (of the tribe, cave, marketplace and theatre); Heidegger's *Geviert* (earth, sky, gods, mortals). Moreover, New Age philosophy now gives us Ken Wilber's *holons* (based on a doubling of the part/whole duality).[2]

These fourfolds may differ greatly from one another, but they share a common method. The only means of obtaining a rigorous quadruple structure is to cross-breed two dualisms, yielding a world split into four distinct zones.

Using this method, even frivolous fourfolds can be generated. For instance, if we define all human nourishment as either eating or drinking, and as occurring during day or night, we can arrange all acts of consumption in a somewhat ridiculous fourfold of daytime eating, daytime drinking, night-time eating and night-time drinking. Just as laughably, we might define humans as either blind or seeing, and as either friendly or unfriendly, yielding a fruitless tetrad of the friendly blind, the unfriendly blind, the friendly seeing and the unfriendly seeing. Every fourfold must ensure that its underlying dualisms are profound enough to warrant inclusion in the gridwork of the universe. The previous two examples do not meet this standard.

Another problem for any fourfold theory is to explain how its four poles interact and transform. In a limit case, they need not transform at all. The air, earth, fire and water of Empedocles are unchanging elements of the world; water is always water, and is never turned into fire. The same is not true of Aristotle's philosophy, in which wood is matter when compared with a table, but form when compared with the unstructured 'prime matter' that underlies all physical things. If wood can serve as both form and matter at different times and in different respects, this means that wood serves as a point of intersection for at least two of the four causes, which intersect in the wood in ways that Aristotle never fully clarifies. Hence, some fourfolds are made up of static poles of unchanging entities that never transform, but most refer to four structures found in all places at all times, which allows individual beings to shift allegiance between varying proportions of the four.

Another issue is whether the four poles occur simultaneously, or whether some belong only to past and future moments of time. A good example of a simultaneous fourfold would be Heidegger's earth, sky, gods and mortals, which are all present in a thing at every instant. This contrasts with Aristotle's four causes, in which things have both matter and form at the present moment, while their efficient cause points back towards their origin, and their final cause may look forward to a future purpose (in one reading of Aristotle, at least). In a phenomenological fourfold such as Heidegger's, it is irrelevant where a thing came from and where it is headed. The exact identity of the cobbler who made the peasant shoes (efficient cause) does not enter into the analysis, and the ultimate fate of the shoes (final cause) is irrelevant as well, since all that matters is how human Dasein interprets the purpose of these shoes *right now*. Though Heidegger is misleadingly read as a critic of isolated now-points, he is actually their greatest champion – folding past and future into an ambiguous single instant rather than stretching them out along so-called 'clock time'.

Finally, there is the question of whether each fourfold has a truly universal scope or applies only to certain classes of entities. The fourfold of solid, liquid, gas and plasma applies only to physical substance, not to immaterial things such as religions or comic revues. Bacon's four idols govern only human prejudice, and teach us nothing about stars and jungle cats. Even

Aristotle's four causes do not apply in all cases, since he himself cites beings (such as numbers) devoid of material cause. The McLuhans hold that their own tetrads are not universal, but apply only to the structure of language and hence only to human productions. Even Heidegger's fourfold is not *meant* to be universal, since he denies his tetrad to such horrific objects as nuclear power plants and plastic cups (in this way Heidegger misreads his own fourfold). By contrast, the fourfold of Scotus Eriugena is a clear example of a universal structure, since one cannot imagine any material or immaterial being that would escape classification as either created or uncreated, and as either capable or incapable of creating.

In short, and without trying to be cute, we find that there are four relevant questions for every fourfold structure:

1. What are the two dualisms that generate it?
2. Do its four poles interrelate and transform, or are they static? If the former, then how does this happen?
3. Do the four poles exist simultaneously, or do one or more push us towards some past or future moment?
4. Do the four poles apply to every corner of reality, or only to a limited class of entities? If a limited class, then we are not dealing with philosophy strictly speaking, but a more specialized type of knowledge.

These questions should be kept in mind as we examine the McLuhanite tetrad. We should also remember the phrase 'the single biggest intellectual discovery of…at least the last couple of centuries'. Instead of mocking this claim for transgressing the customs of modesty, it is more interesting to proceed as though it were literally true. Wild boasts are common in taverns and locker rooms, but surprisingly rare in the works of reputable authors. For this reason we should presume that the boasts of established thinkers, unlike the braggadocio of fishermen and hip-hop artists, are correct until proven otherwise.[3] It is always useful for readers to ask themselves: 'If the book I am reading were the greatest of the century, if it were the recognized classic on which all later work were built, how different would the world look?' This method serves to unmask the hidden mediocrity of so many temporary stars, whose best insights are often nitpicking advances along narrow fronts, changing nothing for anyone. By contrast, the tetrad is a brazen gamble free of all trace of mediocrity. If valid, it demands a total overhaul of how we view much more than technical objects.

5.2 The tetrad: historical background

Before considering the mechanics of the tetrad, we should reflect on the historical motives behind the concept. The McLuhans link their fourfold to several familiar ideas. The best place to start is perhaps the well-known figure/ground distinction of gestalt psychology. According to the gestalt model, any perception has some explicit focus, a foreground of which it is consciously aware. But this conscious figure is visible only against a tacit background that is also perceived without being overtly present. For the McLuhans, the crucial point is that figure and ground are always in constant interplay; the exclusive attention to figure was a specifically Western and modern virus, but a virus already killed off during the twentieth century. The dominance of figure is linked with the visual culture of the West since Renaissance times – with its abstract physics of extension, its three-dimensional perspective in art, and its reduction of time and space to homogeneous continua. The reign of figure entails an abstraction that honours visual space over what the McLuhans call audile–tactile space. Despite the ultimate difference between the acoustic and the tactile, both are allied against visual space.

This makes a clear parallel with Heidegger's critique of metaphysics and technology as reducing the world to a visible presence-at-hand that strips the world of any cryptic ground. Yet there is an important difference: whereas Heidegger believes we can only wait passively for the reign of technology to run its course, the McLuhans hold that the downfall of visual presence is a fait accompli. We have already entered a post-literate space in which relativity, quantum theory, cubist painting, atonal music, symbolist poetry, dyslexia, cultural illiteracy, and the appearance of a global village linked by electronic media, all show that the post-visual, post-literate, discontinuous world is now upon us. While Heidegger shudders at the horrific landscape of presence that surrounds him, the McLuhans are jubilant that history is on their side, and credit history with getting there first.

To repeat, visual space reduces things to abstractions, to figures devoid of their accompanying ground. 'The formal structure of visual space involves the suppression ... of all ground as a guarantor of abstract, static uniformity' (McLuhan and McLuhan, 1988, p. 15). And 'no other sense [but vision] ... can suppress ground by isolating and detaching figures' (ibid.). The rise of abstract visuality, the figural sense par excellence, is the product of a specific and familiar technology: 'Visual space ... is an artefact, a side-effect of using *a phonetic alphabet*. The alphabet acts to intensify the operation of vision and to suppress the operation of the other senses' (ibid., p. 4, emphasis added). Whatever one makes of this blame for the alphabet, it is refreshing that the McLuhans bring the very structure of human consciousness into meaningful dialogue with a specific technology.

Not surprisingly, they also link abstract visual space with Western society. Whereas Western culture breaks the world into isolated figural chunks, Eastern thought views everything in holistic interrelation. Though some may dismiss this point as a cliché, it links nicely with Heidegger's claim that the rise of technology and presence-at-hand is a symptom of Western nihilism since ancient Greece. 'The East, which never had a phonetic alphabet, never had a Euclid and never developed absolute concepts of space and time' (ibid., p. 43). Yet this also leads to a certain dissonance within the McLuhan model of history. On the one hand, the East is described as the land of seamless holistic continuity, and the West as an empire of abstract individual figures detached from their ground. But as the reference to Euclid suggests, the McLuhans also regard visual perception as linked with the model of space and time as abstract *continua*, in contrast with Einstein's later retrieval of a more holistic model of gravity, in which each body creates its own private space and time by warping the fabric of the cosmos. In this way, the West is accused *both* of breaking the world into chunks *and* of reducing it to a continuum; the same holds, *mutatis mutandis*, for the East. Note further that Renaissance painting does not actually break the world into independent chunks in the supposedly 'Western' manner (that was the method of pre-Renaissance iconography), but brings the objects of the world into holistic union under a single governing perspective. For these reasons, it becomes impossible to place the continuum on either the figure or the ground side of the equation. Hence the notion of continuity plays a sort of *pharmakon* role for the McLuhans, both poison and cure, since 'continuum' can either serve as Eastern holism or Western abstraction depending on the needs of the moment.[4]

Turning to a different theme, visual space is not just abstract and figural. It is also sequential. While visual figures unravel the tapestry of space and time, presenting things in abstract isolation, the McLuhans urge us not to forget acoustic space (or *simultaneity*) and tactile space (or *interval*). The acoustic and the tactile do not occur in isolation for the McLuhans, but always work as a team to undermine the pretensions of visual space. The audile/tactile even seems to be the 'natural' form of space, since it is not produced by any known technology, unlike the alphabetic–visual kind. The 'simultaneity' of acoustic space means that numerous figures and grounds are present together at any moment. The 'interval' or 'resonant interval' of tactile space means that figure and ground do not sit side by side, but always mirror or echo one another. The simultaneity of resonant intervals is linked to the idea of 'structure' (McLuhan and McLuhan, 1988, p. 110) and to 'formal causation', which encompasses all of a thing's aspects at once. By contrast, efficient causation emphasizes a sequence of one discrete figure following another.

The McLuhans now add the familiar left-brain/right-brain distinction to the mix. While mainstream academics may smirk at this old chestnut, it remains a tasty nut. In a relevant chart reproduced on page 68 of *Laws of Media*, we find such well-known examples of the left hemisphere as 'speech/verbal, logical, mathematical, linear, detailed, sequential, controlled, intellectual, dominant…' and examples of the right hemisphere including 'spatial/musical, holistic, artistic, symbolic, simultaneous, emotional, intuitive, creative…'.[5] This merely amplifies what we have already learned about the distinction between figure and ground. What is less expected is the McLuhans' link of visual, acoustic and tactile space with the medieval trivium of grammar, rhetoric and dialectic. (The related quadrivium of geometry, astronomy, music and arithmetic is read as four separate forms of grammar.) 'Dialectic' is the member of the trivium that the McLuhans identify with abstract visual space and sequential time. This is seen most clearly in the philosophy of Hegel, where shapes of consciousness pass into later shapes in sequence, with no lingering resonance between simultaneous shapes. By contrast, 'grammar' pays homage to the full menagerie of independent forms found together in any situation. In this sense grammar can be identified with acoustic simultaneity. That would leave 'rhetoric' in charge of the resonant interval of tactile interplay between surface discourse (figure) and unspoken enthymeme (ground). For the McLuhans, if the series of syllogisms in dialectic refers to becoming, the simultaneous weave of grammar and rhetoric refers to being. Admittedly, the current fashion in philosophy regards being as dull and static, and becoming as dynamic and alluring. Yet the McLuhans hold (and Heidegger would agree) that 'being is multidimensional and environmental and admits of no point of view. As with any other ground, Being cannot be perceived directly; it has to be seen by side-effects' (McLuhan and McLuhan, 1988, p. 59). Phrased differently, 'the chiaroscuro of "Becoming" as a sequential process has been pushed aside and replaced by the iconic absolutism of "Being"' (ibid.). It is unfortunate that the term *chiaroscuro* ('lightdark') is ceded to the enemy here, since it is a perfect term for the interplay of figure and ground that the McLuhans champion. But the 'iconic absolutism of being' is an equally effective phrase for describing the multiple simultaneous perspectives of Heisenberg's physics or Picasso's cubist portraits. Like the Easterners and the pre-literate Ancient West, the great twentieth-century figures in all domains are rhetoricians and grammarians, not dialecticians. In this respect they resemble Vico and Francis Bacon, who no one ever ranks among the ten greatest philosophers, but who emerge from *Laws of Media* as towering figures (along with James Joyce, that Hölderlin of the McLuhans).

Earlier, we noted the paradox that *Laws of Media* wants to preserve holistic continuity between things while also denying that space and time are continua (since the continuum treats things as figure-minus-ground in the manner of visual space) (ibid., p. 22). This excess of figuration is linked with the mechanistic philosophy of nature, which reduces things to mere surfaces translating force between one another, suppressing their shadowy resonance between figure and ground. For the McLuhans, mechanism is already overcome by various developments in physics: including the 'field-mosaic' approach (ibid., p. 3), Bohr's discontinuous electron orbits (ibid., p. 43) and the notorious wave/particle duality (ibid., p. 51). Einstein's redefinition of gravity as a warping of time and space is likened to 'acoustic space [in which] every thing or event creates its own space, and time' (ibid., p. 53).

This serves nicely to flesh out the preceding historical claims. But the McLuhans draw another unfortunate conclusion, one in which they are joined by some of the leading thinkers of the past century. What is more harmful than their unreadable duality of good and bad continua is their further assumption that objective things in themselves are groundless visual figures, whereas the *human mind* is responsible for acoustic/tactile holism. In short, the McLuhans imply (needlessly) that *the very notion of an objective world* is a Western/visual/figural symptom. After blaming visual space for drawing a false distinction between 'inner' and 'outer' worlds, the McLuhans choose the 'inner' as their preference, for no evident reason. They praise the following words of Fritjof Capra in his book *The Tao of Physics*: 'The Eastern mystics tell us again and again that all things and events we perceive are creations of the mind…Hinduism holds that all shapes and structures around us are created by a mind under the spell of *maya*, and it regards our tendency to attach deep significance to them as the basic human illusion' (ibid., p. 60 from Capra, 1976, p. 29). The McLuhans' endorsement of Capra is a puzzling inversion of their own views earlier in the book. Initially, they blamed human abstraction for stripping figures from their natural ground, whereas the world itself was supposedly formed of resonant intervals. But now it is the human mind that is suddenly responsible for holistic resonance between things, whereas material things (suddenly demoted to illusory *maya*) are blamed for the figural bias that had previously been described as the work of the biased human intelligence.

This strange leap into hyper-idealism need not be taken too seriously, since it is contradicted by some of the McLuhans' own examples of post-literate reality. For instance, though it is true that idealist interpretations of quantum theory still carry a good deal of weight, the same is not true of general relativity. Einstein teaches that stars and planets *themselves* curve time and space in their own way, not that gravity and the curvature of space-time belong to a mere veil of *maya* woven by the human mind. In this respect the realist Einstein is more radical than the idealist McLuhans, granting to things themselves a power of resonant figure/ground interplay that the McLuhans are tempted to ascribe to the human mind alone. This people-centred bias, typical of philosophy since Kant, echoes Heidegger's assumption that Dasein alone draws inert things (if they even exist) into the humanized theatre of the tool system. This idealist temptation has a serious consequence for the McLuhans, since it bolsters their regrettably modest claim that tetrads are irrelevant outside the human sphere.

5.3 Tetrads: the resonant interval

The best way to summarize the tetrad is to see how it answers the four questions posed earlier to any quadruple structure.

(a) 'What are the two axes of division that generate the tetrad?' Answer: the first duality is between tacit ground and explicit figure, which concerns the *morphology* of an artefact. The second concerns how each of these terms contains the seed of its opposite, which the McLuhans term *metamorphosis*. Against all expectations, whatever is enhanced becomes *ground*, and whatever is obsolesced becomes *figure*. At the same time, any visible figure is also a previous ground, since every medium *retrieves* an old one as its content. And finally, whatever is enhanced contains the potential to *reverse* into its opposite, with the ground rising up as figure.

(b) 'Are the four poles static, or do they interact?' Obviously, the four terms of the tetrad interact for the McLuhans. They are not like the pre-Socratic air, earth, fire and water, sitting side by side and walled off from mutual transformation. Any given medium is sometimes enhanced, sometimes obsolesced, sometimes retrieved and sometimes the end point of a reversal.

 'And if one pole turns into another, how does this happen?' The primary answer, for the McLuhans, is by way of *heating*. One medium reverses into another when it is heated to the limit of its potential. Although retrieval is one of the 'metamorphic' terms of the tetrad, its work is always already accomplished whenever it appears on the scene. The germ of future transformations must be sought in the moment of reversal.

(c) 'Is this tetrad simultaneous in any given instant, or does it require that we bring past and future moments into play?' Despite terminology that suggests otherwise, the McLuhans implode the entire tetrad into a single instant. Although the metamorphic terms hint at a past and a future, the McLuhans avow that retrieval and reversal are both dimensions contained in any instant: right now. When speaking of the reversal of some technology – say, cellular telephones – we are not wondering about their fate 10 or 12 years from now, but look instead to the heart of the present instant to find an already present germ of reversibility.

(d) 'Does the tetrad cover the whole of reality, or only a limited portion of it?' The McLuhans respond that it is limited to human conceptual and technical artefacts, all of which have a linguistic structure. They make no effort to extend their tetrad into the animal and mineral realms; indeed, they hold this to be impossible.

(a) Enhancement

Marshall McLuhan attained stardom with *Understanding Media*, his 1964 magnum opus, which already contains the four poles of the tetrad in germ. In fact, the tetrads were meant as nothing more than a revision of the earlier book, in the face of criticisms that *Understanding Media* was 'unscientific'. In search of a properly 'scientific' method to answer the critics, the elder McLuhan eventually settled on the famous principle of falsifiability: 'one evening, he found the answer in Sir Karl Popper's *Objective Knowledge* – that [a scientific statement] was something stated in such a manner that it could be disproved' (McLuhan and McLuhan, 1988, p. viii). Each component of the tetrads is meant as a possible statement that might be formulated and tested for *any* human technology. Eric tells us that enhancement and obsolescence were discovered immediately. Reversal took only a few more hours. Just three weeks later, retrieval was recognized as the fourth law present in Marshall McLuhan's earlier work.

Enhancement might seem at first to be the simplest of the terms. The subtitle of the 1964 book had been *The Extensions of Man*, and extension is in fact a synonym for enhancement. 'Every technology extends or amplifies some organ or capacity of the user' (ibid.). Hammers extend the human fist. Their power and durability remove the frailty that prevents us from using clenched hands to pound nails and walls. Electronic mail enhances rapid communication, discarding the snail-mail pace of aeroplanes and ships that once haunted paper messages. Search engines enhance memory by granting immediate access to forgotten names and facts, which once required months of timid queries to library staff. Note that enhancement does not create new abilities *ex nihilo*. Instead, it builds on existing strengths. E-mail would mean nothing to illiterates, and merely extends a universe of written correspondence that was already available. In the same fashion, hammers are ill-suited for the intelligent squids and jellyfish of H.P. Lovecraft's tales, and need something like a human hand as their primitive underpinning.

In this way, enhancement extends 'potency into act', as we learn from a series of brilliant diagrams a bit later in *Laws of Media* (ibid., pp. 227–8). Each of the four poles of the tetrad is *itself* found to enhance, obsolesce, retrieve and reverse something. By removing the lethargic pace of transatlantic flights, e-mail unleashes the full potential of rapid-fire exchanges between Princeton and Geneva (enhancement). The price of such enhancement is always 'privation of alternative potentials', since every decision cuts off other potential decisions (obsolescence), and overcommits us to whatever step has been taken. With the emergence of e-mail as the chosen medium for certain forms of communication, other possible means of contact are condemned to death. Safe in their graves, these alternatives are sometimes difficult to imagine. But novelists might dream up alternative worlds of supersonic mail carriers and cities laced with pneumatic-tube infrastructure to enhance the old paper communication. Or we might have addressed the slowness of snail mail with a greater reflection and depth, packing more value into our slow communications. But these alternatives are now moot. The decision has been made, the die has been cast, the alternate options thrown aside.

But this only tells us what enhancement enhances and obsolesces. Does every extension also lead to some retrieval and reversal? The answer is yes. The McLuhans aver that enhancement flips into 'final cause', and though no explanation is given, the point is immediately convincing. When one extension wins out over unborn possible rivals, it begins to carry an air of the inevitable. It becomes difficult to imagine an alternative 1990s in which e-mail would not have triumphed, and nearly impossible to conceive of a human race that shunned hammers for some alternative device. It takes a brilliant historian to retrace the world's unchosen avenues. If science fiction imagines strange possible futures, good history envisages strange possible *presents*. How would a Muslim victory at Tours have changed the present look of Europe? Would a surviving President Roosevelt have been so impulsive in using the atomic bomb? Would a President Gore have invaded Iraq? What sort of children would I have had with my ex-fiancée, and how might they have changed my life? The recent popular boom of 'What If?' history books is not a waste of precious time on the unknowable, but a response to a genuine duty to fight the usual manner in which decisions flip into the appearance of final cause. Hence it is ironic when Marshall McLuhan is accused of 'technological determinism', for such determinism is accounted for and criticized by the tetrad itself.

An 'extension of man' is never a laughing matter, since it silently murders other possible worlds.

> The price we pay for special technological extensions, whether wheel or alphabet or computer, is that they become closed systems. [Yet] our private senses are not closed systems but endless translated into each other... [By contrast,] our extended senses, tools, technologies, mental constructs, through the ages have been closed systems incapable of interplay or collective awareness. (Ibid., p. 226)

By extending our organs into more durable outer materials, what we lose is the ambiguous resonance between the various regions of sense perception. Let this be noted, since later I will partially disagree with the point. Here again, the McLuhans identify the human senses with rich and resonant intervals, and external objects with exaggerated one-dimensional systems. This suggests a programme of restoring objects back to the resonant holistic interactions of the human kingdom, by way of the 'all is one' of Eastern mysticism. In my estimation, this cedes too much ground to the dull naturalistic view of inanimate objects, and Husserl and Heidegger had ceded precisely the same ground.

We are now left with the trickier question of what an extension *retrieves*. The McLuhans tell us that with enhancement, 'old logos returns as new mythos'. This strange phrase is the key to *Laws of Media*. Reading further: 'Retrieval always seems to provide *the keynote or dominant mode of each tetrad*, which may explain why it is often the most difficult of the four to discover' (ibid., p. 228, emphasis added). Recall that the McLuhanite vision is based on the resonant figure/ground relationship. Should enhancement be linked with the *figure* of any perception, or its *ground*? The reader might assume that extending something amounts to increasing its prominence before our eyes, and hence making it more figural than ever before. This would be incorrect. When a new medium enhances something, this enhancement can only take the form of a ground. Though we all occasionally reflect on the status of electronic mail as a cultural medium, more often we simply fire messages back and forth, reacting to what someone sends us. Usually we ignore the medium as a whole, which rumbles as the tacit background supporting individual messages as its content.

The same point is found in Marshall McLuhan's most famous slogan: 'the medium is the message'. Moralistic critics of television who weigh the relative proportions of quality and junk TV shows are missing the point; they remain focused on *content*, as ideologues always do. As we read early in McLuhan's classic 1964 work:

> The instance of the electric light may prove illuminating…The electric light is pure information. It is a medium without a message, as it were, unless it is used to spell out some verbal ad or name. This fact, characteristic of all media, means that *the 'content' of any medium is always another medium*. The content of writing is speech, just as the written word is the content of print, and print is the content of the telegraph. (McLuhan, 1994, p. 8, emphasis added)

The merit of McLuhan's figure/ground model is to undercut our narrow focus on the explicit surface content of any situation and draw our attention instead to the underworld from which it emerges. E-mail is rarely the *logos* or explicit topic under discussion, but is a partly concealed background myth in which rapid exchanges of death threats, love letters and terrorist codes unfold. 'The medium is the message' means, simply, that the unspoken ground is always the more powerful statement in any situation.

Some literary examples may be helpful. Consider the brilliant writing style of Friedrich Nietzsche. Now compare any genuine work of Nietzsche with two possible alternatives: (a) a dry academic summary of 'Nietzsche's views' on power, slave morality and the death of God; (b) a brilliant parody using Nietzsche's style, but in celebration of Christian socialism and the average working man. There can be no doubt that option (b) will have more of a Nietzschean flavour than option (a), despite the utterly opposite *content* of Nietzsche himself and (b). To repeat Nietzsche's opinions in tedious propositional language fails to replicate the Nietzsche medium – but repeating his *style* does convey the essence of the medium, however bizarre the results. The same holds true if we compare a genuine work of the Marquis de Sade with: (a) some low-grade magazine tale of lust and 'transgression', and (b) a parody entitled *The 120 Days of Eden*, written in Sade's exact style, but in praise of chastity and innocence. Here again, there can be no doubt that option (b) is the more Sadean work. Any author is primarily a style, not a content. In similar fashion, electric lights, dogs, atomic bombs and love affairs are more a cold background in which life unfolds than a heated-up stream of detailed information. This yields a strange result: any enhancement, except perhaps in its initial stages, is invisible in the same manner as all grounds. A medium is deeper than its surface effects, even though it is knowable primarily only through those same effects. To extend the hand with a hammer does not usually draw our attention to the hammer; instead, it inaugurates a world in which reeds and bones have lost all prestige as obstacles. To enhance something does not mean to turn it into a floodlit rock star, but rather into a soundless electric or magnetic field. To enhance means to unleash, but only in the sense in which angels are unleashed to perform an invisible deed.

Before moving on, we should note the far greater depth of the McLuhan vision of technology than is found in the sadly monotonous account of Heidegger, who in my view is horribly overrated as a philosopher of technology. For Heidegger, technology is a gloomy drama in which every invention merely strips the mystery from the world and turns all things into a manipulable stockpile of present-at-hand slag. A mass-produced umbrella is no different from a cinder block or an aircraft carrier. The McLuhans see more deeply. They sense the individual ambiguity, the cryptic interplay of surface and depth in every least breakthrough in headphone technology and new style of plastic bag. By contrast, Heidegger views every new object as nothing but another homogeneous step towards hell, or perhaps towards heaven – thanks to the tedious reversibility of Hölderlin's 'danger' and 'saving power'. An optimistic Heidegger would be no better: the problem with his analyses is not their pessimism, but their monotony. Although Heidegger deserves to be called the greatest philosopher of the past century for other reasons, it is scandalous that his philosophy of technology is taken seriously while the vastly superior work of the McLuhans is marginalized as pop media theory.

(b) Obsolescence

History is a field of ruins, and all of those ruins are obsolesced media. The Roman Empire is gone, as are the Etruscans, the Aztecs, and the eras ruled by Jimmy Carter, fountain pens, bank tellers and telephone landlines. Whenever some new extension is made, we must ask not only what it enhances, but also 'what does it render obsolete or displace?' (McLuhan and McLuhan, 1988, p. 7). The ultimate symbol of obsolescence is last week's newspaper, with its dull and elderly assessment of recent stories that have already moved on. Obsolesced media enter 'the rag-and-bone shop of abandoned cliché' (ibid., p. 100). Yet to become obsolete 'is not the end of anything; it's the beginning of aesthetics, the cradle of taste, of art, of eloquence and of slang…The cultural midden-heap of cast-off clichés and obsolescent forms is the cradle of all innovation' (ibid.).

Returning to the masterful diagrams on pages 227 and 228, we examine the four faces of obsolescence. What does obsolescence *enhance*? The answer is that 'act returns to potential' (ibid., p. 227). Against the usual, understandable tendency to assume that actual = visible and potential = invisible, we learned in the previous section that to enhance something is to make it the invisible ground, a pulsing background message that allows us to become distracted with some other foreground of new figures. For example, we generally focus on phone conversations themselves, not on the cellular phone as a medium. When a medium is finally obsolesced, its actuality as a hidden active ground returns to potential; ironically enough, this occurs in the manner of making it *visible*. Continuing further, obsolescence *obsolesces* 'the ground of the old item'. That is to say, the telephone landline, like the previous White House Administration, is no longer the atmosphere we breathe, but just a dated and slightly annoying piece of material that has finally taken on stale definite contours. What obsolescence *retrieves* is 'awareness of ground as all potential', or as the McLuhans put it in a side note, 'potential as a ground of hidden treasure and opportunity: junk heap as dynamic resource' (ibid.). As long as a medium is active, it retains the status of invisible ground. Potentiality belongs instead to the world of figures, where discarded clichés from the rag-and-bone shop are the seedbed of eventual surprises. Future change does not come from the currently active media, which are already doing all that they can do to shape us; instead, change comes from the junkyard of previously obsolesced forms. At the same time, obsolescence *reverses* into 'retrieval mode: ground becomes figure; all potency called into act at once'. Namely, the wasteland of abandoned forms gives rise to aesthetics and retro hipsterism. This can be seen in the eventual return of such jettisoned media as vinyl LPs, midwives, bell-bottom trousers, disco (techno music), Rome (the European Union), and the Assassins of Alamut (al-Qaeda).

The most important lesson of enhancement and obsolescence so far is that, against all expectations, ground must be identified with the actual and figure with the potential. A thing reaches its actuality precisely when it reaches the status of hidden ground: a thing must be medium in order to be message. Enhancement and obsolescence concern what the McLuhans call the 'morphology' of a medium, or its basic structure of visibility and invisibility. The other two moments of the tetrad pertain to what they call 'metamorphosis', or the interweaving of each medium into its forerunner and its heir. We must now consider these other two moments.

(c) Retrieval

Even in 1964, Marshall McLuhan had seen that every medium has an older medium as its content. This content can range from the cast-off clichés of yesteryear to the archetypes that seem to draw from a deeper well. In fact, the archetype is merely 'ye olde cliché writ large' (McLuhan and McLuhan, 1988, p. 100). The passage from cliché to archetype may take centuries, as with the delayed retrieval of Aristotelian philosophy by Averroës and St Thomas Aquinas. Or it can happen with relative speed, as in the case of vinyl LPs, which took less than a decade to evolve from poor man's compact discs into the high-life treasure of a jazzy bohemian elite. Recently, these shifts have become so confusingly rapid that it can be difficult to detect whether a given medium occupies cliché or archetypal status at any given moment. This was observed with typical comic genius by the satirical newspaper *The Onion*, in a story entitled 'Lava Lamps Revert from Passé Retro Kitsch back to Novel Retro Camp'.[6] Here are a few delicious excerpts from the article, which Marshall McLuhan would have greatly enjoyed:

> Lava lamps, the once-popular, then passé, then popular again, then passé again novelty items that have cyclically taken various American subcultures by storm throughout their 35-year history, are back.
>
> The switch marks the 17th time the government has changed the lava lamp's retro classification since its initial resurgence in 1976 as an amusing, campy throwback to the then-outmoded '60s hippie drug culture.
>
> The lamps often simultaneously occupy many different points along the retro-cycle curve, causing confusion among retro cognoscenti. For example, in 1998, computer dweebs considered the lamps 'CyberKewl,' while swing-dancing hipsters dismissed them as 'lame-a-roony-toony.'
>
> 'Lava lamps? Please. I remember back in '88, '89, when everybody had one in their dorm room because they were trying to be all late '60s, early '70s,' said Jen Cushman, 31. 'Talk about over. Having a lava lamp now is *so* late- '80s late '60s/early '70s.'

It is amusing enough to recount these confusing, decadent instances of retrieval in popular culture. But more interesting for us is the exact way that the figure/ground dynamic plays out in retrieval. This is more intricate than might be imagined. It is obvious enough that retrieval brings back an older medium from the graveyard of cliché, converting it into archetype. Something is brought back that was previously obsolesced. But recall that obsolescence does not mean to be forgotten. *Au contraire*: the living medium is the one consigned to true oblivion, since it readjusts our sensory ratios without being explicitly recognized most of the time. The dead medium is the one that becomes visible, though initially only as stale cliché. For this reason, it might seem that the shift of a medium from cliché ('passé retro kitsch') to archetype ('novel retro camp') would merely be the result of changing value judgements within the figural realm in which clichés and archetypes always sit side by side. Concealed grounds would seem to play no role here at all.

But this is not the case. The McLuhans (1998, p. 103) find, convincingly, that the archetype is an 'old ground seen as figure *through a new ground*'. In other words, the cliché does not just automatically become archetype ('novel retro camp') after a certain period of time has elapsed. Real work is needed for this to become possible, and some discarded forms may never be retrieved, or retrieved much later than expected. The McLuhans state this lucidly: 'Retrieval is not simply a matter of hauling the old thing back onto stage, holus-bolus. Some translation or metamorphosis is necessary to place it into relation to the new ground – as anyone can testify who has experienced "revivals" in our culture...The old thing is brought up to date, as it were' (ibid., p. 101). However venerable a thing may be, it cannot serve as archetype without the blessing and electrical power of some living contemporary medium, the only 'up to date' thing there can ever be. There may eventually be a new wave of retrieval for such dead media as French existentialism, *Spy* magazine, Marxism, virginity before marriage, and Cabbage Patch dolls, or there may not be. In each case, it would take real work by some gifted and motivated translator.

Returning briefly to the fourfold tribunal on pages 227 and 228 of *Laws of Media*, we ask about the four deeds of retrieval. First, retrieval *enhances* 'metamorphosis'. Instead of static forms strung out through time in linear fashion, we see the involution of one form in another. Next, retrieval *obsolesces* 'the original matter'. This is glossed as an obsolescence of the 'danger [and] risk of the original ground' (ibid., p. 228). If the re-enactment of American Civil War battles is taken as a form of retrieval, with some participants going so far as to become purposely infested with lice for historical accuracy, it still remains unlikely that any re-enactment will adopt real lead bullets and perform amputations with bone-saws. This is the difference between aesthetics and reality. Retrieval *retrieves* 'recognition of form', since the medium no longer operates silently in the background, but draws our explicit attention. And we already know that retrieval *reverses* into archetype.

(d) Reversal

We now come to reversal. If retrieval was called the dominant note of every tetrad, reversal is its only real engine of change. The reason is that for any given medium at any moment, enhancement, obsolescence and retrieval are always already faits accomplis. Reversal is the one portion of the tetrad that is capable of increasing gradations, in the form of *heating*. When heated to the limit of its potential, a medium flips into its opposite and becomes a discarded cliché. Cellular phones flip into text-message devices, while the text-based Internet reverses into the online telephony of Skype. To cite one of the McLuhans' own more entertaining examples, the sheer business deal of prostitution reverses into sentimentality (ibid., p. 135) (as in stories of the 'hooker with a golden heart'). Pushed to the limit, the Romanization of the barbarians reverses into tribal parochialism. The fragmentation of European vernacular tongues eventually flips into the dominance of English, the new Latin. Traditionally, the city was meant for leisure and the countryside for work. In modern times this relationship was famously turned inside-out (ibid., p. 107). Still later it returned, with the new opposition between suburban 'office slave' compounds and urban entertainment districts.

We now consider the four faces of reversal, just as with the other moments of the tetrad. The McLuhans observe that reversal *enhances* 'metamorphosis: act and potency switch roles'. This is clear enough. With the appearance of massive daily traffic jams, the car becomes an annoying visible figure rather than a smoothly functioning medium, and the once obsolete world of gruelling travel-to-market becomes our medium once again. When overused, random terrorism ceases to frighten tourists and reverses into the same sort of rarely feared natural catastrophe as a tsunami or shark attack. Reversal *obsolesces* 'efficient cause'. The point here is that efficient cause explains events as a series of links in a chain, with one leading to the next. But reversal leads the effect to boomerang back onto the initial cause, giving the opposite result of the one intended – thereby depriving the initial causal agent of its imagined power. Reversal *retrieves* 'complementarity', since the supposed linear progress through time now becomes a repeated cyclical pattern of two forces in permanent opposition. And reversal *reverses* into a situation where 'dynamic becomes static'. For all its dynamism, reversal seems to leave us stranded in permanent alternation between yin and yang, East and West, wave and particle, paper and plastic.

5.4 Concluding philosophical remarks

It will now be clear, I hope, that the tetrads are a powerful utensil for analysing any concept or artefact one might wish to describe. It is worthy of a full treatise of ontology, yet it remains an undervalued concept even in what passes these days for McLuhanite circles. If it were a fair world, there would be a Tetrad Movement no less famous than the Marxist International, the Psychoanalytic Association and the *Yearbook for Phenomenology.*

In the limited pages remaining to me, I will focus briefly on five implications of the tetrad for philosophy. This will serve to outline a future line of research on the tetrads, and will also leave the reader with a handful of translucent pebbles to rub through the palms and hold up to the sun. The five topics are as follows: (1) the mechanisms of heating; (2) the nature of time; (3) indirect communication; (4) false imprisonment in the human realm; (5) the greatness of Bacon and Vico. Since each of these subjects is now left with an average of 450 words apiece, the reader is asked to forgive my highly compressed overview of these themes.

(a) Heating

For the McLuhans, all change in the world occurs through some transmutation of an existing figure/ground relationship. 'Heating' is the means of change that interests them most, but numerous others are possible. Chapter 2 of *Understanding Media* is entitled 'Media Hot and Cold'. A hot medium is 'one that extends one single sense in "high definition"... Hot media do not leave much to be filled in or completed by the listener' (McLuhan, 1994, p. 22). Television is a good example. By contrast, 'telephone is a cool medium, or one of low definition, because the ear is given a meager amount of information ... Cool media are high in participation or completion by the audience' (ibid.). Hieroglyphics are a cold medium, and the phonetic alphabet a hot one. The primary engine of change, for Marshall McLuhan, is the *overheating* of media. Thermodynamics teaches us that heat disperses into greater and greater entropy, but McLuhan's thermodynamics of media takes the opposite tack: temperature always tends to increase. What happens is that a medium eventually becomes overpopulated with too much information, too many separate figures for our senses to manage. 'The reversal aspect of the tetrad is succinctly exemplified in a maxim from information theory: *data overload equals pattern recognition*. Any word or process or form, pushed to the limits of its potential, reverses its characteristics and becomes a complementary form' (McLuhan and McLuhan, 1988, p. 107, emphasis added). When automobile travel becomes too cluttered with individual cars, the mobility of highways flips into the stasis of traffic gridlock. Individual cars were meant to be figures within an invisible medium of highway infrastructure, but they now become the medium itself, reversing into bulky metallic masses that obstruct numerous other such masses. The shiny metallic bodies of trucks and Porsches becomes a new and testy medium in which progress slows to a halt, giving rise to novel 'figures' in the form of road rage incidents and talk radio marathons. The multiplication of too many similar figures (cars) unleashes the hidden ground of those figures (physical bulkiness), which in turn is different from the initial ground of the situation as a whole (smoothly flowing traffic). The captive populace of any medium always tends to assert its rights and become itself the future medium, just as the German-born legionnaires reversed the onward march of Rome from within, suddenly proclaiming their tribal identities.

But we might also ask about the possible *cooling* of media, a topic that does not occupy the McLuhans as much. If it is true that some media are naturally hot (radio) and others naturally cold (television), this suggests that radio has less room for transformation by heating, and that in some cases it transmutes into other forms through cooling. As a trivial parallel example, consider the NCAA basketball tournament, which begins with 65 potential champions, and in just two weeks cools down to four. The high-definition mass of rival teams gradually ceases to become the medium, as we become hypnotized instead by the individual variations of the 'Final Four', with their stylistic quirks and specific human-interest stories. A more serious example would be the formation of literary and scientific canons. Any given century contains hundreds of rival thinkers and poets. Before long, virtually all are forgotten, as the medium cools down to a few worthy survivors. What happens here is that the previous Zeitgeist loses its status as the medium for intellectual work, and what is most idiosyncratic and least typical in the surviving great authors tends to become the new medium. Heidegger's philosophy must have seemed like just one more bit of anti-Weimar irrationalism, and Shakespeare like just one more commercial London actor. In similar fashion, landscapes become low-definition as they recede into the distance, and the frenzied details of our day-to-day lives cools down into a series of oversimplified past monuments. 'Ah yes, my Chicago days ...' What this phrase forgets are the high-definition hassles of tedious Chicago events, which fade from view like blades of grass from the view of speeding motorists, as hazy volcanoes dominate the landscape on afar.

(b) The nature of time

Any theory of time must balance its synchronic and diachronic aspects. Time can be viewed either as a resonant interplay of ambiguous moments in an isolated instant (Heidegger) or a ceaseless becoming that cannot be broken into isolated instants (Bergson, Deleuze). On a related note, it is also important to balance the epochal aspects of time with its gradual ones. Thomas Kuhn's 'paradigm shifts' and Stephen Jay Gould's 'punctuated equilibria' must also leave room for what they devalue: the step-by-step piecework of normal science, and the languid rain of genetic drift.

Though any philosophy of time worth its salt must show a good balance between these competing demands, any author will inevitably place strategic focus on one style of time over another. The McLuhans emphasize time as synchronic, punctuated and periodic (as opposed to diachronic, gradual and linear). Time is synchronic because the moments of the tetrad are simultaneous, with all aspects of figure and ground tied together in a Gordian knot at any instant. Time is punctuated because, despite the often confusing interplay of figure and ground, there is an absolute difference between being figure and being ground. For any given observer Humphrey Bogart may be either 'passé retro' cliché or 'novel retro' archetype; e-mail either is or is not still a medium in which each of us moves. The change may happen at different times for different observers: but when it happens, it happens. Being figure and being ground are not the same mode of being, and the shift between them is sudden even when it is not universal. Finally, time is periodic, since abandoned forms are always likely to return in some changed guise. The lava lamp, with its dizzying cycle of entries into the rag-and-bone shop and café chic, serves as an effective symbol of all human artefacts, as they shift wildly between plenitude and emptiness.

Nonetheless, time is not devoid of diachronic, gradual and linear elements, and any fair-minded philosopher must learn to play the piano with the left hand no less than the right. Where, in the McLuhans' vision, do we gain possible access to the diachronic passage of time through gradual steps, which they otherwise prefer to play down? Here again, the answer seems to be through *heating*. When a medium is slowly heated (or cooled), then by definition it remains the same medium but with differing amounts of content. For this reason, we need a more systematic overview of what it means to heat a medium – especially given that some media (lectures, phonetic scripts, radio) are already said to be hot from the outset.

(c) Indirect communication

When we interact with a medium, or with the figures set loose within it, we remain distinct from these things. 'When we touch something, we contact it and create an interaction with it: we don't connect with it, else the hand and the object would become one. A "static interval" is a contradiction in terms' (McLuhan and McLuhan, 1988, p. 6). Touch is not fusion, but 'involves also the idea of "play", as in the action of the interval between wheel and axle, as the basis of human communication' (ibid., p. 102). As is made clear by the mention of wheel and axle, intervals are found well beyond the scope of human dealings. The McLuhans take an even further step in this direction, when they add that 'interface, of the resonant interval as "where the action is" in all structures, *whether chemical, psychic, or social*, involves touch' (ibid., emphasis added). With this nod to the chemical realm, no less than to wheel and axle, we approach the limits of the human-centred model that hinders the tetrads from reaching their full universal scope. Whenever we begin to speak of structures that apply to every portion of the cosmos, we have entered the realm of first philosophy, or metaphysics. With this notion of the interval, we have discovered one of the first principles of the McLuhan metaphysics. Namely: 'there is no connection between figure and ground, but only interface' (ibid., p. 109).

Their basic ontology is one of interface without contact. Two or more entities affect each other in a shared common space without fully belonging to it. In the history of philosophy, the theory that objects cannot affect one another directly is known as *occasionalism*, usually in the sense that God is what causes everything to happen in every instant. This theory has long been abandoned to the rag-and-bone shop of hoary theological dogma – a wild doctrine of divine intervention that freshmen are encouraged to mock, with the urging of the enlightened post-religious intellect. Yet with their notion of the interval the McLuhans have managed brilliantly to *retrieve* occasional causation. Once it is seen that entities must touch in a shared medium, but without fusion, occasionalism once again becomes archetype: ye olde seventeenth-century cliché writ large. What is needed is a thorough study of the exact workings of touch-without-contact, which is also known in the history (and future) of science as 'action at a distance'.

(d) False imprisonment in the human realm

Despite their concession that intervals occur even in the realm of wheels and chemicals, the McLuhans persist in confining the tetrad and its figure/ground relationship to the sphere of human perception. First, they observe that 'metaphor has four terms that are discontinuous, yet in ratio to one another, [which means that] the basic mode of metaphor is resonance and interval – the audile-tactile' (ibid., p. 120). Given that resonant intervals have already been conceded to the structure of molecules, the McLuhans might have suspected that the term 'metaphor' probably has analogues even in the brute physical realm. But instead of extending the scope of metaphor, they unfortunately choose the other fork in the road, and restrict the meaning of resonance and interval. Resonant intervals are henceforth confined to 'language', which they then read in such a constricted sense that even animal communication is excluded. Repeating their earlier claim that the human mind is what generates resonance, they conclude that 'the four-part structure...is a testimony to the fact that *the mind of man* is structurally active in all human artefacts and hypotheses' (ibid., emphasis added). In other words, if 'the mind of man' were absent, the world itself would be nothing but dull, isolated chunks awaiting the appearance of the Great Holistic Ratio-Animal to bring them into shadowy, ambiguous resonance. For 'these appositional ratios are *not* also present in the structure of the "natural" world ...' (ibid., emphasis added). The scare quotes around 'natural' are a defensive manoeuvre familiar already from the writings of phenomenology – which realizes that it has bracketed mind-independent reality out of existence, that it cannot claim that this exclusion of the natural world is not a problem, but also that it is left with no way to address what happens when 'the mind of man' is far from the scene.

The only solution is to retrieve a new form of realism from the rag-and-bone shop of the history of philosophy. The McLuhans narrowly miss extending their resonant intervals down into the structure of inanimate matter, which would have given us a new theory of fourfold causation with truly shocking scope. As paradoxical as this demand may seem, the first steps towards a 'resonant' theory of inanimate causation should already be clear. When fire burns cotton in the absence of all human observers, fire and cotton will still encounter one another only as abstract figures, not in their full plenitude. We too easily identify abstraction per se with the sheer accident that it is often done by a human mind. If *abstrahere* means 'to draw away', to pull certain portions of a thing away from the thing as a whole, then abstraction is clearly something done even by the most mindless inanimate matter. Fire does not touch the full ground of cotton, but burns its flammable figure, making no contact with the colour or odour that also lie hidden in cotton's secret ground. Fire and cotton reduce each other to figures no less than humans reduce television to its contents. The McLuhans miss this only because they begin with the assumption that the ground or medium must be something present in human perception. The resonant interval does not belong to 'the mind of man', but to all objects that exist. Still, the McLuhans can hardly be blamed for a prejudice found in equal degree in nearly every important philosopher since Kant (the major exception would be Whitehead).

(e) The greatness of Bacon and Vico

Any new thinker will reorganize our assessment of past thinkers – raising formerly marginal ancestors to heavyweight status, while leaving others to fall into shadow. In the case of the McLuhans this remark is not only 'true', but forms an essential part of their system of tetrads. The act of retrieval in intellectual history *requires* that certain authors, formerly reduced to well-known clichés in the historian's arsenal, be transformed in such a way as to provide a new contemporary ground. (They cite T.S. Eliot in support of this view (McLuhan and MuLuhan, 1988, p. 47).) For the McLuhans, Francis Bacon and Giambattisto Vico are not just intellectual footnotes to be mastered by pedants; they are prophets of an uncompleted 'new science' that the McLuhans aim to complete. What Bacon and Vico have in common is that both are 'ancients' (ibid., p.9). They are 'grammarians' (ibid., p. x) (or rhetoricians) rather than dialecticians; Vico is described as 'the last great pre-electric grammarian' (ibid., p. 215), a figure who pays explicit homage to Bacon as his own great model. What they have in common is a shared insight into the 'bias of perception' (ibid., p. xi), which always tends to suppress its own ground. This is the point of Bacon's idols and Vico's partially similar axioms.

Bacon has additional importance for us, since he is surely the most trivialized and misunderstood great figure in the history of philosophy.[7] Bacon is generally viewed as a champion of red-meat empiricism and as a sceptic towards unscientific nonsense, but this is no more than a projection by unimaginative positivists of more recent times. In fact, Bacon is a surprising champion of *formal* causation. As he puts it in his great work, 'efficient and material causes are perfunctory and superficial, and *contribute nothing to true and active knowledge*' (Bacon, 1994, pp. 134–5, emphasis added). Although Bacon seems critical of forms in the first part of the book (the only part that is usually studied), his critique of forms is aimed only at the Platonic separation of forms from bodies, since for Bacon individual bodies are all that exist. But given that true forms are latent in all individual bodies, 'truth in contemplation and freedom in operation follow from the discovery of forms' (ibid., p. 135). This discovery takes place through *induction*, 'not through fire', though 'we must pass, it is clear, from Vulcan to Minerva, if we intend to bring to light the true structures and schematisms of bodies' (ibid., p. 141). The obscurity of forms is not due solely to the human mind, but to the fact that 'since every body contains many forms of natures, linked and in a concrete state, they all beat back, suppress, break, and bind one another, so that each individual form is obscured' (ibid., p. 184).

Hence, the Baconian metaphysics is one of forms wrapped in forms, or grounds wrapped in figures wrapped in grounds wrapped in figures, endlessly. This points forward to the McLuhans, but it also points back to some of Bacon's forerunners: Nicholas of Cusa, Giordano Bruno, and the alchemical tradition, with their respective theories of enfolded forms and virtues.

No one in the seventeenth century (not even Leibniz) allows for such a richly ambiguous interaction of grounds and figures in the world. And no one in the twentieth century, not even Heidegger, does as much as the McLuhans to retrieve the metaphysics of objects as a viable medium. Whether they deserve credit for 'the single biggest intellectual discovery … of at least the last couple of centuries' will depend largely on the imagination of the next couple of centuries.

Notes

1. Personal communication, 15 March 2006.
2. See especially Wilber (1995).
3. For another example, see the unexpected remark by Alain Badiou in his author's preface to the English version of *Being and Event*: 'At that moment I was quite aware of having written a "great" book of philosophy … Not without pride, I thought that I had inscribed my name … in the history of those philosophical systems which are the subject of interpretations and commentaries throughout the centuries' (2005, p. xi).
4. On the notion of *pharmakon*, see Jacques Derrida (1983).
5. Diagram taken by the McLuhans from R.H. Trotter (1976).
6. Dated 7 February 2001. From the online edition at http://www.theonion.com/content/node/28763.
7. I owe this realization to Eric McLuhan himself. Personal communication, December 1997.

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6
The Question Concerning Thinking

Søren Riis

Martin Heidegger's thought-provoking essay 'The Question Concerning Technology' (1977a) placed technology at the heart of philosophy. Heidegger tried to show that the essence of technology provokes humans to think about the world in a very dangerous way. Yet if we follow Heidegger's analysis of technology, what role does that ascribe to philosophy? To be able to understand the programmatic scope of Heidegger's question 'concerning' technology, we need to see it as inseparable from his famous thesis about the end of philosophy (1977c) and what he considers to be the ideal kind of thinking. However, by doing so, we will in the end realize two important things. First, that Heidegger's declaration of the end of philosophy in fact also means the end of anything we can meaningfully call thinking. Second, that Heidegger's own thinking is completely different from his own ideal of thinking. Our question concerning thinking reflects these consequences and finally strives to find another way to think about thinking – a way that brings us back to another of Heidegger's thoughts and that makes it possible to appreciate *the work of thought*.[1]

This critique of Heidegger's investigation of technology is divided into three parts. In the first, we remain close and loyal to Heidegger's argument as presented in 'The Question Concerning Technology'. It is important to understand how tempting Heidegger's interpretation of technology is before we try to distance ourselves from it. In our continued questioning, we will return to insights from this first part. In the second part, we take a step back, put ourselves at a distance from Heidegger's line of thought, and try to reconstruct a modified and more coherent version of his argument. In the third and last part, we step even further back and try to assess Heidegger's own thinking concerning technology in a new way. *Our thesis is that thinking is indeed a technical craft.* It is precisely this technical dimension that makes it possible to create great works of thought. In all, these three parts constitute our question concerning thinking. Just as Heidegger's question concerning technology is not articulated in a single question, but as a comprehensive endeavour to make technology questionable, so is our question concerning thinking an attempt to make Heidegger's understanding of thinking questionable as well.

6.1 The danger of modern technology

Motivated by an ethical goal, Heidegger initiates his inquiry of technology. His aim is to ensure human freedom in relation to technology, or stated in a more urgent manner, to avoid human enslavement. At first glance, this endeavour seems contradictory to the common-sense understanding of technology as subordinate to the will of man and a promoter of his freedom. Heidegger holds this everyday understanding to be a utopian delusion. If we think we can deploy techniques and develop machines and robots that set us free, then we are being fooled and have already begun to reason as if we were machines (1977a, pp. 311ff.). 'The Question Concerning Technology' should be studied carefully, since Heidegger's charge against the general understanding of technology is so extreme that it turns commonly held beliefs upside down. A critical assessment of Heidegger's argument demands that we first try to understand his line of thinking.

To facilitate a 'free' connection to technology it is necessary for Heidegger to reveal what technology essentially is and to refrain from being seduced by easy answers. Subsequently, Heidegger tries to capture the essence of technology and thereby avoid the danger originating from it (Heidegger, 1977a, p. 311).[2] In responding to this twofold task, Heidegger sees the fundamental aspiration as a reflection on technology. This is not an easy task according to Heidegger, since the essence of technology is different from, and not to be found in, any technological device. In fact there is a present danger that we blind ourselves to what technology really means while searching for its essence. Heidegger maintains that if we either love technology or hate every manifestation of it, or even if we consider technology neutral and thus are not able to see the fundamental difference between technology and the essence of technology, our thinking will always be restrained (Heidegger, 1977a, pp. 311ff.).

Heidegger begins his investigation by focusing on the ordinary instrumental account of technology. This account depicts technology as a means to an end and is rooted in an anthropological explanation that views technology as an act of human artifice. He argues that these two ways of thinking about technology are closely connected. Stating ends and finding the right means for reaching them indeed belong together. In other words, thinking about goals and creating new tools and techniques to reach them belongs to an instrumental framework of thinking. The instrumental and anthropological accounts of technology elucidate each other reciprocally and point towards the same end: humans should strive to master technology and use it in the most profitable manner. This understanding of technology seems to be right and harmless, but for Heidegger it is most dangerous and must be overcome (Heidegger, 1977a, pp. 312ff.).

To be able to follow Heidegger's manoeuvre beyond the instrumental anthropological understanding of technology, it is necessary to introduce one of Heidegger's decisive distinctions, one that will play a crucial role throughout this chapter. Heidegger separates 'the correct' from 'the true' (Heidegger, 1977a, p. 313). 'The correct' states a matter of fact. However, to state this, it is not required that the essence of the factual is disclosed. If asked what a human being is, it is 'correct' to say that a human being is a creature who walks on two legs. Nevertheless, by saying that, the essence of a human being has not been revealed. This only happens when 'truth' prevails. In searching for the truth, Heidegger is not satisfied only by the 'correct'.[3] One of the key questions to put to Heidegger therefore becomes: Is the essence of technology disclosed by the instrumental anthropological description? In order for Heidegger to answer this question, he needs to answer another question first: What are human means and ends essentially? The answer to the first question will depend on the response to the second.

Heidegger argues that means and ends belong to the field of causality. To understand what means and ends are, we must see that causality essentially is a way of understanding what causes something to be – or to appear to be – no matter if it is occasioned by man or nature. Heidegger thereby shows the essence of causality as belonging to the sphere of bringing-forth (Heidegger, 1977a, pp. 316ff.). Subsequently, Heidegger compares this line of thought with the ancient Greek understanding of truth, which is expressed in the concept of *alêtheia* (Heidegger, 1977a, p. 318). With this idea, the Greeks meant to conceptualize the process of disclosure. In Heidegger's interpretation, *alêtheia* becomes the process that precedes and facilitates any specific 'correct' conception about beings. In other words, *alêtheia* is thought to characterize the process which makes the world visible and conceivable in a distinct fashion, and which is a prerequisite for being able to verify any given statement about the world as correct or incorrect. A reference to another ancient Greek concept, that of a paradigm, may at this point help to make the principal difference between *alêtheia* and the static concept of the correct more credible. As long as a certain paradigm dominates there can be a number of unchangeable statements that are thought to be correct. Nevertheless, if a new paradigm emerges then some statements that were considered correct must be revised; they were only correct under certain circumstances at a given time (Kuhn, 1970). As such, the change of a paradigm is an event that stands in analogy to the process of disclosure, which Heidegger wants to elucidate by the concept of *alêtheia*.

Going back and forth between ancient Greek and modern thinking, Heidegger succeeds in establishing a connection between a process understanding of truth and the essence of causality. Both concepts belong to the process of disclosure: whereas the essence of causality is to be understood from this process, 'the true', mediated through Heidegger's understanding of *alêtheia*, conceptualizes the quality of this process. From this it follows that the essence of technology is to be thought of as *a way in which truth happens*. In this respect Heidegger tries to unfold the essence of technology beyond a mere instrumental and anthropological account in order to place it at the heart of philosophy. Before investigating Heidegger's specific account of the way in which modern technology discloses beings and makes the world comprehensible, it is important to recognize the significance of what Heidegger has hereby done to philosophy of technology. Linking together the essence of technology with the foundation of truth and ontology, philosophy of technology becomes indispensable to philosophical reflection. Heidegger thus is accredited as one of the founding fathers of philosophy of technology.[4] The reason why Heidegger's philosophy of technology is read with increasing interest and concern today does to a great extent rely on what we are about to examine – that is, Heidegger's challenging answer to the more specific question: How does the world appear when disclosed through modern technology?[5]

The essence of modern technology is to disclose beings, but, according to Heidegger, the modern kind of technology does so in a particular manner. In disclosing beings, the essence of modern technology prepares nature to stand at command and be able to deliver what is ordered from it (Heidegger, 1977a, p. 320). The world is thereby captured in terms of a resource, which ultimately must be completely describable in quantitative terms that make resources easier to count and control. Heidegger maintains that the technically disclosed world is imagined (*vor-gestellt*) as a potentially fully controllable object. In this framework, everything appears as something, which ultimately can be manipulated at will. What humans fail to notice is that they are themselves disclosed and thought of as something manipulable as well. This paradigm of modern technology allows humans to be conceptualized, organized and put to work in the most efficient way; it lets humans be treated as mere resources in order to produce and secure even further resources.

> Only to the extent that man for his part is already challenged to exploit energies of nature can this revealing that orders happen. If man is challenged, ordered, to do this, then does not man himself belong even more originally than nature within the standing reserve? The current talk about human resources, about the supply of patients for a clinic, gives evidence of this. (Heidegger, 1977a, p. 323)

To add importance and credibility to this argument, we can refer to another of Heidegger's texts where he quotes the former Nobel Prize winner in chemistry, Wendell Standley, as saying that 'the hour is near, in which life is laid in the hands of the chemist who can decompose, build and change this living substance at his wish' (quoted in Heidegger, 1956, p. 20). Heidegger sees this bold way of reasoning as a direct consequence of the technological world disclosure. For Heidegger this statement is such a radical attack on life that even an explosion of a hydrogen bomb means little in comparison (Heidegger, 1956, p. 20).

Whether it is in the shape of Wendell Standley's proclamation or manifested in the sapping of energy taking place in the obstruction of rivers or in the hollowing out of fuel in coalmines, Heidegger elucidates the common traits of modern technological revealing of nature with the concept of 'challenge'. The technical world disclosure challenges everything to come to appear in a standing reserve of objects. The disclosure of modern technology brings all things into a specific and controllable 'stand'. Heidegger conceptualizes this specific world disclosure with the German concept, *das Gestell*.[6] When agreeing with Heidegger's understanding, it becomes increasingly clear that technology, ontology and ethics cannot be separated. Subordinate to the rule of *das Gestell*, ethics is far from being a way of thinking that tries to respond to the way humans are connected to the event of truth. Instead, ethics has become an instrument to mobilize and organize men and women and transform them into controllable subjects or objects. In the end, when challenged by the rule of *das Gestell*, there is no difference between subjects and objects – and this is the fundamental danger of modern technology according to Heidegger. Under the rule of *das Gestell* thinking is transformed into positivism and epistemology, which catalyses the idea of the world as a standing reserve of information. In the end, thinking is nothing but a tool that is expected to deliver increasingly better solutions to the only important question: How do we find more efficient ways to achieve information about how to control the world? The goal of the type of thinking provoked by *das Gestell* would be in establishing a manual for everything – including humans – and thereby establish a strict world order.

6.2 Reinterpreting the danger of technology

Heidegger's argument against modern technology is in principle quite straightforward and can be restated in the following way. Technology and techniques are used to achieve specific goals using different kind of resources. The technique of a doctor is normally to cure by means of different kinds of medication; the technology of medicine is to cure. A carpenter constructs specific things, such as furniture, and for this purpose he uses certain tools and different kinds of natural resources; the technique of a carpenter is to create specific constructions. Before we continue this modified interpretation of Heidegger's argument, it is important to recognize that ancient and modern technologies both belong to an instrumental framework of thinking. However, we would like to underline that there is a significant difference between the levels of automatization in various techniques and technologies. By asserting this, we address the extent to which the practitioner of a technique or the producer of technology reflects on what he creates and brings to presence. A danger arises if technology automatically complies with gradually more pre-established measures, which define its means and ends. If this happens, a pre-established framework of the world is taken for granted and no questions are asked as to its limitations, history and prerequisites. The given technology solely tries to reason within the *given* framework as efficiently as possible. In that sense, the response of thinking to every question becomes increasingly more self-evident. The task of thinking is then just to continue to think along the pre-established and automated lines of thinking:

> The essence of technology lies in enframing [*das Gestell*]. Its holding sway belongs within destining. Since destining at any given time starts man on a way of revealing, man, thus under way, is continually approaching the brink of the possibility of pursuing and promulgating nothing but what is revealed in ordering, and of deriving all his standards on this basis. (Heidegger, 1977a, p. 331)

In other words, increasingly automated technologies demonstrate a way of thinking that shows no understanding for Heidegger's concept of truth, but only operates in the realm of the 'correct'.

In a modified understanding of Heidegger's argument, we can interpret 'modern technology' as automated technologies in general, which rely on specific predetermined measures. 'Ancient technology', however, we would understand as a more self-reflective kind of technology that is conscious of the act of revealing itself. In this interpretation, 'modern technology' is not limited to the age of modernity, and the contemporary development of technology does not have to manifest itself only in 'modern technology'. In ancient Greece, the production of boats also complied with a number of specific and slowly changing standards for the use of materials and the design of hull and sails. This technology must also be considered as relying on unquestioned measures, even though it was carried out with bare hands and very basic tools. Conversely, today we have technology and create artefacts that are signs of questioning previous basic standards of technology. For example, the case of contemporary architecture and its expanding horizon in terms of design and how it is able to bring of all sorts of materials into play. In favour of Heidegger's assessment, we may add that although 'modern technology' in our modified interpretation is not limited to modernity, there not only is more technology present today compared with antiquity, but technology is also increasingly automated and operates on predetermined and gradually more global standards. The expansion of existing standard measures and benchmarks to ever new markets testifies to this fact. We become an illustration of this development by looking for example at IKEA furniture. Not only are these pieces of furniture produced according to identical norms in millions of pieces to markets around the world, but they can also fulfil their function in all kinds of rooms to create a standard looking and operating living space.

In Heidegger's argument against modern technology, the phenomenon of perfection implicitly plays a crucial role. With regard to the concept of perfection, it is important to see how new technologies develop from previous ones. We need to ask: Is the search for perfection inherent to the development of new techniques and technology? In order to answer this question, let us first consider a few everyday examples. If we compare the production and design of cars today with the beginning of car manufacturing, a specific trajectory towards perfection has obviously taken place. Not only do cars accelerate and drive much faster today and have more aerodynamic designs, but they are also safer to drive. Another example: most people have tried to practise some type of sport and have been amazed by the techniques of the well-trained experts. If we for instance study the technique of the well-trained athletes in a discipline such as swimming, then we recognize how they have perfected their bodily action by exact movements of arms and legs and a specific rhythm of breathing, and through the improvement of certain muscular groups. Here too the struggle for perfection is inseparable from the development of new techniques. Finally, if we take a look at amateur handiwork, then many people have tried to work with less than perfect tools and wished for better ones (for example, fastening screws with a knife, hammering with something other than a hammer or trying to cut something in two without using a saw). In that way, we motivate and come to appreciate the perfection of tools. As a consequence, we nowadays have all sorts of hammers, screwdrivers and saws for carrying out very specific tasks.

Based on these everyday examples, it is easy to see that there are ways to measure and differentiate worse from better techniques and technological equipment. And there is a very good reason for this, which is the basic prerequisite of every technology and technique. By definition, they are goal-oriented. In other words, we develop techniques to reach specified goals in the most efficient way. This also becomes clear if we turn this insight upside down: it makes no sense to say that we have developed a technique but we do not know what it is good for. Technology and techniques are always subsequent to a specific goal and perfection therefore is an inherent part of the technique, in the sense of the endeavour to fulfil the goal in the most efficient and easy way (this systematic account of perfection is also supported by the fact that the word is derived from Latin *perfectio*, which means 'to complete'). Technique, technology and perfection are in this sense inseparable. However, this does not mean that technology and techniques are not changing fundamentally. For example, the transition in transportation technology from horse-drawn carriages to fuel-driven cars is an original change. The invention of cars was a new way to think of transportation, even though the design of the first cars resided within the framework of horse-drawn carriages.

However, cars were invented out of the same framework of thinking about transportation, according to which faster and stronger is better – so this development is still a manifestation of 'perfection'.

Against this elucidation of technology, someone may object that it supports what Heidegger describes as the instrumental misunderstanding of technology. But we have to remember that Heidegger also points out that the instrumental account of technology is correct: 'The instrumental definition of technology is indeed so uncannily correct that it even holds for modern technology, of which, in other respects, we maintain with some justification that it is, in contrast to older handicraft technology, something completely different and therefore new' (Heidegger, 1977a, p. 312). The instrumental account of technology is just not the whole explanation about the relevance of technology for philosophy. So how can we better understand the danger in the fact that technology goes hand in hand with perfection?

> But this much remains correct: Modern technology too is a means to an end. This is why the instrumental conception of technology conditions every attempt to bring man into the right relation to technology. Everything depends on our manipulating technology in the proper manner as a means. We will, as we say, 'get' technology 'intelligently in hand'. We will master it. The will to mastery becomes all the more urgent the more technology threatens to slip human control. (Heidegger, 1977a, p. 313)

By thinking of technology as a neutral instrument, we are, according to Heidegger, 'delivered over to it in the worst possible way' (Heidegger, 1977a, pp. 311ff.). 'For this conception of it, to which today we particularly like to pay homage, makes us utterly blind to the essence of technology' (Heidegger, 1977a, p. 311). By interpreting technology as a mere instrument at our disposal, humans fail to see that technology really masters humans and the way in which we are, as Heidegger says, 'delivered over to it' (Heidegger, 1977a, p. 311). By trying to become the masters of technology and specific techniques, we tend to focus on them to the extent that we do not see and question the framework in which they and we operate. We thereby support this framework and put it in a position of power. Thus, we are working on the fundamental premises of these technologies and towards their pre-established goals. By using a hammer we silently support an understanding of the world, which was the prerequisite of creating it – and the better we master the technique of hammering, the less we question it. In other words, the professional carpenter does not question whether thinking in terms of hammers and nails should be changed entirely, but rather whether hammers and nails serve their pre-established purposes. So Heidegger's argument is not that technology does not belong to an instrumental framework of thinking; rather, he endeavours to show the character of this framework (which cannot be understood) if we only take a hammer, an instrument or a resource on their face value and do not recognize that they belong to a certain way of revealing beings and thinking about the world. The basic assumption common to all technologies and the way in which they encourage us to reason is in terms of means and ends, and objects. And this kind of reasoning is, according to Heidegger, calculation in its primary sense.[7] This framework or paradigm of reasoning also allows for humans to appear as means, for example in the notion of 'human resources' and 'the workforce'.

Through this line of thinking, we have bent Heidegger's argument. For it is clear to us that the preoccupation with mastering tools and techniques took place in antiquity as well and that the instrumental reasoning must have been common to the ancient Greeks because it is inherent in their technology. The possible danger at the root of technology, according to this interpretation, is not limited to present-day technology.[8] By way of this reinterpretation, we believe we have made Heidegger's argument more consistent, and more difficult to escape, because we cannot just flee into handiwork technology and thereby avoid the danger stemming from an instrumental revealing of the world. Ancient technology does not rescue us from the instrumental way of thinking. As we thus do not only limit this danger of thinking to the modern period, we are now better able to understand Heidegger's famous critique of philosophy as metaphysics as well. In connecting Heidegger's analysis of philosophy as metaphysics with his critique of modern technology, it becomes easy to see how his critique must apply to ancient technology too. In fact, the depth and universality of Heidegger's critique are exactly its force and weakness.

As we now go on to connect Heidegger's investigation of metaphysical thinking with his analysis of modern technology and begin to study Heidegger's conception of technology more critically, it is crucial to understand that we cannot accept Heidegger's understanding of *alêtheia*, as designating any kind of bringing-forth.

> But where have we strayed to? We are questioning concerning technology, and we have arrived now at *alêtheia*, at revealing. What has the essence of technology to do with revealing? The answer: everything. For every bringing-forth is grounded in revealing. [...] If we inquire step by step into what technology, represented as means, actually is, then we shall arrive at revealing. The possibility of all productive manufacturing lies in revealing [...] *Technê* is a mode of *alêtheuein*. (Heidegger, 1977a, pp. 318ff.)

In our interpretation, every kind of bringing-forth is *not* a mode of *alêtheuein*, and certainly not ancient handicraft. In other words, if *technê* and technology are modes of *alêtheuein*, then this concept does not grant Heidegger what he wants from it: namely that *alêtheia* designates the most elementary and original way of something to come into being, which precedes the 'correct'. Heidegger has exactly argued that ancient handicraft, *technê*, brings forth according to an *eidos* (Heidegger, 1977a, p. 315). When creating a chair, the carpenter has a physical or imaginative model for his work, the *eidos*, which predefines the result of what he is doing. In fact, the *technê* of a carpenter is defined by his ability to *reproduce* an actual chair based on the *eidos* of a chair. In the same derivate sense of bringing-forth, according to which a modern machine can be said to bring forth the design defined by a computer program; this is reproduction and must be considered an instance of what Heidegger describes as the 'correct', not an event of 'truth'. The essence of technology is therefore not *alêtheuein*. The creation and conceptualization of the *eidos* of a chair and the design of the model for computer-driven technology are qualitatively different and take place before the bringing-forth of the actual chair. The latter operates within a pre-established framework, and it does not question the 'paradigm' of a chair, let alone that of sitting, but acts according to a settled framework, and this is derivative thinking *par excellence*. Exactly because of this difference, Heidegger elsewhere distinguishes between handicraft and art: 'We think of creation as a bringing forth. But the making of equipment, too, is a bringing forth. Handicraft – *Hand-werk* – a remarkable play of language – does not, to be sure, create works, not even when we contrast, as we must, the handmade with the factory product' (Heidegger, 1977b, p. 183).

According to Heidegger's argument in 'The Origin of the Work of Art' (1977b), artwork is an event of truth, because artworks do not just reproduce ideas, whereas what handicraft brings forth is predefined. It is this line of thought concerning technology that we have tried to follow above, and it reveals the 'danger' belonging to ancient technology as well. In another of Heidegger's texts, which we take to be crucial to understanding Heidegger's critique of philosophy, he writes:

> Philosophy is metaphysics. Metaphysics thinks beings as a whole – the world, man, God – with respect to Being, with respect to the belonging together of beings in Being. Metaphysics thinks beings as beings in the manner of a representational thinking that gives grounds. For since the beginning of philosophy, and with that beginning, the Being of beings has shown itself as the ground (*archê, aition*, principle). The ground is that from which beings as such are what they are in their becoming, perishing and persisting *as something that can be known, handled, and worked upon.* (Heidegger, 1977c, p. 432; emphasis added)

Heidegger continues:

> This development [the development of science] looks like the mere dissolution of philosophy, yet in truth is precisely its completion. It suffices to refer to the independence of psychology, sociology, anthropology as cultural anthropology, or the role of logic as symbolic and semantics.

> Philosophy turns into the empirical science of man, of all that can become for man the experiential object of his technology, the technology by which he establishes himself in the world by working on it *in the manifold modes of making and shaping*. All of this happens everywhere on the basis of and according to the criterion of the scientific discovery of the individual areas of beings. (Heidegger, 1977c, pp. 433ff.; emphasis added)

Heidegger's argument against philosophy, as it unfolds in these two passages, explicitly connects his analysis of philosophy with his critique of technology. In Heidegger's view, philosophy does not think about how beings come into being, how their identity is shaped and is in fact a product of a previous event of 'truth'. Philosophy brings beings into a specific 'stand' that allows for beings to be understood as *something knowable and manageable*. In this sense, philosophy has no concept of the processuality of being, the event of bringing-forth and the ascription of identity. This is all the more significant as it is philosophy that, according to Heidegger, has given beings their initial identity. Philosophy has established beings as something fixed and manageable without being self-reflective about this very event. Instead philosophy has continued to act on this conception of 'Being' in order to produce more detailed studies and thereby it has become increasingly detached from the event of truth, which according to Heidegger inevitably has led to the development of science and technology. Therefore, philosophy must be criticized with the very same arguments as technology. Even so, it is not until the late phase of modern technology that the consequences of philosophical thinking become transparent. Hence, in Heidegger's view, philosophy has originally empowered technology. It is not until philosophy fulfils its task of making all areas of being knowable and manageable that philosophy turns to be self-reflective and critical towards its own history and practice – it has been too preoccupied with its initial task.[9] As philosophy, understood as metaphysics, reaches its initial goal and has delegated the remaining work to the sciences, in modernity, Heidegger strives to recast philosophy so that thinking can come to understand the origin of 'truth' and the essence of its own work.

6.3 The feast of thought

Heidegger's critique of technology is so fundamental that in order for him to be consistent, he needs to declare the end of philosophy. Heidegger's critique not only makes traditional philosophy superfluous, as the work of philosophy is delegated to the sciences and technologies. In Heidegger's view, philosophy understood as metaphysics also poses a great danger. Following Heidegger's line of thought, there is no fundamental difference between the theoretical approach to the world as manifest in philosophy and the practical approach performed by technology. That is, a theoretical approach to the world is indeed practical as well. According to Heidegger, philosophy has created and shaped a seemingly stable world of *knowable and manageable* objects out of the flux of nature. After the formation of philosophy, humans indeed inhabit a different world. In Heidegger's view, the creation of the basic structure of this world and the task of philosophy in getting to know the different entities in the world, is, in a manner of speaking, the original sin of philosophy.

The practical approach to the world as manifest in technology also belongs to a certain theoretical conceptualization of the world, namely one according to which the world also consists of *knowable manageable* objects, which are thought of and acted upon as able to be shaped and ordered according to ideas. The foundations of technology and philosophy are basically the same in Heidegger's view – both have a metaphysical foundation and are theoretical and practical at the same time. Analogically, thoughts can be derivative as actions and beings, and therefore framed or 'contaminated' as well. It is not only through the rise of modern technology that this instrumental understanding of the world comes to rule. Indeed, it seems that the beginning of philosophy is a late result of an instrumental way of thinking and acting. However, this is not our primary concern. Rather, we want to ask Heidegger: What alternatives do we have to philosophy, science and technology? How can we think differently in order not to blind ourselves to the 'truth'? Heidegger's response to these questions is to be found in his appeal to his concept of 'the task of thinking' (Heidegger, 1977c, p. 436). This programmatic thought is articulated most clearly in Heidegger's lecture 'The End of Philosophy and the Task of Thinking'.

Before unfolding our real critique of Heidegger's approach, it is again worth noting the critical potential in Heidegger's interpretation of technology, science and philosophy. Everything derivative and unaware of its own coming into being must be corrected, carefully reflected upon or discarded altogether. This we can see in Heidegger's renowned critique of the sciences:

> For it is true that what has been said so far, and the entire discussion there is to follow, have nothing to do with scientific knowledge, especially not if the discussion itself is to be a thinking. *This situation is grounded in the fact that science itself does not think, and cannot think* – which is its good fortune, here meaning the assurance of its own appointed course. (Heidegger, 1977d, p. 373; emphasis added)

What is just as obvious, but not so often thought about, are the consequences of this critique for Heidegger's judgement of the modern universities. In one sense, they deserve an even harder critique than the sciences, since they can be described as preparing the youth not to think. Heidegger maintains that universities educate according to an educational set of ideals, which already frames students as *manageable designable resources*. If the universities put these ideals in question, they obstruct their own efficiency and their specific political assignment – they would then have to stop producing students and new degrees.

> 'Universities' as 'sites for scientific research and teaching' (in this way they are products of the nineteenth century) become merely operational institutions – always 'closer and closer to actuality' – in which nothing comes to decision. They will retain the last remnant of a *cultural decoration* only as long as for the time being they must continue to be the instrument for 'culture-oriented political' propaganda. Anything like what is ownmost to the 'university' will no longer be able to unfold from them – on the one hand, because the political–national mobilization renders superfluous such an ownmost; but on the other hand because scientific operation maintains its course far more securely and conveniently *without* the will to mindfulness. (Heidegger, 1999, p. 108)

Nevertheless, no matter how accurate Heidegger might be in his critique of the practice of the universities and the basic blindness of science, technology and philosophy, we now want to turn the game around and examine in which sense Heidegger's ideal of thinking presents an alternative. What is it that Heidegger calls thinking and what is its task?

Our thesis is that Heidegger's critique of philosophy, technology and science is so severe that it makes 'thinking' in any meaningful way impossible. Our very question concerning a clear meaning of thinking can also be said to be bound to fail, since in advance it frames thinking to be something 'knowable'. Heidegger could object that we thus pursue thinking in a technical framework, which automatically calls for a technical disclosure of it. Since we are not even able to pose this question on technology properly, let alone answer it in an appropriate manner, we now indeed find ourselves in a difficult situation.

We do not become much wiser if we approach thinking differently and ask about its task and way of working. Nevertheless, at first glance, Heidegger seems to welcome this approach to 'thinking', as he entitles his programmatic essay 'End of Philosophy and the Task of Thinking'. Yet to assign *a task* to 'thinking' compromises Heidegger's own effort to reveal thinking outside an instrumental framework. However, if we for a moment leave these considerations aside, we will try to go beyond the mere title of his lecture and study what Heidegger in fact argues in the text. Heidegger's point is initially, as we have seen, that philosophy has no awareness of the fundamental prerequisite for something to appear. The primary precondition for anything to appear is what Heidegger refers to as the 'clearing'. The 'clearing' means the open empty space, which is a precondition for anything to come into being.

If philosophy studies beings and entities themselves, it is already too late to think about the fundamental precondition of beings – the 'clearing': 'all philosophical thinking that explicitly or inexplicitly follows the call "to the matter itself" is in its movement and with its method already admitted to the free space of the clearing. *But philosophy knows nothing about the clearing*' (Heidegger, 1977c, p. 443). Heidegger therefore sees *the beginning of philosophy as a point of departure* – namely the point of departure from the 'clearing' itself. It is Heidegger's suggestion that the 'task of thinking' is to reflect on the 'clearing': 'a task that has concealed itself from philosophy since its very beginning, *even in virtue of that beginning*, and thus has withdrawn itself continually and increasingly in the times that followed?' (Heidegger, 1977c, p. 436; emphasis added).

Our argument against Heidegger is that if this is the task of thinking, then thinking should think about nothing at all – no entity – and assume nothing either. Thinking in that sense cannot be methodological and positive in any way, but can only try to remain thoughtful of no thoughts at all. This we cannot call thinking; but we may indeed call it 'dwelling', which Heidegger sometimes uses as a synonym for his ideal way of thinking (Heidegger, 1977e). The 'clearing' is free open space, emptiness – the emptiness that proceeds and grants individual appearing. Heidegger says: 'But above all, the thinking in question remains *unassuming, because its task is only of a preparatory*, not of a founding character' (Heidegger, 1977c, p. 436; emphasis added). This thinking is 'unassuming' because it really starts and ends with *nothing*. We cannot even call it 'preparatory', as Heidegger does, because 'thinking' in Heidegger's ideal form should not prepare anything either (to come into being), as it then generates a focus outside of the 'clearing' itself and thus establishes 'thinking' as part of an instrumental framework. The task of thinking in Heidegger's view should rather be interpreted as a way of thinking that negates any kind of synthetic or analytic thinking altogether. The task of thinking in Heidegger's view must be to 'dwell' on nothingness. Any kind of thinking that 'assumes' anything at all is derivative compared with the pure 'dwelling' on the 'clearing' and thus a target of Heidegger's critique. The concept of a 'clearing' in Heidegger's sense is analogous to a beginning before the actual beginning or the concept of the pure possibility itself. These are all primary concepts, but impossible to think about; they are absolute abstractions – we may call the 'clearing' the abstraction of abstraction. No matter what we think about and no matter in which way we are doing it, we are trapped in Heidegger's critique of assuming too much and not being original enough in our thinking. This is exactly why Heidegger's ideal of thinking in our view is infinitely critical but at the same time absurd. Thinking in Heidegger's sense cannot be *really* critical, as criticism is assuming as well, and with his concept of thinking we cannot come to understand anything and try to change something for the better. By thinking about thinking in a way that allows thinking to help change the world for the better, we would implicitly support a concept of thinking that also conceives the world as knowable and manageable.

However, Heidegger also assumes too much to be thinking in his own terms. Thus Heidegger's ideal of thinking must not be confused with his own very concrete and extremely systematic way of thinking. In Heidegger's approach and subsequent critique of the universities, he certainly takes universities to be something knowable and manageable – in effect, his critique aims at another management of the universities.[10] According to the ideal sense of thinking, Heidegger also confesses that he is not thinking at all: 'we are still not thinking; none of us, including *me who speaks to you, me first of all*' (Heidegger, 1977d, p. 379; emphasis added). Heidegger's ideal of thinking is incompatible with speaking, with articulation of language, and might at best be expressed in silence. By the end of 'The End of Philosophy and the Task of Thinking', Heidegger lets it remain a mere hypothesis that such a way of 'thinking' is achievable. Perhaps he knows that he is not manifesting it and that his own way of thinking rests on a technical metaphysical framework: '*Perhaps* there is a thinking outside the distinction of rational and irrational. More sober-minded and hence removed, without effect, yet having its own necessity' (Heidegger, 1977c, p. 449; emphasis added).

In another attempt to access 'thinking' in its original sense, Heidegger starts out by asking two guiding questions: What is called thinking? And: What calls for thinking? In the first part of the text unfolding this attempt, he establishes that the first question should be interpreted as derivative compared with the second question (Heidegger, 1977d, p. 387). 'But the question, asked properly, "What calls for thinking on our part?" means something else.... It means: What is it that directs us into thought and gives us directives for thinking' (Heidegger, 1977d, p. 384). It is not philosophy that calls on us to think in Heidegger's interpretation.

> Even if we devoted many years to the intensive study of the treatise and writings of the great thinkers, the fact is still no guarantee that we ourselves are thinking, or even are ready to learn thinking. On the contrary – preoccupation with philosophy more than anything else may give us the stubborn illusion that we are thinking just because we are incessantly 'philosophizing'. (Heidegger, 1977d, p. 371)

Heidegger argues that what calls on us to think and gives us 'food for thought' is to be understood as that which is 'thought-provoking'. What is most thought-provoking is exactly what really calls on us to think. In this way a paradox occurs according to Heidegger's thesis, since the most thought-provoking in Heidegger's understanding of thinking is that we are not thinking: 'most thought-provoking in our thought-provoking time is that we are still not thinking' (Heidegger, 1977d, p. 371). After presenting this thesis, Heidegger goes on to argue in favour of the same thought, which we saw emerging in 'The End of Philosophy and the Task of Thinking', namely that through the actual beginning of thinking, thinking loses contact with its origin that initially called on thinking.

> The problems that here lie in wait come rushing at us when we add still further: That which properly gives us food for thought did not turn away from man at some time or other that can be fixed in history – no, what properly must be thought keeps itself turned away from man since the beginning. (Heidegger, 1977d, pp. 372ff.)

In Heidegger's interpretation, what calls on us to think keeps itself turned away through the very beginning of thinking. In other words, when the 'clearing' successfully triggers our thinking, thinking has already departed from the 'clearing'; thinking is always too late to think about the clearing itself. *Discursive thinking cannot catch up to a presumed beginning outside of the realm of the thinkable, and therefore this kind of thinking cannot possibly be thinking in Heidegger's ideal sense*. Compared with the ideal of thinking, Heidegger also admits, as we have seen, that he is not thinking either – he is talking and reasoning, and therefore not thinking: 'We are still not thinking; none of us, including me who speaks to you, me first of all' (Heidegger, 1977d, p. 379).

There is no way of reaching Heidegger's ideal of thinking step by step. He asserts that the only way to achieve it is through a 'leap' (Heidegger, 1977d, p. 373). We may even say that Heidegger agrees that there is no way to think about the 'clearing' as thinking always comes too late for its own beginning. Therefore, Heidegger's actual line of thought is only thought of as 'preparatory' in the sense that it can only take the listeners so far: 'By way of this series of lectures we are attempting to learn thinking. The way is long. [...] If all goes well, they will take us to the foothills of thought. But they will take us to places that we must explore to reach the point *where only the leap will help us further*' (Heidegger, 1977d, p. 377; emphasis added). We can only reach Heidegger's ideal of thinking through a leap, and, we may add, by a leap of thoughtlessness.

If we try to summarize our interpretation of Heidegger's concept of thinking, then we would like to stress that a concept of thinking, which is not 'assuming' anything at all, cannot think of anything and must be regarded as impotent. Heidegger's ideal concept of thinking goes beyond or before the rise of intentionality; by its very definition it must negate any attempt to think about something in particular. It is not even possible to 'think' the 'clearing' as this also suggests intentionality on the part of thinking. Heidegger indeed says: 'Most thought-provoking in our thought-provoking time is that we are still not thinking – not even yet, *although the state of the world is becoming constantly more thought-provoking*' (Heidegger, 1977d, p. 371, emphasis added). This assertion must also be interpreted as a critique of

Heidegger's ideal of 'thinking' since it is impossible with his concept of thinking in mind to alter the 'thought-provoking state of the world'. In addition, the 'state of the world' can in fact only be thought-provoking if the 'world' is something knowable, and the 'state of the world' can only be changed if the world is something manageable. Therefore, Heidegger's thinking seems to be contradictory. To 'dwell' on the 'clearing' will only allow what Heidegger and many conservative thinkers take to be a thought-provoking development of the world to continue without any interference. 'Dwelling' on the 'clearing' would clear the way for pervasive technology and go against Heidegger's own antique preferences.

Thus, we will not follow Heidegger to this point, where he thinks it becomes necessary to leap. We think of his way as a dead end (*Holzweg*). Through Heidegger's manner of framing his investigation and turning the question 'What is called thinking?' into the question 'What calls for thinking?', he not only misguides the investigation but changes it altogether. Heidegger in fact here *agrees* that thinking, as any specific line of thought, obeys laws, is discursive, technical and performed by humans. But this is not the main point in Heidegger's quest to find 'what calls for thinking'.

> The investigation considers a process that occurs in man. Man takes a special part in the process, in that he performs the thinking. Yet this fact, that man is naturally the performer of thinking, need not further concern the investigation of thinking. The fact goes without saying. Being irrelevant, it may be left out of our *reflection on thinking*. Indeed, it must be left out. For the laws of thought are after all valid independently of the one who performs the individual acts of thinking. (Heidegger, 1977d, p. 385; emphasis added)

In this passage, Heidegger confuses two things: man as the performer of thinking can be left out of an investigation of *the laws of thought*, but this inquiry is not the same as an investigation trying to assess the origin of thinking or what calls for thinking. In the latter investigation 'man as the performer of thinking' should not be left out, on the contrary. It is exactly Heidegger's strategy to 'leave out humans and the process of thinking' in his investigation of 'what calls for thinking'. If we accept that we have to go beyond humans and the process of thinking itself to find the origin of thinking, then we accept Heidegger's framing of the inquiry on the basis of a confusion and we have to go searching (think of) for the origin of thinking outside of the thinkable. In this way the origin of thinking can never be found – it will always withdraw itself from thinking – and 'dwelling' is not going to help us find it.

Our thesis is exactly that humans are capable of thinking because they can ignite thinking themselves. This happens when thoughts are directed towards thoughts, problems and concrete beings and when we put thoughts in question.[11] If we now review Heidegger's thesis that the '*most thought-provoking is that we are still not thinking*' (Heidegger, 1977d, p. 370), then we would like to pay attention to the fact that Heidegger actually takes this 'thought' to be the most thought-provoking. This is the thought that initiates his own line of thoughts. What is most thought-provoking are apparently the thoughts themselves according to what Heidegger does and says. We therefore turn Heidegger's understanding of the 'leap' against him. *By stressing the discontinuity between 'thinking' and the 'clearing', we maintain that thinking cannot be understood through the 'clearing', but only through thinking itself, and that the task of thinking is not equal to a dwelling on the clearing.*

In the remaining part of the chapter, we will try to outline how our own interpretation of 'thinking' is linked to another one of Heidegger's investigations, namely his investigation of the work of art in 'The Origin of the Work of Art'. By doing so, we will show how Heidegger here develops a concept of a circle of thinking, which he in this text considers to be 'unthinkable' to go beyond. We would like to sketch some ideas regarding an alternative concept of thinking, which does not necessarily lead to the 'sapping of energy from nature' and the construction of increasingly efficient tools, but which is able to respect constructive discursive thinking.

In 'The Origin of the Work of Art', Heidegger tries to approach the phenomenon of the 'origin' or the 'beginning' as well, but does not go beyond 'thinking' and the experience of beings to find it. By connecting this lecture to 'What Calls for Thinking' we will come to see how decisive Heidegger's technique of thinking is. Here we cannot go through Heidegger's whole line of thought in 'The Origin of the Work of Art'. Without doing so, it is still possible to understand the main arguments of this investigation, and subsequently to link them to our inquiry of thinking.

Heidegger begins the 'The Origin of the Work of Art' by arguing that on the one hand an artist is usually considered the originator of the work of art. One the other hand, the artist only becomes an artist through the work of art. Both of these concepts, artist and work of art, have to be thought of as belonging to the sphere of art, which Heidegger approaches through the study of real works of art. In the very *beginning* of his line of thought about the *origin* of the work of art, Heidegger finds himself caught in a circle of thinking: 'anyone can easily see that we are moving in a circle. Ordinary understanding demands that this circle be avoided because it violates logic' (Heidegger, 1977b, p. 144). Yet Heidegger's argument is exactly that this circle is not 'vicious', but that thinking in this circle is the only way to approach the phenomena of the 'origin'. Heidegger maintains that this circle of thinking is a sign of coherence and will finally reveal to us what the origin of the work of art is.

> Thus we are compelled to follow the circle. This is neither a makeshift nor a defect. *To enter upon this path is the strength of thought. To enter upon*

> *this path is the strength of thought, to continue on it is the feast of thought, assuming that thinking is a craft.* Not only is the main step from work to art a circle like the step from art to work, but every separate step that we attempt circles in this circle. (Heidegger, 1977b, p. 144; emphasis added)

After Heidegger has taken the reader though a number of critical arguments against various approaches to the work of art, by way of studying real art works, he shows that the work of art reveals beings and entities. In that sense, the *work* of art is essentially an event of 'truth':

> The Greeks called the unconcealment of beings alêtheia. We say 'truth' and think little enough in using this word. If there occurs in the work a disclosure of a particular being, disclosing what and how it is, then there is here an occurring, a happening of truth at work. In the work of art the truth of beings has set itself to work. 'To set' means here 'to bring to stand'. (Heidegger, 1977b, pp. 161ff.)

Heidegger finally confirms the circle of thought as he, towards the end of the text, repeats the insight from the beginning in a more detailed manner and links it to the concept of the 'origin'. To be able to understand Heidegger's own circle of thought, to see how the end of his investigation is connected to its beginning, and to understand how this reveals the origin of the work of art, it is important to see that during his investigation Heidegger explicitly draws the interpreter of the work of art (himself, the listener to his lecture or the reader of his text) into the circle of thinking. Heidegger calls the interpreter 'the preserver': we can indeed translate 'preserver' by 'interpreter', because the task of both is the same. The 'preservers' are in Heidegger's account inseparable from the work of art, since the work of art cannot be appreciated without them. We cannot think of the one without asserting the other – just like Heidegger showed how we could not think of the artist without the work of art and vice versa. Heidegger's circle of thought in this way manifests itself again.

> The preservers of a work belong to its createdness with an essentiality equal to that of the creators. But it is the work that makes the creators possible in their essence, the work that by its own essence is in need of preservers. If art is the origin of the work, this means that art lets those who essentially belong together at work, the creator and the preserver, originate, each in his own essence. (Heidegger, 1977b, p. 196)

The 'origin' (in German: *Der Ursprung*, which means *the original leap*) of the work of art in Heidegger's interpretation of art can only be thought of as the systematic *simultaneity* of the work of art, the artist and the preserver. It does not designate a leap from outside of art to inside the sphere of art and beings (from the 'clearing'). Between the work of art, the artist and the preserver there is a circle of thinking such that it is impossible to understand one of them without the other two. None of them takes priority over the other, and therefore Heidegger speaks of an 'original leap': there is no gradual progress from one of them to another, meaning that one cannot derive a full understanding of a work of art, of an artist, or of a preserver and then afterwards reach the other two. They are linked to one another immanently from the beginning. This is the fundamental insight following from Heidegger's investigation of the work of art, which we now need to explicitly connect to what we will call the *work of thought*.

If we take Heidegger's circle of thought seriously, then this circling is thinking. An interpretation is the work of thought, which, as Heidegger shows, is simultaneous with the origin of a work of art. The work of art may trigger thinking, but thinking also co-establishes what is thought about. There is no way to think beyond the thinkable and indeed this explains Heidegger's understanding of the 'feast of thought'. We do not have to understand 'thinking' from the 'clearing' but through the *simultaneity* of thinking and thoughts as well as thinking and experience – this is the fundamental circle of thinking. According to how Heidegger proceeds through his investigation in 'The Origin of the Work of Art', we can understand thinking based on other thoughts and real beings and thus also through the works of thought of great thinkers. These works also disclose the world in various ways and are to be understood as specific events of truth. They are the 'shining stars', as Heidegger at times has called them, which help create visibility.

By way of this interpretation we strive to rehabilitate philosophy, make thinking and the world itself thought-provoking, and to show how Heidegger's critique of philosophic thinking is misguided. This is not to be understood as a plea for some kind of idealism; it takes the world and our thinking about it seriously and states that the one cannot be understood without the other – it does not need to go beyond beings to the 'clearing' to find the origin of anything, but shows the way to the world immanently.

We will never understand thinking and thoughts if we only 'dwell' on the 'clearing'. In fact, in the same way, 'clearing' is a prerequisite for a work of art, a work of thought, a work of technology, and all other kinds of beings; and the study of the 'clearing' does not allow us to differentiate between these. Indeed, the sheer 'dwelling' on the 'clearing' can at best be compared with a pure observation of a 'white canvas'. Nothing of real importance to the work of art follows from this observation, least of all great works of art. Seen through Heidegger's interpretation in 'What Calls for Thinking' we even compromise extraordinary works of art as this interpretation suggests they have the same origin as hopeless art. To 'dwell' on the 'clearing' would not only mean the end of philosophy, but also the end of anything we can meaningfully call thinking. Alternatively, we have to enter the circle of thinking – but this 'is neither a makeshift nor a defect. To enter upon this path is the strength of thought, to continue on it is the feast of thought, assuming that thinking is a craft' (Heidegger, 1977b, p. 144).

Notes

1. In German, *Technik* means technology as well as technique. Whereas 'thinking' is not a technology, it indeed might have the characteristics of a technique.
2. It is important to note that Heidegger treats the 'essence of technology' as a dynamic category. The concept of 'essence' might be able to translate the meaning of the German noun *Wesen*, but Heidegger explicitly says that this concept is not adequate for his investigation – he is focusing on what can be called technology or technique in action (Heidegger, 1977a, p. 334). The key word in Heidegger's investigation of technology is the German verb *wesen*, which is related to the meaning of 'enduring' and 'continuously unfolding'. To describe the phenomena of change and endurance, we also use the concept 'nature'. This concept translates Heidegger's use of *Wesen* better, as it stresses the dynamic connotation of *Wesen*, which was very important to him. Keeping this in mind, the common translation of *Wesen* into 'essence' should not mislead our discussion of Heidegger.
3. Don Ihde's interpretation of Heidegger's distinction between the 'true' and the 'correct' is very clear and comprehensive: 'The phenomenological form of the argument here is that correctness is not in itself untrue, but limited or inadequate, and may be characterized as a partial truth. But the catch is that unless it is seen for precisely this it can be taken for more than a partial truth in which case it now covers over the larger or more basic truth which founds it. It then becomes *functionally* untrue by concealing its origin. Moreover, it is only by comprehending the whole which founds that it can be seen as partial. Thus what is involved in taking correctness for truth is like a fallacy of taking a part for the whole. But it is also more than that in that comprehension of the whole is a necessary condition for recognizing what is a part' (Ihde, 1979, p. 105).
4. See also: 'Most philosophers of technology would probably agree that, for good or ill, Martin Heidegger's interpretation of technology, its meaning in Western history, and its role in contemporary human affairs is probably the single most influential position in the field' (Scharff and Dusek, 2003, p. 247).
5. In unfolding the way technology discloses being, Heidegger primarily focuses on modern technology. However, Heidegger fails to make his distinction between ancient and modern technology sufficiently credible. Initially, we will not pursue the question of whether Heidegger's understanding of modern technology also applies to ancient forms of technology. Instead, we will follow the more specific task of developing the characteristics belonging to the essence of modern technology in Heidegger's interpretation.
6. Because the English translation of *Gestell*, enframing, does not refer to a specific 'stand', I shall continue to use the German concept *Gestell* to characterize what Heidegger means by the essence of modern technology.
7. 'Calculation – comes to power primarily by the machination of technicity, is grounded in terms of knowing in the mathematical; here the unclear foregrasping into guiding principles and rules and thus the certainty of steering and planning.... Everything must be adjusted to the existing state of calculation. From here on the priority of organization, renunciation from the ground up of a freely

growing transformation. The incalculable is here only what has not yet been mastered by calculation, although at some point also recuperable in itself – therefore not at all outside the real of all calculation' (Heidegger, 1999, p. 84).

8. See also Richard A. Cohen's interpretation of the story of the Tower of Babel (Cohen, 2006, p. 157). Even though Cohen thinks there is a number of principal differences between ancient and modern technology, he considers the story of the Tower of Babel, in agreement with the Midrash [commentary of Jewish scriptures], as telling for the danger of *modern* technology. Cohen links this story to a way of thinking which prevails in modern technology: 'Kiln-fired bricks, the ones used in building the Tower of Babel, are perhaps the instance of *technology par excellence*, for the brick is an artefact that "served them as stone". It places a more natural building block, one that God insisted upon for altars that would thereby not be touched by iron, an instrument of war. Furthermore, baked in a kiln it does not even make use of the natural heat of the sun. It is completely artificial, as much as any artefact can be artificial. As the tower grew in height so too did the difficulty in transporting bricks to the top – a construction problem. The evil, however, begins when, due to the greater labor, time, and expense of transporting bricks, they come to be treated as more valuable than humans. According to the Midrash, when a brick fell from the top it was more lamented than when a worker fell from the top. Indeed the loss of the brick was lamented; the loss of the worker was ignored. A technology serving humanity is quite different – morally – than a humanity serving technology' (Cohen, 2006, p. 157; emphasis added).

   Thereby Cohen rather succeeds in making transparent a possible danger in ancient technology and in doing so, he shows a fundamental continuity between ancient and modern technology. In addition, Cohen talks about 'technology par excellence' and thereby disregards a systematic difference between two kinds of technology.
9. See also Scharff (2006, p. 140): 'Indeed, for him [Heidegger] at least, we now increasingly experience the danger in our condition first; and we must learn how, in his technical sense of the terms, to "destroy" and "rethink" everything we inherit in order to find in this condition a "saving grace".'
10. See also Iain Thomson's comprehensive and interesting interpretation of Heidegger's critique of and vision for the universities in Germany (Thomson, 2005).
11. Whereas Heidegger probably would criticize Albert Borgmann (1984) for turning his attention to the 'things and practices' and thus away from the 'clearing', our interpretation of thinking is also able to account for and encourage Borgmann's 'focal things and practices'.

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7

Understanding Technology Ontotheologically, or: the Danger and the Promise of Heidegger, an American Perspective

Iain Thomson

Heidegger's famous critique of technology is widely recognized as the most concrete and practically relevant dimension of his later thought. I have no desire to contest that view, for it is right as far as it goes. Indeed, much of my own work has sought to demonstrate the continuing relevance of Heidegger's ontotheological understanding of technology by defending his insightful views from the most formidable objections raised against them (by Andrew Feenberg and others) and by developing the important implications of his groundbreaking understanding of technology for the future of both higher education and environmentalism.[1] What I shall show here, however, is that Heidegger's widely celebrated understanding of technology also leads back to the very core of his later philosophical views. In fact, the insight and relevance of Heidegger's understanding of technology, which continues to impress so many, follow from some of the deepest, most mysterious and most difficult of his later ideas, ideas which still remain very little understood. Fortunately, the endeavour to understand, critically appropriate and apply the insights at the core of Heidegger's prescient philosophy of technology continues unabated. In order to help aid and inspire this important project here, I shall thus seek to illuminate some of the deeper and more mysterious philosophical views behind Heidegger's celebrated critique of technology.

7.1 Introduction: the danger and the promise of Heidegger

Thanks to Heidegger, we have learned to hear the ambiguity of subjective and objective genitives in many phrases with the form, 'The X of Y'. We needed to be *taught* to hear this ambiguity, because it is concealed by the impossible simultaneity of its dual meanings. *Critique of Pure Reason*, for example, signifies both criticism *directed at* pure reason and criticism *belonging to* pure reason. Ordinarily, however, we hear the title of Kant's great work only as an objective genitive, as a critique directed at the pretensions of pure reason, and so not also as a subjective genitive, as a critique used by pure reason in order to establish and secure its own legitimate domain. What is more, even after we learn to recognize that *Critique of Pure Reason* also means the critique which belongs to pure reason, we still cannot hear both meanings *at the same time*. This is because we hear one meaning *instead* of the other; what we hear occupies the place of what we do not.

The point is nicely illustrated by the gestalt figure Wittgenstein made famous (Figure 7.1). Unless this figure has already been introduced as a 'duck-rabbit', we do not ordinarily notice that it has another aspect (that it can be seen as a rabbit), because the aspect we do see (the duck) stands in the place of the aspect we do not see (the rabbit), and we cannot see both the duck and the rabbit at once.[2] After we have recognized that the figure can be seen as either a duck or a rabbit, most of us can freely gestalt-switch back and forth between them. Yet, untutored viewers of gestalt figures like the duck-rabbit, Necker cube and Janus vase do not usually see that there is anything they do not see, because what they do see stands in the place of what they do not see. The crucial point, for our purposes, is that we see what we see *instead of* what we do not see.

I begin by rehearsing such seemingly obvious and rudimentary phenomenological lessons because I want to suggest that Heidegger, in a strictly analogous way, teaches us to see 'the danger' of technology as standing *in the place of* 'the promise' of technology. Heidegger's hope for the future, I shall show, turns crucially on helping us learn to make a gestalt switch whereby we come to see the promise *instead* of the danger – there, in the same place. When we examine the precise meaning Heidegger gives these philosophical terms of art, it will become clear that seeing the promise *instead* of the danger does not mean adopting some Pollyannish optimism.[3] Rather, learning to see the promise *instead* of the danger means developing a phenomenological comportment attuned to what we can anticipate but never expect, that is, in a word, the *future*.[4]

For the same reasons, the title of this introductory section (and the subtitle of this chapter) can also be heard in at least two different senses. First, 'The Danger and the Promise of Heidegger' signifies what remains dangerous and

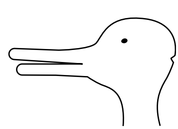

Figure 7.1 Wittgenstein's rendition of Jastrow's duck-rabbit

promising *about* Heidegger. We tend to hear the title first in this sense, I think, despite the fact that what remains dangerous and promising about Heidegger's thinking cannot easily be reduced to a single 'danger' or 'promise'. Heidegger's *dangerousness* may be most obvious in his unapologetic attempt to think 'the inner truth and greatness' of National Socialism, but it is also clearly visible in his claim to have 'dissolved the idea of "logic" in the turbulence of a more originary questioning', in his reading of the entire history of Western metaphysics as 'nihilism', and in his never-relinquished endeavour to restore to thinking 'a proper though limited leadership in the whole of human existence' (IM 213; P 92; 83). Rather than multiplying examples of the dangers attendant upon Heidegger's thinking, or exploring their important interconnections (as I have done elsewhere), I would prefer to risk a hypothesis that does not presume to stand entirely outside these dangers, as though diagnosing them from a safe distance.[5] For, in my view, these dangers, undeniable though they are, cannot be entirely disassociated from 'the promise of Heidegger', that is, from what remains promising about Heidegger's thinking. Admittedly, it sounds provocative to maintain that what is promising about Heidegger remains linked to what is most dangerous in his thinking. It is, however, precisely this difficult and troubling juxtaposition of danger *and* promise that my title gathers together in order to think.

This, then, is how I intend the 'and' in my title: Heidegger's thinking remains dangerous *and* promising, in one and the same place. Of course, the *and* in my title can be understood differently. 'The Danger and the Promise of Heidegger' could easily be taken as entitling one to specify the dangers of Heidegger's thinking, on the one hand, and then, on the other hand, to comment upon what remains promising about his work. This, however, presumes that we can take the measure of Heidegger's thinking by weighing its 'pros and cons' in separate scales. If I think it more fitting to ask about what remains *both* dangerous *and* promising in Heidegger's thinking, this is not only because understanding such a task accords nicely with Heidegger's cherished Hölderlinian maxim (from the late hymn, *Patmos*): 'Yet, where the danger is, the saving power also grows.' It is also because, as I try to show in *Heidegger on Ontotheology: Technology and the Politics of Education*, we understand what remains most promising in Heidegger's thinking precisely by exploring what is most dangerous in his work.[6]

There I show, to sketch only the most striking example, how Heidegger's philosophical view of the relation between philosophy and the other sciences motivated his attempt to transform the German university in 1933–34. This means that the infamous connection between Heidegger's philosophy and his opprobrious commitment to National Socialism cannot be understood apart from his radical philosophical efforts to rethink and reform higher education by uncovering and contesting the ontotheological roots of global technologization. Instead of using this dangerous connection as an excuse to dismiss Heidegger's promising views on education, however, I contend that his prescient critique of the university has only become more relevant since he elaborated it, and that, with the important philosophical corrections suggested for this philosophical research programme by his so-called 'turn', the later Heidegger's mature vision for a reontologization of education merits the careful attention of those of us seeking to understand the 'technological' roots and implications of our own growing crisis in higher education. This is to suggest, in other words, that we cannot critically reconstruct and develop Heidegger's views on the future of education – one of the most promising dimensions of his thinking – without first understanding the philosophical depths of his commitment to Nazism, however dangerous that subject remains. While my book is anything but an apology for Heidegger's disastrous Nazism, then, it does suggest that we recognize what remains most promising in his thinking only by coming to terms with what remains most dangerous about it, and, moreover, that this intimate connection between danger and promise holds not only for Heidegger's long-developed vision for higher education and his resulting commitment to Nazism, but also for his controversial critique of our current 'technological' ontotheology and his complementary vision of an 'other beginning' for Western history, a beginning whereby our history might regain its future – and this is the connection I shall seek to elucidate here.

As I began by suggesting, however, we can also understand this title in a second sense, seemingly quite different from the way we have been reading it. 'The Danger and the Promise of Heidegger' can be heard not as entitling an examination of what remains dangerous and promising *about* Heidegger's thinking, but rather as calling for an elucidation of Heidegger's *own* understanding of 'the danger and the promise'. Indeed, we begin to appreciate the semantic riches concealed by the very economy of this title when we realize that Heidegger not only explicitly uses the concepts of 'the danger' and 'the promise' himself, but that the precise meanings he gives to these two concepts link them inextricably together. What is so suggestive, in other words, is that Heidegger does not just think 'the danger' as well as 'the promise'; he thinks 'the danger *and* the promise' – and, moreover, he thinks the danger and the promise specifically in order to address the question of the future. This future turns, for Heidegger and for us, on our philosophical understanding of technology, the very issue which has brought this book together. Such coincidences seem too promising merely to be adventitious, and I shall focus here upon Heidegger's reasons for thinking these matters together, examining, in particular, the way they intersect with, and give rise to, Heidegger's provocative critique of 'America'.

7.2 Heidegger on technology's greatest danger

Heidegger's conception of 'the danger' can only be fully understood against the background of his famous critique of 'enframing' (*Gestell*), our 'technological' understanding of the being of entities. In turn, this critique of 'enframing' *follows from*, and so can only be fully understood in terms of, the understanding of metaphysics as 'ontotheology' central to his later thought. Our endeavour to fully understand Heidegger's own sense of 'the danger' of technology must thus begin with a quick sketch of his profound but idiosyncratic conception of metaphysics as *ontotheology*.

Heidegger, as I understand him, is a great critical heir of the German idealist tradition.[7] He builds upon the Kantian idea that we implicitly participate in the making-intelligible of our worlds, but maintains that our sense of reality is mediated by lenses we inherit from metaphysics. In effect, Heidegger *historicizes* Kant's 'discursivity thesis', which holds that intelligibility is the product of a subconscious process by which we 'spontaneously' organize and so filter a sensibly overwhelming world to which we are fundamentally 'receptive'.[8] For Heidegger, this implicit organization is accomplished not by historically fixed cognitive 'categories' but, rather, by the succession of changing historical ontotheologies that make up the 'core' of the metaphysical tradition. These ontotheologies establish 'the truth concerning entities as such and as a whole', in other words, they tell us both what and how entities *are* – establishing both their essence and their existence, to take only the most famous example. When metaphysics succeeds at this ontotheological task, it temporarily secures the intelligible order by grasping it both 'ontologically', from the inside out, and 'theologically', from the outside in. These ontotheologies provide the dual anchors that suspend humanity's changing sense of 'reality', holding back the flood waters of historicity long enough to allow the formation of an 'epoch', a historical constellation of intelligibility which is unified around its ontotheological understanding of the being of entities.

I thus interpret Heidegger's understanding of the ontotheological structure of Western metaphysics ('the history that we *are*') as advancing a doctrine of *ontological holism*. By giving shape to our historical understanding of 'what *is*', metaphysics determines the most basic presuppositions of what *anything* is, ourselves included. This is what Heidegger means when he writes that: 'Western humanity, in all its comportment toward entities, and even toward itself, is in every respect sustained and guided by metaphysics' (N4 205/NII 343). This ontological holism explains how the successful ontotheologies can function historically like self-fulfilling prophecies, pervasively reshaping intelligibility. Put simply, since all entities *are*, when a new ontotheological understanding of what and how entities *are* takes hold and spreads, it progressively transforms our basic understanding of *all* entities. By explicitly focusing and disseminating an ontotheological understanding of the being of entities, our great metaphysicians help establish the fundamental conceptual parameters and ultimate standards of legitimacy for each of our successive historical 'epochs'.

Nietzsche is the pivotal figure in Heidegger's critique of our technological epoch of enframing because, according to Heidegger's reductive yet revealing reading, Nietzsche's 'unthought' metaphysics provides the ontotheological lenses that implicitly structure our current sense of reality. Let us recall that Nietzsche criticized what he (mistakenly) took to be Darwin's doctrine of 'the survival of the fittest' by pointing out that life forms cannot survive by aiming at mere survival.[9] In a changing environment characterized by material scarcity and hence competition, life can survive only by continually overcoming itself, surpassing whatever stage it has previously reached. From the perspective of this inner 'will' of life (what Nietzsche calls 'will-to-power'), any state of being previously attained serves merely as a rung on the endless ladder of 'sovereign becoming'. As Heidegger thus puts it, Nietzsche understands 'the totality of entities as such' *ontotheologically* as 'eternally recurring will-to-power', that is, as an unending disaggregation and reaggregation of forces with no purpose or goal beyond the self-perpetuating augmentation of these forces through their continual self-overcoming. (In this, Nietzsche was effectively universalizing insights that Darwin had already drawn from his study of living entities and Adam Smith from his examination of the economic domain.) Now, our Western culture's unthinking reliance on this implicitly Nietzschean ontotheology is leading us to transform all entities into *Bestand*, mere resources standing by to be optimized, ordered and enhanced with maximal efficiency. As this historical transformation of beings into intrinsically meaningless resources becomes more pervasive, it increasingly eludes our critical gaze. Indeed, we late-modern Nietzscheans come to treat even ourselves in the nihilistic terms that underlie our technological refashioning of the world: no longer as modern subjects seeking to master an objective world, but merely as one more intrinsically meaningless resource to be optimized, ordered and enhanced with maximal efficiency, whether cosmetically, psychopharmacologically, genetically or even cybernetically.[10]

As this 'technological' understanding of being takes hold and spreads, it dramatically transforms our relations to ourselves and our worlds, yet we tend not to notice these transformations, because their very pervasiveness helps render them invisible, a seemingly paradoxical fact Heidegger explains by appeal to the 'first law of phenomenology'.[11] This 'law of proximity' (the 'distance of the near') states that the closer we are to something, the harder it is to bring it clearly into view (the lenses on our glasses, for example, or Poe's eponymous purloined letter), and thus that the more decisively a matter shapes us, the more difficult it is for us to understand it explicitly. Eventually, however, Heidegger thinks that either new ways of understanding the being of entities will emerge and take hold (perhaps, as Kuhn suggests, out of the investigation of those anomalous entities which resist being understood in terms of the dominant ontotheology), or else our conception of *all* entities will be brought permanently into line with our spreading Nietzschean ontotheology. The latter alternative has never yet occurred (since no previous ontotheology succeeded in permanently entrenching itself), but this is precisely what Heidegger calls 'the danger' (*die Gefahr*), in the singular – the singular danger of technology which he often designates using such superlatives as 'the greatest danger' and 'the most extreme danger'. The danger, in other words, is that our Nietzschean ontotheology could become permanently *totalizing*, 'driving out every other possibility of revealing' (QCT 27/GA7 28) by overwriting and so effectively obscuring Dasein's 'special nature', our defining capacity for world-disclosure, with the 'total thoughtlessness' of lives lived entirely in the grip of the Nietzschean conception of all entities, ourselves included, as intrinsically meaningless resources on stand-by to be optimized for maximally flexible use (DT56/G 25).

If this technological 'enframing' manages to secure its monopoly on the real, pre-emptively delegitimating all alternative understandings of being (by deriding them as 'non-naturalistic', for example, and thus as irrelevant, ridiculous, non-serious, mystical, irrational and so on), this enframing could effect and enforce a double forgetting in which we lose sight of our distinctive capacity for world-disclosure *and* forget that anything has thus been forgotten. The greatest danger, put simply, is that we could become so *satiated* by the endless possibilities for flexible self-optimization opened up by treating our worlds and ourselves as resources to be optimized that we could lose the very sense that anything is lost with such a self-understanding.[12] This explains the later Heidegger's strange, controversial and seemingly paradoxical claim that the 'greatest danger' is expressed in the 'authentic need' of 'needlessness' (GA79 56), his idea that we live in the age of greatest need precisely insofar as we experience ourselves as not needing anything at all.[13] It is, moreover, precisely this concealed manifestation of the greatest danger – in which dystopia masquerades as utopia – that the later Heidegger comes to associate with 'America'.

7.3 America *as* the danger of technology

When Heidegger first develops his conception of the danger in the late 1930s, he associates it primarily with the *total mobilization* of the Nazi war machine, which was then expanding to an unprecedented scale the metaphysical logic of 'technicity' (*Technik*) or 'machination' (*Machenschaft*) – Heidegger's first names for the historical mode of revealing he later calls *enframing*. In 'The Turning in Enowning', the penultimate section of 'The Final God', the concluding 'fugue' of his *Contributions to Philosophy: From Enowning* (1937–38), Heidegger envisions this metaphysical logic reaching its conclusion in the dead end of a historical age unable to recognize that it has rationally managed and controlled its own 'future' right out of existence. In the ominous scenario he foresees:

> Man with his machinations might for centuries yet pillage and lay waste to the planet, [and] the gigantic character of this driving might 'develop' into something unimaginable and take on the form of a seeming rigor as

> the massive regulating of the desolate as such... The only thing that still counts [here] is the reckoning of [the] succeeding and failing of machinations. This reckoning extends itself to a presumed 'eternity', which is no eternity but rather only the endless etcetera of what is most desolately transitory. (CP 287/GA65 408–9)[14]

Recognizing that this 'desolate' mode of technological revealing is rooted in Nietzsche's metaphysics of 'constant overcoming', Heidegger maintains that '[t]he bewitchment by technicity and its *constantly self-surpassing progress* is only *one* sign of this enchantment, by which everything presses forth into calculation, usage, breeding, manageability, and regulation' (CP 87/GA65 124, first emphasis added).[15]

As such critical references to 'breeding' suggest, Heidegger associates the Nietzschean danger of technological thinking with National Socialism in 1938. By 1940, however, when America directly enters the Second World War in response to the bombing of Pearl Harbor, Heidegger is no longer sure Germany will win the massive arms race for global control he thinks all nations are being driven into by the technological ontotheology underlying the age. Heidegger thus concludes his 1940 Nietzsche lectures dramatically, interpreting (for those students who have not already gone off to war) Nietzsche's famous prophecy that: 'The time is coming when the struggle for dominion over the earth will be carried on...in the name of *fundamental philosophical doctrines*.' According to the reading Heidegger will never subsequently relinquish, Nietzsche's ontotheological understanding of the being of entities predetermines the destiny of our contemporary world. Nietzsche's ontotheological understanding of 'the totality of entities as such' as 'eternally recurring will-to-power' not only intensifies 'the struggle for the unrestrained exploitation of the earth as a source of raw materials' (a struggle already implicit in the modern subject/object divide), it also generates our distinctively late-modern, reflexive application of that limitless objectification back upon the subject itself. This objectification of the subject dissolves the subject/object distinction itself and so lays the ground for what Heidegger already recognizes in 1940 as 'the cynical exploitation of "human resources" in the service of the absolute empowering of will to power' (N3 250/NII 333).[16]

Heidegger thinks that the way Nietzsche's ontotheology reduces the subject to just another resource to be optimized renders it inevitable that 'humanity...be forged and bred into a type, a type that possesses the essential aptitude for establishing absolute dominion over the earth' (N3 245/NII 327), but he is no longer sure that Germany is the nation which will prove itself equal to the metaphysical essence of the age and so inherit the destiny of global domination. Indeed, he expresses such dangerously 'unpatriotic' doubts (for 'all those who had ears to hear') in the final hour of this 1940 lecture: 'The question remains as to which peoples and what kinds of humanity ultimately...will rally to the law of this fundamental trait and thus pertain to the early history of dominion over the earth' (N3 250/NII 332–3). By 1969, however, at the height of the Vietnam War, there no longer seems to be any question in Heidegger's mind: 'America' has become virtually synonymous with 'the danger'.

'As for America', Heidegger says during his 1969 seminar in France – not hesitating to pronounce his views on a land he would never deign to visit, despite numerous invitations from Americans deeply interested in his thought – 'the reality of that country is veiled from the view of those interested' here in the question of being. The 'reality' of 'America', Heidegger proclaims, must be understood as 'the collusion between industry and the military', that is, in terms of 'economic development and the armament that it requires' (FS 56/GA15 359). To see that Heidegger is not simply advancing another critique of America's notorious 'military–industrial complex', we need to understand the context in which he introduces these remarks.

Discussing 'the end of physics' with Jean Beaufret and others, Heidegger employs a logic I examine in detail in *Heidegger on Ontotheology* that allows him to argue that physicists, as physicists, cannot understand the being of physical entities, but instead tend unknowingly to adopt from metaphysics the ontotheological understanding of the physicality of the physical which implicitly guides their scientific endeavours. Thus, when Heidegger asserts that 'technology is not grounded in physics, but rather the reverse; physics is grounded upon the essence of technology' (FS 54/GA15 355), his point is that physics' guiding understanding of the being of physical entities is taken over from Nietzsche's 'technological' ontotheology, which has already pre-understood the being of entities as intrinsically meaningless forces seeking only their self-perpetuating increase. Thus, while Heidegger acknowledges that 'nothing is more natural than to ask whether science will be able to stop in time', he maintains that: 'Such a stop is nevertheless fundamentally impossible' (FS 55/GA15 358). Long before the explosive developments we have witnessed in biotechnology, the human genome project, stem-cell research, cloning, genetic engineering and their like, Heidegger recognized that we would not be able to control the scientific objectification by which we seek to extend control even over our own human being. As Hubert Dreyfus succinctly explains, 'the drive to control everything is precisely what we do not control', because this drive towards increasing control over the human being simply expresses the ontotheology definitive of our historical age.[17]

For Heidegger, the distinctive dictum of enframing is expressed in our fundamental conviction that: 'The human can be produced according to a definite plan just like any other technological object' (FS 55/GA15 358). What *distinguishes* our late-modern, technological enframing of all entities as resources to be optimized from the modern subject's domination of the objective world, we have seen, is the reflexive application of this objectification back upon the subject itself; for, this self-objectification 'dissolves' the subject into the resource pool. That which makes enframing unique, however, is also precisely what makes possible the emergence of a historically unprecedented technological *danger*. As Heidegger says here in 1969:

> The most extreme danger [*die äußerste Gefahr*] is that man, insofar as he produces [*herstellt*] himself, no longer feels any other necessities than the demands of his self-production.... What is uncanny, however, is not so much that everything will be extinguished [*ausgelöscht*], but instead that this [extinction of language and tradition] does not actually come to light. The surge of information veils the disappearance of what has been, and prospective planning is just another name for the obstruction of the future. (FS 56/GA15 359)

It is no coincidence that Heidegger explicitly mentions 'America' in the sentence that immediately follows this description of a dystopia blithely mistaking itself for utopia. Clearly, 'America' is the name on the tip of Heidegger's tongue for a life lived in the eternal sunshine of the permanent present, for a humanity alienated from its own alienation, blind to the fact that the relation to the past preserved in its language is being buried beneath an unprecedented 'surge of information', and unaware that its own prodigious capacity for generating far-reaching plans for the control of every foreseeable eventuality is in danger of blocking its path to the *future* – that is, the 'opening' of a genuinely new understanding of human beings and 'an entirely new relation to nature' (FS 55/GA15 358). In sum, then, when Heidegger names 'America' as his sole example for 'the emergence of a new form of nationalism ... grounded upon technological power' (ibid.), his point is not simply that America has become the world's most advanced military–industrial complex, but rather that we have become this by succeeding where the Nazis failed, by making ourselves into the most extreme expression of the technological ontotheology of the age. For Heidegger, America is the avant-garde of the greatest danger of ontohistorical technologization, the country working hardest to obscure the 'most important ... insight that man is not an entity who makes himself' (FS 56/GA15 359).

Although it will be obvious to anyone who knows more about 'America' than what they read in the newspapers that Heidegger's critique is terribly one-sided, he does diagnose this one terrible side with an unequalled depth of insight. Indeed, it is hard to deny that Heidegger was right to see 'America' as blazing the trail towards the greatest danger of technology, since, guided by enframing's endless optimization imperative, we continue to develop a broad spectrum of cosmetic psychopharmacologies – from Prozac to Viagra – with which to eradicate whatever remaining existential anxieties we cannot escape by throwing ourselves into an accelerating work world or else distract ourselves from by means of our burgeoning entertainment technologies. So, is our self-proclaimed 'super-power' really working out the will of the will-to-power and thereby increasing the danger that any other future becomes merely 'a thing of the past'?[18] To begin to discuss this important question, which is all I can hope to do here, allow me to quote just one telling anecdote. In an article on the increasingly prominent role religious convictions have come to play in American politics (both abroad and at home), Ron Suskind, the former senior national affairs reporter for *The Wall Street Journal* (the unofficial newspaper of the American ruling class), reports on a conversation he had in 2002 with a 'senior advisor to [President George W.] Bush'. This senior advisor, who was unhappy with a magazine article Suskind had written, said:

> that guys like [Suskind] were in 'what we call the reality-based community', which he defined as people who 'believe that solutions emerge from your judicious study of discernible reality'. [Suskind] nodded and murmured something about enlightenment principles and empiricism. He cut [Suskind] off. 'That's not the way the world really works anymore', he continued. 'We're an empire now, and when we act, we create our own reality. And while you're studying that reality – judiciously, as you will – we'll act again, creating other new realities, which you can study too, and that's how things will sort out. We're history's actors…and you, all of you, will be left to just study what we do.'[19]

It is, of course, both alarming and revealing to hear such imperialistic hubris expressed so openly by one of President Bush's senior advisors. One thing it shows, from a Heideggerian perspective, is that recognizing historicity is not sufficient for actually transforming history. For, from this important insight that humanity's basic sense of reality changes with time, it does not follow that the American administration even recognizes the nature of our current historical reality, let alone is succeeding in changing it. Indeed, this administration's delusions of 'empire' seem to be reifying and reinforcing rather than transforming the same ontotheologically grounded historical self-understanding that Heidegger already recognized in America in 1969, and before that, in Nazi Germany in 1940.

Of course, there is always something grotesque and misleading about such comparisons, by which we ignore hugely important differences in order to emphasize a deeper continuity that usually passes unnoticed. Granted, happily. A more interesting objection to what I have just said, however, would be the suggestion that the current American administration, under the control of religious fundamentalists such as President Bush, is doing its best to reverse the technological control of human beings, as can be seen in its outlawing the use of federal funds for further genetic lines for stem cell research, its increasing restrictions on abortion, reproductive freedom, cloning and so on. To this my response would be as follows. First, that if America abdicates its leading global role in these rather obvious manifestations of the technological transformation of human beings into resources, other countries – as well as extra- and intra-national entities (multinational biotech corporations and my home state of California, for example) – already have shown themselves more than eager to compete to assume this role themselves. Thus, even if America turns against this small spectrum of the technological enframing of humanity, this underlying enframing itself is not likely to stop anytime soon.

In fact, it will never stop, and this is the second point, without a prior diagnosis which recognizes and addresses the ontotheological roots of the problem, rather than simply seeking to ameliorate a few of its most obvious symptoms. For such an effort, insofar as it succeeds, simply gives us a *symptom-free disease* – and what is that but another way of describing Heidegger's greatest danger? Third, and perhaps most importantly, what this objection misses is that transcending technological enframing does not require us to abandon biogenetic research and cloning, let alone reproductive freedom. Instead, Heidegger insisted, a real solution demands not that we abandon our technological manipulation and control of human beings (which he recognized will not happen in the foreseeable future), but rather that we find ways to integrate these technological projects for increasing self-optimization into our basic sense of self without allowing this sense of self to be completely dominated by enframing's optimization imperative. Attaining such a 'free' relation to technology means, in other words, making the danger of technology less dangerous (or getting past the 'greatest danger'), and this, in turn, requires an insight Heidegger first sought to communicate under the heading of 'the promise'. I shall thus say a few words about what Heidegger means by *the promise*, showing how its intimate connection with the danger of technologization expresses his most basic insight concerning what we need first in order to regain the future.

7.4 From the danger to the promise of technology

In 'Nihilism as Determined by the History of Being' (1944–46), the important but difficult essay which forms the capstone of his *Nietzsche* work, Heidegger addresses the relationship between technology's greatest danger and 'the promise' (*das Versprechen*). We have seen that the danger is Heidegger's dystopian scenario for the end-of-history, his depiction of what could happen if our current understanding of entities as intrinsically meaningless resources on stand-by for optimization becomes *totalizing* by driving out, co-opting, or preventing the formation of any other ways of understanding ourselves and our place in the world. *'Yet, where the danger is, the saving power also grows.'* The point of Hölderlin's salvific insight, as Heidegger understands it, is not that it is always darkest before the dawn, but rather that the new day is discovered in another way of experiencing the greatest darkness. Midnight, seen otherwise, *is* dawn. That sounds paradoxical, but

Heidegger believes that we discover what saves us precisely by deeply experiencing what most endangers us, and he first tries publicly to communicate his way of making sense of this idea in terms of 'the promise'.

Heidegger's basic insight here is the secularized theological idea that being has *promised* itself to us, and that this 'promise' cannot be broken even if we forget about it. Phenomenologically put, 'Dasein' (our mere 'being-here') *is* the place where being takes place and becomes intelligible to itself, and we remain the place being takes place, even if the way being takes place for us is by not taking place (or becoming unintelligible to itself). In other words, the *promise* is Heidegger's name for the insight that, although being shows up for us as nothing, this noth-ing (or 'nihilating') safeguards the future possibilities of being. Heidegger expresses this difficult idea as follows:

> [I]nsofar as being is the unconcealment of entities as such, being has…already addressed itself to [*zugesprochen*] the essence of man. Being has already spoken out for and insinuated itself in the essence of humanity insofar as it has withheld and saved itself in the unconcealment of its essence. Addressing [us] in this way, while withholding itself in staying-away, being is the promise of itself [*Sein ist das Versprechen seiner selbst*]. To think to encounter being itself in its staying-away means to become aware of the promise, as which promise being itself 'is'. (N4 226/NII 368–9)

That is, being discloses itself in our way of understanding the being of entities. But our current, 'technological' understanding of the being of entities – as eternally recurring will-to-power – reduces being itself to nothing, dissolves it into 'sovereign becoming'. Viewed from within enframing, then, being shows up as nothing; it 'comes across' as 'staying away', as Heidegger puts it here.

Nevertheless, our technological understanding of being, which reduces being to nothing, is still an understanding of being. Recognizing our ineliminable ontological receptivity, Heidegger thinks, makes possible this *crucial* insight: *rather than experience being as nothing, we can instead experience the nothing as the way being shows itself to us.* To experience being as nothing is to reach the fulfilled peak of Western nihilism. Yet, precisely this same experience – the most extreme point of technology's greatest danger – can be experienced differently: We 'become aware of the promise' when, instead of experiencing being as nothing, we experience the nothing as being. In this simple gestalt switch, in which we pass from experiencing being as nothing to experiencing the nothing as the way being happens for us, we have passed, by just turning in place, from the most extreme point of the greatest danger to the promise. With this gestalt switch we have taken both 'the step back' beyond metaphysics and, at the same time, the first step into the future Heidegger calls the other beginning. (These two steps, taken together, bring us full circle back to ourselves, helping us to accomplish what *Heidegger on Ontotheology* calls that 'revolutionary return to ourselves' central to Heidegger's educational thinking.)

In other words, the relation of the danger to the promise of technology is very much like the relation of the duck to the rabbit in the figure of the duck-rabbit with which we began: both can be 'gestalted' otherwise; each has a second, non-simultaneous aspect, which we can learn to see in the place of the first, as replacing it, standing in its stead. Because the danger is a *totalizing* understanding, which nihilistically reduces everything into intrinsically meaningless resources, the danger is *replaced* by seeing the promise, that is, by experiencing the nothing of being as concealing and thereby preserving other ways of understanding ourselves and the meaning of our worlds. We see the promise instead of the danger when, rather than see being as nothing, we learn to recognize this nothing as the 'nihilating' of being – that is, as the 'presencing' of being as such which makes itself felt in its *difference from* enframing. In this experience entities show up not as intrinsically meaningless resources, but otherwise, namely as being richer in meaning than we are capable of doing justice to conceptually, and thus as already exceeding, in the direction of the future, the ontologically reductive confines of enframing. There is, of course, much more to say about this 'noth-ing' or verbal 'nihilating', which was Heidegger's first name, in 1929, for the phenomenological presencing which exceeds the ontological difference (which he previously thought unsurpassable). In my view, Heidegger's recognition that the 'nihilating' of the nothing is the action of being as such, an activity which exceeds and so cannot be explained in terms of the ontological difference between being and entities, is the defining experience at the heart of his so-called 'turn' and the *sine qua non* of his 'later' thought.

Despite withering attacks from Rudolph Carnap and others, Heidegger never gave up this difficult notion. Rather, he struggled his whole life to develop this phenomenological insight more clearly, continually seeking new names with which to evoke the way being gives itself which would not hypostatize this giving as if it were a given entity, names such as 'noth-ing', 'earth', 'being as such', 'being' (written under a 'cross-wise striking-through'), 'the fourfold', 'the difference' and so on. Indeed, we see evidence of this if we simply notice that, following the discussion of America as the greatest danger we examined, Heidegger immediately turns to help his students think 'the identity of being and nothing ... in departure from the ontological difference' (FS 56/GA15 361). That segue will look like a bizarre non-sequitur, an abrupt change of topics, to anyone who does not recognize that, as late as 1969, Heidegger is still trying to help his students learn to make that gestalt switch from danger to promise which turns on recognizing that (as he puts it here): 'The nihilation of the nothing "is" being' (FS 57/GA15 361). The passage from danger and promise we have examined is thus only one of Heidegger's first attempts to communicate his recurring later notion of a 'freeing' gestalt switch, a 'lightning flash' in which we catch sight of an active phenomenological 'presencing' which our technological ontotheology denies yet presupposes, coming thereby to exceed metaphysics from within. In this gestalt switch we come to recognize that (as Heidegger puts it on what I cannot help but note was 11 September 1969): 'Enframing is, as it were, the photographic negative of enowning' (FS 60/GA15 366). Despite many such attempts, however, Gianni Vattimo recounts that Heidegger himself remained deeply distressed by his sense that he had failed to develop this necessary gestalt switch with the requisite clarity. Tellingly, Heidegger believed that his 'insufficient elaboration of this intuited relation' between the danger and the promise remained a 'failure of his thought' greater even than 'the wretched business of his involvement with (alas!) Nazism'.[20]

Obviously, such matters have a temporality of their own, and cannot be forced. I thus think it fitting to acknowledge here that the seed for the way I have tried to develop the connection between the danger and the promise – as dual and duelling aspects of the same figure – was planted years ago, by one of Jacques Derrida's observations which has long haunted me. Only after reaching what I take to be the same point myself, do I now understand that Derrida already recognized, in 1981, Heidegger's crucial insight that the highest point of fulfilled nihilism belongs to two different planes – joining, in a single point, the danger of metaphysics and the promise of what exceeds it – and that this is the *crucial point*, so to speak, of Derrida's lucid but unexplained observation that Heidegger's *Nietzsche* lectures are

> directed at gathering together the unity and the uniqueness of Nietzsche's thinking, which, as a fulfilled unity, is itself in a fair way toward being the culmination of occidental metaphysics. Nietzsche would be precisely at the crest, or ridge, atop the peak of this fulfillment. And thus, he would be looking at both sides, down both slopes.[21]

If this is right, then the connection between danger and promise I have developed here can, I hope, be understood as a belated homage to and development of Derrida's insight.

7.5 Conclusion: technology and the future

To sum up the view I have presented here, then, *ontotheology* is the dual attempt to conceptually grasp all of reality from both the inside out (ontologically) and the outside in (theologically) at the same time. The problem with ontotheology is not that it is impossible but that, on the contrary, the way our successive historical ontotheologies do in fact function to structure our historical sense of reality has increasingly come to undermine the meaningfulness of our very sense of reality. The main problems haunting our age of enframing follow from the particular Nietzschean ontotheology in which our technological enframing is grounded. For, this Nietzschean ontotheology pre-understands the being of entities as nothing but eternally recurring will to power, that is, as mere forces coming together and breaking apart with no end beyond their self-perpetuating augmentation. Insofar as our sense of reality is shaped by this 'technological' understanding of the being of entities, we increasingly come to treat all entities as intrinsically meaningless resources, *Bestand* on stand-by merely to be optimized, enhanced and ordered for maximally flexible use. Environmental devastation, our growing obsession with biogenetic optimization, the increasing reduction of higher education to empty optimization imperatives, and the nihilistic erosion of all intrinsic meaning are just some of the most obvious symptoms of the underlying technological ontotheology 'enframing' our sense of reality.

These problems are as serious as they are deeply entrenched. Fortunately, Heidegger's work also helps suggest a treatment, and so a future for thinking. We need to learn to practise that phenomenological comportment he calls 'dwelling'. When we learn to dwell, we become attuned to the phenomenological 'presencing' (*Anwesen*) whereby 'being as such' manifests itself; we thereby come to understand and experience entities as being richer in meaning than we are capable of doing justice to conceptually, rather than taking them as intrinsically meaningless resources awaiting optimization. In this way we can learn to approach all things with care, humility, patience, gratitude, awe and even, I would suggest, love. Such experiences can become microcosms of, as well as inspiration for, the revolution beyond our underlying ontotheology that Heidegger teaches us we need in order to transcend our technological enframing and so set out to set our world aright. The future task of thinking is thus to help us combat and transcend our ontotheology and its devastating nihilistic effects, in our lives, our academic institutions, and our world at large.

What I have tried to show is that Heidegger, in keeping with his most cherished Hölderlinian maxim, understands 'the greatest danger' and 'the promise' at the core of technology as two different ways of recognizing precisely the same phenomenon, namely, *being* showing itself to us as *nothing*. In the danger, we see being as nothing; when we see the nothing as the way being happens for us (as the 'noth-ing' or 'nihilating' of being), however, we have entered into and so understood the promise otherwise concealed within technologization. On an analogy with the famous gestalt figure of the 'duck-rabbit' Wittgenstein popularized, I have suggested that the danger and the promise can be recognized as the two competing aspects of the same figure, aspects which conceal one another by standing in the same place. Learning to see and experience the promise *instead* of the danger is thus literally *crucial* for Heidegger: The danger is the peak of historical nihilism, the very 'fulfillment' of Western metaphysics, yet, seeing the promise, the obverse of precisely the same phenomenon, constitutes the first step into what he calls 'the other beginning' of history.

By tracing the development of these crucial views in Heidegger's thought, I have tried to restore some of their phenomenological concreteness and – by examining the intimate link between the greatest danger and 'America' – their historical particularity. It is my hope that such efforts will help demonstrate the continuing relevance of Heidegger's thought by showing how his deeply insightful perspective on the increasingly global phenomenon of technologization can continue to inspire our efforts to achieve a deeper understanding of our contemporary world situation and so offer us not blinding optimism or fatalistic despair but, instead, real hope for the future.

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Abbreviations used for works by Heidegger (translations frequently modified)

CP *Contributions to Philosophy (From Enowning)*, trans. P. Emad and K. Maly (Bloomington, Ind.: Indiana University Press, 1999).

DT *Discourse on Thinking*, trans. J. Anderson and E. Freund (New York: Harper & Row, 1966).

FS Martin Heidegger, *Four Seminars*, trans. A. Mitchell and François Raffoul (Bloomington and Indianapolis: Indiana University Press, 2003).

G *Gelassenheit* (Pfullingen: Neske, 1959).

GA3 *Gesamtausgabe*, Vol. 3: *Kant und das Problem der Metaphysik*, Friedrich-Wilhelm von Herrmann (ed.) (Frankfurt: V. Klostermann, 1991).

GA5 *Gesamtausgabe*, Vol. 5: *Holzwege*. Friedrich-Wilhelm von Herrmann (ed.) (Frankfurt: V. Klostermann, 1977).

GA7 *Gesamtausgabe,* Vol. 7: *Vorträge und Aufsätze*, Friedrich-Wilhelm von Herrmann (ed.) (Frankfurt a. M.: V. Klostermann, 2000).

GA15 *Gesamtausgabe*, Vol. 15: *Seminare*, Curd Ochwadt (ed.) (Frankfurt: V. Klostermann, 1986).

GA50 *Gesamtausgabe*, Vol. 50: *Nietzsches Metaphysik*, Petra Jaeger (ed.) (Frankfurt: V. Klostermann, 1990).

GA65 *Gesamtausgabe*, Vol. 65: *Beiträge zur Philosophie (Vom Ereignis)*, Friedrich-Wilhelm von Herrmann (ed.) (Frankfurt: V. Klostermann, 1989).

GA79 *Gesamtausgabe*, Vol. 79: *Bremer und Freiburger Vorträge*, Petra Jaeger (ed.) (Frankfurt: V. Klostermann, 1994).
IM *Introduction to Metaphysics,* trans. G. Fried and R. Polt (New Haven: Yale University Press, 2000).
KPM *Kant and the Problem of Metaphysics*, trans. R. Taft (Bloomington, Ind.: Indiana University Press, 1997).
N3 *Nietzsche: the Will to Power as Knowledge and as Metaphysics*, David Farrell Krell (ed.), trans. J. Stambaugh, D. F. Krell and F. Capuzzi (New York: Harper & Row, 1987).
N4 *Nietzsche: Nihilism*. David Farrell Krell (ed.), trans. F. Capuzzi (New York: Harper & Row, 1982).
NII *Nietzsche,* Vol. II (Pfullingen: G. Neske, 1961).
P *Pathmarks,* William McNeill (ed.) (Cambridge: Cambridge University Press, 1998).
PLT *Poetry, Language, Though,* trans. A. Hofstadter (New York: Harper & Row, 1971).
QCT *The Question Concerning Technology,* trans. W. Lovitt (New York: Harper and Row, 1977).
TTL 'Traditional Language and Technological Language', trans. W. T. Gregory, *Journal of Philosophical Research,* XXIII (1998): 129–45.
USTS *Überlieferte Sprache und Technische Sprache*, Hermann Heidegger (ed.) (St. Gallen: Erker-Verag, 1989).

Notes

1. See Iain Thomson, 'From the Question Concerning Technology to the Quest for a Democratic Technology: Heidegger, Marcuse, Feenberg', *Inquiry*, 43(2) (2000): 203–16; Iain Thomson, *Heidegger on Ontotheology: Technology and the Politics of Education* (Cambridge: Cambridge University Press, 2005); and Iain Thomson 'Environmental Philosophy', in Hubert L. Dreyfus and Mark A. Wrathall (eds) *A Companion to Phenomenology and Existentialism* (Oxford: Blackwell, 2006), pp. 445–63.
2. See Wittgenstein, *Philosophical Investigations*, trans. G. E. M. Anscombe (New York: The Macmillan Company, 1968), p. 194. Whether a naive viewer sees Wittgenstein's figure as a duck or as a rabbit seems to depend upon the angle at which it is viewed. As the picture is rotated such that the 'duck's beak' points north, this 'beak' becomes increasingly likely to appear as the 'ears' of a rabbit. As this suggests, neither the gestalt figures nor the subjective–objective genitives have an intrinsically dominant aspect (although in each precise case there is a dominant aspect which we tend to see instead of the other), and this constitutes a noteworthy difference from the danger–promise ambiguity, in which the danger more insistently eclipses the promise.
3. 'The greater danger consists in optimism, which recognizes only pessimism as its opponent' (N4 247/NII 393). I would suggest, nonetheless, that the old cliché of 'seeing the glass as half full rather than half empty' turns out to be a rather appropriate image for what Heidegger has in mind (although it would be even better to learn to see an empty glass as full of emptiness).

4. This chapter started out as a paper I was invited to present to the French Parliament of Philosophers' international colloquium on 'Heidegger: the Danger and the Promise', at the University of Strasbourg, France, 4 December 2004. The announcement for this international colloquium began: 'To situate this project under the title "Heidegger – the Danger and the Promise" [*sous le titre "Heidegger – le danger et la promesse"*] is not only to engage reflection on the thinking of one of the most important philosophers of the 20th century, but it is also to propose an encounter with our historical destiny and its future. And, [to speak] more precisely about this question: Would not the future be a thing of the past?' Yes, I shall suggest here, but only if Heidegger's thinking is considered a thing of the past; for there is a future – and more than one – disclosed by his thinking of the ontotheological roots of global technologization.
5. I refer here, and below, to my *Heidegger on Ontotheology: Technology and the Politics of Education*.
6. On the question of whether Heidegger himself consistently lived up to his own joining of danger and promise, see Giorgio Agamben, *Remnants of Auschwitz: the Witness and the Archive*, trans. D. Heller-Roazen (New York: Zone Books, 1999), p. 75, where Agamben relies upon 'Hölderlin's principle' to suggest, *pace* Heidegger, that 'precisely in the extreme situation of the camp appropriation and freedom ought to be possible'.
7. Of course, for Heidegger 'critical heir' is a pleonasm, since the calcified tradition is only turned into the living heritage through the critical 'reciprocative rejoinder' which updates it, altering it so that it can speak to the changed needs of the contemporary world.
8. On Kant's 'discursivity thesis', see Henry Allison, *Kant's Transcendental Idealism: an Interpretation and Defense* (New Haven: Yale University Press, 1983), pp. 65–8. For Heidegger, the 'discursivity' (*Diskursivität*) 'which belongs to the essence of understanding is the sharpest index of its finitude' (KPM 21/GA3 29–30), and 'the understanding of being which thoroughly dominates human existence... manifests itself as the innermost ground of human finitude' (KPM 160/GA3 228).
9. See John Richardson, 'Nietzsche Contra Darwin', *Philosophy and Phenomenological Research,* 65 (3) (2002): 537–75.
10. Heidegger is deeply worried that within our current technological constellation of intelligibility, the post-Nietzschean epoch of enframing, it is increasingly becoming the case that: 'Only what is calculable in advance counts as being' (TTL 136/USTS 17). For, our technological understanding of being produces a 'calculative thinking' (DT 46/G 13) which quantifies all qualitative relations, reducing entities to bivalent, programmable 'information' (TTL 139/USTS 22), digitized data ready to enter into what Jean Baudrillard aptly describes as 'a state of pure circulation' on the Internet. See Baudrillard's *The Transparency of Evil: Essays on Extreme Phenomena*, trans. J. Benedict (London: Verso, 1993), p. 4; and Dreyfus's important monograph, *On the Internet* (London and New York: Routledge, 2003).
11. For a detailed explanation and defence of Heidegger's use of the adjective 'technological' to characterize our current mode of revealing, see *Heidegger on Ontotheology*, Ch. 2, esp. p. 45 note 1 and p. 75 note 60.
12. For Heidegger, the danger thus has two isomorphic aspects: 'humanity is threatened with the annihilation of its essence, and being itself is endangered in its usage of its abode' (N4 245/NII 391).
13. Thus we get Heidegger's provocative evocation of the great danger we could call, with a nod to Marx, *the problem of the happy enframer*: 'What has long since been

threatening man with death, and indeed the death of his own nature, is the unconditional character of mere willing in the sense of purposeful self-assertion in everything [i.e. 'will-to-will', Heidegger's shorthand for the ontotheological unity of will-to-power and eternal recurrence]. What threatens man in his very nature is the willed view that man, by the peaceful release, transformation, storage, and channeling of the energies of physical nature could render the human condition, man's being, tolerable for everybody and happy in all respects' (PLT 116/GA5 294). Heidegger's postulation of a great 'need of needlessness' initially sounds bizarre (he was writing at a time when nuclear energy promised to conquer material scarcity), but he develops here a line of thought long familiar to German philosophy (and not only critical theory), going all the way back to the Hippocratic tradition of diagnosing diseases of which the patient remains blissfully unaware. See Raymond Geuss, *The Idea of a Critical Theory: Habermas and the Frankfurt School* (Cambridge: Cambridge University Press, 1981).

14. It is worth noting that the 'promise' is already present in its absence here, in Heidegger's first description of the danger: 'yet the greatness of be-ing continues to be closed off, because decisions are no longer made about truth and untruth and what is most their own'.
15. 'Machination itself...is the essencing of being as such [*die Wesung des Seyns*]' (CP 89/GA65 128).
16. The fuller context runs: 'Nietzsche's metaphysics, that is to say, the truth of the totality of entities as such...is the fundamental trait of the history of our age, which is inaugurating itself only now in its incipient consummation as the contemporary age....That is not to say, however, that the struggle for the unrestrained exploitation of the earth as a source of raw materials or the cynical exploitation of "human resources" in the service of the absolute empowering of will to power will explicitly appeal to philosophy for help in grounding its essence, or even will adopt philosophy as its façade. On the contrary, we must assume that philosophy will disappear as a doctrine and a construct of culture, and that it can disappear only because as long as it was genuine it identified the reality of the real, that is, being, on the basis of which every individual entity is designated to be what it is and how it is. *"Fundamental metaphysical doctrines" means the essence of self-consummating metaphysics, which in its fundamental traits sustains Western history, shapes it in its modern European form, and destines it for "world domination".*...Nietzsche's metaphysics is at its core never a specifically German philosophy. It is European, global.' In the *Gesamtausgabe* edition of this text, moreover, Heidegger explicitly identifies this global phase of fulfilled metaphysics with 'the English empire' (GA50 82).
17. See Dreyfus, 'Heidegger on the Connection between Nihilism, Art, Technology, and Politics', in Charles Guignon (ed.) *The Cambridge Companion to Heidegger* (Cambridge: Cambridge University Press, 1993), pp. 307–10.
18. See note 4 above.
19. Ron Suskind, 'Without a Doubt', *New York Times Magazine*, 17 October 2004 (ellipses in original).
20. Vattimo credits Hans-Georg Gadamer as the source of this telling remark. See Vattimo, *Nihilism and Emancipation: Ethics, Politics, and Law*, Santiago Zabala (ed.) trans. William McCuaig (New York: Columbia University Press, 2003), p. 14. I have sought to develop my own sense of this connection in more concrete detail in *Heidegger on Ontotheology*, as well as in Iain Thomson, 'The Philosophical Fugue: Understanding the Structure and Goal of Heidegger's *Beiträge*', *Journal of the British Society for Phenomenology,* 34 (1) (2003): 57–73.

21. See Derrida, 'Interpreting Signatures (Nietzsche/Heidegger): Two Questions', in D. P. Michelfelder and R. E. Palmer (eds and trans.) *Dialogue and Deconstruction: the Gadamer–Derrida Encounter* (Albany: SUNY Press, 1989), p. 58. Derrida had agreed to participate in the meeting of the international Parliament of Philosophers (for which this chapter was originally written) before his untimely death, and his absence was thus quite palpably present at the meeting.

Part III

Technology: Ethical and Political Issues

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8
Human Enhancement and Personal Identity

Philip Brey

8.1 Introduction

In this essay, I will investigate the implications of human enhancement for personal identity and assess likely social and ethical consequences of these changes. Human enhancement, also called human augmentation, is an emerging field within medicine and bioengineering that aims to develop technologies and techniques for overcoming current limitations of human cognitive and physical abilities (Naam, 2004; Wilsdon and Miller, 2006; Garreau, 2005; Parens, 1998; Agar, 2004). Technologies developed in this field are called *human enhancement technologies* (HETs). HETs rely on advances in genetic engineering, pharmacology, bioengineering, cybernetics and nanotechnology. In these fields, it is becoming possible to develop techniques that improve human functions beyond a normal range. The envisioned applications are limitless, and include the enhancement of human traits like muscular strength, endurance, vision, intelligence, mood and personality.

The possibility of human enhancement requires a rethinking of the aims of medicine. The primary aim of medicine has always been the treatment of illness and disability. That is, medicine has traditionally been *therapeutic*: it has been concerned with restoring impaired human functions to a state of normality or health. Human enhancement aims to bring improvements to the human condition that move beyond a state of mere health. Part of the contemporary debate on human enhancement therefore concerns the question whether the traditional aims of medicine should be expanded to include human enhancement as one of its aims.

Human enhancement has been advocated most forcefully by self-identified *transhumanists* (Bostrom, 2003a, b; Kurzweil, 2005; Young, 2005).[1] Transhumanism is an international movement with the explicit aim of supporting human enhancement technology to improve human life. Transhumanists, like Nick Bostrom and Max More, believe that HETs can be used to improve human life and hold that there are no moral imperatives by which embargoes on the development and use of HETs can be justified. Critics of human enhancement, like Francis Fukuyama (2002) and Leon Kass (2002), oppose tinkering with human nature for the purpose of enhancement. Human enhancement has been opposed for a variety of reasons, including claims that it is unnatural, undermines human dignity, erodes human equality, and can do bodily and psychological harm.

One of the issues in the debate on human enhancement has been its potential impact on *personal identity* (DeGazia, 2005; Hogle, 2005). Personal identity is here understood as the collection of (perceived) attributes that make someone a unique person, especially as understood by themselves.[2] Human enhancement can be expected to affect personal identity because it involves the modification of human minds and bodies and equips humans with supernormal abilities. These new abilities may change the way that persons look and behave, and may change the way they experience the world and themselves. Humans may even be modified to the extent that the resulting organism is no longer fully identifiable as a member of *Homo sapiens*, and has become a transhuman or posthuman lifeform, which will lead to even more drastic changes in personal identity.

In what follows, I will analyse potential and actual implications of human enhancement for personal identity, and I will assess the social and moral importance of these implications. Before these implications can be studied, it first has to be discussed more precisely what human enhancement is and what different kinds there are. This will be done in the next section.

8.2 Types of enhancements and enhancement technologies

A brain prosthesis is likely to have different consequences for personal identity than a breast implant. To adequately analyse the consequences of human enhancement for personal identity, we therefore need to distinguish between different kinds of enhancements, to enable us to explore different effects on identity. Enhancements are improvements of *human traits*, which include mental and physical attributes and abilities and behavioural dispositions. The impact of an enhancement on identity may vary with (1) the type of trait that is modified, (2) the means by which it is modified, and (3) the extent or degree to which it is modified. I will now discuss the different types of enhancements that can be distinguished along these lines.

Types of enhancement by trait

A basic distinction can be made between *bodily* and *mental* or *psychological enhancements*, where the former include improvements of the body, and the latter improvements of the mind and behaviour.[3] Bodily enhancements can be further divided into physical and cosmetic enhancements, and mental enhancements into cognitive, affective and personality enhancements.[4]

Physical enhancements are enhancements of human physical capacities, which are capacities for physical action and for the maintenance of a good physical condition. They include capacities like strength, speed, agility, endurance, precision, and resistance against heat and cold. *Cognitive enhancements* are enhancements of human perceptual and cognitive capacities. They enhance human abilities for sensory perception, memory, decision-making, thought and imagination. *Affective and personality enhancements* are enhancements of mood, personality traits and (social) behavioural tendencies, such as tendencies to have positive moods, to have greater confidence or to be more sympathetic.[5] *Cosmetic enhancements*, finally, are aesthetic enhancements of features of the body. Existing cosmetic enhancements include a variety of cosmetic surgery procedures, like eyelid and breast surgery, and focus on visual beauty. They could conceivably also be targeted at non-visual features like voice and smell.

Techniques for enhancement

There are three major techniques for human enhancement: *prosthesis* (the fitting of prosthetic devices and tissues), *pharmacological treatment* (the use of drugs to improve biological systems) and *genetic engineering*. The corresponding enhancements may be termed prosthetic, chemical and genetic.[6] *Prosthetic enhancements* are enhancements that result from the fitting of prostheses to the human body. A prosthesis is an artificial body part. Artificial parts can be used to either replace (parts of) human organs or be fitted next to organs to improve their function (Brey, 2005). Very few prostheses that currently exist can be understood as genuine enhancements, since most of them are not capable of performing better than normally functioning organs. This may change, however, because of advances in neuroprosthetics and robotics and in the growth of bioartificial organs.

Chemical enhancements are chemical modifications of biological organs or processes that yield superior functioning. Well known are performance-enhancing drugs in sport ('doping'), of which a wide range already exists, including hormonal substances like anabolic steroids and human growth hormone. Similarly, virility drugs like Viagra, used to treat erectile dysfunction, are used to enhance sexual performance in normally functioning individuals. An important class of chemical enhancements is located within the realm of *psychoactive drugs*, which are chemicals that temporarily or permanently alter brain function, with resulting changes in perception, cognition, mood, personality traits or behaviour. Some of these psychoactive drugs can be used for enhancement, such as *nootropics*, or 'smart drugs', which are psychoactive drugs that boost cognitive abilities, such as memory, alertness, verbal facility and creative thought.

Genetic enhancements are enhancements brought about through genetic engineering. Genetic engineering, or genetic modification, involves the modification of genomes (DNA) in cells, usually by the introduction of foreign DNA. So far, human genetic enhancement is still largely science fiction, but it may not be far away. It is generally agreed that genetic enhancements are best achieved through germ-line genetic modification. In such a process, the genome of germ cells would be manipulated to include 'superior' genes for certain traits. In this way, it would be possible to create 'designer babies' (Stock and Campbell, 2000; Stock, 2002).

An additional theoretical possibility is the use of animal DNA rather than human DNA in human genetic engineering. The resulting humans would be *transgenic*, meaning that they carry DNA from another species. Transgenic animals already exist with human DNA, like transgenic chickens that are able to synthesize human proteins in their eggs. Another possibility is the creation of *human–animal chimeras*. Chimeras are organisms made out of the cells of two or more different zygotes. A human–animal chimera is an interspecies chimera from a human and an animal zygote. Chimeras have already been brought into existence, including a combination of a sheep and a goat ('geep'), a chicken with a quail's brain, and a human–rabbit chimera that was not allowed to grow beyond an embryonal stage.

Intra-normal and supernormal enhancements

Enhancements were defined as non-therapeutic modifications of traits that bring them beyond a normal condition. But 'normal' is ambiguous between normal for the individual and normal for the species. We can therefore distinguish between *intra-normal enhancements*, which are improvements of traits that remain within the normal range for human beings, and *supernormal enhancements*, which are improvements beyond the normal human range and additions of qualitatively new traits (Wachbroit, 2000).

Within the class of supernormal enhancements a further distinction is warranted between traits that are merely exceptional for humans, and traits that have a value or quality beyond the known human range. Traits in the latter category are not merely supernormal, they are *superhuman*. For example, a mere supernormal enhancement of strength may help a weightlifter lift 300 or 400 kg, where the world record is 472. A superhuman enhancement, in contrast, may help him lift 600 kg.

8.3 Human enhancement and personal identity

Having explored the notion of enhancement and the different kinds that exist, let us now turn to the notion of personal identity. The notion of identity, when applied to persons, is customarily used to designate those qualities that jointly define a person as a unique individual, distinct from others.[7] Any persistent quality that one has can be part of one's identity. Very diverse qualities, like having freckles, being stubborn, believing in free will, being the survivor of an earthquake and being a German-American can, to a greater or lesser degree, help define one's uniqueness and therefore help define one's identity.

Social scientists normally define identity not as an objective condition of persons, but as a subjective or attributed condition. Identities, in this sense, are assemblies of attributed qualities by which persons are identified and characterized as unique individuals, either by themselves or by others. Identity attributed by a person to him- or herself is called *self-identity*. Self-identity is hence the way in which a person or *self* reflexively understands him- or herself. *Third-person identities* are identities attributed to a person by others. Self-identity and third-person identities often differ. For example, it may be part of someone's self-identity that she is obese, whereas most others perceive her as thin. The focus of research on identity in the social and behavioural sciences and humanities has mostly been on self-identity.

In the psychological literature on self-identity, a person's self-identity is often analysed as constituted by a *self-concept* (Wylie et al., 1979; Markus and Wurf, 1987). A self-concept is a relatively stable conceptual structure that contains beliefs about oneself, in particular about one's enduring attributes. The psychological function of the self-concept is, according to an influential study by Epstein (1973), twofold: it has an integrative and a hedonic function. Its *integrative* function is that of aiding in the organization and assimilation of experience, with special emphasis on the demarcation and categorization of experiences of oneself. The *hedonic* function can be described, in contemporary terminology, as that of enhancing *self-esteem*; it involves the comparative evaluation of one's own attributes. Such self-evaluations play a significant role in determining one's subsequent behaviour, attitudes and intentions.

To perform its integrative and hedonic functions, the self-concept has to succeed in two tasks: it has to draw a boundary between the self and its environment, and it has to discern attributes in the thus delineated self. The first process, which is believed to occur in infancy, has been called the formation of the *existential self*, or the self as subject (Lewis and Brooks-Gunn, 1979). The second process, which is thought to continue throughout one's lifespan, is called the formation of the *categorical self*, or the self as object (ibid.). Individuals begin defining themselves within systems of categories from an early age, and keep refining and changing these definitions as they grow older.

Society has a major role in the formation of the categorical self. Psychological research shows that the self-categorizations of individuals strongly correlate with the ways in which they expect to be judged by others (Shrauger and Scheneman, 1979). Although self-identity is hence shaped by society, it does not follow that self-identity reduces to *social identity*. Social identity is identity derived from group membership, and self-attributed social identity is the way in which one defines oneself as belonging to particular social groups (Markus and Wurf, 1987; Tajfel, 1982). Many personal attributes, especially physical and psychological attributes like being tall and being melancholy, are not, by this definition, part of one's social identity, as individuals with these traits are not, or hardly, distinguishable as separate social groups with their own historically formed identity. The notion of social identity is therefore sometimes contrasted with that of *psychological identity,* which is based on self-categorizations that include idiosyncratic attributes of individuals, especially those that relate to their physical and psychological traits.

In most attempts to give a more precise analysis of its structure, the self-concept is analysed as consisting of a system of *self-schemas*, which are cognitive and affective structures that contain beliefs and feelings about the self along some dimension, such as bodily appearance, character traits or group membership. These self-schemas are stored in long-term memory, but may be activated to frame and categorize self-experiences and guide thought and behaviour in particular instances. Persons have self-schemas about their body (Cash and Pruzinsky, 1990); *character traits* (Feldman, 1992); *values and beliefs* (Taylor, 1989); *abilities* (Bandura, 1977); *social identity* (Tajfel, 1982); and *personal history* (Giddens, 1991).

The moral and social importance of self-identity rests in the fact that it determines how people feel about themselves, and is a strong determinant of people's intentions, attitudes and behaviours. A poorly developed self-concept could either bring about low self-esteem, resulting in self-deprecation or even suicide, or superiority complexes that result in unrealistically high expectations in life and poor treatment of others. Similarly, attributed third-person identities determine in large part how one is treated by others, and poorly formed third-person identities could make one the subject of discrimination and poor treatment. The way that personal identities are defined in a society is therefore of major importance to it and its individuals. Human enhancement is likely to lead to major changes in personal identities, and it is therefore important to assess what changes are likely to occur and whether these changes are desirable for the individual and for society.

On a naive transhumanist analysis, changes in personal identity resulting from human enhancement can only be for the good. Human enhancement makes for better people, who have more self-esteem and are held in higher esteem by others, and all these individual benefits add up to a benefit for society as a whole. Over the next three sections, I will argue that reality is more complex, and that changes in personal identities can also lead to significant harms. In the next section, I will analyse how human enhancement is likely to impact on self-conceptions of agency and achievement, and therefore self-esteem. Next, I will analyse how the large-scale use of certain human enhancements may change existing conceptions of normality and how this may impact on the social status and self-esteem of the unenhanced. Third, I will analyse how the introduction of superhuman traits and traits that cross species boundaries would produce new social identities and could lead to new class systems. In a concluding section, I will discuss implications of these three analyses for health care and health policy.

8.4 Personal history and identity

An important part of self-identity is constituted by an understanding of one's personal history, including ontogenetic history, which is an account of how one became to be the person one is. O*ntogenetic identity* may be defined as that part of one's self-concept that recounts one's ontogenetic history. Ontogenetic identity is undoubtedly an important constituent of self-identity, because it is explanatory of who one is. The fundamental question 'Who am I?' is answered in part through an answer to the question 'Where did I come from?' Ontogenetic identity provides reasons or causes why one has the traits one has and why one finds oneself in the situation one is in.

Human enhancement affects ontogenetic identity by adding an essentially new type of explanation for human traits. People tend to explain their own traits by reference to either nature or nurture, or a combination of the two. In *nature-based explanations*, traits are held to have been predetermined at birth, and to be part of one's nature since birth. These explanations can be secular, referring to the forces of 'nature' or to genetic evolutionary forces, or religious, referring to a god or creator. Traits like height, eye colour, intelligence, and friendliness can be explained by saying 'I was born that way', 'they are in my genes' or 'It is God's gift'.

In *nurture-based explanations*, human traits are explained as resulting from nurture: influences after birth. Such influences may be external or self-produced. External influences are circumstances beyond one's control that cause changes in oneself. For example, 'My mother made me into a sceptical person', 'The sun has made my skin wrinkled'. Self-produced influences include personal choices and efforts: 'I have worked hard to make my body strong and versatile', 'I have cultivated an optimistic outlook in life'. Self-produced influences, to the extent that they lead to improvement, are typically the result of individual effort aimed at self-improvement.

Human enhancement changes this existing order by enabling the artificial modification of traits that were once held to be fixed by nature and by enabling the enhancement of traits through relatively effortless technological intervention that could once only be enhanced through individual effort over a sustained period of time. Let us now consider the implications of these two changes in the existing order. First, the engineering of human traits that are traditionally held to be part of pre-given 'nature' will necessarily bring it about that these humans will not fully conceive of themselves as either a 'natural human being' or as a 'creation of God'. They will realize that part of their nature is engineered by human beings and is, in effect, a human artefact.

Such a realization would be unwelcome if they subscribe to ideals of naturalness or to religious beliefs according to which such engineering of their nature is undesirable. However, many people may not have such beliefs, and may be happy to improve themselves. Persons may then come to conceive of themselves as partially their own creation. This may be experienced by them as liberatory, as Donna Haraway (1985) has argued in relation to cyborgs. Yet, informed consent cannot always be assumed in relation to enhancement. Enhancements may also selected by others, for instance at birth or at a young age by parents. In such cases, persons will come to understand themselves as partially engineered by others, with purposes that were not freely chosen by themselves (cf. Habermas, 2003). For instance, persons may find out that they are tall because their parents wanted them to become a basketball player, or that they are intelligent and diligent because their parents wanted them to go to law school. Such revelations could trigger identity crises and strain social relationships.

They could also give persons the idea that they are not autonomous individuals but persons whose identity has been preprogrammed by others. Such an idea may result from the realization that one's traits are not given by nature or God but have been carefully selected by others to fulfil their ends. The selection of enhancements by others may especially undermine images of oneself as an agent with free will if the enhancements are in the realm of mood and personality. Imagine a future in which a child has been carefully designed through genetic and chemical engineering to have certain personality traits that her parents found desirable. Her personality has been enhanced so that she has a tendency to be optimistic, friendly, tolerant and ambitious. Her kind actions or her ambitious choices are then likely to be interpreted by herself and others as not wholly free, because conditioned by her parents' engineering of her personality. In other words, her identity may not be that of a free agent. Yet in Western culture since the Enlightenment, conceptions of the self-worth of human beings have been strongly connected to their being free-willed, autonomous agents. A realization that one is not a wholly free agent is therefore likely to undermine her self-esteem and make it more difficult for her to function in society.

A second change in existing orders comes from enhancements that substitute for individual effort. There is a widely held belief in Western societies that self-improvement and human excellence strongly depend on individual effort and require prolonged training, discipline and self-control. Human enhancement provides technological procedures to improve traits without the necessity of individual effort. To many, such procedures would be appealing. Why, for example, train for years to become a successful athlete if human enhancements could give one the same abilities immediately? Human enhancement could therefore seriously alter the conventional relation between effort, self-improvement and achievement, as is already happening in sport due to the use of doping. Yet, the relation between effort and achievement is very important in many religions and ideologies, from Buddhism to Christianity and from socialism to liberalism. These ideologies all emphasize the central role of effort and training in achievement and self-actualization, and define human identity in terms of it.

If human traits and achievements become less dependent on individual effort, the whole current system for assigning praise and reward in society will be undermined, along with associated notions of self-esteem. As Michael Sandel (2002) has argued, when one's traits are not there by one's own making, one's achievements will not receive the same amount of admiration. When a javelin thrower excels in his sport, the admiration and respect he gains from others are not just directed at successful individual throws. They are also directed at his achievement in training his body so that he is able to make successful throws. When a javelin thrower excels because of human enhancement, then this admiration will largely disappear. Perhaps admiration will go instead to the doctors or engineers who enhanced the javelin thrower. The javelin thrower's self-identity is likely to be similarly affected. He will not see his enhanced body, and his actions performed with it, as fully his own achievement.

8.5 Commodification and changing standards of normality

Human enhancement not only affects ontogenetic identity, it also affects bodily identity (how we perceive our bodies) and social identity (how we perceive ourselves in relation to others). In this section, I will explore how the use of HETs is likely to affect bodily and social identity in contemporary Western societies. Contemporary Western societies are nearly all characterized by a market economy, a consumer culture and a liberal system of government. These features of societies strongly determine the way in which enhancements are made available and the way in which they will be used. This, in turn, will influence the impact they have on identity.

The centrality of the market in contemporary societies means that enhancements are likely to be developed and advertised by commercial firms. This is already true for existing enhancements like cosmetic surgery and performance-enhancing drugs. In such societies, enhancements will have the status of *consumer goods*: goods that satisfy human wants through their consumption or use. People will buy them if they can afford them and have been convinced that they will improve their lives. In a consumer culture, products are believed to improve one's life if they satisfy wants or improve one's status. Advertising is the primary medium used by producers to convince consumers that products will indeed satisfy their wants and improve their status. The wants of consumers are to an extent manufactured through such advertising, and through the culture as a whole, which defines certain things as desirable and worth having (Slater, 1997).

Another feature of most contemporary societies is that they have a mostly liberal system of government, meaning that they emphasize individual freedom, including free enterprise, and do not advocate or endorse a particular conception of the good for its citizens (Rawls, 1993). That is, in their regulation of human activity, including commerce, governments usually do not prohibit or require activities, unless this is necessary to prevent agents from doing harm to others. A liberal attitude towards enhancements would require that they are safe for the user (so that producers do not cause harm to users) and that they are not likely to do harm to others when used properly. Further regulation is likely to be limited, since further regulation would mean that the state privileges a particular conception of the good (e.g. a moral or religious one) above other conceptions that also have their place in society. This liberal attitude towards enhancement is already visible in the regulation of cosmetic surgery and performance-enhancing drugs, where restrictions on access, if any, are usually legitimized by health and safety concerns, and not by a moral or religious conception of what is good for people.

In modern societies, then, enhancements will be goods that can be bought and sold. In other words, they will be *commodities*. Consumers can *buy* height, intelligence, beauty and a pleasant personality, and companies *sell* such products. Unavoidably, the availability of commodified enhancements will lead to a commodification of human traits, meaning that traits themselves are seen as purchasable and replaceable objects. The way in which people conceptualize and evaluate human traits will be influenced by the fact that a monetary value can be put on them, and that some traits are affordable, whereas others are not. Other qualities of traits, such as personal meanings they may carry, may become less prominent because of their commodification.

When traits are commodified, they change their status from a *natural good*, a good that is a fixed part of one's human nature, to a *social good*, a good that can be bought, sold and redistributed. As a consequence, they will no longer be markers of someone's fixed human nature. Rather, they will become markers of status and wealth that signify economic success, social superiority and good taste.

If demand is great enough, and prices are kept low enough, then some enhancements may be possessed by most members of the middle class and thus become the norm in society. The rise of cosmetic surgery shows that such a scenario is not unthinkable. In South Korea, it is now estimated that more than 50 per cent of women in their twenties have had some form of cosmetic surgery (Scanlox, 2005). Usually, this is facial surgery, such as eyelid surgery, aimed at making the face look more beautiful and 'Western'. When enhancements become the norm for a trait, normality is redefined, and unenhanced traits become inferior rather than normal, and may come to mark either lower status, social and economic failure, or nonconformity.

This tendency may be even further exacerbated through advertising. The strategy that is often followed in the marketing of products is not only to project images of happiness and superiority in relation to using a product, but also to project images of unhappiness, inadequacy and inferiority for not using the product. Acquiring the product then becomes a means of overcoming one's own inadequacy and unhappiness. This strategy is clearly followed in the advertising of current enhancements like cosmetic surgery and pharmaceutical enhancements, where descriptions, images and testimonials emphasize the unhappiness and inadequacy of people prior to surgery or drug use (Little, 1998; Berlo, 1998; Elliott, 2003).

Depictions of normal traits as inferior may even get a (pseudo)scientific basis through *medicalization*, which is the characterization of human traits in terms of disease and ailment. When normal human traits can be enhanced, their unenhanced counterparts may be redefined as abnormal or inadequate through market-driven medicalizations. This already happens in cosmetic surgery, in which the human body is measured up to an unrealistic ideal of beauty and perfection. Relative to this ideal, 'corrections' are performed and 'deformities' removed, and flat-chested women are called 'micromastic'. The same tendency is visible in the market of mood enhancers, where normal feelings of unhappiness and anxiety are defined as abnormal and become treatable conditions (President's Council on Bioethics, 2003). A medicalized attitude towards normal human traits is also visible in transhumanism, in which unenhanced human beings are seen as limited and defective. As Nick Bostrom has put it, 'Transhumanists view human nature as a work-in-progress, a half-baked beginning that we can learn to remold in desirable ways' (Bostrom, 2003a, p. 493).

Human enhancement, to conclude, is likely to commodify human traits, and may in the process end up redefining the enhanced as normal and the unenhanced as abnormal. Human traits, as represented in the self-concept, will be reconceptualized as social goods that have a monetary value and that can be acquired to mark social and economic status. Unenhanced human beings may come to see themselves as incomplete and inferior in comparison to new norms of normality, and their self-esteem is likely to suffer as a result.

8.6 Superhuman traits, species membership and new social identities

While some enhancement may become standard in society, causing human beings without the enhancement to be seen as 'abnormal', other enhancements will remain exceptional. In such cases, it is enhanced persons who are at risk of being perceived as abnormal. Persons are seen as abnormal, in the sense of 'deviating from the norm' when they have traits beyond the normal human range or when they look different due to the presence of visible prostheses, discolorations or deformities of the body. These deviations from the norm, and the social categories and judgements of which others avail themselves to underline them, will be reflected in the self-concept, and will affect self-esteem.

Effects on self-esteem can be positive or negative. Positive effects result when enhancements are recognized to provide superior powers or enhance one's status. Negative effects result from negative appraisals by others. People with enhancements may be categorized pejoratively as 'deviants', 'freaks', 'monsters' or 'mutants'. The history of fiction is replete with quasi-human beings, from Frankenstein's monster to the X-Men, that, because of their deviant features, do not fit in and become outcasts. The deviance from normality of the superabled, their otherness, combined with their minority status, may limit their social acceptance and consequently lower their self-esteem.

Human beings with only a few superhuman qualities will most likely still be seen as human beings. More radical forms of enhancements, however, may yield beings that are not fully recognized as members of the human race. Human–animal chimeras, for example, will likely be classified somewhere between human and animal. Since animals are placed lower in the natural order than human beings, such organisms will likely be seen as inferior to human beings, in spite of possible enhanced powers like better smell or greater strength. They may consequently not be granted full personhood (Roberts and Baylis, 2003). Advanced cyborgs, in which important organ functions are taken over by prostheses, especially brain functions, are also likely to be seen as not fully human. Since machines are also placed lower in the natural order than human beings, there is a serious risk that such beings will be held to be inferior to normal humans.

The perception of (super)enhanced humans as different may create new social statuses and identities for them. New social categories may be created to refer to different classes of cyborgs, chimeras, superenhanced humans and designer babies, with corresponding expectations and prejudices about their moral status and their role in society. These social prejudices may become reflected in laws and policies, and will also be reflected in the self-concept of the enhanced. The consequences for self-esteem are difficult to predict, as self-esteem may both increase and decrease as a result of new social identities. There is a serious risk, however, that the enhanced will not be seen by themselves and others as equal to the unenhanced, but as either superior or inferior to them.

8.7 Conclusion: ethical considerations

Human enhancement is likely to have serious implications for personal identity. Such implications are especially likely for enhancements of mood and personality, enhancements that add superhuman traits or cross species boundaries, enhancements that change visual appearance beyond what is considered normal, and enhancements chosen by parents or others before birth or in early childhood. But what are the moral implications of changes in personal identity resulting from enhancement? Do some of these changes violate moral principles?

It would clearly be a moral wrong if human enhancement would create divisions between identities that would systematically cause certain classes of humans or humanoid organisms in society to be recognized as having inferior status. In the preceding discussion, several scenarios were presented in which this would happen. The enhanced may acquire an inferior status through their otherness, and by not being seen as fully human. The unenhanced may gain an inferior status when certain enhancements become normal. Feelings of inferiority and low self-esteem may also result from perceptions that one's actions are not wholly free because determined by personality characteristics that were engineered by others, and because one's achievements are not seen as resulting from one's own effort.

Negative implications of enhancement for self-esteem are morally significant because self-esteem has been argued in moral philosophy to be a *primary good* (Rawls, 1971). Primary goods are things that people need to function as free and equal persons in society, and that are necessary for them to achieve their goals in life. As Johns Rawls has argued, it is the responsibility of society to provide a social basis for the development of self-esteem. This requires there to be a public affirmation of the status of equal citizenship, including equal rights and an equal moral worth. Human enhancement could undermine such public affirmations by increasing differences between people and by engineering superhuman or transhuman beings that may not be recognized to have normal personhood.

As transhumanists and other defenders of human enhancement have emphasized, such negative implications are not necessary. They will depend on how society conceives of enhanced human beings, and, they argue, there is no reason why we should not see them as equals (Bostrom, 2005; DeGrazia, 2005). While this may be true in principle, there is no guarantee whatsoever that this is how things will also work out in practice. True, there is a strong belief in the moral equality of all rational beings in contemporary (Western) societies, implying that all rational beings have equal moral status and dignity and deserve equal treatment and respect. This belief is a core tenet of the Enlightenment ideals that have shaped Western societies, and is a cornerstone of Christianity, Islam and Judaism.

However, the history of the human race shows that this existing moral code is often broken in practice, and that observable differences between people tend to lead to moral and social inequalities, whether they are differences in race, gender, ethnicity, religion, sexual orientation or ability. Even though such inequalities may have decreased over time, the idea that not all human beings are equal still lingers in individual attitudes, whether in the form of (latent) racism, sexism or similar discriminatory attitudes, and can under the right circumstances lead to overt discrimination.

Not only does a similar risk to unequal treatment emerge when a class of transhuman or posthuman beings is created, there is an even greater risk, which is that the very basis of the modern notion of moral equality is undermined. This notion rests on the idea that there is an identifiable class of rational beings, called humans, that should be considered morally equal, either because they are inherently morally equal (by natural law or by divine order) or because they have agreed to a social contract in which they are declared morally equal. However, if a new class of rational (or subrational or superrational) beings emerges that transcends human nature, the notion of inherent moral equality does not seem to apply, because such a class is not fully human, and any notion of a social contract may not apply either, because that social contract was agreed upon among humans. It is likely, therefore, that human enhancement will lead to new, unjustified inequalities, and may even undermine the core Western notion of moral equality. This gives us a reason for being cautious about the application of HETs.

Even if new inequalities could somehow be prevented, which seems unlikely, the question would remain whether human enhancement would really improve human lives. It might do so by enhancing our potential and by improving our self-image so as to make us feel better about ourselves. These positive changes may well occur, but possibly harmful effects have also been observed. Notably, it has been argued that human enhancement may bring about a devaluation of achievement through the disposability of effort and may further commodify the human body. In addition, for many traits their large-scale enhancement in human populations may not end up giving humans an advantage. Many traits deliver *positional goods*: goods of which the value is not absolute but determined by the extent to which others lack the same good. If everyone becomes taller or faster through enhancement, then the relative social value of these traits remains the same, because one is only tall or fast relative to others.

Because the impact of human enhancement on personal identity is hence an issue of major social and ethical importance, this impact should be high on the agenda in both medical research and health care policy. In medical research and development, a thorough consideration of the potential implications of particular HETs for personal identity is therefore a necessity. These implications can be anticipated to some extent through serious engagement with existing research on personal identity and through extensive trials. In health policy, technology assessment and scenario building for new HETs should take place to anticipate possible social effects. Human enhancement should then be carefully regulated based on the outcomes of such assessments. As I have tried to argue, failure to take these implications for personal identity seriously in the development and regulation of HETs is likely to engender an introduction of new inequalities into society and to enable the development of HETs that end up harming rather than improving the quality of life.

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Notes

1. Naam (2004) also embraces transhumanism.
2. In philosophy, personal identity is often defined as a set of criteria that must be fulfilled for persons to persist from one time to another. This diachronic conception of identity is not the one discussed in this chapter. Rather, this chapter focuses on the synchronic conception of identity as uniqueness in relation to others, the conception that is prevalent in social science. See DeGrazia (2005).
3. This distinction may not be valid for traits that seem to be both bodily and mental (e.g. sexual functioning).
4. For a somewhat different typology, see Baylis and Robert (2004).
5. In psychology, *personality* is a collection of emotional, thought and behavioural patterns that are unique to a person and relatively consistent over time.
6. There are also enhancements that do not fit in any of these three categories, including non-prosthetic surgery, as in certain types of cosmetic surgery, and procedures that modify human traits through non-surgical, non-genetic and non-chemical means, as in neurofeedback, which makes use of sounds or visual stimuli. These are rather marginal cases, however.
7. Although this is the more common interpretation of the term 'identity', philosophical discussions of personal identity often employ a different interpretation, focusing on the problem of personal identity over time. This problem is what metaphysical conditions determine when two persons at different points in time can be identified as being the same person. This notion of identity is not at issue in this essay.

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9
The Future of Humanity

Nick Bostrom

9.1 The future of humanity as an inescapable topic

In one sense, the future of humanity comprises everything that will ever happen to any human being, including what you will have for breakfast next Thursday and all the scientific discoveries that will be made next year. In that sense, it is hardly reasonable to think of the future of humanity as a *topic*: it is too big and too diverse to be addressed as a whole in a single essay, monograph, or even 100-volume book series. It is made into a topic by way of abstraction. We abstract from details and short-term fluctuations and developments that affect only some limited aspect of our lives. A discussion about the future of humanity is about how the important fundamental features of the human condition may change or remain constant in the long run.

What features of the human condition are fundamental and important? On this there can be reasonable disagreement. Nonetheless, some features qualify by almost any standard. For example, whether and when Earth-originating life will go extinct, whether it will colonize the galaxy, whether human biology will be fundamentally transformed to make us posthuman, whether machine intelligence will surpass biological intelligence, whether population size will explode, and whether quality of life will radically improve or deteriorate: these are all important fundamental questions about the future of humanity. Less fundamental questions – for instance, about methodologies or specific technology projections – are also relevant insofar as they inform our views about more fundamental parameters.

Traditionally, the future of humanity has been a topic for theology. All the major religions have teachings about the ultimate destiny of humanity or the end of the world (Hughes, 2007). Eschatological themes have also been explored by big-name philosophers such as Hegel, Kant and Marx. In more recent times the literary genre of science fiction has continued the tradition. Very often, the future has served as a projection screen for our hopes and fears; or as a stage setting for dramatic entertainment, morality tales, or satire of tendencies in contemporary society; or as a banner for ideological mobilization.

It is relatively rare for humanity's future to be taken seriously as a subject matter on which it is important to try to have factually correct beliefs. There is nothing wrong with exploiting the symbolic and literary affordances of an unknown future, just as there is nothing wrong with fantasizing about imaginary countries populated by dragons and wizards. Yet it is important to attempt (as best we can) to distinguish futuristic scenarios put forward for their symbolic significance or entertainment value from speculations that are meant to be evaluated on the basis of literal plausibility. Only the latter form of 'realistic' futuristic thought will be considered in this essay.

We need realistic pictures of what the future might bring in order to make sound decisions. Increasingly, we need realistic pictures not only of our personal or local near-term futures, but also of remoter global futures. Because of our expanded technological powers, some human activities now have significant global impacts. The scale of human social organization has also grown, creating new opportunities for coordination and action, and there are many institutions and individuals who either *do* consider, or *claim* to consider, or *ought* to consider, possible long-term global impacts of their actions. Climate change, national and international security, economic development, nuclear waste disposal, biodiversity, natural resource conservation, population policy and scientific and technological research funding are examples of policy areas that involve long time horizons. Arguments in these areas often rely on implicit assumptions about the future of humanity. By making these assumptions explicit, and subjecting them to critical analysis, it might be possible to address some of the big challenges for humanity in a more well-considered and thoughtful manner.

The fact that we 'need' realistic pictures of the future does not entail that we can have them. Predictions about future technical and social developments are notoriously unreliable – to an extent that have led some to propose that we do away with prediction altogether in our planning and preparation for the future. Yet while the methodological problems of such forecasting are certainly very significant, the extreme view that we can or should do away with prediction altogether is misguided. The view is expressed, to take one example, in a recent paper on the societal implications of nanotechnology by Michael Crow and Daniel Sarewitz (2001, p. 98), in which they argue that the issue of predictability is 'irrelevant':

> preparation for the future obviously does not require accurate prediction; rather, it requires a foundation of knowledge upon which to base action, a capacity to learn from experience, close attention to what is going on in the present, and healthy and resilient institutions that can effectively respond or adapt to change in a timely manner.

Note that each of the elements Crow and Sarewitz mention as required for the preparation for the future relies in some way on accurate prediction.

A capacity to learn from experience is not useful for preparing for the future unless we can correctly assume (predict) that the lessons we derive from the past will be applicable to future situations. Close attention to what is going on in the present is likewise futile unless we can assume that what is going on in the present will reveal stable trends or otherwise shed light on what is likely to happen next. It also requires non-trivial prediction to figure out what kind of institution will prove healthy, resilient and effective in responding or adapting to future changes.

The reality is that predictability is a matter of degree, and different aspects of the future are predictable with varying degrees of reliability and precision.[1] It may often be a good idea to develop plans that are flexible and to pursue policies that are robust under a wide range of contingencies. In some cases, it also makes sense to adopt a reactive approach that relies on adapting quickly to changing circumstances rather than pursuing any detailed long-term plan or explicit agenda. Yet these coping strategies are only one part of the solution. Another part is to work to improve the accuracy of our beliefs about the future (including the accuracy of conditional predictions of the form 'if x is done, y will result'). There might be traps that we are walking towards that we could only avoid falling into by means of foresight. There are also opportunities that we could reach much sooner if we could see them further in advance. And in a strict sense, prediction is *always* necessary for meaningful decision-making.[2]

Predictability does not necessarily fall off with temporal distance. It may be highly unpredictable where a traveller will be one hour after the start of her journey, yet predictable that after five hours she will be at her destination. The *very* long-term future of humanity may be relatively easy to predict, being a matter amenable to study by the natural sciences, particularly cosmology (physical eschatology). And for there to be a degree of predictability, it is not necessary that it be possible to identify one specific scenario as what will definitely happen. If there is at least some scenario that can be *ruled out*, that is also a degree of predictability. Even short of this, if there is some basis for assigning different probabilities (in the sense of credences, degrees of belief) to different propositions about logically possible future events, or some basis for criticizing some such probability distributions as less rationally defensible or reasonable than others, then again there is a degree of predictability. And this is surely the case with regard to many aspects of the future of humanity. While our knowledge is insufficient to narrow down the space of possibilities to one broadly outlined future for humanity, we do know of many relevant arguments and considerations which in combination impose significant constraints on what a plausible view of the future could look like. The future of humanity need not be a topic on which all assumptions are entirely arbitrary and anything goes. There is a vast gulf between knowing exactly what will happen and having absolutely no clue about what will happen. Our actual epistemic location is some offshore place in that gulf.[3]

9.2 Technology, growth and directionality

Most differences between our lives and the lives of our hunter-gatherer forebears are ultimately tied to technology, especially if we understand 'technology' in its broadest sense, to include not only gadgets and machines but also techniques, processes and institutions. In this wide sense we could say that technology is the sum total of instrumentally useful culturally transmissible information. Language is a technology in this sense, along with tractors, machine guns, sorting algorithms, double-entry bookkeeping and Robert's Rules of Order.[4]

Technological innovation is the main driver of long-term economic growth. Over long timescales, the compound effects of even modest average annual growth are profound. Technological change is in large part responsible for many of the secular trends in such basic parameters of the human condition as the size of the world population, life expectancy, education levels, material standards of living, and the nature of work, communication, health care, war, and the effects of human activities on the natural environment. Other aspects of society and our individual lives are also influenced by technology in many direct and indirect ways, including governance, entertainment, human relationships, and our views on morality, mind, matter, and our own human nature. One does not have to embrace any strong form of technological determinism to recognize that technological capability – through its complex interactions with individuals, institutions, cultures and environment – is a key determinant of the ground rules within which the games of human civilization get played out (see e.g. Wright, 1999).

This view of the important role of technology is consistent with large variations and fluctuations in deployment of technology in different times and parts of the world. The view is also consistent with technological development itself being dependent on sociocultural, economic or personalistic enabling factors. The view is also consistent with denying any strong version of inevitability of the particular growth pattern observed in human history. One might hold, for example, that in a 'rerun' of human history, the timing and location of the Industrial Revolution might have been very different, or that there might not have been any such revolution at all but rather, say, a slow and steady trickle of invention. One might even hold that there are important bifurcation points in technological development at which history could take either path with quite different results in what kinds of technological systems developed. Nevertheless, *under the assumption that technological development continues on a broad front*, one might expect that *in the long run*, most of the important basic capabilities that could be obtained through some possible technology, will in fact be obtained through technology. A bolder version of this idea could be formulated as follows:

> *Technological Completion Conjecture*. If scientific and technological development efforts do not effectively cease, then all important basic capabilities that could be obtained through some possible technology will be obtained.

The conjecture is not tautological. It would be false if there is some possible basic capability that could be obtained through some technology which, while possible in the sense of being consistent with physical laws and material constraints, is so difficult to develop that it would remain beyond reach even after an indefinitely prolonged development effort. Another way in which the conjecture could be false is if some important capability can only be achieved through some possible technology which, while it could have been developed, will not in fact ever be developed even though scientific and technological development efforts continue.

The conjecture expresses the idea that which important basic capabilities are eventually attained does not depend on the paths taken by scientific and technological research in the short term. The principle allows that we might attain some capabilities sooner if, for example, we direct research funding one way rather than another; but it maintains that provided our general techno-scientific enterprise continues, even the non-prioritized capabilities will eventually be obtained, either through some indirect technological route, or when general advancements in instrumentation and understanding have made the originally neglected direct technological route so easy that even a tiny effort will succeed in developing the technology in question.[5]

One might find the thrust of this underlying idea plausible without being persuaded that the Technological Completion Conjecture is strictly true, and in that case, one may explore what exceptions there might be. Alternatively, one might accept the conjecture but believe that its antecedent is false, i.e. that scientific and technological development efforts will at some point effectively cease (before the enterprise is complete). But if one accepts both the conjecture and its antecedent, what are the implications? What will be the results if, in the long run, all of the important basic capabilities that could be obtained through some possible technology are in fact obtained? The answer may depend on the order in which technologies are developed, the social, legal and cultural frameworks within which they are deployed, the choices of individuals and institutions, and other factors, including chance events. The obtainment of a basic capability does not imply that the capability will be used in a particular way or even that it will be used at all.

These factors determining the uses and impacts of potential basic capabilities are often hard to predict. What might be somewhat more foreseeable is which important basic capabilities will eventually be attained. For under the assumption that the Technological Completion Conjecture and its antecedent are true, the capabilities that will eventually be include all the ones that could be obtained through some possible technology. While we may not be able to foresee all possible technologies, we can foresee many possible technologies, including some that are currently infeasible; and we can show that these anticipated possible technologies would provide a large range of new important basic capabilities.

One way to foresee possible future technologies is through what Eric Drexler (1992) has termed 'theoretical applied science'. Theoretical applied science studies the properties of possible physical systems, including ones that cannot yet be built, using methods such as computer simulation and derivation from established physical laws.[6] Theoretical applied science will not in every instance deliver a definitive and uncontroversial yes-or-no answer to questions about the feasibility of some imaginable technology, but it is arguably the best method we have for answering such questions. Theoretical applied science – both in its more rigorous and its more speculative applications – is therefore an important methodological tool for thinking about the future of technology and, a fortiori, one key determinant of the future of humanity.

It may be tempting to refer to the expansion of technological capacities as 'progress'. But this term has evaluative connotations – of things getting better – and it is far from a *conceptual* truth that expansion of technological capabilities makes things go better. Even if empirically we find that such an association has held in the past (no doubt with many big exceptions), we should not uncritically assume that the association will always continue to hold. It is preferable, therefore, to use a more neutral term, such as 'technological development', to denote the historical trend of accumulating technological capability.

Technological development has provided human history with a kind of directionality. Instrumentally useful information has tended to accumulate from generation to generation, so that each new generation has begun from a different and technologically more advanced starting point than its predecessor. One can point to exceptions to this trend, regions that have stagnated or even regressed for extended periods of time. Yet looking at human history from our contemporary vantage point, the macro-pattern is unmistakable.

It was not always so. Technological development for most of human history was so slow as to be indiscernible. When technological development was that slow, it could only have been detected by comparing how levels of technological capability differed over large spans of time. Yet the data needed for such comparisons – detailed historical accounts, archaeological excavations with carbon dating, and so forth – were unavailable until fairly recently, as Robert Heilbroner (1995, p. 8) explains:

> At the very apex of the first stratified societies, dynastic dreams were dreamt and visions of triumph or ruin entertained; but there is no

> mention in the papyri and cuniform tablets on which these hopes and fears were recorded that they envisaged, in the slightest degree, changes in the material conditions of the great masses, or for that matter, of the ruling class itself.

Heilbroner argued in *Visions of the Future* for the bold thesis that humanity's perceptions of the shape of things to come has gone through exactly three phases since the first appearance of *Homo sapiens*. In the first phase, which comprises all of human prehistory and most of history, the worldly future was envisaged – with very few exceptions – as changeless in its material, technological and economic conditions. In the second phase, lasting roughly from the beginning of the eighteenth century until the second half of the twentieth, worldly expectations in the industrialized world changed to incorporate the belief that the hitherto untamable forces of nature could be controlled through the appliance of sciences and rationality, and the future became a great beckoning prospect. The third phase – mostly post-war but overlapping with the second phase – sees the future in a more ambivalent light: as dominated by impersonal forces, as disruptive, hazardous and foreboding as well as promising.

Supposing that some perceptive observer in the past had noticed some instance of directionality – be it a technological, cultural or social trend – the question would have remained whether the detected directionality was a global feature or a mere local pattern. In a cyclical view of history, for example, there can be long stretches of steady cumulative development of technology or other factors. Within a period, there is clear directionality; yet each flood of growth is followed by an ebb of decay, returning things to where they stood at the beginning of the cycle. Strong local directionality is thus compatible with the view that, globally, history moves in circles and never really gets anywhere. If the periodicity is assumed to go on forever, a form of eternal recurrence would follow.

Modern Westerners who are accustomed to viewing history as a directional pattern of development may not appreciate how natural the cyclical view of history once seemed.[7] Any closed system with only a finite number of possible states must either settle down into one state and remain in that one state forever, or else cycle back through states in which it has already been. In other words, a closed finite state system must either become static or else start repeating itself. If we assume that the system has already been around for an eternity, then this eventual outcome must already have come about, i.e. the system is already either stuck or is cycling through states in which it has been before. The proviso that the system has only a finite number of states may not be as significant as it seems, for even a system that has an infinite number of possible states may only have finitely many *perceptibly different* possible states.[8] For many practical purposes, it may not matter much whether the current state of the world has already occurred an infinite number of times, or whether an infinite number of states have previously occurred each of which is merely imperceptibly different from the present state.[9] Either way, we could characterize the situation as one of eternal recurrence – the extreme case of a cyclical history.

In the actual world, the cyclical view is false because the world had a beginning a finite time ago. The human species has existed for a mere 200,000 years or so, and this is far from enough time for it to have experienced all possible conditions and permutations of which the system of humans and their environment is capable.

More fundamentally, the reason why the cyclical view is false is that the universe itself has existed for only a finite amount of time.[10] The universe started with the Big Bang an estimated 13.7 billion years ago, in a low-entropy state. The history of the universe has its own directionality: an ineluctable increase in entropy. During its process of entropy increase, the universe has progressed through a sequence of distinct stages. In the eventful first three seconds, a number of transitions occurred, including probably a period of inflation, reheating and symmetry breaking. These were followed, later, by nucleosynthesis, expansion, cooling, and formation of galaxies, stars and planets, including Earth (circa 4.5 billion years ago). The oldest undisputed fossils are about 3.5 billion years old, but there is some evidence that life already existed 3.7 billion years ago and possibly earlier. Evolution of more complex organisms was a slow process. It took some 1.8 billion years for eukaryotic life to evolve from prokaryotes, and another 1.4 billion years before the first multicellular organisms arose. From the beginning of the Cambrian period (some 542 million years ago), 'important developments' began happening at a faster pace, but still enormously slowly by human standards. *Homo habilis* – our first 'human-like ancestors' – evolved some 2 million years ago; *Homo sapiens* 100,000 years ago. The agricultural revolution began in the Fertile Crescent of the Middle East 10,000 years ago, and the rest is history. The size of the human population, which was about 5 million when we were living as hunter-gatherers 10,000 years ago, had grown to about 200 million by the year 1; it reached 1 billion in AD 1835; and today over 6.6 billion human beings are breathing on this planet (Bureau, 2007).[11] From the time of the Industrial Revolution, perceptive individuals living in developed countries have noticed significant technological change within their lifetimes.

All techno-hype aside, it is striking how recent many of the events are that define what we take to be the modern human condition. If we compress the timescale such that the Earth formed one year ago, then *Homo sapiens* evolved less than 12 minutes ago, agriculture began a little over 1 minute ago, the Industrial Revolution took place less than 2 seconds ago, the electronic computer was invented 0.4 seconds ago, and the Internet less than 0.1 seconds ago – in the blink of an eye.

Almost all the volume of the universe is ultra-high vacuum, and almost all of the tiny material specks in this vacuum are so hot or so cold, so dense or so dilute, as to be utterly inhospitable to organic life. Spatially as well as temporally, our situation is an anomaly.[12]

Given the technocentric perspective adopted here, and in light of our incomplete but substantial knowledge of human history and its place in the universe, how might we structure our expectations of things to come? The remainder of this chapter will outline four families of scenarios for humanity's future:

- extinction;
- recurrent collapse;
- plateau;
- posthumanity.

9.3 Extinction

Unless the human species lasts literally forever, it will some time cease to exist. In that case, the long-term future of humanity is easy to describe: extinction. An estimated 99.9 per cent of all species that ever existed on Earth are already extinct (Raup, 1991, p. 3f.).

There are two different ways in which the human species could become extinct: one, by evolving or developing or transforming into one or more new species or life forms, sufficiently different from what came before so as no longer to count as *Homo sapiens*; the other, by simply dying out, without any meaningful replacement or continuation. Of course, a transformed continuant of the human species might itself eventually terminate, and perhaps there will be a point where all life comes to an end; so scenarios involving the first type of extinction may eventually converge into the second kind of scenario of complete annihilation. We postpone discussion of transformation scenarios to a later section, and we shall not here discuss the possible existence of fundamental physical limitations to the survival of intelligent life in the universe. This section focuses on the direct form of extinction (annihilation) occurring within any very long, but not astronomically long, time horizon – we could say 100,000 years for specificity.

Human extinction risks have received less scholarly attention than they deserve. In recent years, there have been approximately three serious books and one major paper on this topic. John Leslie (1996), a Canadian philosopher, puts the probability of humanity failing to survive the next five centuries to 30 per cent in his book *End of the World*. His estimate is partly based on the controversial 'Doomsday argument' and on his own views about the limitations of this argument.[13] Sir Martin Rees (2003), Britain's Astronomer Royal, is even more pessimistic, putting the odds that humanity will survive the twenty-first century to no better than 50 per cent in *Our Final Hour*. Richard Posner (2004), an eminent American legal scholar, offers no numerical estimate but rates the risk of extinction 'significant' in *Catastrophe*. And I published a paper in 2002 in which I suggested that assigning a probability of less than 25 per cent to existential disaster (no time limit) would be misguided (Bostrom, 2002b). The concept of *existential risk* is distinct from that of extinction risk. As I introduced the term, an existential disaster is one that causes either the annihilation of Earth-originating intelligent life or the permanent and drastic curtailment of its potential for future desirable development.[14]

It is possible that a publication bias is responsible for the alarming picture presented by these opinions. Scholars who believe that the threats to human survival are severe might be more likely to write books on the topic, making the threat of extinction seem greater than it really is. Nevertheless, it is noteworthy that there seems to be a consensus among those researchers who have seriously looked into the matter that there is a serious risk that humanity's journey will come to a premature end.[15]

The greatest extinction risks (and existential risks more generally) arise from human activity. Our species has survived volcanic eruptions, meteoric impacts and other natural hazards for tens of thousands of years. It seems unlikely that any of these old risks should exterminate us in the near future. By contrast, human civilization is introducing many novel phenomena into the world, ranging from nuclear weapons to designer pathogens to high-energy particle colliders. The most severe existential risks of this century derive from expected technological developments. Advances in biotechnology might make it possible to design new viruses that combine the easy contagion and mutability of the influenza virus with the lethality of HIV. Molecular nanotechnology might make it possible to create weapons systems with a destructive power dwarfing that of both thermonuclear bombs and biowarfare agents (Drexler, 1985).[16] Superintelligent machines might be built and their actions could determine the future of humanity – and whether there will be one (Bostrom, 2002b; Yadkowsky, 2007). Considering that many of the existential risks that now seem to be among the most significant were conceptualized only in recent decades, it seems likely that further ones still remain to be discovered.

The same technologies that will pose these risks will also help us to mitigate some risks. Biotechnology can help us develop better diagnostics, vaccines and anti-viral drugs. Molecular nanotechnology could offer even stronger prophylactics (Freitas, 1999). Superintelligent machines may be the last invention that human beings ever need to make, since a superintelligence, by definition, would be far more effective than a human brain in practically all intellectual endeavours, including strategic thinking, scientific analysis and technological creativity (Bostrom, 1998). In addition to creating and mitigating risks, these powerful technological capabilities would also affect the human condition in many other ways.

Extinction risks constitute an especially severe subset of what could go badly wrong for humanity. There are many possible global catastrophes that would cause immense worldwide damage, maybe even the collapse of modern civilization, yet fall short of terminating the human species. An all-out nuclear war between Russia and the United States might be an example of a global catastrophe that would be unlikely to result in extinction. A terrible pandemic with high virulence and 100 per cent mortality rate among infected individuals might be another example: if some groups of humans could successfully quarantine themselves before being exposed, human extinction could be avoided even if, say, 95 per cent or more of the world's population succumbed. What distinguishes extinction and other existential catastrophes is that a comeback is impossible. A non-existential disaster causing the breakdown of global civilization is, from the perspective of humanity as a whole, a potentially recoverable setback: a giant massacre for man, a small misstep for mankind.

An existential catastrophe is therefore qualitatively distinct from a 'mere' collapse of global civilization, although in terms of our moral and prudential attitudes perhaps we should simply view both as unimaginably bad outcomes.[17] One way that civilization collapse could be a significant feature in the larger picture for humanity, however, is if it formed part of a repeating pattern. This takes us to the second family of scenarios: recurrent collapse.

9.4 Recurrent collapse

Environmental threats seem to have displaced nuclear holocaust as the chief spectre haunting the public imagination. Current-day pessimists about the future often focus on the environmental problems facing the growing world population, worrying that our wasteful and polluting ways are unsustainable and potentially ruinous to human civilization. The credit for having handed the environmental movement its initial impetus is often given to Rachel Carson, whose book *Silent Spring* (1962) sounded the alarm on pesticides and synthetic chemicals that were being released into the environment with allegedly devastating effects on wildlife and human health. The environmentalist forebodings swelled over the decade. Paul Ehrlich's (1968) book *Population Bomb*, and the Club of Rome report *Limits to Growth*, which sold 30 million copies, predicted economic collapse and mass starvation by the 1980s or 1990s as the results of population growth and resource depletion (Meadows and Club of Rome, 1972).

In recent years, the spotlight of environmental concern has shifted to global climate change. Carbon dioxide and other greenhouse gases are accumulating in the atmosphere, where they are expected to cause a warming of Earth's climate and a concomitant rise in sea water levels. The more recent report by the United Nations' Intergovernmental Panel on Climate Change, which represents the most authoritative assessment of current scientific opinion, attempts to estimate the increase in global mean temperature that would be expected by the end of this century under the assumption that no efforts at mitigation are made. The final estimate is fraught with uncertainty because of uncertainty about what the default rate of emissions of greenhouse gases will be over the century, uncertainty about the climate sensitivity parameter, and uncertainty about other factors. The IPCC therefore expresses its assessment in terms of six different climate scenarios based on different models and different assumptions. The 'low' model predicts a mean global warming of + 1.8 °C (uncertainty range 1.1–2.9 °C); the 'high' model predicts warming by + 4.0 °C (2.4–6.4 °C) (Solomon et al., 2007, p. 749). Estimated sea level rise predicted by these two most extreme scenarios among the six considered is 18–38 cm, and 26–59 cm, respectively (ibid., p. 750).

While this prognosis might well justify a range of mitigation policies, it is important to maintain a sense of perspective when we are considering the issue from a 'future of humanity' point of view. Even the *Stern Review on the Economics of Climate Change*, a report prepared for the British government which has been criticized by some as overly pessimistic, estimates that under the assumption of business-as-usual with regard to emissions, global warming will reduce welfare by an amount equivalent to a permanent reduction in per capita consumption of between 5 and 20 per cent.[18] In absolute terms, this would be a huge harm. Yet over the course of the twentieth century, world GDP grew by some 3700 per cent, and per capita world GDP rose by some 860 per cent.[19] It seems safe to say that (absent a radical overhaul of our best current scientific models of the Earth's climate system) whatever negative economic effects global warming will have, they will be completely swamped by other factors that will influence economic growth rates in this century.

There have been a number of attempts by scholars to explain societal collapse – either as a case study of some particular society, such as Gibbon's classic *Decline and Fall of the Roman Empire* – or else as an attempt to discover failure modes applying more generally (Gibbon and Kitchin, 1777). Two examples of the latter genre include Joseph Tainter's *Collapse of Complex Societies*, and Jared Diamond's more recent *Collapse: How Societies Choose to Fail or Succeed*. Tainter (1988) notes that societies need to secure certain resources such as food, energy and natural resources in order to sustain their populations. In their attempts to solve this supply problem, societies may grow in complexity – for example, in the form of bureaucracy, infrastructure, social class distinction, military operations and colonies. At some point, Tainter argues, the marginal returns on these investments in social complexity become unfavourable, and societies that do not manage to scale back when their organizational overheads become too large eventually face collapse.

Diamond (2005) argues that many past cases of societal collapse have involved environmental factors such as deforestation and habitat destruction, soil problems, water management problems, overhunting and overfishing, the effects of introduced species, human population growth, and increased per capita impact of people. He also suggests four new factors that may contribute to the collapse of present and future societies: human-caused climate change, but also build-up of toxic chemicals in the environment, energy shortages, and the full utilization of the Earth's photosynthetic capacity. Diamond draws attention to the danger of 'creeping normalcy', referring to the phenomenon of a slow trend being concealed within noisy fluctuations, so that a detrimental outcome that occurs in small, almost unnoticeable steps may be accepted or come about without resistance even if the same outcome, had it come about in one sudden leap, would have evoked a vigorous response (2005, p. 425).

We need to distinguish different classes of scenarios involving societal collapse. First, we may have a merely local collapse: individual societies can collapse, but this is unlikely to have a determining effect on the future of humanity if other advanced societies survive and take up where the failed societies left off. All historical examples of collapse have been of this kind. Second, we might suppose that new kinds of threat (e.g. nuclear holocaust or catastrophic changes in the global environment) or the trend towards globalization and increased interdependence of different parts of the world create a vulnerability to human civilization as a whole. Suppose that a global societal collapse were to occur. What happens next? If the collapse is of such a nature that a new advanced global civilization can *never* be rebuilt, the outcome would qualify as an existential disaster. However, it is hard to think of a plausible collapse which the human species survives but which nevertheless makes it permanently impossible to rebuild civilization. Supposing, therefore, that a new technologically advanced civilization is eventually rebuilt, what is the fate of this resurgent civilization? Again, there are two possibilities. The new civilization might avoid collapse; and in the following two sections we will examine what could happen to such a sustainable global civilization. Alternatively, the new civilization collapses again, and the cycle repeats. If eventually a sustainable civilization arises, we reach the kind of scenario that the following sections will discuss. If instead one of the collapses leads to extinction, then we have the kind of scenario that was discussed in the previous section. The remaining case is that we face a cycle of indefinitely repeating collapse and regeneration (see Figure 9.1).

While there are many conceivable explanations for why an advanced society might collapse, only a subset of these explanations could plausibly account for an unending pattern of collapse and regeneration. An explanation for such a cycle could not rely on some contingent factor that would apply to only some advanced civilizations and not others, or to a factor that an advanced civilization would have a realistic chance of counteracting; for if such a factor were responsible, one would expect that the collapse–regeneration

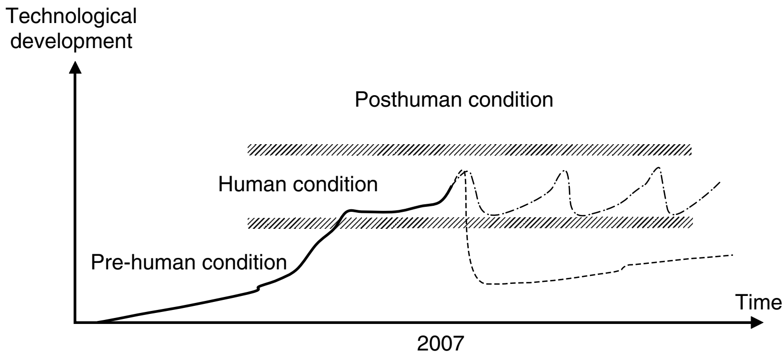

Figure 9.1 Schematic of two types of scenario for the future of humanity. One line illustrates an annihilation scenario in which the human species is destroyed a short while (perhaps a few decades) after the present time. The other line illustrates a recurrent collapse scenario, in which human civilization oscillates indefinitely within the range of technological development characteristic of a human condition. (The *y*-axis is not an index of value; 'up' is not necessarily 'better'.)

pattern would at some point be broken when the right circumstances finally enabled an advanced civilization to overcome the obstacles to sustainability. Yet at the same time, the postulated cause for collapse could not be so powerful as to cause the extinction of the human species.

A recurrent collapse scenario consequently requires a carefully calibrated homeostatic mechanism that keeps the level of civilization confined within a relatively narrow interval, as illustrated in Figure 9.1. Even if humanity were to spend many millennia on such an oscillating trajectory, one might expect that eventually this phase would end, resulting in either the permanent destruction of humankind, or the rise of a stable sustainable global civilization, or the transformation of the human condition into a new 'posthuman' condition. We turn now to the second of these possibilities, that the human condition will reach a kind of stasis, either immediately or after undergoing one of more cycles of collapse–regeneration.

9.5 Plateau

Figure 9.2 depicts two possible trajectories, one representing an increase followed by a permanent plateau, the other representing stasis at (or close to) the current status quo.

The static view is implausible. It would imply that we have recently arrived at the final human condition even at a time when change is exceptionally rapid: 'What we do know', writes distinguished historian of technology Vaclav Smil (2006, p. 311), 'is that the past six generations have amounted

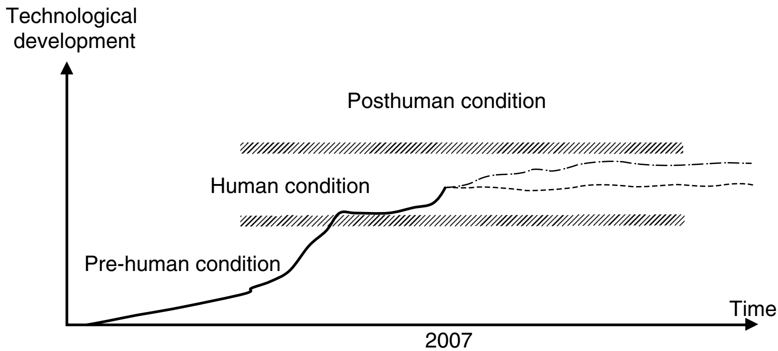

Figure 9.2 Two trajectories: increase followed by plateau; or stasis at close to the current level

to the most rapid and the most profound change our species has experienced in its 5,000 years of recorded history.' The static view would also imply a radical break with several long-established trends. If the world economy continues to grow at the same pace as in the last half century, then by 2050 the world will be seven times richer than it is today. World population is predicted to increase to just over 9 billion in 2050, so average wealth would also increase dramatically (United Nations Population Division, 2006). Extrapolating further, by 2100 the world would be almost 50 times richer than today. A single modest-sized country might then have as much wealth as the entire world has at the present. Over the course of human history, the doubling time of the world economy has been drastically reduced on several occasions, such as in the agricultural transition and the Industrial Revolution. Should another such transition occur in this century, the world economy might be orders of several magnitudes larger by the end of the century (Hanson, 2000).

Another reason for assigning a low probability to the static view is that we can foresee various specific technological advances that will give humans important new capacities. Virtual reality environments will constitute an expanding fraction of our experience. The capability of recording, surveillance, biometrics and data-mining technologies will grow, making it increasingly feasible to keep track of where people go, whom they meet, what they do, and what goes on inside their bodies (Brin, 1998).

Among the most important potential developments are ones that would enable us to alter our biology directly through technological means (Bostrom, 2005, 2007c). Such interventions could affect us more profoundly than modification of beliefs, habits, culture and education. If we learn to control the biochemical processes of human senescence, healthy lifespan could be radically prolonged. A person with the age-specific mortality of a

20-year-old would have a life expectancy of about 1000 years. The ancient but hitherto mostly futile quest for happiness could meet with success if scientists could develop safe and effective methods of controlling the brain circuitry responsible for subjective well-being (Pearce, 2004). Drugs and other neurotechnologies could make it increasingly feasible for users to shape themselves into the kind of people they want to be by adjusting their personality, emotional character, mental energy, romantic attachments and moral character (ibid.). Cognitive enhancements might deepen our intellectual lives (Bostrom and Ord, 2006; Bostrom and Sandberg, 2006).

Nanotechnology will have wide-ranging consequences for manufacturing, medicine and computing.[20] Machine intelligence, to be discussed further in the next section, is another potential revolutionary technology. Institutional innovations such as prediction markets might improve the capability of human groups to forecast future developments, and other technological or institutional developments might lead to new ways for humans to organize more effectively (Hanson, 1995; Wolfers and Zitzecsitz, 2004). The impacts of these and other technological developments on the character of human lives are difficult to predict, but that they will have such impacts seems a safe bet.

Those who believe that developments such as those listed will not occur should consider whether their scepticism is really about ultimate feasibility or merely about timescales. Some of these technologies will be difficult to develop. Does that give us reason to think that they will never be developed? Not even in 50 years? 200 years? 10,000 years? Looking back, developments such as language, agriculture and perhaps the Industrial Revolution may be said to have significantly changed the human condition. There are at least a thousand times more of us now; and with current world average life expectancy at 67 years, we live perhaps three times longer than our Pleistocene ancestors. The mental life of human beings has been transformed by developments such as language, literacy, urbanization, division of labour, industrialization, science, communications, transport and media technology.

The other trajectory in Figure 9.2 represents scenarios in which technological capability continues to grow significantly beyond the current level before levelling off below the level at which a fundamental alteration of the human condition would occur. This trajectory avoids the implausibility of postulating that we have just now reached a permanent plateau of technological development. Nevertheless, it does propose that a permanent plateau will be reached not radically far above the current level. We must ask what could cause technological development to level off at that stage.

One conceptual possibility is that development beyond this level is impossible because of limitation imposed by fundamental natural laws. It appears, however, that the physical laws of our universe permit forms of organization that would qualify as a posthuman condition (to be discussed further in the next section). Moreover, there appears to be no fundamental obstacle to the development of technologies that would make it possible to build such forms of organization (see e.g. Bostrom, 2003b; Moravec, 1999; Drexler, 1985; Kurzweil, 2005). Physical impossibility, therefore, is not a plausible explanation for why we should end up on either of the trajectories depicted in Figure 9.2.

Another potential explanation is that while theoretically possible, a posthuman condition is just too difficult to attain for humanity ever to be able to get there. For this explanation to work, the difficulty would have to be of a certain kind. If the difficulty consisted merely of there being a large number of technologically challenging steps that would be required to reach the destination, then the argument would at best suggest that it will take a long time to get there, not that we never will. Provided the challenge can be divided into a sequence of individually feasible steps, it would seem that humanity could eventually solve the challenge given enough time. Since at this point we are not so concerned with timescales, it does not appear that technological difficulty of this kind would make any of the trajectories in Figure 9.2 a plausible scenario for the future of humanity.

In order for technological difficulty to account for one of the trajectories in Figure 9.2, the difficulty would have to be of a sort that is not reducible to a long sequence of individually feasible steps. If all the pathways to a posthuman condition required technological capabilities that could be attained only by building enormously complex, error-intolerant systems of a kind which could not be created by trial and error or by assembling components that could be separately tested and debugged, then the technological difficulty argument would have legs to stand on. Charles Perrow (1984) argued in *Normal Accidents* that efforts to make complex systems safer often backfire because the added safety mechanisms bring with them additional complexity which creates additional opportunities for things to go wrong when parts and processes interact in unexpected ways. For example, increasing the number of security personnel on a site can increase the 'insider threat', the risk that at least one person on the inside can be recruited by would-be attackers (see e.g. Sagan, 2004). Along similar lines, Jaron Lanier (2000) has argued that software development has run into a kind of complexity barrier. An informal argument of this kind has also been made against the feasibility of molecular manufacturing (Burkhead, 1999).

Each of these arguments about complexity barriers is problematic. And in order to have an explanation for why humanity's technological development should level off before a posthuman condition is reached, it is not sufficient to show that *some* technologies run into insuperable complexity barriers. Rather, it would have to be shown that *all* technologies that would enable a posthuman condition (biotechnology, nanotechnology, artificial intelligence, etc.) will be blocked by such barriers. That seems an unlikely proposition. Alternatively, one might try to build an argument based on complexity barriers for social organization in general rather than for particular technologies – perhaps something akin to Tainter's explanation of past cases of societal collapse, mentioned in the previous section. In order to produce the trajectories in Figure 9.2, however, the explanation would have to be modified to allow for stagnation and plateauing rather than collapse. One problem with this hypothesis is that it is unclear that the development of the technologies requisite to reach a posthuman condition would necessarily require a significant increase in the complexity of social organization beyond its present level.

A third possible explanation is that even if a posthuman condition is both theoretically possible and practically feasible, humanity might 'decide' not to pursue technological development beyond a certain level. One could imagine systems, institutions or attitudes emerging which would have the effect of blocking further development, whether by design or as an unintended consequence. Yet an explanation rooted in unwillingness for technological advancement would have to overcome several challenges. First, how does enough unwillingness arise to overcome what at the present appears like an inexorable process of technological innovation and scientific research? Second, how does a decision to relinquish development become implemented globally in a way that leaves no country and no underground movement able to continue technological research? Third, how does the policy of relinquishment avoid being overturned, even on timescales extending over tens of thousands of years and beyond? Relinquishment would have to be global and permanent in order to account for a trajectory like one of those represented in Figure 9.2. A fourth difficulty emerges out of the three already mentioned: the explanation for how the aversion to technological advancement arises, how it gets universally implemented and how it attains permanence, would have to avoid postulating causes that in themselves would usher in a posthuman condition. For example, if the explanation postulated that powerful new mind-control technologies would be deployed globally to change people's motivation, or that an intensive global surveillance system would be put in place and used to manipulate the direction of human development along a predetermined path, one would have to wonder whether these interventions, or their knock-on effects on society, culture and politics, would not themselves alter the human condition in sufficiently fundamental ways that the resulting condition would then qualify as posthuman.

To argue that stasis and plateau are relatively unlikely scenarios is not inconsistent with maintaining that *some aspects* of the human condition will remain unchanged. For example, Francis Fukuyama (1992) argued in *The End of History and the Last Man* that the end point of mankind's ideological evolution has essentially been reached with the end of the Cold War. Fukuyama suggested that Western liberal democracy is the final form of human government, and that while it would take some time for this ideology to become completely universalized, secular free-market democracy will in the long term become more and more prevalent. In his more recent book *Our Posthuman Future* (2002), he adds an important qualification to his earlier thesis, namely that direct technological modification of human nature could undermine the foundations of liberal democracy. But be that as it may, the thesis that liberal democracy (or any other political structure) is the final form of government is consistent with the thesis that the general condition for intelligent Earth-originating life will not remain a *human* condition for the indefinite future.

9.6 Posthumanity

An explication of what has been referred to as 'posthuman condition' is overdue. In this chapter, the term is used to refer to a condition which has at least one of the following characteristics:

- population greater than 1 trillion persons;
- life expectancy greater than 500 years;
- large fraction of the population has cognitive capacities more than two standard deviations above the current human maximum;
- near-complete control over the sensory input, for the majority of people for most of the time;
- human psychological suffering becoming rare occurrence;
- any change of magnitude or profundity comparable to that of one of the above.

This definition's vagueness and arbitrariness may perhaps be excused on grounds that the rest of this chapter is at least equally schematic. In contrast to some other explications of 'posthumanity', the one above does not require direct modification of human nature (e.g. Bostrom, 2003b, 2007c). This is because the relevant concept for the present discussion is that of a level of technological or economic development that would involve a radical change in the human condition, whether the change was wrought by biological enhancement or other causes.

The two dashed lines in Figure 9.3 differ in steepness. One of them depicts slow gradual growth that in the fullness of time rises into the posthuman level and beyond. The other depicts a period of extremely rapid growth in which humanity abruptly transitions into a posthuman condition. This latter possibility can be referred to as *the singularity hypothesis*.[21] Proponents of the singularity hypothesis usually believe not only that a period of extremely rapid technological development will usher in posthumanity suddenly, but also that this transition will take place soon – within a few decades. Logically, these two contentions are quite distinct.

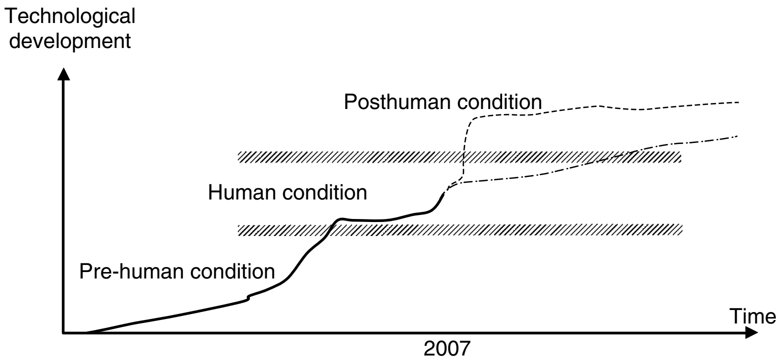

Figure 9.3 A singularity scenario, and a more incremental ascent into a posthuman condition

In 1958, Stanislaw Ulam (1958, p. 5), a Polish-born American mathematician, referring to a meeting with John von Neumann, wrote:

> One conversation centered on the ever accelerating progress of technology and changes in the mode of human life, which gives the appearance of approaching some essential singularity in the history of the race beyond which human affairs, as we know them, could not continue.

The idea of a technological singularity tied specifically to artificial intelligence was perhaps first clearly articulated by the statistician I. J. Good (1965, p. 33):

> Let an ultraintelligent machine be defined as a machine that can far surpass all the intellectual activities of any man however clever. Since the design of machines is one of these intellectual activities, an ultraintelligent machine could design even better machines; there would then unquestionably be an 'intelligence explosion', and the intelligence of man would be left far behind. Thus the first ultraintelligent machine is the *last* invention that man need ever make... It is more probable than not that, within the twentieth century, an ultraintelligent machine will be built ...

Mathematician and science fiction writer Vernor Vinge elaborated on this idea in his 1993 essay *The Coming Technological Singularity*, adjusting the timing of Good's prediction: 'Within thirty years, we will have the technological means to create superhuman intelligence. Shortly thereafter, the human era will be ended.' Vinge considered several possible avenues to superintelligence, including AI in individual machines or computer networks, computer/human interfaces, and biological improvement of the natural human intellect. An important part of both Good's and Vinge's reasoning is the idea of a strong positive feedback loop as increases in intelligence lead to increased ability to make additional progress in intelligence-increasing technologies. ('Intelligence' could here be understood as a general rubric for all those mental faculties that are relevant for developing new technologies, thus including for example creativity, work capacity, and the ability to write a persuasive case for funding.)

Sceptics of the singularity hypothesis can object that while *ceteris paribus* greater intelligence would lead to faster technological progress, there is an additional factor at play which may slow things down, namely that the easiest improvements will be made first, and that after the low-hanging fruits have all been picked, each subsequent improvement will be more difficult and require a greater amount of intellectual capability and labour to achieve. The mere existence of positive feedback, therefore, is not sufficient to establish that an intelligence explosion would occur once intelligence reaches some critical magnitude.

To assess the singularity hypothesis one must consider more carefully what kinds of intelligence-increasing interventions might be feasible and how closely stacked these interventions are in terms of their difficulty. Only if intelligence growth could exceed the growth in difficulty level for each subsequent improvement could there be a singularity. The period of rapid intelligence growth would also have to last long enough to usher in a posthuman era before running out of steam.

It might be easiest to assess the prospect for an intelligence explosion if we focus on the possibility of quantitative rather than qualitative improvements in intelligence. One interesting pathway to greater intelligence illustrating such quantitative growth – and one that Vinge did not discuss – is uploading.

Uploading refers to the use of technology to transfer a human mind to a computer. This would involve the following steps: first, create a sufficiently detailed scan of a particular human brain, perhaps by feeding vitrified brain tissue into an array of powerful microscopes for automatic slicing and scanning. Second, from this scanning data, use automatic image processing to reconstruct the three-dimensional neuronal network that implemented cognition in the original brain, and combine this map with neurocomputational models of the different types of neurons contained in the network. Third, emulate the whole computational structure on a powerful supercomputer (or cluster). If successful, the procedure would result in a qualitative reproduction of the original mind, with memory and personality intact, onto a computer where it would now exist as software.[22] This mind could either inhabit a robotic body or live in virtual reality. In determining the prerequisites for uploading, a trade-off exists between the power of the scanning and simulation technology, on the one hand, and the degree of neuroscience insight on the other. The worse the resolution of the scan, and the lower the computing power available to simulate functionally possibly irrelevant features, the more scientific insight would be needed to make the procedure work. Conversely, with sufficiently advanced scanning technology and enough computing power, it might be possible to brute-force an upload even with fairly limited understanding of how the brain works – perhaps a level of understanding representing merely an incremental advance over the current state of the art.

One obvious consequence of uploading is that many copies could be created of one uploaded mind. The limiting resource is computing power to store and run the upload minds. If enough computing hardware already exists or could rapidly be built, the upload population could undergo explosive growth: the replication time of an upload need be no longer than the time it takes to make a copy of a big piece of software, perhaps minutes or hours – a vast speed-up compared to biological human replication. And the upload replica would be an exact copy, possessing from birth all the skills and knowledge of the original. This could result in rapidly exponential growth in the supply of highly skilled labour (Hanson, 1994).[23] Additional acceleration is likely to result from improvements in the computational efficiency of the algorithms used to run the uploaded minds. Such improvements would make it possible to create faster-thinking uploads, running perhaps at speeds thousands or millions times that of an organic brain.

If uploading is technologically feasible, therefore, a singularity scenario involving an intelligence explosion and very rapid change seems realistic based only on the possibility of quantitative growth in machine intelligence.[24] The harder-to-evaluate prospect of qualitative improvements adds some further credence to the singularity hypothesis.[25]

Uploading would almost certainly produce a condition that would qualify as 'posthuman' in this chapter's terminology, for example on grounds of population size, control of sensory input, and life expectancy. (A human upload could have an indefinitely long lifespan as it would not be subject to biological senescence, and periodic backup copies could be created for additional security.) Further changes would likely follow swiftly from the productivity growth brought about by the population expansion. These further changes may include qualitative improvements in the intelligence of uploads, other machine intelligences, and remaining biological human beings.[26]

Inventor and futurist Ray Kurzweil has argued for the singularity hypothesis on somewhat different grounds. His most recent book, *The Singularity is Near* (2005), is an update of his earlier writings. It covers a vast range of ancillary topics related to radical future technological prospects, but its central theme is an attempt to demonstrate 'the law of accelerating returns', which manifests itself as exponential technological progress. Kurzweil plots progress in a variety of areas, including computing, communications and biotechnology, and in each case finds a pattern similar to Moore's law for microchips: performance grows as an exponential with a short doubling time (typically a couple of years). Extrapolating these trend lines, Kurzweil infers that a technological singularity is due around the year 2045.[27] While machine intelligence features as a prominent factor in Kurzweil's forecast, his singularity scenario differs from that of Vinge in being more gradual: not a virtually overnight total transformation resulting from runaway self-improving artificial intelligence, but a steadily accelerating pace of general technological advancement.

Several critiques could be levelled against Kurzweil's reasoning. First, one might of course doubt that present exponential trends will continue for another four decades. Second, while it is possible to identify certain fast-growing areas, such as IT and biotech, there are many other technology areas where progress is much slower. One could argue that to get an index of the overall pace of technological development, we should look not at a hand-picked portfolio of hot technologies, but instead at economic growth, which implicitly incorporates all productivity-enhancing technological innovations, weighted by their economic significance. In fact, the world economy has also been growing at a roughly exponential rate since the Industrial Revolution; but the doubling time is much longer, approximately 20 years (De Long, 1998). Third, if technological progress is exponential, then the current rate of technological progress must be vastly greater than it was in the remote past. But it is far from clear that this is so. Vaclav Smil – the historian of technology who, as we saw, has argued that the past six generations have seen the most rapid and profound change in recorded history – maintains that the 1880s was the most innovative decade of human history (2006, p. 131).

9.7 The longer term

The four families of scenarios we have considered – extinction, recurrent collapse, plateau and posthumanity – could be modulated by varying the timescale over which they are hypothesized to occur. A few hundred years or a few thousand years might already be ample time for the scenarios to have an opportunity to play themselves out. Yet such an interval is a blip compared to the lifetime of the universe. Let us therefore zoom out and consider the longer-term prospects for humanity.

The first thing to notice is that the longer the timescale we are considering, the less likely it is that technological civilization will remain within the zone we termed 'the human condition' throughout. We can illustrate this point graphically by redrawing the earlier diagrams using an expanded scale on the two axes (Figure 9.4).

The extinction scenario is perhaps the one least affected by extending the time frame of consideration. If humanity goes extinct, it stays extinct.[28] The

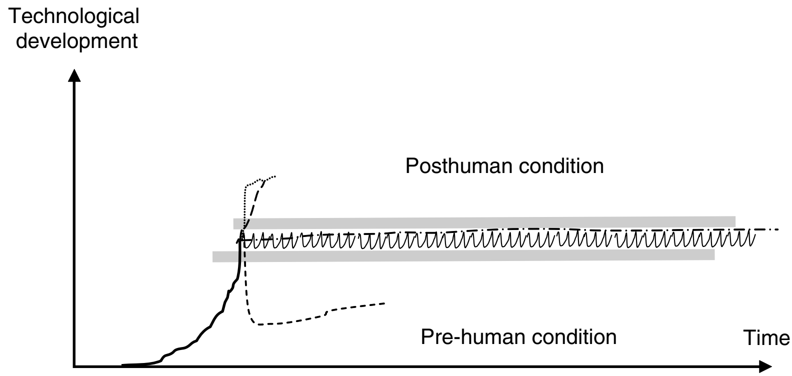

Figure 9.4 The scenarios presented in previous figures are here represented with a time axis that is slightly closer to linear and a *y*-axis that slightly better reveals how narrow a band the 'human condition' is among all the possible levels of organismic and technological development. The graph is still a mere schematic, not a strictly quantitative representation. Note how the scenarios that postulate that the human condition will continue to hold indefinitely begin to look increasingly peculiar as we adjust the scales to reveal more of the larger picture.

cumulative probability of extinction increases monotonically over time. One might argue, however, that the current century, or the next few centuries, will be a critical phase for humanity, such that if we make it through this period then the life expectancy of human civilization could become extremely high. Several possible lines of argument would support this view. For example, one might believe that superintelligence will be developed within a few centuries, and that, while the creation of superintelligence will pose grave risks, once that creation and its immediate aftermath have been survived, the new civilization would have vastly improved survival prospects since it would be guided by superintelligent foresight and planning. Furthermore, one might believe that self-sustaining space colonies may have been established within such a time frame, and that once a human or posthuman civilization becomes dispersed over multiple planets and solar systems, the risk of extinction declines. One might also believe that many of the possible revolutionary technologies (not only superintelligence) that *can* be developed *will* be developed within the next several hundred years; and that if these technological revolutions are destined to cause existential disaster, they would already have done so by then.

The recurrent collapse scenario becomes increasingly unlikely the longer the timescale, for reasons that are apparent from Figure 9.4. The scenario postulates that technological civilization will oscillate continuously within a relatively narrow band of development. If there is any chance that a cycle will either break through to the posthuman level or plummet into extinction, then there is for each period a chance that the oscillation will end. Unless the chance of such a breakout converges to zero at a sufficiently rapid rate, then with probability one the pattern will *eventually* be broken. At that point the pattern might degenerate into one of the other ones we have considered.

The plateau scenarios are similar to the recurrent collapse scenario in that the level of civilization is hypothesized to remain confined within a narrow range; and the longer the time frame considered, the smaller the probability that the level of technological development will remain within this range. But compared to the recurrent collapse pattern, the plateau pattern might be thought to have a bit more staying power. The reason is that the plateau pattern is consistent with a situation of complete stasis – such as might result, for example, from the rise of a very stable political system, propped up by greatly increased powers of surveillance and population control, and which for one reason or another opts to preserve its status quo. Such stability is inconsistent with the recurrent collapse scenario.

The cumulative probability of posthumanity, like that of extinction, increases monotonically over time. By contrast to extinction scenarios, however, there is a possibility that a civilization that has attained a posthuman condition will later revert to a human condition. For reasons paralleling those suggested earlier for the idea that the annual risk of extinction will decline substantially after certain critical technologies have been developed and after self-sustaining space colonies have been created, one might maintain that the annual probability that a posthuman condition would revert to a human condition will likewise decline over time.

Acknowledgement

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Notes

1. For example, it is likely that computers will become faster, materials will become stronger, and medicine will cure more diseases; cf. Drexler (2003).
2. You lift the glass to your mouth because you predict that drinking will quench your thirst; you avoid stepping in front of a speeding car because you predict that a collision will hurt you.
3. For more on technology and uncertainty, see Bostrom (2007b).
4. I'm cutting myself some verbal slack. On the proposed terminology, a particular physical object such as farmer Bob's tractor is not, strictly speaking, technology but rather a *technological artefact*, which depends on and embodies technology-as-information. The individual tractor is physical capital. The transmissible information needed to produce tractors is technology.
5. For a visual analogy, picture a box with large but finite volume, representing the space of basic capabilities that could be obtained through some possible technology. Imagine sand being poured into this box, representing research effort. The way in

which you pour the sand will determine the places and speed at which piles build up in the box. Yet if you keep pouring, eventually the whole space gets filled.

6. Theoretical applied science might also study potential pathways to the technology that would enable the construction of the systems in question, that is, how in principle one could solve the bootstrap problem of how to get from here to there.
7. The cyclical pattern is prominent in dharmic religions. The ancient Mayans held a cyclical view, as did many in ancient Greece. In the more recent Western tradition, the thought of eternal recurrence is most strongly associated with Nietzsche's philosophy, but the idea has been explored by numerous thinkers and is a common trope in popular culture.
8. The proviso of a *closed* system may also not have seemed significant. The universe is a closed system. The universe may not be a finite state system, but any finite part of the universe may permit of only finitely many different configurations, or finitely many perceptibly different configurations, allowing a kind of recurrence argument. In the actual case, an analogous result may hold with regard to spatial rather than temporal repetition. If we are living in a Big World then all possible human observations are in fact made by some observer (in fact, by infinitely many observers); see Bostrom (2002c).
9. It could matter if one accepted the 'Unification' thesis. For a definition of this thesis, and an argument against it, see Bostrom (2006).
10. According to the consensus model; but for a dissenting view, see e.g. Steinhardt and Turok (2002).
11. There is considerable uncertainty about the numbers especially for the earlier dates.
12. Does anything interesting follow from this observation? Well, it is connected to a number of issues that do matter a great deal to work on the future of humanity – issues like observation selection theory and the Fermi paradox; see Bostrom (2002a).
13. Leslie defends the Cater–Leslie Doomsday argument, which leads to a strong probability shift in favour of 'doom' (i.e. human extinction) occurring sooner rather than later. Yet Leslie also believes that the force of the Doomsday argument is weakened by quantum indeterminacy. Both of these beliefs – that the Doomsday argument is sound, and that if it is sound its conclusion would be weakened by quantum indeterminacy – are highly controversial. For a critical assessment, see Bostrom (2002a).
14. Some scenarios in which the human species goes extinct may not be existential disasters – for example, if by the time of the disappearance of *Homo sapiens* we have developed new forms of intelligent life that continues and expands on what we valued in old biological humanity. Conversely, not all existential disasters involve extinction. For example, a global tyranny, if it could never be overthrown and if it were sufficiently horrible, would constitute an existential disaster even if the human species continued to exist.
15. A recent popular article by Bill Joy (2000) has also done much to disseminate concern about extinction risks. Joy's article focuses on the risks from genetics, nanotechnology and robotics (artificial intelligence).
16. Drexler is even more concerned about the potential misuse of tools based on advanced nanotechnology to control and oppress populations than he is about the possibility that nanotechnology weapons systems would be used to directly cause human extinction (Drexler, 2007, p. 57).

17. How much worse would an existential risk be than an event that merely killed 99 per cent of all humans but allowed for eventual recovery? The answer requires a theory of value. See e.g. Parfit (1984) and Bostrom (2003a, 2007a).
18. Stern and Great Britain Treasury (2006); for references to critiques thereof, see e.g. Nordhaus (2007) and Cox and Vadon (2007).
19. These numbers, which are of course approximate, are calculated from data presented in De Long and Olney (2006); see also De Long (1998).
20. Molecular nanotechnology (aka molecular manufacturing, or machine-phase nanotechnology) is one area where a considerable amount of 'theoretically applied science' has been done, although this has not yet resulted in a consensus about the feasibility of this anticipated technology; see e.g. Drexler (1992).
21. 'Singularity' is to be interpreted here not in its strict mathematical meaning but as suggesting extreme abruptness. There is no claim that any of the quantities involved would become literally infinite or undefined.
22. I use the term 'qualitative reproduction' advisedly, in order to sidestep the philosophical questions of whether the original mind could be quantitatively the same mind as the upload, and whether the uploaded person could survive the procedure and continue to live as an upload. The relevance of uploading to the present argument does not depend on the answers to these questions.
23. Absent regulation, this would lead to a precipitous drop in wages.
24. The antecedent of the conditional ('if uploading is technologically feasible') includes, of course, assumptions of a metaphysical nature, such as the assumption that a computer could in principle manifest the same level of intelligence as a biological human brain. However, in order to see that uploading would have wide-ranging practical ramifications, it is not necessary to assume that uploads would have qualia or subjective conscious experiences. The question of upload qualia would be important, though, in assessing the meaning and value of scenarios in which a significant percentage of the population of intelligent beings are machine-based.
25. To say something more definite about the probability of a singularity, we would at this stage of the analysis have to settle on a more unambiguous definition of the term.
26. The distinction between quantitative and qualitative improvements may blur in this context. When I suggest that qualitative changes might occur, I am not referring to a strict mathematical concept like Turing computability, but to a looser idea of an improvement in intelligence that is not aptly characterized as a mere speed-up.
27. Note that the expected arrival time of the singularity has receded at a rate of roughly one year per year. Good, writing in 1965, expected it before 2000. Vinge, writing in 1993, expected it before 2023. Kurzweil, writing in 2005, expects it by 2045.
28. It is possible that if humanity goes extinct, another intelligent species might evolve on Earth to fill the vacancy. The fate of such a possible future substitute species, however, would not strictly be part of the future of *humanity*.

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10

Technology, the Environment and the Moral Considerability of Artefacts

Benjamin Hale

Ever since environmental ethics kicked off as an accepted subdiscipline of applied ethics in the late 1960s, there have been two primary issues with which theorists have grappled. On one hand, there is the ontological issue of what nature is; and on the other hand, there is the ethical issue of what matters ethically. These issues have more or less been approached from two traditional but separate branches of philosophy: metaphysics and value theory.

In recent years, theorists have recast the direction of environmental ethics by taking a 'pragmatic turn', seeking to answer both questions at once. This pragmatic turn has had a number of variants: some have leaned on the American pragmatists (James, Dewey or Pierce), while others have leaned on theorists of the Frankfurt School (Marcuse and Adorno) (Bookchin, 1980, 1982; Feenberg, 1991; Light 1998; Marcuse, 1964; Vogel, 1996). Still others, myself included, have sought refuge in the insights of discourse theory (Apel and Habermas) (Dryzek, 2000; Eckerskey, 1990; Patzig, 1983), a seeming unfriendly compatriot to environmental ethics. The 'communication-centred' approach holds promise over other variant pragmatisms precisely because it overturns the dichotomies that have plagued environmental ethics from the beginning, while also providing a clear account of the normative commitments to which agents are 'always already' bound.

Of course, discourse ethics is saddled with its own set of problems, most of which pertain to its rootedness in language and consequent extreme anthropocentrism. It is my contention, however, that the way out of this environmental fly-bottle is to understand the human/world arrangement not in terms of the presuppositions of communication, but in terms of the presuppositions of interaction. The idea, in short, is to locate reasons in nature by pointing out that interactions, not just validity claims, give rise to reasons. This position – the 'interaction-centred approach' – therefore overcomes the original problems in environmental ethics by blurring the distinction between nature and culture; and, more directly, between nature and technology. With this interactive turn, however, has come a seeming intractable new problem. It would appear that if one is to discard the nature–culture or the nature–artefact distinction, then one would either have to hold that both nature and technology are morally considerable, or that neither nature and technology are morally considerable.

Peter-Paul Verbeek asks in this volume about the morality of technological artefacts, and proposes to take a 'posthumanist' position. This position, he reasons, considers technological artefacts also to have a moral status. Verbeek's strategy is to focus on the technologically mediated character of human action, and thus to emphasize that our autonomy has always been dependent upon our technology. This, he believes, entitles technological artefacts to a kind of moral status, since they are always caught up in the question of 'what to do'.

Where Verbeek's approach has its attraction, in this chapter I argue quite differently. I argue that where it is the case that nature *is* morally considerable by virtue of its independence from human determination and justification, technological artefacts, precisely because they are the product of ends-oriented justification, do not demand of us the same kind of inquiry. While not directly critical of Verbeek's analysis, this chapter instead argues that technological artefacts are themselves shot through with justificatory reasons, such that their value can be understood as solely, or mostly, anthropogenic.

To accomplish this, I discuss in Section 10.1 the difference between traditional conceptions of moral status and a more contemporary characterization of moral considerability. I then briefly review an argument for moral considerability that finds its footing in the discourse ethics of Jürgen Habermas. In Section 10.3 I cover my argument for 'interaction-centring' and follow this discussion with an examination of the considerations that go into deliberations. This brings me to the heart of this essay, where I distinguish in Sections 10.5 and 10.6 between the considerability of nature and the considerability of technological artefacts. In Section 10.7 I present a second argument against the moral considerability of technological artefacts, which I follow with a discussion of possible objections.

10.1 A different kind of value: moral status, moral considerability and the EV1

The 2006 film *Who Killed the Electric Car?* is as much a tragedy as it is a cautionary tale (Paine, 2006). Its cautionary aspects are well understood, as they point the finger for the death of the electric car (the EV1) at a bevy of interested parties, accusing the automobile manufacturers, the oil industry, the government, the hype over the hydrogen fuel cell, the California Air Resources Board, and consumers themselves of orchestrating the untimely demise of the innovative transportation technology.

At the beginning of the film, we are introduced to several EV1 enthusiasts who have been leasing and driving the car from General Motors for years.[1] As the film unfolds, we learn that the fate of the car is in jeopardy and that these drivers are powerless to do anything to save their precious automobiles. Car after car is first apprehended by General Motors, retained at a storage facility in town, and then, eventually, sent to a graveyard in Arizona to be compacted and destroyed. Former drivers protest, shout, scream, cry and pound the pavement in an attempt to keep their prized vehicles from meeting this sad end. Given the strong emotions that the film inspires, one may be inclined to suggest that the film bears witness to the natural moral outrage that ensues when an otherwise lifeless, but nevertheless extremely valuable, technological entity is destroyed. As a viewer, one feels these sentiments of disapprobation and may even be drawn to the strong conclusion that technologies such as the EV1 have 'moral considerability'.

If one were to draw this conclusion, there would be at least two important observations to make about such a claim. First, it is testament to the peculiarity of academic philosophy that the word 'consider' could acceptably be coupled with the word 'ability' to produce the unwieldy neologism 'moral considerability'. Second, it is a relic of bygone moral theories that one could make the claim that some entity 'has' moral considerability, like one might have the hiccups.

So what could one possibly mean upon arriving at such a conclusion? What one probably means is that there is something exceptionally troubling – morally troubling even – about the destruction of the EV1. On some ways of thinking, this moral troublingness could originate from no place other than some feature or attribute specific to the EV1. So naturally, one may be inclined to think that there is a morally significant attribute of the EV1 – perhaps that it is fantastically fuel efficient, or that it inaugurates a wave of new thinking about automotive technology, and that this value is intrinsic to the car. Or perhaps one will even make more abstract claims, like that human lives in the posthuman environment are such composites of technology and nature that, in a certain respect, our technology functions as an extension of our selves. P. P. Verbeek makes this claim in his essay in this volume. Perhaps this is what someone might mean if they suggest that the EV1 has 'moral considerability'. But let us examine this claim more closely.

Moral status is one of the central themes in moral theory, and virtually every normative doctrine has an accompanying theory of moral status that specifies which entities have it, which do not, and why. Very often, these theories specify some special attribute that qualifies a given entity for moral status. In some cases the 'capacity to suffer' emerges as the primary qualifier for moral status; in others, it is 'ability to reason'. The manifold criteria are wide-ranging and span the literature.[2] In recent work, I have argued against standard conceptions of moral status, reasoning along lines sympathetic with those of Kenneth Goodpaster and later theorists of environmental ethics that the moral status question is better understood as several questions wrapped in one (Hale, 2004, 2006; Goodpaster, 1978; Hayward, 1994). Let us first understand why I argue for this.

G. J. Warnock reveals the problem at the heart of these theories when he nobly takes on those who prefer strict requirements for inclusion in the moral circle. He argues that while it may be the case that *reasoning* is fundamental to being a moral agent, there is no reason to conclude from this that reasoning is fundamental to being a moral *patient*. He writes (1971, p. 148): 'Let us consider the question to whom principles of morality apply from, so to speak, the other end – from the standpoint not of the agent, but of the "patient". What, we may ask here, is the condition of moral *relevance*? What is the condition of having a claim to be *considered*, by rational agents to whom moral principles apply?' This comment is remarkable not because it offers an alternative to the strict anthropocentric requirements for moral status, but because it reveals a tendency to understand moral status as something to be *had* by the other, by the 'patient'.

Warnock goes on to reason that moral agency is an insufficient criterion for establishing the scope of moral theory. His position is that we can extend the circle of moral considerability as wide as we can possibly conceive of patients that have the capacity to suffer. This view is widely shared in the environmental ethics literature and can be found in theorists as wide-ranging as Albert Schweitzer (1936), Paul Taylor (1986), Gary Varner (1998) and even Peter Singer (1989). Actions upon others that are unfelt by those others, he reasons, are not actions that have any significance for the other, and thus have significance only for us.

As I have suggested, I think that this approach gets off on the wrong foot. I propose that the better way to understand the question of moral status is as captured by three central deontological questions: a question about moral considerability (What must we consider?), a question about moral relevance (What considerations are relevant?), and a question about moral significance (How relevant are these considerations?). So the first step in making clearer sense of the question of moral status involves dissecting it into its constituent deontological parts. I shall explain more in a moment.

10.2 A discursus on discourse

Before I get too far, allow me to examine briefly a more contemporary body of work where I think the question of moral status has potential to take on this new trajectory. In the discourse ethics advanced by Jürgen Habermas, moral status emerges via the communicative arrangement and does not appear as a metaphysical feature specific to a given entity. The details of discourse ethics have been charted countless times in countless other essays and I do not have the space to recapitulate them here (see e.g. Habermas, 1987a, b, 1991, 1995, 1998). What is important for our purposes is to see that discourse ethics is necessarily an *intersubjective* theory. It calls attention not to the *attributes* of speaker or hearer, but rather to the delicate interplay between one or more participants to discourse. It locates normative value in the exchange of claims.

According to this view, as a speaker engages a hearer, the hearer is positioned in such a way that he, as a matter of course, assumes the speaker to be making claims that make sense. Concomitantly, the speaker is positioned in such a way that she, as a matter of course, assumes that her hearers can understand and make sense of her claim. As discourse is generally a symmetrical affair, either participant to discourse can, at any given time, assume the role of either speaker or hearer; and in a normal communicative interaction, a participant will assume both roles throughout the course of the discussion. All participants therefore bring to the table a mutually shared set of background assumptions that inform the claims that they raise in the context of discourse. In particular, they share the assumption that their claims can always be challenged or put to the test of other interlocutors. This is true about all claims, whether they be regarding truth, truthfulness or rightness.

On this view then, the rightness and wrongness of norms is cast not in terms of the good, but in terms of whether the norms in question have been justified. And in this case, the justificatory apparatus is communicative interaction. The Habermasian view is therefore cognitivist, since it proposes that we can understand our obligations to one another by assessing the formal commitments to which we are always already bound. It is fallibilist, because it acknowledges that any given decision should always remain open to the objections of a community of interlocutors who may be affected by that decision. It is critical, because it defines the right in terms of what is justified (or as what has gone through the correct justificatory process). And it is pragmatic, because it does not make a claim about the metaphysical nature of the good. In short, Habermas effectively detranscendentalizes Kantian moral theory to apply not to transcendental presuppositions of reason, but instead to the formal (or universal) presuppositions of discourse.

This reformulation results in two related principles: the Principle of Universalization (U) and the Principle of Discourse (D). Here is (U) as stated by Habermas (1991, p. 65):

> (U) *All* affected can accept the consequences and the side effects its *general* observance can be anticipated to have for the satisfaction of *everyone's* interests (and these consequences are preferred to those of known alternative possibilities for regulation).

This differs only slightly from (D), which states that:

> (D) Only those norms can claim to be valid that meet (or could meet) with the approval of all affected in their capacity *as participants in a practical discourse*. (Ibid., p. 66)

For obvious reasons, both (U) and (D) pertain strongly to the topic of moral considerability. While the differences between the two may appear minimal, (D) differs from (U) in its emphasis on participants to discourse, and according to Habermas, (U) differs from Rawls's recommendation that normative principles be universalizable because it requires from participants a real consideration of others.[3] For one, 'the principle of universalization is intended to compel the *universal exchange of roles* that G. H. Mead called "ideal role taking" or "universal discourse"' (Habermas, 1991, p. 65). There is a good pragmatic reason for this universal role-taking. This Meadian role exchange functions both descriptively, by explaining the pragmatics of meaning production as it operates in the real world, and normatively, by acting as an ideal standard to which interlocutors might appeal. It functions to distinguish discourse theory from Rawlsian contract theory by providing for (U), the demand of interlocutors that they in fact *do* take the interests of others into account, not just that they *could* do so.[4] In this way, (U) and (D) function as detranscendentalized variants of the categorical imperative and the Rawlsian difference principle. Thomas McCarthy (1978, p. 326) explains Habermas's reformulation of the categorical imperative, and by extension, Habermas's reformulation of Rawls's universalizability requirement, this way:

> Rather than ascribing as valid to all others any maxim that I can will to be a universal law, I must submit my maxim to all others for the purposes of discursively testing its claim to universality. The emphasis shifts from what each can will without contradiction to be a general law, to what all can will in agreement to be a universal norm.[5]

Thus, both (U) and (D) are real tests that Habermas says *ought* to be applied in all instances where there is potential disagreement, and tests that he justifies by suggesting that these are principles that we 'always already' apply.

Though Habermas does not tend to the question of moral status directly, status appears to be dependent upon the capacity of an individual to engage in communicative interaction. Since non-humans – non-communicative or 'asymmetrical' others – cannot make meaningful claims in the context of communicative interaction, they are generally excluded from the 'circle of moral considerability'. But it is my contention that this elides an important problem, and elides many of our common intuitions about what is morally worthy. What I propose, instead, is a dramatic reworking of the question of moral status so that it can be understood in deontological terms. If we make such a move, we can 'expand the circle' of discourse ethics to include non-human, non-communicative entities with whom we are only asymmetrically related.

My strategy elsewhere has been to gain access to others with whom we are asymmetrically related – others, in other words, who do not maintain a communicative capacity – by way, first, of a reinterpretation of the question of moral status, and second, of an attention to the details of all forms of interaction, both communicative and strategic. Where Habermas proposes that we take a 'communication-centred' approach to the question of normative obligation, I propose that we take an 'interaction-centred' approach to the question of moral considerability.

10.3 Moral considerability and interaction-centring

I do not have the space in this essay to offer the full argument that gives this position its strength, but the main points of the interaction-centred approach are the following:

1. Decisions to act involve either explicit or implicit endorsement of a particular claim about what is justified.
2. What is justified is what has passed tests of justification, which in this case involves standing up to the scrutiny of others in practical discourse via communicative interaction.
3. Communicative interaction between two subjects is guided by several key normative presuppositions, and these presuppositions can be assessed by examining the formal structure of communicative reason.
   (a) This formal structure requires, by virtue of the necessary presuppositions of communicative reason, that speaker and hearer consider all articulated validity claims of all parties before endorsing or rejecting the claims.
4. Non-communicative interrelations between subject and non-subject can be examined in much the same way that communicative interactions between two subjects can be examined – by assessing the formal structure of practical reason.
   (a) This formal structure requires, by virtue of the necessary presuppositions of practical reason, that rational agents consider all relevant claims, articulated and unarticulated, before choosing to act (and thus endorsing a claim).
5. Insofar as it is a formal pragmatic requirement of communicative reason that one assess, evaluate and weigh all articulated validity claims for relevance and significance, it is also a formal pragmatic requirement of practical reason that one consider carefully the implications of one's action before choosing to act.
6. Not doing so therefore constitutes a failure of practical reason, and amounts to a performative contradiction.

This is (loosely) the argument that I have advanced elsewhere (Hale, 2004, 2006). The grand import of this argument is that one has an obligation to respect the claims of others, as well as to seek out claims, perhaps where they are not immediately evident, before undertaking to act. With regard to practical deliberation, this means that justified action occurs only when the principles that guide actions have gone through and passed the tests of extensive justificatory deliberation. More practically, this means that the reasons that guide all of our actions – whether they impact on individual agents (with so-called undisputed and inalienable rights), individual non-human animals (who stand on the periphery of traditional moral status boundaries), or abstract environmental entities (like species, ecosystems and aquifers, which are widely presumed only to maintain moral status on expansive ecocentric or holist views) – must be subjected to the scrutiny of justification. Put differently, we, as moral actors and agents, bear the burden of demonstration that our actions are justified. We bear the burden of seeking out conflicts with validity claims as well as of evaluating validity claims that are presented to us by affected parties. This burden is exceptionally strong if all of nature is morally considerable, as I believe; but it is also very weak, because it does not insist upon rigid protections. Constraints are to be hashed out only upon the determination of the relevance and significance of considerations.

Acknowledging this point involves adding at least one further stipulation to Habermas's two central principles (D) the Discourse Principle and (U) the Principle of Universalization. What I have argued is not that Habermas is wrong about what counts as a justified action, but only that moral status is better understood as a question for the agent. Moral decision-making must still subject itself to the aggressive and strong requirements of Habermas's (U) and (D), but it must now also answer to a considerability requirement:

> (C): All participants to discourse are required to assess and evaluate the interests, needs, and integrity (as considerations) of all affected, whether those affected are participants to discourse or not.

The addition of (C), I believe, results in a critical emendation to (U), the altering of which places the justificatory burden of proof squarely on the shoulders of the decision maker:

> (U′): All affected can accept the consequences and the side effects its *general* observance can be anticipated to have for the satisfaction of *all interests and needs*, insofar as they are discernible (and these consequences are preferred by actors to those of known alternative possibilities for regulation).

Of course, the strength of Habermas's discourse position is that real participants to real discourse under ideal conditions are called upon not just to 'imagine' what others might want or need, but instead to test their claims about what others might want or need by subjecting these claims to public scrutiny. Unfortunately, the world is not structured in such a way that all morally relevant considerations are accessible to all parties to discourse. The world is replete with 'asymmetrical' others who are simply incapable of offering up challenges to validity claims. That they are asymmetrically related to humans cannot count as a criterion for exclusion from moral consideration without extraordinarily unpalatable consequences. This much was made clear during the multiculturalism and diversity debates of the mid-1990s.

10.4 Considerations and deliberations

Allow me to clarify. At any given decision juncture, an agent faces a plethora of options, any one of which could turn out any given way. Each option, therefore, has a near infinite set of prognoses which reflect how the world will respond to the given option once it is chosen.[6] Options can also be understood, however, as maintaining a near infinite set of considerations, any of which will pertain both to the option and its prognoses.

Justified courses of action can be understood as considered options, where relevant and significant considerations are assessed and evaluated through some justificatory procedure, the nature of which is not important for this essay. In Habermas's work, the justificatory procedure is real-world communicative deliberation; in Rawls's work, it is the hypothetical process of achieving reflective equilibrium. Importantly, considerations can sometimes be understood in agent-neutral terms, where states of the world, the good that is sought, define the value arrangement. But they can also be understood in agent-relative terms, where outcomes of an action have value only for a given agent, where deontological constraints limit a given set of options, and where agent-specific obligations (like promises) require individual agents to lean in the direction of a given course of action. Some considerations will be completely irrelevant, and so will not pass the relevance test, where others may be relevant and bear very strongly on the decision. With regard to moral considerability, it is important for an agent to evaluate and weigh all considerations prior to deciding to act. This is true in discursive as well as in non-communicative deliberation.

So moral considerability understood on this way of thinking is really quite different from moral status traditionally conceived. First, as I have explained, moral considerability refers not to the objects themselves, but only to the considerations that arise by virtue of some entity's interactions with the world. A tree is morally considerable by virtue of its constituent considerations: that someone climbed it as a child, that it has fewer leaves this year, that it is near a farmhouse, that it produces acorns, that it grows of its own accord, and so on. These considerations are very much tied to an agent's reasoning about what to do. The same can be said of more and less traditional moral status-bearing entities: a young child is morally considerable by virtue of its fledgling consciousness, its relationship to its parents, its future earning potential, its ability to feel pain, and so on. An individual adult cougar is morally considerable by virtue of its ability to feel pain, its uniqueness, its endangeredness, its beauty, its place in the feline pecking order, etc. A species is morally considerable by virtue of its uniqueness, its necessity to the ecosystem, the interests of each individual of which it is composed, its role in the evolutionary chain, etc.

Second, the normative force of all considerations emerges from the rational actor, and not from the entity itself. This is true, so to speak, before the filter for relevance is turned on. On this line of thinking, therefore, many *irrelevant* considerations are also morally considerable about a child – that his name is Jasper, that he has not yet begun walking, that he is nearly bald like his father, that he is presently holding his bottle, and so on. The swirl of moral considerations surrounding any entity may include a range of seemingly crazy and not so crazy facts: that it has a unique fur pattern, that it is right in front of me, that the light is gleaming in its eye, that it has nowhere to run, that it is baring its teeth, and on and on. In most circumstances, the myriad considerations will be irrelevant to any specific choice or course of action. It is instead up to agents to determine, collectively through discourse or individually through reflection, the relevance and significance of these considerations. More importantly, it is critical that the agent do so in a way that is charitable, honest, forthright and fair; as well as to subject his claims about right and wrong to the scrutiny of others. It is a presupposition of practical reason that one act according to reasons that could pass tests for validity.

Third, many people believe that moral status entitles entities to certain protections. If we say that a person has moral status, then we mean that we are constrained from doing certain things to that person. If we say that an animal has moral status, there are further constraints on our behaviour. To say that nature has moral status, which I argue for elsewhere, suggests that our actions should be constrained to the point at which we cannot do much at all. Or so goes the orthodoxy. My view is that we should reinterpret the question of moral status as a question about what we must consider, as a deontological question about moral considerability. The practical effect of this view is that morally permissible actions bear the burden of justification, which occurs through discourse, and so constraints will vary depending on circumstances.

10.5 Considerations in nature

Suppose I must decide whether to build a school on a wetland marsh. To be justified, this decision must entertain a plethora of concerns, and it must do so in a way that ensures that nothing is left off the table. At first, then, all possible considerations must be assessed in an impartial and undifferentiated way: the prevalence of endangered species, the type of building to be built, the need for that school, but also the milliseconds that the town clock loses over a single day, the number of hairs on Pedro Almodovar's head, the smell of basil on a warm summer evening, and so on. Of course, a great many of these considerations can easily and rapidly be disposed of, the latter several being of just that sort. Many others, conversely, will present themselves as manifestly significant, and still others will present difficulties as to their relevance and significance. The amount of wetland area remaining on the globe, the buried gum wrapper of a now-grown teenager, the rate at which your fingernails grow, etc. – these are all considerations relevant in certain contexts, but utterly irrelevant in other contexts. (If this sounds patently ridiculous, or at least epistemically implausible, consider the boss who says to his employees: 'But have we considered *everything*?' He asks not just whether all relevant considerations have been taken into account, but whether every possible base has been covered. He asks his employees to seek out all angles hitherto considered or unconsidered; and he views this as their obligation.)

Naturally, most of this deliberation will have to take place at the level of real public discourse. Scientists, economists, local officials, landowners, private stakeholders, schoolchildren, biologists and 'all affected' are obligated to play a part in the discussion about how to proceed, about whether this is a worthwhile endeavour. Much of this is outlined by discourse theory. What is not outlined by discourse theory, however, are the requirements brought to bear on each participant to that discourse. Here we can see that each participant to the dialogue has an obligation not only to hear the claims of all affected parties, but actively to seek out criticism of the proposed course of action; to consider the implications of the course of action on a world that is otherwise closed to the purposes of humanity.

If we can grant this, then the very idea of moral status takes on a different hue. On this line of reasoning, moral status does not inhere in the entity, but rather, moral considerability stands as an obligation of the agent. All decisions are of the sort described above; and all decisions face the prospect that an Other, either nature or the free will of agents, will push back and create further considerations. Because of this, nature is a *source* of consideration: it generates considerations like other wills generate considerations, independent and external to our individual or collective decision-making process. What is morally noteworthy about nature, then, is that it is a constant resource of unconsidered relations, interests, needs, sentiments, and so on. The pains of animals demand consideration, the health of trees, the integrity of ecosystems,[7] the vitality of species – these are all considerations over which we humans exert no generative power. These considerations emerge on their own, precisely because humanity does not maintain a thoroughgoing dominion over these aspects of nature. Of course, every consideration is impacted somewhat by the decisions of humankind. As such, nature demarcates the point at which our wills bump up against the rest of the world.

Thus, the conclusions of the view that I have advanced are both very strong and very weak. The reasoning works such that almost nothing in the world is morally inconsiderable. Or, put differently, that everything in the world is morally considerable. We have an obligation to consider *everything*. Everything, I should qualify, *except technological artefacts*. Due to the peculiar nature of the technological artefact – it is *already* a product of careful consideration – when making a determination about what to do, we have no obligation to *re*consider it. We can, in effect, look beyond the technological dimension of an artefact, since *it has already been considered*. Its technical component is not relevant to its moral status.

10.6 The emergence of technology

Suppose now that I intend to create some technological gizmo to help me achieve a particular end. Suppose that prior to doing so, I work through the requisite technical and justificatory questions – What do I need? How will it work? Will it harm others or impinge on their rights? and so on. I determine that the gizmo meets all of the relevant criteria that qualify it as prudent and justified. Suppose that after this requisite deliberation, I go forward with its development, creation, and even put it into use. This, we may assume, is what we do when we create technological artefacts. Because this is roughly the process by which a technological artefact emerges, the artefact cannot be said to generate new considerations in the same way that nature generates new and novel considerations. Instead, technological artefacts are the *outcome* of a process of deliberation.

Before getting too far, one may object with this assertion outright: that this does not accurately describe the deliberative process by which we create technological artefacts. There are clearly many technologies that have not gone through this procedure, that have not been subjected to such rigorous moral scrutiny. Nuclear technologies, space technologies, weapons technologies, and so on, all raise issues about the moral temerity of their creators. But simply because there are some technologies that have not gone through this deliberative process does not mean that this is not the technical ideal. The observation that there are many cases of ill-conceived technologies no more indicts this claim about the nature of the process of artefact creation than the observation that many industries have emerged thanks to the exploitation of labour or the exploitation of tax loopholes indicts the claim that one must ensure that production does not violate the rights of citizens or accords with tax law. Of course it is *possible* to forgo or cut corners on the deliberative process – we do it all the time – but if we value reason and the reasons that we have for taking actions, we ought not to.

My claim then is that technological artefacts, unlike almost all other objects and entities in the universe, are the *products* of a deliberative and justificatory process geared to create objects with express ends, and in this respect are not generative of new considerations. As an outcome of justificatory deliberation, the only further question that must be asked of the technological artefact is not 'Does it have value in itself?' but 'Does it serve its purpose?' The creation of a technological artefact is presumably a paradigm implementation of the deliberative process. As such, considerations that emerge in the wake of the creation of a technological artefact will always be tied to the initial consideration that gave rise to the artefact in the first place.

One may object to this claim as well. Plainly some of the development of the gizmo will be generative of new considerations. There is now a gizmo where before there was no gizmo. Surely this is a new consideration. But the simple fact that there now is some*thing*, where before there was no*thing*, does not generate considerations that have not already been taken into account in the deliberative process that gave rise to that something's existence in the first place. Therefore this gizmo, the technological artefact, is considerable only by virtue of the considerations that have emerged, so to speak, apart from it.

To put this more formulaically, suppose a set of considerations $C[a, b, c, d, \ldots, n]$ go into artefact α. This set of considerations must be weighed and evaluated together. Artefact α does not become a new consideration on top of the other considerations. Suppose now that I bring together several considerations to create an artefact β. Suppose I want to (a) clean out my toolbox, (b) dispose of some old string and wire, and (c) catch a butterfly. Suppose that I can fashion a butterfly net (β) using just the amount of string and wire in my toolbox. If I build this net and use it to catch a butterfly, I will have done something very nice for myself, and fulfilled many of my purposes. The question here is whether this artefact β, this butterfly net, suddenly takes on a new nature as an artefact in itself, or whether all of the purposes and considerations that went into its construction are already incorporated into the object.

Surely, there are new considerations generated by the development of β, but all of these considerations $C[\beta]$ are not intrinsic to β, but rather related to its possible purposes or uses. β could be used (i) to snare moths, or (ii) to catch fish, or (iii) to make bubbles. $C[\beta_i, \beta_{ii}, \beta_{iii}, \ldots \beta_n]$ are, one might reason, new considerations independent of the considerations that initially justified the creation of β in the first place. So there are now new considerations, none of which are the end result of the intent or will of the creator. We might think that these are unforeseen considerations. But in this case, and I suspect in all cases of technological artefacts, all iterations of considerations are tied to the use of the artefact. Alternative considerations may always emerge, of course, but if they do, this has little do to with the technology and more to do with the artefact as a raw resource. Consider then the somewhat more complex objection that many devices can be broken down and put to uses for which they were not intended. A hammer can be used as a plumb bob, a toothbrush can be used as a weapon, a circuit board can be used as a serving tray, and so on. One may say that this plurality of uses, all told, is not subject to the same justificatory process as the process employed in the creation of initial artefact itself, and so therefore the artefact is, by virtue of this, morally considerable. But I submit that this line of reasoning so thoroughly reconfigures the artefact such that it loses its status as that technological artefact. It reverts, so to speak, back to a resource: back to a mere thing (Feinberg, 1980; Hunt, 1980; Frey, 1980).

To see this, we would be wise to distinguish between several aspects of the technological artefact. First, an artefact is a thing. Second, it is a creation of rational beings. Finally, it is a device of *techne*, a creation of rational beings for some purpose. All told, these are at least three critical aspects of the technological artefact. The latter two of these three – that it is created by rational beings for some purpose, and not that it is a thing – suggest that its value is tied expressly to the purpose for which it was created (see Bloom, 1996; Simon, 1996; Verbeek, 2005). In other words, technological artefacts are all system and no lifeworld (see Habermas, 1970, 1987a, b; Feenberg, 1996). The value of a technological artefact is its value to us. Apart from its thingness, its historical rarity and its aesthetic qualities, its value is constructed on a string of justifications. The argument for moral considerability that I have advanced requires that we must consider the *unjustified* world; the world that stands apart from our imprint of rationality and that asserts itself upon us.

10.7 Constraints, consideration and artefacts

As I mentioned earlier, moral status is often taken to imply that certain constraints must be placed on treatment of the entity with that status. It is therefore common to meet with the objection that attributions of moral status to nature result in such paralysing restrictions on action that they cannot be taken seriously (Regan, 2004; Callicott, 1989; Zimmerman, 1997). If all of nature has moral status, goes the reasoning, then one could hardly take action without violating some right of the valued entity. This conclusion becomes that much more problematic if moral status is attributed not just to nature, but to technological artefacts as well.

My approach has been to recast the question of moral status in deontological terms. If the deontological constraints that emerge from this view stipulate only that an agent must consider seriously an action before undertaking to act, then there is little need to specify the extent to which these deontological constraints function. The requirement of the position is that the reasons that guide an action must be justified by meeting with and passing stringent validity tests. So let us approach the question of the creation of the artefact from another angle. Doing so will allow us to see how technological artefacts differ from other creations of humans.

Consider a common non-technological artefact – an artwork. If I create a painting, I first place a brushstroke on a blank canvas, creating, in effect, a mini-painting. Let us call this blank canvas P and the canvas with the first brushstroke P^1. We can see that P^1 necessarily involves, in many respects, the destruction of the blank canvas P, but also the creation of a new object. We can then understand the next brushstroke as P^2 and recognize that P^2 involves, plainly, the destruction of P^1, just as much as P^3 involves the destruction of P^2. With every stroke the artist is engaged in a project of destruction and creation, such that every subsequent brushstroke can be understood as destructive of the previous work of art. It is only once we have arrived at P^n (where n indicates the number of brushstrokes that meet the satisfaction of the artist) that we can say that a true artwork has been created. As the creator of the artwork, the artist is involved in a continual evaluation and consideration of each state of the canvas, from P through to P^n. It is true that a new artwork is created and then destroyed with every flick of the brush, but it is also true that the new artwork generated in its wake has gone through the justificatory and evaluative process privately available to the artist and his consideration of his canvas.

On traditional conceptions of moral status, if the artwork were to be granted a 'special' moral status, each iteration of the painting would involve a violation of its previous instantiation. On the interaction-centred approach, the considerations generated by the artwork are tied both to the intentions of the artist as well as the world as it pushes back. If the paint does not lie right, the artist will respond accordingly, manipulating the canvas to do his bidding. In this case, we can see quite plainly that there are no new considerations that emerge over the creation of the painting apart from the agent-relative considerations involving the painter and his work of art. The canvas is not injured or violated, and it does not suffer degradation as paint is cautiously applied.

In a certain respect, the same process is under way in the development of all artefacts. An actor considers a course of action, assesses the world around him, and chooses to act accordingly. Sometimes she may choose to characterize such artefacts as artworks, as when a painter puts his mind to the production of a portrait, and sometimes she may characterize these artefacts as technological, as when an agent creates a device to fulfil some purpose. In the case of the technological artefact, what matters is that the artefact fulfil its intended end. In the case of the artwork what matters is what the author intends the artwork to convey, represent, look like, be, and so on.

Suppose now that I decide that I will make a work of art out of someone else's artwork, as was the case when Toronto art student Jubal Brown ingested dye and paint, walked into the Museum of Modern Art, and flamboyantly vomited all over Piet Mondrian's *Composition in Red, White and Blue* (DePalma, 1996). Not surprisingly, his act inspired public outrage. Many felt that a crime against history had been committed, that the valuable artwork had been irrevocably destroyed, and for no reason. Brown's position that his was an artistic act won little favour with a sceptical public.

One might be inclined to think that the problem here is that the work of art itself was morally considerable. But that is not so clear to me. It seems to me that the problem is that the artwork functions as a source of considerations, and provides for interpreters a range of possible delights that are tied tightly to the psychology and expression of the respected artist Piet Mondrian. If this is true, then it is Mondrian and his aesthetic judgement that we respect – his creative genius, he as an artist – and we are outraged because the new painting, covered with Jubal Brown's fluorescent vomit, is not what Mondrian would have wanted or intended. The work of art was degraded through this act, sullied by the violation of the relationship between the artist and the work of art. Many human creations, of course, are sources of considerations just as nature is. This is what inspires us to outrage when Jubal Brown vomits on Mondrian's painting. Brown overrides Mondrian's process, abuses the rights and values of the artist. It is an assumed abuse of Mondrian, of what Mondrian would have wanted, of what he would have willed. Suppose, by contrast, that Mondrian himself had done the vomiting. I think the act would have been viewed differently. Mondrian can effect a change in his artwork legitimately, for he is the originating artist. He can do so in a manner that bespeaks justification, for the painting is his creation, and the process by which an alteration to the artefact becomes justified is reflexive.

This is not, of course, to suggest that such an act of destruction is always justified if it originates from the author of the artwork. The act must still withstand the scrutiny of an affected public. Suppose that Mondrian were to lose his mind and then destroy his painting, as Nikolai Gogol is reputed to have destroyed the second instalment of *Dead Souls* shortly before his death (Mirsky, 1999). In this case, we may face some difficulty in claiming the act justified. We may want to say that an artefact of great value has been lost. In claiming this, we may have firm ground to support us, as Mondrian's painting has been widely respected as complete by art critics the world over. But it is nevertheless the privilege of the artist, the creator of the artefact, to call the artwork complete, and so we would need to argue our position on grounds either of bifurcated Mondrians – that the early Mondrian, the true artist, would not have desired such a change, while the later Mondrian was an imposter on the early genius – or we would have to argue that Mondrian's judgement about art was not quite as good as we had once thought it to be. But we would not want to argue that there was a significant moral violation, as was the case when Jubal Brown took his regurgitative liberties with the *Composition in Red, White and Blue*.

Consider now the moral dimension more closely. Suppose that I approach a person in the street and decide that I will transform *her* into a painting. Suppose that I decide so without her consent. I begin applying paint to her face, to her arms and legs, as she implores me to stop. If I apply paint to the face of this stranger, each stroke of my brush consists of a single act in itself. With the first movement of my brush, this stranger may have reason to be quite angry with me. My movement from P to P^1 is a violation of her rights. By my second stroke, she may be livid; and so on down the line – from P^1 to P^2, from P^2 to P^3 – such that each stroke of mine on her body involves a separate act and constitutes a continued violation of her person. If I persist and she objects, her objections, and the outrage of all observers, will likely grow louder with each stroke. My decision in this case is not a singular decision based on one consideration about whether the act of creating an artwork is justified. It is a decision that involves many considerations, all of which change as I push on the world and the world pushes back. My victim is generative of new considerations and I must evaluate each action of mine. Suppose instead that the stranger *asks* me at the outset to create a painting of her. I begin by applying paint to her face. If this is so, each of my brushstrokes, from P^1 to P^n, can be viewed as one permissible act: that of transforming this stranger into a painting. Considerations arising during this process are just as they would be were she an inanimate canvas. She is no longer generative of considerations related to the painting. The painting is my work, not hers. After a few strokes, suppose she changes her mind, deciding that she does not like her transformation from person into painting. She asks me to stop. If I do not stop, and instead continue because she has asked me to create a painting of her, I will be violating her will. This much is clear. What is clear is that my action, heretofore justified by her consent and my consideration of her will, has lost its justification. Her will has changed and each of my new paintings, P^5, P^6, P^7, constitutes a continued and single violation.

Suppose that I do something slightly different. Suppose I decide that shaving my cat will make for a dandy afternoon.[8] Suppose that I begin this activity to the squeals and protestations of the cat. One might believe that this too constitutes several acts wrapped in one. My decision to shave the cat is not a singular decision, but rather a series of decisions, like my decision to paint a stranger. I may be forgiven for my indiscretion upon the first pass of the clippers. I may not have known, for instance, that the cat did not want to be shaved, but only learned this upon taking clippers to fur. On this line of reasoning, I would not necessarily be wrong to start shaving the cat, but would be wrong to continue shaving the cat. The cat, like the stranger, is generative of considerations.

Suppose further that I decide that I will carve a living tree into a living sculpture. Suppose I do so over some time, such that it becomes clear halfway through my project that my tree will die if I proceed. In this case, it would be internally inconsistent of me to continue, for my living sculpture will, at the end of my project, no longer be living. But suppose that I intend instead to carve a living tree into a dead sculpture. I can do this in at least two ways. I can cut the tree down beforehand and make my sculpture, or I can kill the tree via the process of making my sculpture. If I choose the former course of action, then I have several matters to consider prior to the cutting down of the tree – is it beloved? Do people want to keep it around? Is it rare or one of a kind? Do other species depend on it? etc. Once the tree is felled, I need not consider again whether I should fell it. If instead I choose to kill the tree by way of making it into a sculpture, such that it endures a slow death, then it seems to me that I have very different considerations throughout my act. I must ask at each step along the way whether my act is justified, whether each gouge of my sculpting tool is permissible. Should I continue?

Now apply this to technological artefacts. As we have seen, all artefact creation goes through a process much like the one I describe above: an actor engages the world, assesses the situation, evaluates relevant and significant considerations, and determines how to proceed. Upon making this decision, he undertakes a process of destruction and creation until his end is achieved and a complete artefact emerges. The creator of the technological artefact is no different. He determines that some artefact is necessary to fulfil some purpose, either his own or that of others, and he creates an artefact to fulfil that purpose. The difference between the technological artefact and the artwork lies here: that the intended purpose of the artefact is presumably available to all rational agents, or at least to all who can understand and fathom the purpose of the artefact, and not seated in a private relationship between the artefact and its creator. Any degradation that the artefact might be said to undergo is degradation only to its intended use. Like the sculptor who decides to carve a sculpture from a dead tree, no new considerations emerge during this process of destruction and creation.

With this analysis of artefact creation, we can see that the conditions under which one might object to the destruction of an artefact do not obtain in the case of technological artefacts. The purposive aspects of technological artefacts are importantly tied directly to their uses and not to assertions of the wills of their creators. Inanimate technological artefacts do not have wills, are not generative of further considerations and thus do not push back. Nature and art push back.

10.8 Objections

My claim is dependent upon the assertion that technological artefacts have already been subjected to purposive consideration and do not act like the natural world in generating for us novel considerations. Simple instances of technological artefacts, like hammers, cellphones and electric cars, may be too easy. There are many technologies that interface a great deal with the natural world, and in doing so, remain immune to the systemization of instrumental reason.

Technologies of dominion

Consider some *biotechnological creations*, like genetically modified organisms. They are in many respects artefacts of technology, the creations of science. They are created in a lab with extremely precise technologies in order to fulfil some purpose. Yet if we carry this line of reasoning to its natural conclusion, as many advocates of GM technologies are wont to do, one might rightly ask whether even non-genetically modified livestock could be considered 'artefacts', since they are the products of animal husbandry. We also choose to raise livestock for some purpose and we also use technology to ensure that they will propagate, flourish and survive.

Yet these organisms, we can assume, will take on a life of their own once they have been created. They become self-organizing and self-sufficient upon their creation. They are alive, and in this case, this is sufficient to disqualify creations of biotechnology from the category of 'artefact'. Genetically modified organisms are not *mere* things. They are living organisms, with interests and needs. Insofar as they exhibit attributes that can be understood as interests and needs, we can understand them as generative of considerations, just as in our cat and tree example above. It is not their technological origins that are at issue, except insofar as we have committed ourselves to their existence. Livestock and genetically modified organisms, unlike inanimate technological devices, are *generative* of further considerations. They reveal to us considerations that are not caught up in their originally intended purpose. When we create them, we cannot limit the purpose to which they are put. They have experiences, which we do not control. They have desires, which we cannot intend. If we could eradicate these other considerations from their development – as might be the case if we could grow genetically modified meat in a Petri dish (see my piece on this topic, Hale, 2007), then there would be no further problem with regard to their moral considerability. Their flesh would be living, but more or less inert.

The same might be said of mountain trails or of river beds or of ocean shore. Certainly, we manipulate these natural areas to be just as we want them to be. But it is not so clearly the case that these landscaped areas qualify as 'artefacts' of our own creation either. The ocean encroaches on our planned boardwalk; Virginia creeper tickles its way into our garden paths; the rocks and wind and pine needles clutter up our carefully manicured trails. Nature makes its presence known, and it is nature with which we must contend; it is nature that presents new considerations, hitherto unforeseen, that alter our moral commitments to the trailhead or river bed or shore.

Technologies of intelligence

This raises a second issue. What of extremely complex and artificially intelligent artefacts? Are these systems not generative of considerations? In an essay of this length I do not have the space to outline a theory of artificial intelligence. However, a reasonable response can come out of the distinction between weak AI and strong AI. Weak AI understands as intelligent systems those that fulfil strictly algorithmic purposes, like chess-playing computers. Strong AI, by contrast, understands as intelligent systems those that take on a life of their own, or become self-aware. If a system can accurately be classified as truly artificially intelligent in the strong sense (supposing we can agree on a criterion to establish this), then it seems to me that it must also be generative of new considerations.

Consider briefly the weakly intelligent chess-playing computer. It seems to me true that chess-playing computers are *at least* generative of considerations. Plainly, they offer up responses to our actions, much like animals do. If we move our knight, they respond by moving their rook. But look for a moment at the sorts of considerations they generate. These considerations are tied directly back to the use for which they have been created. In a world without chess, the considerations that they generate are useless. Consider, by contrast, the fantasy robots of strong artificial intelligence, like *Star Trek's* Data or *2001*'s Hal 9000. Here are artefacts that can reason, that have consciousness. These artefacts, it would appear to me, are generative of further considerations that stand apart from their originally intended use. They are self-organizing in a way much more like animals than chess-playing computers.

In both cases, either of weak AI or strong AI, new considerations emerge. If the intelligence is weak, it is algorithmic and tied to the purposes of its creators. If it is strong, on the other hand, it is intelligent according to some functional description, and it very much can be generative of considerations that did not go into its creation. This distinction and the related question of moral considerability, unfortunately, is fodder for another essay.

Technologies of mediation

Some technologies are generative of considerations in yet other ways. Don Ihde (1990, 1998) mentions at least two ways in which technologies can mediate our experiences: they can either function as an extension of our body, such that we experience the world through them (as 'embodiment artefacts'), or they can provide for us a new relation to the world, such that we come to interpret the world in conjunction with them (as 'hermeneutic artefacts'). The embodiment artefacts of the first sort may include items such as spectacles, automobiles, walking sticks, prosthetic limbs, and so on. Imagine that a prosthetic device enables you as an amputee to circumambulate. Would we not want to say that the artefact has value in itself? It certainly may seem so. But from my vantage, that seems patently absurd. The artefact is valuable, to be sure, but its value is tied directly to its user, directly to the reason that it was created in the first place.

The hermeneutic artefacts of the second sort include such objects as thermostats, MRI machines, telescopes and so on. But hermeneutic artefacts are no more generative of considerations than a hole in the wall is generative of considerations about what is on the other side. These artefacts are used for a specific purpose, to teach us something about how the world is. Like chess-playing computers, they are generative of considerations to be sure; but these are the considerations for which they were created.

There is yet a third sense in which technologies may be said to mediate our moral decision-making. Some technologies make some acts morally acceptable that might otherwise not be acceptable. Invasive medical technologies, in particular, offer up possibilities for actions that hitherto would be impossible. Stitches and sutures make it acceptable to cut a person open, where before this would have been unacceptable. Other technologies make single acts morally reprehensible. The mechanization of the slaughterhouse, of forestry practices, of fishery harvesting, make the simple extraction of a resource into coordinated devastation on a heretofore unimaginable scale. In this sense, then, one might reason that the technology is the difference that makes all the difference. Indeed, the technology does generate new considerations. Railroads that are used to transport cattle, 13 km-long trawl nets, feller bunchers capable of decimating acres of forest in days instead of months, do not present these new considerations to us, but function rather as sources of considerations.

Technological artefacts are always a part of the consideration of what to do. I cannot contemplate a policy solution to cure river blindness if I do not have a means of implementing the solution. Verbeek is partially right about this. Technological artefacts *are* always a part of our moral deliberations, and thus bear on our possibilities for doing right and wrong. But they are not generative of new considerations any more than my car is generative of the consideration about whether to turn right or left at the traffic light. The existence of my car makes it possible for me to turn left at the traffic light but I have already considered, presumably, whether to drive or to walk, and need not revisit consideration a second time.

Relational values

Some might still object to this view, suggesting that technologies can be just as unique, rare and interesting as endangered species and artworks. Rube Goldberg machines are rare, wild, creative and fun. When they work, this is value unto itself. I am inclined to think that this also counts as a consideration in itself. Some artworks are of this nature, and to some extent my butterfly net is of this nature. If I create a fantastic butterfly net, using uncommon techniques, attention to detail and creative flair, then I may have created something new and exciting – something rare and valuable. But this rarity is extrinsic to the technological aspects of the artefact, independent again of the considerations that went into its development. Edison's first gramophone – this rare, unique and fascinating artefact – is itself valuable by virtue of a consideration specific to that artefact, but nevertheless extrinsic to it. It has historical value, educational value and aesthetic value. The technological aspect of the gramophone, its ability to play records, on the other hand, can only be understood as valuable insofar as it continues to work or insofar as individuals still find value in it. Because it is the result of many considerations, it is constructed entirely of considerations.

Technological artefacts do not take on a life of their own once they are developed. They fit squarely into a nexus of human creations that emerge out of system thinking.

Conclusion

What I have argued is that the uses to which technological artefacts can be put are separable from the considerability of the artefact itself. While we may say such things as that the artefact is worthy of moral consideration – as an art object, as an archaeological signifier, as a resource – the *technological* artefact as a piece of technology created for an express purpose, is not. It is only considerable insofar as it is valuable to somebody. The circuit board on my father's Commodore 64, the keypad of a mass-produced shortwave radio, the drained batteries that sit in my dresser drawer: these are not useful except as raw resources – as doorstops or wall decorations or relics of a time gone by.

My conclusion may seem counter-intuitive or unacceptable. If 'everything in the world' is morally considerable, as I claim above, but technological artefacts are excluded from the category of things that are morally considerable, then plainly *everything* in the world is not morally considerable. But my claim is not that technological artefacts, qua things, are morally *inconsiderable*; only that to consider them and their technical aspects, qua technological artefacts, is to double-count. It is to consider the already considered. Because the primary use of a technological artefact is the reason for its having been built, it cannot count as a consideration itself. If I build a device that will desalinate my water, I build that device for the purpose of desalinating my water. That it desalinates my water is an important consideration related to the object, to be sure. But it is a consideration independent of the device that I have built. I could have built the device any number of ways, so long as it fulfilled my purpose. More importantly, it is a consideration that I have already subjected to the scrutiny of relevance and significance.

Remember the EV1? I agree with the makers of the documentary on at least one count. The murder of the electric car is a tragedy, but it is a tragedy because a perfectly functional and valuable piece of technology, with uses plain to any and all who had ever driven it, with desires to continue driving it, was taken out of commission. The car did not actually die, its rights were not violated, and nobody is guilty of killing it. If anything, the accused in this case are guilty of acting wrongly, of acting in an *unjustified* manner. All of the reasons that they can be said to have done wrong relate to the potential uses to which the technology could have been put; and none of them relate to the intrinsic value of the EV1 itself.

Notes

1. The EV1 was actually only ever *leased* to its drivers. General Motors thus maintained authority over the eventual fate of the car.
2. Among others mentioned in this chapter, see for instance, Warren (2000), A. Brennan (1984), Attfield (1983), Stone (1996) and Cahan (1988).
3. Writes Rawls in *Theory of Justice* (1971), 'Principles are to be universal in application. They must hold for everyone in virtue of their being moral persons. Thus I assume that each can understand these principles and use them in his deliberations' (p. 132). Though Rawls does not formalize a principle of universalization, as perhaps Habermas makes it seem, he clearly intends that readers apply principles that could apply to all and that could be used in deliberation by all.
4. Notice that it does *not* mandate that interlocutors must hear the articulated interests for these interests to be taken into account, but only that the interests *be* taken into account, regardless of whether or not they are articulated by those affected. If, however, the interests are articulated, then it mandates also that they cannot be ignored. The claims should then be subjected to a community of participants to discourse.
5. Habermas assents to this synopsis of his position, and cites this quote of McCarthy himself.
6. Philip Pettit uses the terminology of 'option' and 'prognosis' to explain the kinds of decisions that go into justifications for decisions like those that are promoted by consequentialism. I am adapting the terminology to assess the reasoning that lies in wait of the justification.
7. Mark Sagoff has spilled a great deal of ink on the definition of ecosystem, reasoning that ecosystem ecology cannot overcome the conceptual difficulties of demarcating and classifying ecosystems. I am not concerned with this debate here. See Sagoff (1985, 1997, 2003).
8. Incidentally, three of Jubal Brown's fellow artists – Jesse Power, Anthony Wennekers and Matt Kaczorowski – have received some acclaim for skinning a live cat and videotaping the act to show at the 2005 Toronto Film Festival. I hesitate to use this as an example because it seems to me that some actions are just so patently offensive and wrong that one cannot see any rational justification that permits the act (Asher, 2004).

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11
Cultivating Humanity: towards a Non-Humanist Ethics of Technology

Peter-Paul Verbeek

11.1 Introduction

Ever since the Enlightenment, ethics has had a humanist character. Not 'the good life' but the individual person now has a central place in it, taken as the fountainhead of moral decisions and practices. Yet, however much our high-technological culture is a product of the Enlightenment, this very culture also reveals the limits of the Enlightenment in ever more compelling ways. Not only have the ideals of manipulability and the positivist slant of Enlightenment thinking been mitigated substantially during the past decades, but also the humanist position that originated from it. The world in which we live, after all, is increasingly populated not only by human beings but also by technological artefacts that help to shape the ways we live our lives – technologies have come to mediate human practices and experiences in myriad ways (cf. Verbeek, 2005).

This technologically mediated character of our daily lives has important ethical implications. From an Enlightenment perspective, ethics is about the question of 'how to act' – and in our technological culture, this question is not answered exclusively by human beings. By helping to shape the experiences and practices of human beings, technologies also provide answers to this ethical question, albeit in a material way. Artefacts are 'morally charged'; they mediate moral decisions, and play an important role in our moral agency (cf. Verbeek, 2006b). A good example of such a 'morally charged' technology – which will function as a connecting thread through this chapter – is obstetric ultrasound. This technology has come to play a pervasive role in practices around pregnancy, especially in antenatal diagnostics and, consequently, in moral decisions regarding abortion. Decisions about abortion, after having had an ultrasound scan (and subsequent amniocentesis) showing that the unborn child is suffering from a serious disease, are not taken by human beings autonomously – as fountainheads of morality – but in close interaction with technologies that open up specific interpretations and actions, and generate specific situations of choice.

Within the established frameworks of ethical theory, this moral role of technology is hard to conceptualize. Lacking intentions and freedom, objects can hardly have moral relevance, not to mention moral agency. Moreover, human behaviour that is steered or provoked by technology cannot be called 'moral action'. In order to do justice to the moral relevance of technology, therefore, the humanist foundations of ethics need to be broadened. To be sure, this is not to deny the importance of humanism as an ideological movement, which has brought forth a set of values the importance of which cannot be overestimated. The modernist metaphysics behind humanism, however, appears to be ever less suitable to understand what is happening around us. In their modernity critiques, authors like Bruno Latour (1993) and Martin Heidegger (1976 [1947], 1977 [1950]) elaborated the thesis that the rigid separation of subject and object in modernist thinking makes it virtually impossible to see the many ways in which subjects and objects are actually interwoven. And taking into account this interwoven character is crucial to understanding our technological culture, in which human decisions and practices are increasingly shaped in interaction with technologies.

Against the modern, Enlightened image of the autonomous moral subject, therefore, an amodern, heteronomous moral subject needs to be articulated whose actions are always closely interwoven with the material environment in which they play themselves out. In order to do this, I will engage in a discussion about a critique of humanism that has caused a great deal of controversy: Peter Sloterdijk's 'Rules for the Human Park' (*Regeln für den Menschenpark*, 1999). Sloterdijk's text is a reply to Heidegger's 'Letter on Humanism' (1976 [1947]), which Heidegger wrote as an answer to the Frenchman Jean Beaufret. Beaufret asked Heidegger to clarify the relations between his philosophy and existentialism, which was rapidly gaining importance and which Sartre declared a form of humanism. Heidegger, however, did not take the side of Sartre – which could have helped him in his process of rehabilitation and denazification (cf. Safranski, 1999) – but rather distanced himself radically from humanism, which, for him, was a too narrowly modernist approach to humanity. In 'Rules for the Human Park', Sloterdijk takes up this critique of humanism, and radicalizes it in such a way that, 50 years after Heidegger's text, he came to be associated with the same fascism that Heidegger could not shake off.

In what follows I will join this discussion. This contribution can be read as an answer to Sloterdijk's 'reply letter on humanism'. In order to clear the path, I will first investigate the humanist character of contemporary ethics and its supporting modernist ontology. Second, I will elaborate the moral relevance of non-human reality, by discussing the mediating role of technology in moral practices and decisions. After this, I will engage in a discussion with Sloterdijk's 'posthumanist' position. I will dispel all associations with fascism from his approach, while using his critique of humanism as a basis for a non-modern approach to ethics, which does justice to non-human forms of morality and to the ways in which humans have to deal with them.

11.2 Humanism in ethics

Humanism is surrounded by the same phenomenon as what Michel Foucault witnessed regarding the Enlightenment – there is a form of blackmail in it: whoever is not in favour of it, is against it (Foucault, 1997). While criticizing the Enlightenment usually directly results in the suspicion of being hostile towards the rationalist world view and liberal democracy, criticizing humanism evokes the image of a barbarian form of misanthropy. Humanism embodies a number of values – like self-determination, integrity, pluriformity and responsibility – that are fundamental to our culture in articulating human dignity and respect for human beings. Yet, these humanist values do not need to be jettisoned when criticizing humanism as a *metaphysical* position. And precisely this humanist metaphysics behind contemporary ethics needs to be overcome in order to include the moral dimension of objects and their mediation of the morality of subjects.

Humanism and modernism

Humanism is a very specific answer to the question of what it means to be a human being. As theorists like Bruno Latour and Martin Heidegger have shown, modernity can be characterized by the strict separation it makes between subjects and objects, between humans and the reality in which they exist. Heidegger's work emphasizes how this modern separation of subject and object forms a radically new approach to reality. When humans understand themselves as subjects as opposed to a world of objects, they detach themselves from the network of self-evident relations which arises from their everyday occupations. Whoever reads a book, is engaged in a conversation or prepares a meal, just to mention a few examples, does not direct himself as a 'subject' towards some 'objects', but finds himself in a web of relations in which humans and world are intertwined and give meaning to each other. To understand oneself as a subject facing objects, an explicit act of separation is needed. Humans are not self-evidently 'in' their world any more here, but have a *relation* to it while being also distanced from it.

Heidegger emphasizes that the word 'subject' is derived from the Greek *hypokeimenon*, which he literally translates as 'that which lies before', and 'which, as ground, gathers everything onto itself' (Heidegger, 1977). The modernist subject becomes the reference point for reality; real is only what is visible for the detached and objectifying gaze of the subject. For such a subject, the world becomes a picture, a representation of objects in a world 'out there', projected on the rear wall of the darkroom of human consciousness. This is not to imply that the modernist metaphysics of subjects versus objects would not have any legitimacy. On the contrary; it is at the basis of modern science and has made possible a vast field of scientific research. But this modern 'world picture' should not be made absolute as the only one valid. The subject–object separation is only one of the possible configurations in the relations between humans and reality – only one specific way to think this relation, which emerged at a specific moment in time.

In his book *We Have Never Been Modern*, Bruno Latour (1993) interprets modernity in a closely related way. For him, modernity is a process of purifying subjects and objects. Whereas the everyday reality in which we live consists of a complex blend of subjects and objects – or 'humans' and 'non-humans' as Latour calls them, in his non-modern vocabulary – modernity proceeds as if subjects and objects had a separate existence. The modernist metaphysics divides reality into a realm of subjects, which form the domain of the social sciences, and a realm of objects, with which the natural sciences occupy themselves. As a result, the vast variety of hybrid mixings of humans and non-humans among which we live remains invisible. The ozone hole, for instance, is not merely 'objective' or 'natural': it grants its existence to the human beings who make it visible, who might have caused it, and who represent it in specific ways when discussing it. But it is not merely 'subjective' or 'social' either, because there does exist 'something' that is represented and exerts influence on our daily lives. The only adequate way to understand it is in terms of its hybrid character; it cannot be reduced to either objects or subjects, but needs to be understood in terms of their mutual relations. In Latour's words: 'One could just as well imagine a battle with the naked bodies of the warriors on the one side, and a heap of armour and weapons on the other' (Latour, 1997, p. 77 – translation PPV).

Latour indicates the rise of the modernist approach to reality as 'the strange invention of an outside world' (Latour, 1999, p. 3). Only when humans start to experience themselves as a consciousness separated from an outside world – as *res cogitans* versus *res extensa*, as Descartes articulated – the question of the certainty of knowledge about the world can become meaningful:

> Descartes was asking for absolute certainty from a brain-in-a-vat, a certainty that was not needed when the brain (or the mind) was firmly attached to its body and the body thoroughly involved in its normal ecology. (...) Only a mind put in the strangest position, looking at a world *from the inside out* and linked to the outside by nothing but the tenuous connection of the *gaze*, will throb in the constant fear of losing reality (...). (Latour, 1999, p. 4; emphasis by Latour)

By making humans and reality absolute – in the literal sense of the Latin *absolvere* which means to 'untie' or to 'loosen up', modern thinking about the human can congeal into humanism, and modern thinking about reality into realism. In the world in which we live, however, humans and non-humans cannot be had separately. Our reality is a web of relations between human and non-human entities that form ever new realities on the basis of ever new connections. In order to understand this reality, we need a symmetrical approach to humans and non-humans, according to Latour, in which no a priori separation between both is made. The metaphysical position of humanism is by definition at odds with this principle of symmetry. In Latour's words:

> (...) [T]he human, as we now understand, cannot be grasped and saved unless that other part of itself, the share of things, is restored to it. So long as humanism is constructed through contrast with the object (...) neither the human nor the nonhuman can be understood. (Latour, 1993, p. 136)

The humanist basis of ethics

From their metaphysical and ontological analyses of modernity, Heidegger and Latour only sporadically draw conclusions regarding ethics. Yet, once reality has fallen apart in subjects with consciousness 'within' on the one hand, and mute objects in a world 'out there' on the other, this has direct implications for ethics. After all, ethics now suddenly has to be located in one of the two domains. And almost automatically, that domain is the one of the subject, which asks itself from a distance how to act in the world of objects. The core question of ethics then becomes 'how should I act?' Ethics is the exclusive affair of *res cogitans*, focusing on judging and calculating to what extent its interventions in the outside world are morally right, without this world having any moral relevance in itself.

The development of modern ethics sharply reflects its modernist origins. Two principal approaches have developed, each centred round its own pole of the subject–object dichotomy. One, a *deontological* approach came into being, which focuses on the subject as a source of ethics; and two, a *consequentialist* approach came into being, which seeks to find grip in objectivity. Or, put in different words, while deontology directs itself at the 'interior' of the subject, consequentialism emphasizes the 'outside' reality. And in this way, both options are used that become possible on the basis of a metaphysics of subjects with consciousness 'within' versus objects in a world 'out there'.

The way in which Immanuel Kant formulated the principles of deontological ethics pre-eminently embodies the inward movement of the modern subject. Ethics here is centred around the question of how the will of the subject can be subordinated to a universally valid law, while also kept 'pure', i.e. free from the influence of accidental circumstances in the outside world. Because of this urge to purify the subject, only reason itself can provide something to go on, while any interference from the outside world must be rejected as pollutive. In Kant's own words:

> From what we have adduced it is clear that all moral concepts have their seat and origin fully *a priori* in reason (…); that these concepts cannot be abstracted from any empirical, and therefore mere contingent, cognition; that their dignity lies precisely in this purity of their origin, so that they serve us as supreme practical principles; that whatever one adds to them of the empirical, one withdraws that much from their genuine influence and from the unlimited worth of actions. (Kant, 2002, p. 28)

In its striving for pure judgement the subject here isolates itself from reality and attempts to derive moral principles from the workings of its own thinking. From this approach, morality does not get shape in practices from which humans are involved with the reality in which they live, but in a solitary and inner process of autonomous judgement that may not be disturbed by the outside world.

Consequentialist ethics, on the other hand, does not seek to find grip in the pure will of the subject but in determining and assessing as objectively as possible the consequences of human actions. To be sure, consequentialism does pay attention to the *ways in which* moral assessments can be made – for instance in the distinction between act-utilitarianism, that balances the desirable and undesirable consequences of an action against each other, and rule-utilitarianism, that seeks to find rules that result in a predominance of desirable consequences over undesirable ones. But the primacy is with determining the value of the consequences of actions. In order to make a moral assessment, one needs to make an inventory, as complete as possible, of all consequences of the action involved and of the value of these consequences.

Several variants of consequentialist ethics have developed which all attempt to assess the value of consequences of actions in specific ways. They range from hedonist utilitarianism (which considers valuable what promotes happiness) and pluralist utilitarianism (which also recognizes other intrinsic values beside happiness) to preferential utilitarianism (which does not seek intrinsic values but aims to meet the preferences of as many stakeholders as possible). All these variants share the ambition to determine which action in the world 'out there' has the most desirable consequences for the people 'out there'. They put effort in determining and assessing these consequences, in order to make a substantiated decision.

Each of these approaches in modern ethics therefore embodies one of the two poles of the modernist subject–object dichotomy. In this way, they both represent a humanist ethical orientation in which humans are opposed as autonomous subjects to a world of mute objects. Both approaches take as their starting point a solitary human being that is either focused on the workings of its own subjective judgements, or on the objective consequences of its actions.

This humanist orientation radically differs from its predecessor: classical and medieval virtue ethics. Here, not the question of the right action was central but the question of the good life. This question does not depart from a separation of subject and object, but from the interwoven character of both. A good life, after all, not only is shaped on the basis of human decisions, but also on the basis of the world in which it plays itself out (De Vries, 1999). The way in which we live is not only determined by moral decision-making but also by the manifold practices which connect us to the material world in which we live. This makes ethics not a matter of isolated subjects, but rather of connections between humans and the world in which they live.

Obstetric ultrasound, or antenatal diagnostics in a broad sense, can be an example here (cf. Verbeek, 2006a). Ultrasound imaging and amniocentesis make it possible to determine already during pregnancy if the unborn suffers from spina bifida or Down's syndrome. The very availability of such tests determines to a large extent which moral questions are relevant or even which questions can be posed at all, in practices surrounding pregnancy. Moral questions regarding, for instance, aborting foetuses with congenital defects can only arise when these defects can be discovered and when abortion is an option at all, both from a technological and from a cultural–ethical point of view.

To a certain degree, the moral significance of antenatal diagnostic technology can be expressed in the vocabulary of humanist ethics. Questions like 'is one allowed to abort a foetus with serious congenital defects?' and 'is one allowed to give life to a child while knowing that it will suffer severely?' are entirely phrased in modern, action-ethical terms, just like the more reflexive question 'is it morally right to delegate to parents the moral responsibility to decide about the life of their unborn child on the basis of an estimation of risks?' A closer analysis of these moral questions, however, directly jams the modernist purification machine. For if ultrasound indeed helps to determine which moral decisions human beings make, this immediately breaks the autonomy of the subject and also the purity of its will and its moral considerations. Not only do we then appear to have failed in keeping the outside world 'out there', but this world also appears to consist of more than *res extensa*. Ultrasound imaging 'does' something in this situation of choice; an ultrasound scanner is much more than a mute and passive object which is only used as an instrument to look into the womb.

Technology appears to be able to 'act' in the human world, albeit in a different way than humans do. By doing so, they painlessly cross the modernist border between subject and object. A humanist ethics, in Harbers's words, departs from a 'human monopoly on agency' (Harbers, 2005, p. 259). Because of this, it is not able to see the moral dimension of artefacts, which causes it to overlook an essential part of moral reality. In Latour's words: 'Modern humanists are reductionists because they seek to attribute action to a small number of powers, leaving the rest of the world with nothing but simple mute forces' (Latour, 1993, p. 138). This is not to say, to be sure, that Latour thinks artefacts are *moral* agents. In fact, Latour seldomly addresses ethics (except in Latour, 2002). Moreover, he always approaches agency as part of a network of relations, for which reason artefacts can never 'have' moral agency 'in themselves'. Yet, this does not take away the fact that the 'action' of artefacts which Latour thematizes can actually have moral relevance. Artefacts, after all, do help to shape human actions and decisions. Only a non-humanist approach in ethics is able to address this moral relevance of non-human reality. But what could an ethical framework look like in which not only humans but also artefacts 'act' and in which the actions of human beings are not only the result of moral considerations but also of technological mediations?

11.3 Cultivating humanity: Sloterdijk's escape from humanism

As a starting point for articulating a non-humanist approach to ethics I will critically discuss Peter Sloterdijk's highly contested but equally fascinating lecture *Regeln für den Menschenpark* ('Rules for the Anthropic Garden' – Sloterdijk, 1999).[1] This text was the focus of a fierce and vicious debate at the end of 1999, in which Sloterdijk was accused of national-socialist and eugenic sympathies. Sloterdijk flirted with what can be seen as one of the biggest taboos in post-war Germany: the *Übermensch*, the 'superman'. His text, therefore, is certainly not danger-free.

Rules for the Anthropic Garden – or *Rules for the Human Zoo*, as it has also been translated – is usually read as a text on biotechnology. But in fact, it was written as a critique of humanism. Sloterdijk's lecture is a sparkling and contrary answer to Martin Heidegger's *Letter on Humanism*. In this text, Heidegger distanced himself resolutely from the suggestion that his work could be seen, just like Sartre's existentialism, as a form of 'humanism' – however convenient this would have been for the rehabilitation of both his work and his person after the Second World War. According to Heidegger, humanism entails a far too limited understanding of what it means to be human. Characteristic of humanism (also of its pre-modern variants), for Heidegger, is its approach to the human in terms of the animal: as *animal rationale* or *zoon logon echon* – an animal with speech and reason, or an animal with instincts that can and need to be controlled. Humanism, according to Heidegger, 'thinks the human from *animalitas* and does not think toward *humanitas*' (Heidegger, 1976, p. 323 – trans. PPV).

Heidegger, therefore, rejects humanism because it ultimately fixates humanity on its biological basis. A biological understanding of the human ignores the radical distinction between human and animal, which for Heidegger exists in the ability to think the being of beings. Heidegger does not want to think *humanitas* from the animal, and even less from Sartre's 'existence' which would precede 'essence', like matter being moulded into a form. Heidegger thinks humanity in terms of ek-sistence: the 'being open' to an always historically determined understanding of what it means to 'be'. Elaborating what Heidegger means by this would fall way outside the scope of this chapter, but what matters here, is Heidegger's rejection of an understanding of humans as animals-with-added-value. For it is precisely at this point that Sloterdijk turns Heidegger's argumentation upside down. Sloterdijk shares Heidegger's resistance against humanism, but, contrary to Heidegger, he does not elaborate his resistance into an *alternative* to the image of humans as 'animals with reason', but into a *radicalization* of this image. As opposed to the emphasis Heidegger puts on the lingual aspect of being human ('Language is the house of being' – Heidegger, 1976, p. 313), Sloterdijk emphasizes the *bodily* aspect of the human. What it means to be human, for him, is not only shaped from language but also from corporality.

Sloterdijk shows that language has been the most important medium of humanism. Humanism has always made use of books, which he interprets as kinds of letters; they are written by people who are confident that their text will actually arrive somewhere and that people will actually be prepared to read it. For this reason, Sloterdijk states that behind all forms of humanism there is the 'communitarian phantasm' of a literary society, a 'reading group' (Sloterdijk, 1999, p. 10). The literary character of our society, however, is rapidly decreasing – and therefore our society is also rapidly becoming posthumanist. To establish connections between people, letters will not do any more. We need 'new media of political–cultural telecommunication' because 'the friendship model of the literary society' has become obsolete (Sloterdijk, 1999, p. 14).

The literary epistles of the humanists aimed to cultivate humans. Behind humanism, therefore, for Sloterdijk, hides the conviction that humans are 'animals under the influence' and that they need to be exposed to the right kind of influences (Sloterdijk, 1999, p. 17). But which media can take over the role of books? What can be appropriate to tame the human when humanism has failed? At this point, Sloterdijk takes a path that gave some German intellectuals cause to bring his work in connection with Nazism. Therefore this path needs to be trod carefully. I will briefly sketch the outlines of Sloterdijk's proposal, and after that I will make a counter-proposal which makes his critique of Heidegger relevant for the ethics of technology in a broader sense than Sloterdijk himself did.

Sloterdijk argues that Heidegger's approach systematically overlooks the biological condition of humanity. He elaborates the thought that

Heidegger's analysis of the *Lichtung*, the 'open space' where 'being' can manifest itself, ignores that this open space is no 'ontological natural state' but a place that humans actually have to enter, as physical beings. Being-in-the-world is only possible on the basis of coming-in-the-world, the biological and physical act of birth. This opens an entirely new space to understand what it means to be human, and what shapes our humanity. Not only lingual forces that 'tame' us are relevant then, but also physical and material forces that help to 'breed' us. Both aspects of shaping humanity are contained in the word 'cultivation'. Human culture is both spiritual and material; it is the outcome of both 'producing' and 'refining', of 'breeding' and 'civilization'. Not only the 'lections' of the humanists help to shape *humanitas* but also the 'se-lections' of the growers of humans that we have always been and that we will be ever more explicitly now that we have biotechnology (Sloterdijk, 1999, p. 43). Because of the possibilities offered by new technologies, we cannot confine ourselves to disciplining humans. Inevitably the question will force itself upon us: which human beings will procreate, and which ones will not? This also lays bare a new social conflict: who are the breeders and who are the ones being bred? (Sloterdijk, 1999, p. 44).

Nietzsche already pointed out that Western culture has developed a smart combination of ethics and genetics, because of which it is no longer only the strongest that procreate, but rather those who are collectively weakened by an ethics of solidarity. We already have an implicit ethics of breeding, therefore. The question that Sloterdijk raises for the future is: what will this ethics look like when it needs to be made explicit in the biotechnological revolution? Humanity is suddenly facing the need to make political decisions about the properties of its own species (Sloterdijk, 1999, p. 46). When comparing society to a zoological park – which is the metaphor that forces itself upon us when thinking in biological rather than lingual terms about humanity – the issue is not only to determine the rules we need to follow for 'keeping' ourselves in this park, but also the rules to arrange procreation and the growth of the population. The main question biotechnology raises is to what extent the humanist tradition will be able to guide us here. Classical texts often abandon us here. They are on shelves in archives, 'as "poste restante" which is not collected any more (...), sent by authors of whom we cannot say any more if they could still be our friends. Letters that cannot be delivered any more, are no longer sent to people who could be friends – they change into archived objects. (...) All the signs are that the archivists and filing clerks are the successors to the humanists' (Sloterdijk, 1999, p. 55–6 – trans. PPV).

Especially because of its explicit references to Plato's *Republic*, which I did not include in this discussion, Sloterdijk's text was associated with the eugenic programme of the Nazis. Against this interpretation, however, I propose to read Sloterdijk's text as an attempt to face the ultimate consequences of the biotechnological revolution. Appealing to the archives of the tradition allows philosophers to comfortably position themselves outside of reality, and to simply refuse to discuss the breeding of humans. But as soon as the technologies to do this become an explicit part of society, the discussion Sloterdijk attempts to open becomes inevitable. Moreover, he who sees with Nietzsche that the predominant humanist approach of humanity also has genetic consequences, has no argument to stand aloof from the posthumanist space opened up by new technologies. Sloterdijk simply makes explicit the questions evoked by new technological possibilities, by placing them provocatively in front of us. He does not propose to design a specific transhuman entity, or to breed a specific variant of the human. He merely shows that the simple fact of our biological birth, added to our ability to alter our biological constitution, implies that the rules that have always implicitly organized our reproduction might have to be made explicit in the future and might ask for a reorientation.

With this essay, however, I do not aim to contribute to the discussion about the biological future of *Homo sapiens*. My interest here is the ethics of technology, and the question how to move beyond the humanist bias in ethics in order to make room for the moral relevance of technological artefacts. And to answer this question, the proposal to develop rules for the human zoo – however important it is – is actually the least interesting part of Sloterdijk's discussion with Heidegger. Much more interesting is Sloterdijk's ambition to think about ethics and technology beyond humanism. In Sloterdijk's analysis it becomes clear how the biological and 'material' aspect of the human has been neglected in the humanist tradition, and how the media used by this tradition are losing their self-evident relevance. Precisely this 'material' turn in approaching humanity creates points of application for a non-humanist ethics of technology. Not the 'transhumanist' development towards an enhanced version of *Homo sapiens* is central then, but the 'posthumanist' development beyond humanism as a predominant way of understanding what it means to be human.

The most important contribution of Sloterdijk's text to the ethics of technology therefore consists in opening a non-modern space to think about ethics. Precisely such a space is needed to escape from the humanist points of departure of contemporary ethics, and to make room for the moral relevance of non-human entities. By approaching human beings not only in terms of their being-in-the-world but also in terms of their coming-in-the-world, they not only appear as 'subjects' but also as 'objects', not only as the *res cogitans* of their consciousness but also as the *res extensa* of their bodies with which they experience and act in the world. Such a posthumanist approach to the human is as least as important for understanding the everyday life of the *Homo sapiens* we still are, as it is for the transhuman forms of life to which Sloterdijk primarily directs himself in this text.

11.4 Humanities and posthumanities: new media for cultivating humanity

In order to elaborate the contours of a posthumanist ethics, therefore, we need to bracket Sloterdijk's ideas about 'breeding' human beings, and focus again on 'taming' humanity. In *Rules for the Anthropic Garden*, Sloterdijk exclusively associates the activity of taming with the humanist tradition. Yet, his observation that the lingual media of humanism are becoming ever more obsolete because of new technologies, does not necessarily justify the conclusion that we also need to replace the humanist 'taming' of humanity with a posthumanist 'breeding'. A non-humanist approach to humanity, which does not separate the 'objectivity' and 'subjectivity' of human beings, also reveals points of application for new forms of 'taming' that remain undiscussed in Sloterdijk's lecture.

In our technological culture, it has become clear that *humanitas* is not only shaped by the influence of ideas on our thinking, or by physical interventions in our biological constitution, but also by material arrangements of the technological environment in which we live. Humanity and ethics do not exclusively spring from the cerebral activities of a consciousness housed in a bodily vessel, but also from the practical activities in which human beings are involved as physical and conscious beings. By associating the 'taming' of *res cogitans* only with texts, and associating technology only with the 'breeding' of *res extensa*, Sloterdijk ignores – at least in *Rules for the Anthropic Garden*[2] – how human beings, as *res extensa*, cannot only be bred, but are also being *tamed* by technology. If the lingual media of humanism have indeed become obsolete, as Sloterdijk observes, material media have taken their place. Beside the anthropotechnologies of writing and human engineering, there is a vast field of anthropotechnologies that need to be taken into account to understand what it means to be human: the pile of technological artefacts that help to shape how we experience the world and live our lives, ranging from television sets and mobile phones to medical diagnostic devices and aeroplanes.

Again, obstetric ultrasound is a good example here. By the specific way in which this technology represents the unborn, it helps to shape a specific *practice* of dealing with uncertainties regarding the health of unborn children. This new practice has important implications for the moral considerations of expecting parents. First of all, ultrasound imaging disconnects the unborn from the body of its mother. It is made present as an individual person, as if it could exist apart from the woman in whose womb it is growing. As Ingrid Zechmeister put it, this creates a new ontological status for the foetus (Zechmeister, 2001), in which it has a quasi-autonomous existence, rather than forming an organic unity with its mother. Secondly, obstetric ultrasound (re)presents the foetus in terms of medical norms. Ultrasound devices are programmed to measure specific dimensions of the foetal body, which are all indications of the unborn's health.

Because of the specific way in which ultrasound helps to shape how the unborn is experienced, new interpretations of pregnancy arise, and new practices of dealing with the risk of congenital defects. After all, the very possibility to determine already before a child is born if it is suffering from a specific disease raises the question whether this pregnancy should be continued.[3] This is not to say that ultrasound would only *stimulate* expecting parents to have an abortion when serious congenital defects are found. One the one hand, ultrasound imaging unmistakably has this effect, since an abortion can prevent suffering for both a seriously ill child and its parents. But on the other hand, ultrasound imaging also establishes an intimate relation between parents and their unborn child, which enhances their bonding and rather makes abortion more difficult. In both cases, though, the very possibility to have an ultrasound examination done constitutes an entirely new ethical practice. Also *not* having such an examination done is a moral decision now, since this implies rejecting the possibility of sparing an unborn child an incurable disease and possibly dead-end suffering. An ultrasound scan of an unborn child is never a neutral peek into the womb. It helps to constitute the unborn as a possible patient and its parents as decision-makers about the life of their unborn.

Ultrasound, therefore, is a non-lingual medium of morality; it 'tames' human beings in a material way. Ironically, in this example the 'taming' of humanity is also directly relevant to practices of 'breeding'. This immediately makes clear that Sloterdijk's work is not only relevant for analysing wild scenarios of a transhuman future, but also for making visible how also the current everyday breeding practices of *Homo sapiens* (which we still are) are thoroughly posthumanist in character. Moral decisions about pregnancy and abortion in many cases are shaped in interaction with the ways in which ultrasound imaging makes visible the unborn child. Apparently, moral action cannot be understood here in terms of a radical separation of a human moral agent on the one hand, acting in a world of mute material objects on the other. Ultrasound imaging actively contributes to the coming about of moral actions and the moral considerations behind these actions. This example, therefore, shows that moral agency should not be seen as an exclusively human property; it is distributed over human beings and non-human entities. Moral action is a *practice* in which humans and non-humans are intricately connected, generate moral questions, and help to answer them.

In these connections, not only is *res extensa* more active than the modernist approach makes visible, but also is *res cogitans* less autonomous. From a modernist orientation, it is impossible to classify an action induced by behaviour-influencing technology as moral action. Someone who, for instance, slows down near a school because there is a speed bump on the road, does not act morally and responsibly; his or her behaviour is simply steered in a specific direction. The ultrasound example, however, shows that morality has a broader domain. Here, technology does not *impede* morality, but rather *constitutes* it. Ultrasound imaging organizes a situation of moral decision-making while also helping to shape the frameworks of interpretation on the basis of which decisions can be made. As soon as we see that morality is not an exclusively human affair, material 'interventions' in moral judgements of the subject are no pollutions of a 'pure will', but media of morality. To paraphrase Kant: ethics without subjects is blind, but without objects it is empty. In the pure space of subjectivity the subject cannot encounter a world to find a moral relation to; as soon as this world is there, practices come into being that help to shape the moral space of the subject. Mediated action is not amoral, but rather the pre-eminent place where morality finds itself in our technological culture.

Sloterdijk's conclusion that the influence of the media of humanism is declining, therefore, does not need to imply that the 'taming' of humanity is about to be replaced by 'breeding'. Many more media appear to tame us than only the texts of humanism, and these new media need to be especially scrutinized: the technological artefacts that help to shape our daily lives. After all, the cohesion of the literary society in which humanity attempts to tame itself might be diminishing, but the attractiveness of the human park in which humanity attempts to breed itself in sophisticated ways is far from big enough yet to consider the literary society completely obsolete. Rather, the posthumanist and non-modern space opened up by Sloterdijk shows that this literary society has never been as literary as it thought. The texts that were written, read, interpreted, and handed down have always been the product of concrete practices in which they were considered relevant and in which the humanity of humans was shaped not only on the basis of their self-written texts but also of their self-created material environment in which these practices were shaped. The human of modernist humanism has never existed.

11.5 Toward a non-humanist ethics

How to augment the ethics of technology in such a way that we can include this posthumanist and amodern perspective? The most important prerequisite for such an expanded ethical perspective is the enlargement of the moral community so as to include also non-human entities and their connections to human beings. Only in this way can justice be done to the observation that the medium of ethics is not only the language of subjects but also the materiality of objects. This implies a shift of ethics. Beside developing lingual frameworks for moral judgement, ethics then also consists in designing material infrastructures for morality. When matter is morally charged, after all, designing is the moral activity par excellence, but simply 'by other means'. Designers materialize morality. Ethics is no longer a matter of etheric reflection but also of practical experiment, in which the subjective and the objective, the human and the non-human, are interwoven.

From this interwoven character, two important lines of thought can be discerned in a posthumanist ethics: *designing* mediating technology (designing the human into the non-human) and *reflecting* on the moral role of things (making visible the human in the non-human). These two lines might seem to reflect the modernist distinction between an actively reflecting subject and a passively designed world. But rather than reinforcing this distinction, a posthumanist ethics aims to think both poles together by focusing on their connections and interrelations.

Ethics of design

The insight that any technological artefact will inevitably play a mediating role in human experiences and practices makes designing a highly morally relevant activity. Rather than being merely functional instruments that help human beings to realize their intentions, technologies actively contribute to human interpretations and actions. In doing so, they help to shape not only the quality of our lives, but also the nature of our moral decisions and actions. The designers of these technologies, consequently, have the responsibility to help to shape these mediating roles in desirable ways. Instead of shying away from the implicit mediating roles of technologies, designers should make these roles explicit and incorporate them in their design activities.

This is not a self-evident thing to do, however. When the Dutch philosopher Hans Achterhuis proposed to start moralizing *technology*, rather than only *human beings*, he was immediately criticized for being a technocrat trying to undermine human freedom (Achterhuis, 1995). After all, no democratic deliberation but technological intervention then determines human behaviour. Yet, this criticism is too shallow to be adequate. After all, we saw that technologies inevitably mediate human experiences and practices – and this implies that it would be rather immoral to ignore this by focusing on the functionality of artefacts only. Human beings inevitably 'tame' themselves with the help of the material world they design themselves, to phrase it in Sloterdijkian terms. And once this is clear, it becomes impossible *not* to consider a responsible design of the material environment a central task of ethics. After all, this would imply that the ethical charge of technologies is deliberately left an implicit by-product of the work of designers. This would result in precisely the kind of technocracy that opponents of a 'moralization of technology' fear.

From a non-humanist perspective, therefore, explicitly designing mediating technologies is not the amoral activity it might seem to modernist eyes. It is rather the moral activity *par excellence*. When the modernist separation of human subjects and non-human objects is overcome, ethics can move beyond the fear that non-human objects will start to suffocate human subjects and direct its attention to the moral quality of associations of subjects and objects. In their activities, ethicists are not limited to choosing between either language or matter – as Sloterdijk's dilemma between 'taming' and 'breeding' suggests – but rather face the challenge to find an adequate language for making moral decisions about materiality and to inspire adequate designs that fit the moral considerations we express in language.

As I elaborated elsewhere (Verbeek, 2006b), designers have two ways to take technological mediation into account. One, they can try to anticipate mediating roles of their designs, in order to make explicit what would otherwise have remained implicit and to assess if the resulting mediating roles are morally acceptable. Two, they can deliberately 'inscribe' or 'build in' specific forms of mediation into a technological artefact.

Anticipating technological mediation is a highly complicated affair. The actual mediating role of technologies, after all, cannot be entirely reduced to the intentions of a designer. Technologies have to be interpreted and appropriated in order to be used, and in this process they can acquire different meanings and identities than intended in their design. Well-known examples are the telephone and the typewriter, which were intended to be aids for the hard of hearing and the visually impaired, but acquired different functionalities for a different group of users. Moreover, unintentional and unexpected forms of mediation can also arise when technologies are used in the way their designers intended. A good example is the revolving door which keeps out both cold air and wheelchair users. Technological mediations, therefore, are products of a complex interaction between designers, users and technologies.

This implies that not only the *anticipation* of mediations is a complicated affair – requiring a sophisticated form of moral imagination, assisted by insights into the phenomenon of technological mediation – but also the explicit *design* of mediations. Actually, the metaphor of 'inscribing' morality suggests too much of a central steering role of the designer. Moralizing technology can never be the work of a 'prime mover' (cf. Smith, 2003), but comes down to establishing connections between three 'agents': the designer who shapes the technology and its intended mediating role; the user who interprets and appropriates the technology; and the artefact itself, which can give rise to 'emergent' mediations, which were not intended by the designer and cannot be reduced to unexpected interpretations of users either.

The technological 'taming' of humanity – to rephrase the activity of 'moralizing technology' in Sloterdijk's terms – is therefore a thoroughly non-modern and non-humanist affair. It is not simply a matter of translating the moral beliefs of designers into material objects. Rather, it requires us to cross the boundary between humans and non-humans. Ethics of technology can only be done by creating alliances between humans and non-humans, and by taking seriously the specific contribution of each of these. Not only does the *medium* of ethics need to be expanded from language to materiality, but the source of ethics needs to shift from the decision-making processes of autonomous individuals to well-reflected and well-designed alliances of humans with non-human entities.

Such alliances, to be sure, do not necessarily aim at steering and controlling human behaviour, as obviously 'moralized' technologies like speed bumps and tourniquets do. Beside such 'coercive' technologies, designers can also aim to develop 'persuasive' technologies that try to convince people to act in specific ways, and even 'seductive' technologies that entice users into specific actions. Such technologies rather seek an *interaction* with their users, not direct *intervention* in their behaviour. The Dutch psychologist Cees Midden, for example, has extensively investigated how devices that provide users with feedback can influence human behaviour (e.g. Midden, 2006), like washing machines that indicate how much energy and water they use per kilogramme of laundry, and 'econometers' in cars that show how energy-efficient one's driving behaviour is. Users preserve the freedom to act as they think right, but are offered extra considerations which might lead them to change their behaviour.

Another way in which technologies can effectuate their moral dimensions is by seducing people to act in specific ways. Here, not only are the cognitive aspects of human action addressed but also its less conscious components. In the Netherlands, for instance, the Eternally Yours Foundation has been working on what it calls 'culturally durable product development' (cf. Muis, 2006). It has been looking for possibilities to design products that discourage their users from throwing them away prematurely. This can be done, for instance, by making it possible to repair or upgrade products. Many products cannot even be opened any more: they are not closed with screws but sealed. More often, though, it is the visual appearance of products that makes people decide to throw them away; they do not like the product any more because it looks worn out or obsolete, or they are simply tired of it. This can be prevented in many ways. For instance by avoiding product skins that age in an ugly way, like shiny polished chromium, and by using materials that tend to become more attractive when they age – wood and leather are obvious examples of such materials, but specific synthetics lend themselves to this purpose very well too. Or by letting the product wear out in surprising ways, like the couch designed by Sigrid Smits with an upholstery that reveals a beautiful and initially invisible stitched-in pattern by wearing out – a couch that renews itself by getting old.

Ethics of use: technology and moral subjectivity[4]

A second, and equally important, constituent of a non-humanist approach to ethics focuses on the technologically mediated character of the moral subject. Beside moralizing technological *objects*, an ethical approach that aims to overcome the subject–object dichotomy should also reflect morally on the technological mediation of the *subject*. As the example of obstetric ultrasound showed, an important aspect of the moral character of technologies consists in the ways they help to constitute specific relations between human beings and their environment, in which specific moral questions are generated or even answered. By isolating the unborn from the body of its mother, and by presenting it in terms of medical norms, ultrasound constitutes the unborn as a possible patient and its parents as decision-makers about its life.

The nature and quality of such mediations are not only to be approached in terms of the design of the mediating technologies involved. The resulting mediation and its moral impact, after all, also depends on the ways the mediating technology is appropriated and taken into people's moral reflection. Addressing this active role of the subject, therefore, forms the necessary complement to enhancing technological design processes. In order to elaborate this, I need to bring in the work of yet another critic of humanism: Michel Foucault. Just like Heidegger and Sloterdijk, Foucault aims to overcome the limitations of humanism and its autonomous and isolated image of humanity. And, as Dorrestijn (2004) convincingly shows, the ethical analyses Foucault made in the final stage of his work are highly relevant for developing a non-humanist ethics of technology. His work makes it possible to approach technological mediation as precisely what is at stake in ethics, rather than as an alienating force which deprives agents of the autonomy that is needed to do ethics at all.

In the last two parts of his 'History of Sexuality', Foucault elaborates an unconventional approach to ethics (Foucault, 1990, 1992). He develops the thought that ethics is not primarily about the question how to act or which imperatives to follow, but about how human beings constitute themselves as 'subjects' of a moral code. And rather than aiming to develop a new moral code himself, Foucault investigates what these codes 'do' to people and how humans 'subject' themselves to it. For this, Foucault reverts to ethical approaches from classical Antiquity, where ethics was explicitly directed at constituting oneself as a specific subject. In fact, the very word 'subject' suggestively brings to expression that ethics is not only a matter of being the 'subject' of one's actions, but that this person also 'subjects' him- or herself to a specific moral code. This 'subject-ion' is where Foucault locates ethics.

Moral 'subjection' has taken many shapes, with manifestations like the Kantian subject that aims to keep its intentions pure and assesses them in terms of the possibility to let them function as universal laws, or the utilitarian subject that aims to examine the consequences of its actions in order to attain a prevalence of positive outcomes over negative outcomes. The most interesting characteristic of *classical* ethical frameworks for Foucault is, however, that they were *explicitly* directed at the constitution of moral *subjectivity*, rather than implicitly defining a moral subject by elaborating a specific way to determine the rightness of one's actions. Foucault showed, for instance, that in classical Antiquity sexuality was not organized via a moral code of imperatives and prohibitions, but primarily in terms of *styling*. Ethics consisted in dealing with one's sexual passions and drives in such a way that they did not *determine* the self but became the object of the activity of shaping one's subjectivity. The purpose of such activities was not to subordinate the passions to a code, but to *stylize* one's sexual behaviour.

Foucault's views of ethics and sexuality are highly relevant for the ethics of technology. The ethical approach he elaborates connects the radically mediated character of the subject with the ability of the subject to relate itself to what mediates it. Not an autonomous subject is the pivot of ethics here, but a mediated subject that finds a relation to this mediation. And just like the ancient Greek and Romans did not deny or suppress the sexual passions, but rather acknowledged them and actively helped to shape them, people in our technological culture can develop a relation to the technological mediations that help to shape their subjectivity, by actively relating to and intervening in these mediations. In other words: from a Foucauldian perspective, the technologically mediated character of life in a technological culture does not need to be seen as a *threat* to the morality of the subject but rather forms a specific way in which the subject is *constituted*, and which can be morally addressed. The technologically mediated constitution of the subject is not a state of affairs we simply have to accept; it rather is the starting point for moral self-practices (cf. Dorrestijn, 2004, pp. 89–104).

Foucault's work, therefore, makes it possible to connect ethics with the phenomenon of technological mediation. Ethics of technology then consists in carefully assessing and experimenting with technological mediations, in order to explicitly help shape the way in which we are constituted as technologically mediated subjects. Ethics of technology is not a matter of juxtaposing the human activity of doing ethics and the non-human affordances of technologies that will affect human beings. It rather consists in linking the realms of the human and the non-human, by taking technological mediations seriously and actively 'styling' how they affect us.

The example of ultrasound can, again, clarify what such experiments can entail. As we saw, ultrasound substantially contributes to the experience of expecting a child, by framing pregnancy in medical terms, and confronting expecting parents with a dilemma if their unborn appears to have a significant risk of a serious disease. Such dilemmas have a tragic dimension. As explained above, the risk estimation offered by ultrasound can only be converted into certainty by having an amniocentesis done, which has a risk of provoking a miscarriage – and in many cases this risk is higher than the risk of having a child suffering from Down's syndrome. Having antenatal ultrasound examinations done, therefore, inevitably implies the choice for a specific kind of subjectivity, in which humans are constituted as subjects that have to make decisions about the life of their unborn child, and in which obtaining certainty about the health condition of an unborn child is worth the price of losing a healthy unborn child.

From a Foucauldian perspective, the ethics of technology should direct itself at this technological mediation of subject constitution. By deliberately dealing with ultrasound imaging, after all, this subject constitution can be modified and refined. For instance, by only using ultrasound to determine the expected date of birth, while refusing further information about nuchal translucency or neural tube defects. Or by only using it to determine the risk of having a child with a specific disease, in order to be mentally and practically prepared for this, without exposing oneself to the risks of having an amniocentesis done. Or by actually having all tests done, as an explicit choice rather than a self-evident part of medical practices around pregnancy. Or by refusing ultrasound examinations at all (cf. Rapp, 1998), not wanting to be made implicitly responsible for the health of one's child and for decisions about the value of its life.

To answer the question of what kind of mediated subjects we want to be, to be sure, existing ethical frameworks like classical virtue ethics and modern deontological and utilitarian systems can continue to play an important role. Foucault's thesis that all ethical systems imply a specific subject, after all, does not take away the fact that the frameworks that were handed down to us from the past can still prove to be valuable for dealing with the technological mediation of our subjectivity. Moral self-practices in a technological culture, in which human beings attempt to give a desirable shape to the technological mediation of their subjectivity, offer plenty of space for the virtue-ethical aspiration to the good life, the deontological ambition to meet moral norms, and the utilitarian goal to reach a preponderance of positive effects over negative effects. Regarding the case of obstetric ultrasound again, parents can for instance choose to have their unborn child screened for diseases because the birth of a child with a serious disease could have very negative effects on the other children in the family. They can also refuse ultrasound screening, for instance on the basis of the norm that unborn life may not be terminated, or from the desire not to be brought in a position of having to make a decision about the life of one's unborn child.

In all of these cases, however, there is a deliberate shaping of the ways in which humans are being constituted as a moral subject, from the realization that technology plays a mediating role here too. Human beings are not fully autonomous in their subject constitution; they have to accept both the pregnancy and the possibility of having ultrasound screening done as a given fact. But they do have the freedom to let themselves be constituted as a specific subject – a subject that will have to decide about the life of its unborn child; a subject that orients itself on norms which exist separately from the situation in which they need to be applied; or a subject that wants to use the availability of a technological form of contact with unborn life for a careful assessment of all possible consequences of letting a child be born with a serious disease.

Conclusion

In order to take seriously the complex role of technology in our culture, the ethics of technology needs to move beyond the humanism that is implicit in most ethical theory, and to give also technological artefacts a central place in moral reflection. In order to make the social and cultural role of technologies more explicit, they should be approached as *res publica*, to use Latour's term; technologies are literally 'public things' (cf. Latour, 2005). Just like Heidegger did in his text 'Das Ding' (Heidegger, 1951), Latour pointed out that the old German word *Ding* not only meant 'material object' but also 'gathering place', or 'that which brings together'. 'Things' can be seen as entities that gather human and non-human entities around themselves, as the focus of new practices and interpretations. From this approach, technological 'things' not only mediate our existence, but also are places where these mediations are made explicit. Things gather people around themselves; they are places where humans discuss the quality of the ways in which these things help to shape their lives.

This immediately makes clear that a posthumanist ethics does not need to abandon the traditional humanist values. On the contrary. The posthumanism I defend here to augment and criticize Sloterdijk does move beyond humanism, but not beyond the human. It simply gives a central place to the idea that the human can only exist in its relations to the non-human. Not the *human* is declared obsolete by this form of posthumanism, rather *humanism* as an all too human approach of what it means to be a human being. In order to cultivate humanity, we need to take seriously how technologies also help to cultivate us. Only by approaching the human as more-than-human does it become possible to adequately give shape to the respect for humanity the humanist tradition has rightly been defending for so long.

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Notes

1. All translations of Sloterdijk's *Rules for the Anthropic Garden* are by the author of this article – PPV.
2. Other works of Sloterdijk do pay attention to the (technologically) mediated character of humanity. His discussion of humanism in *Rules for the Anthropic Garden* could have benefited from including these earlier insights in order to develop a broader approach to the technological 'cultivation' of humanity.
3. To be sure: in many cases an ultrasound examination does not provide enough certainty to make such a decision, since it only makes it possible to calculate a *risk* while certainty can only be provided by amniocentesis.
4. This section incorporates fragments of my article 'Obstetric Ultrasound and the Technological Mediation of Morality' (Verbeek, 2008).

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Part IV

Comparative Philosophy of Technology

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12

Technology Transfer and Globalization: a New Wave for Philosophy of Technology?

Evan Selinger

Introduction

Despite the social, political ethical and epistemic importance of globalization and technology transfer, philosophers tend to be prioritizing other areas of inquiry. In order to clarify the strengths and weaknesses found in the dominant assessments of these topics, I begin this chapter with meta-philosophical analysis that reviews representative forms of inquiry. The remainder of the chapter clarifies a vision of how philosophers of technology can pursue a new wave of socially significant investigation. In order to exposit this vision in concrete terms, I turn to the example of the Village Phone Programme in Bangladesh. While advocates tout this endeavour as a new development paradigm that empowers impoverished and mistreated women by providing them with microcredit and mobile phones, detractors can find the programme's implementation reproducing and augmenting insidious patriarchical forces.[1] By questioning what considerations economic and ethnographic analyses occlude, I not only hope to shed light on the Village Phone Programme and the underlying trends that drive it, but I further hope to clarify how philosophers of technology can enter into meaningful dialogue with a range of development theorists and practitioners.

12.1 Are philosophers aware of globalization?

For activists, citizens and theorists alike, 'globalization' remains a contested term. In popular and academic discussions, 'globalization' is evoked to explain and contextualize many of the extreme and contradictory outcomes that have come to be associated with integrated changes in culture, economics, the environment, politics and technology. To highlight but a few salient topics, globalization discourse extends to views on: the relations between capitalism, technology and historical change; the extent to which cultural diversity is a desirable end; the best ways to understand the differences between secular and religious perspectives, and the most useful ways to ameliorate their tensions; the identities of, and relations between, developed and developing countries; potent environmental changes; phenomenological transformations in how time, space and place are experienced, and the institutional mechanisms that accommodate these changes and promote additional alterations; and the putatively declining authority of the nation state.

Despite living amidst globalization's contentious changes, many philosophers continue to concentrate on other topics; in so doing, they perpetuate the long-standing and rather unfortunate stereotype that philosophy is an esoteric and other-worldly enterprise. To crystallize this point, consider the following results, obtained during a recent search of the *Philosopher's Index*:

- 'ethics' (57,845 entries)
- 'metaphysics' (55,135 entries)
- 'aesthetics' (18,528 entries)
- 'phenomenology' (9,376 entries)
- 'bioethics' (2,510 entries)
- 'globalization' (682 entries)
- 'development ethics' (12 entries)
- 'technology transfer' (5 entries)
- 'digital development' (0 entries)
- 'microloans' (0 entries)
- 'microcredit' (0 entries)
- 'Grameen Bank' (2 entries)
- 'Grameen Phone' (0 entries)

Globalization and normative ethics

When philosophical analysis is given to globalization, the topic of technology is typically reduced to an analytic framing device, a springboard for addressing issues of responsibility that do not stretch or dissolve the conceptual parameters which permit the standard forms of normative analysis (e.g. cosmopolitanism, utilitarianism, the capabilities approach, communitarianism, Habermasian Critical Theory) to clarify how human agency and human action can be judged in a coherent and potentially systematic fashion. While some discussions about justice, well-being and moral duty do refer to technology explicitly, the paradigm cases of environmental ethics, labour ethics, cultural ethics and military ethics, remain more the exception than the rule. And even these analyses scarcely emphasize the concrete dimensions of material culture – what it is, how it can be reproduced and altered, and how it can participate in the organization and disruption of public and private projects – or integrate insights from phenomenology and the cognitive sciences about how embodied human beings respond to artefacts. Such occlusions testify to the fact that the technologies which Bruno Latour (1993) characterizes as 'the missing masses' continue to remain largely invisible from the otherwise discerning philosophical eye.

Globalization and development ethics

Since the standard philosophical approaches to globalization insufficiently address core problems in development theory and practice, it might be hoped that development ethicists would present robust analyses of technology and technique. David Crocker, Senior Research Scholar at the Institute for Philosophy and Public Policy, defines the relation between development work and development ethics as follows (2007, p. 59):

> Development – conceived generally as desired or desirable social change – is the work of policymakers, project managers, grassroots communities, and international aid donors, all whom confront daily moral questions in their work with poor countries. Seeking explicit and reasoned answer to these questions is the work of development philosophers and other ethicists.

Crocker further identifies five issues as development ethicists' central concerns (2007, pp. 60–3):

1. What is the best way to define the parameters of 'development' and the means for achieving it?
2. Who is morally responsible for promoting 'development'? Is it a nation's government, civil society, the market, international institutions, or collaboration between some or all of these actors?
3. Do affluent nations, states, corporations or individuals have obligations to the poor? If so, what are they?
4. How should the impact and potential of globalization be understood and ethically assessed?
5. How should the moral issues that emerge in development policy-making and practice be addressed and resolved?

Although technological issues are central to all five of these questions, development ethicists mostly address them through other foci. For example, in the wonderful book, *The Ethical Dimensions of Globalization* (Gehring, 2007), contributors focus on the following questions:

- Can general philosophical principles concerning the nature of punishment and justice be brought to bear on the problems of 'retribution' and 'reconciliation' as they are arising in South African contexts?
- Can practices of 'cultural re-enactment', such as William Kentridge's animated film study of apartheid, shed light on instances in which democratic

citizens are 'complicit' in acts of starvation and mass violence occurring far from home that they normally do not feel responsible for?

- Can the appeal to general moral principles be justified and rendered pragmatically useful in instances where human rights and local cultural norms conflict, for example cases concerning female genital mutilation and child labour?
- Which view of responsibility is more defensible, the view of cosmopolitanism, according to which we are not entitled to treat those near and dear to us as more morally valuable than those human beings with whom we have no ties of family, ethnicity, nationality or citizenship, or the particularist view of internationalization, according to which citizens who share in political institutions and a common destiny can justifiably, in some respects, privilege themselves?
- Do advocates of globalization routinely hold views about free trade and migration that are deeply incompatible?

While all of these topics are significant, the development ethicists who consider them nevertheless offer sparse consideration to technology, and this is due to their reliance upon the concepts and methods found in the standard normative philosophical literatures on globalization.

Globalization and the philosophy of technology

While the limits of development ethics are somewhat predictable given their sources of intellectual inspiration, it is all the more unfortunate that matters are not much better within the mainstream philosophy of technology. As recently as 1995, the German philosopher Friedrich Rapp could conclude a review essay by identifying the 'globalization of technology' as a 'new horizon' of philosophical debate that had only 'recently' begun to occupy the 'centre' of discussion. Furthermore, the two main philosophy of technology anthologies that were published after this observation was made, *Philosophy of Technology: the Technological Condition* (Scharff and Dusek, 2002) and *Readings in the Philosophy of Technology* (Kaplan, 2004), scarcely address globalization or technology transfer, even though they engage with many of the philosophical concepts that should be brought to bear upon these issues. And while contemporary analyses of postmodern warfare (e.g. Jean Baudrillard, 2002; Paul Virillio, 2002; Slavoj Žižek, 2002) do concentrate upon the relation between technology and globalization, they focus mostly on abuses of power that occur during conflict; no consideration is given to technology transfer during peacetime.

Given these trends, it can be lamented that the Society for Philosophy and Technology waited until 2007 to make globalization its central conference theme. Even then, despite laudably including presenters from around the world and a plenary session on Thomas Friedman's *The World is Flat* (2006), there was less discussion of globalization than one might have hoped for. As an instructive contrast, we can note my home institute – Rochester Institute of Technology, a college that focuses on training students in matters of applied technology, but which lacks a philosophy major – has long incorporated into its mission statements the discourse of preparing students to become 'caring and productive members of global society'.

When philosophers of technology actually do address globalization, their attention typically remains on the problems and hopes of the West. A counter-trend that addresses technological issues in non-Western cultures does exist, and such theorists as Don Ihde (1990), Andrew Feenberg (1995), Carl Mitcham (1994), Hans Poser (1991), Val Dusek (2006) and Aidan Davison (2001) have done commendable work. Again, their interventions are exceptional.

The Western bias under discussion here has not gone completely unrecognized. Many of the insights expressed in the philosophy of technology originate in phenomenology, and eminent globalization theorist, Niklas Luhmann, argues that Edmund Husserl's reflections on the crisis of history are tainted by Eurocentrism (2002, p. 38):

> Most conspicuous is perhaps a Eurocentrism that one rarely finds elsewhere in the twentieth century. European humankind is in crisis, European humankind is in need of salvation – and this by itself. This has certainly nothing to do with imperialism, colonialism, and exploitation, but obviously only with a spiritual consciousness of superiority that not only excludes 'the gypsies who constantly vagabond around Europe', but also considers a Europeanization of all other humans 'whereas we, if we understand ourselves correctly, will, for instance, never Indianize ourselves'. No consideration of the political and economic relations around the globe, no thought of the possibility that the European tradition could slowly be dissolved into other, differently structured relations in a world society. The emphasis on crisis and salvation, autonomously achieved, is owing to these blind spots, which at that time were already non-credible and which would become obviously even less so after the Second World War.

Updating this criticism, Trish Glazebrook, a Heidegger scholar, uses her contribution to *Globalization, Technology, and Philosophy* as an opportunity to comment on the Western bias currently found in the philosophy of technology (2004, p. 143):

> Technology theorists are remarkably silent on the topic of globalization. Although philosophy of technology is burgeoning as a discipline, its proponents have little to say about technology transfer to developing nations, and the impact of the global human condition on technology outside the West, or, as it is also called, the North.

To concretize this observation, consider some of the topics reviewed in that volume:

- In 'On Globalization, Technology, and the New Justice', globalization protestors are characterized as 'profoundly conservative' and unduly 'fearful of change'. The author's main point is that given the pace of technological and scientific innovation, it is useless nostalgia to look for conceptions of 'planetary justice' that are not firmly embedded in contexts where technical systems promote ever-increasing efficiency.
- In 'Democracy in the Age of Globalization', globalization is characterized as a desubjectivized postmodern culture that challenges the commitment to virtue. The author's main point is that strategies of resistance need to be cultivated to combat the fact that consumerism and atavistic tribalism have become the dominant horizons for thinking and acting.
- In 'Globalization, Technology, and the Authority of Philosophy', globalization is characterized as a movement towards 'barbarism'. The author's main point is that the speed of technology has created a culture that no longer cultivates the slow and careful patience required for attaining genuine 'wisdom'.
- In 'Communication versus Obligation: the Moral Status of Virtual Community', we are informed that virtual relationships rarely can rise to the level of genuine community. The author's main point is that online interaction routinely fails to provide a context for participants to exhibit the quality of regard and obligation that face-to-face communities can inspire.
- In 'The Problem with "The Problem of Technology"', we are informed that unless distance from technology can be achieved, the pre-digital past will continue to be looked down upon as a primitive period. The author's main point is that as a consequence of demeaning history, we deprive ourselves of critical resources for understanding and pursuing happiness.
- In 'The Human Condition in the Age of Technology', globalization is characterized as a period where 'our liberation from the materiality of the world is purchased at the price of inhabiting a parallel world of incomparably less depth and density'. The author's main point is that the 'ascendancy of the virtual over the real' has undercut 'the very reality of human existence'.

While all of these issues are worth considering, even if the conclusions are contentious (and, in some cases, perhaps even wrong), it is important to acknowledge that the main problems addressed are difficulties concerning general attitudes towards technology – specifically, Western attitudes that tend to be presented in terms of dilemmas about declining civics faced by a monolithic community, the universal 'we'. On the rare occasions in which concrete attention is given to specific technological practices, it is solely to determine their moral impact on developed nations. For example, it is noteworthy that the chapter which examines online virtual communities does not question the benefits and detriments that arise (and which can be expected to arise) when laptop computers are exported to developing countries.

Finally, given the persistent appeals to Martin Heidegger throughout the philosophy of technology, it is beneficial to end this meta-philosophical section by noting that in exemplary cases, such evocations diminish, rather than enhance, analysis. For example, in *The Creation of the World or Globalization* Jean-Luc Nancy (2007) presents a bombastic indictment of globalization that places technology at the centre of a dystopian polemic. On the assumption that Heidegger's account of technology and Foucault's account of 'biopower' are both, more or less, accurate, Nancy feels justified in articulating dire proposals, such as the claim that 'technological and economic planetary domination' are leading to the 'disintegration of the world', including 'unprecedented geopolitical, economic, and ecological catastrophe', without referring to any empirical case studies, or even examples (2007, pp. 3, 50). Succinctly put, Nancy opposes two possible human 'destinies' by contrasting 'globalization', which designates a uniform economic and technological logic, with *mondialization*, which designates the possibility of 'authentic world-forming'. Embedded in this binary distinction are a variety of other overly reductive contrasts, including demarcations between: creativity and nihilism, immanence and transcendence, un-world and habituation, representation and practice, and principle and mystery. Technology is demonized at the level of metaphysics because Nancy associates 'metaphysical history' with 'denaturation', and characterizes the history of philosophy as a horizon that limits thought through the technological manipulation of *logos* (2007, pp. 77–90). As the translators of the text, Francois Raffoul and David Pettigrew, approvingly note: 'The technology of *logos* thus reveals the denaturation of history, of the human being and of life itself. Life, Nancy insists, is no longer pure or bare, but rather produced according to technology. On Nancy's account, life becomes *techne*, and politics the management of *ecotechnology*' (2007, p. 13). *Given this monolithic and essentializing reductivism, it is not surprising that Nancy does not closely consider any empirical examples, or acknowledge benefits, much less ambiguities, that attend to globalized technological practices*!

12.2 Village phone: preliminary considerations

With the meta-philosophical analysis of globalization and technology transfer completed, the time has come to turn our attention to a specific case of globalized technology transfer and my sense of how philosophers can contribute to extant discussions of it. To establish sufficient context, this transition necessitates a few comments on current affairs.

In recognition of how his microcredit projects ‘advance democracy and human rights’ by creating ‘economic and social development from below’, the 2006 Nobel Committee chose Muhammad Yunus to be the first economist to receive the Peace Prize, an award traditionally bestowed upon politicians and statesmen.[2] Such prestigious and unprecedented recognition suggests that while diverse approaches to microcredit exist, many people view Yunus’s methods and aspirations to be the paradigmatic alternatives to ‘top-down’ government-sponsored and NGO-run development initiatives – initiatives that are often equated with a ‘Western’ approach to addressing global poverty.

Yunus founded the Grameen Bank, an institution that achieved international acclaim for offering small ‘entrepreneurial’ loans to impoverished Bangladeshis who lack collateral. He also helped start the Village Phone Programme (henceforth VP), an initiative that provides Bangladeshi women with an opportunity to become entrepreneurs by renting calling time on mobile telephones to mostly illiterate villagers who cannot afford to obtain their own telecommunications devices.[3] Inspired by the success of this programme and the replicated versions instantiated around the world (e.g. the Philippines, Rwanda, Uganda and Cameroon), mobile phones have become elevated to symbols of effective digital development; they are routinely characterized as ‘weapons against poverty’.

According to *New York Times* foreign correspondent Celia Dugger, Yunus’s economic programmes qualify as genuine contributions to peace because microcredit can *empower* women who have been disfranchised by religious fundamentalism:

> [Microcredit] offers hope. It offers, very importantly, *empowerment to women*. Overwhelmingly these microcredit loans are provided to women who are often quite financially powerless in their families. They often don’t have rights to inherit property, they don’t have bank accounts of their own. So the fact that the woman suddenly has the power to obtain a loan, even a very small loan, can be very important in giving her power and a counterbalance to the appeal of Islamic fundamentalism, which subsumes often the role of women. (Sims, 2006, emphasis added)

While Dugger conveys a widely held opinion, unanimous agreement does not exist on the matter. In light of reliable ethnographic observations and reasonable views on political agency, some detractors view the Grameen Bank’s reforms as *disempowering*.

At first glance, it can be difficult to appreciate why so much importance is given to the matter of whether women are, in fact, empowered by programmes such as VP. After all, other issues are pressing. Is VP an effective programme for bringing mobile phones to rural villages in Bangladesh? Is it justifiable to use economic reform, technology transfer, or economic reform that employs technology transfer as a means for challenging traditional cultural norms? Is the very notion of 'empowerment' so thoroughly Western that it is a chauvinist act to apply it to Bangladeshis?

Although there is no easy answer to the problem of chauvinism, the fact remains that 'empowerment' is the dominant concept that assessors use when judging the impact of microcredit programmes on women, a population deemed vulnerable, marginalized and deserving of prioritized attention. Given the prevalence of 'empowerment' in both advocacy and critical development literatures, development ethicists have a responsibility to examine whether or not it is the most appropriate term to use for making sense of and evaluating how women's lives change as a consequence of gaining new access to capital and technology. In other words, since 'empowerment' has become the primary 'talking point' for framing discussions of microcredit programmes, philosophers ought to reflect on the underlying presuppositions governing its use. In so doing, the questions raised above will in fact be addressed, even if only indirectly.

The purpose of this essay is to advance discussions of VP by suggesting that the empowerment debate may be based on a poorly posed problem. Contrary to the prevailing accounts that present us with the choice of judging Bangladeshi women to be either fundamentally empowered or else fundamentally disempowered by microcredit, I will contend that the loan recipients should be understood as *embodied subjects who are embedded in conditions in which relations of independence and dependence exist simultaneously*. In arguing that the Grameen Bank's assessors would benefit from reflecting on this *ambiguity*, I will appeal to *applied phenomenological* insights. Although traditional phenomenology has been criticized for being subjectivist, apolitical, insensitive to gender, and reductivist with respect to material culture, I will demonstrate that the phenomenological approach to 'lived experience' can shed crucial light on the culturally contingent, value-laden form of labour that a particular group of Bangladeshi women routinely engage in. In this context, I am seeking to bring Marxism, feminism and the postphenomenology of technology into better dialogue. This endeavour can be considered an exercise in *postphenomenology* because it is written in a 'middle voice' that aims for a subtle equipoise between critique and endorsement of innovative technological practice. Such a position builds upon and therefore is indebted to the dystopian attitude towards technology expressed in previous phenomenological inquiry.[4]

12.3 Microcredit empowers

The women who participate in VP are called 'phone ladies', and they have the potential to earn a salary that exceeds the daily income of three-quarters of Bangladeshis (Murphy, 2002, p. 163). When phone ladies are characterized as empowered, the following seven reasons are cited (Yunus, 2003b; Aminuzzaman et al., 2003).[5]

First, in targeting women, VP is praised for recognizing the potential of the 'poorest of the poor', a marginalized population that routinely has been denied access to credit and exploited by moneylenders. Second, VP is credited for providing women with employment opportunities that traditional Muslim customs of purdah inhibit. Under these customs, women are restricted to home-based domestic work; they are discouraged from speaking with males who are not relatives. What VP facilitates, therefore, is a socially permissible opportunity for phone ladies to speak with male phone clients. Third, as a consequence of the economic opportunities that VP generates, women gain authority and 'respect' from their spouses and communities. Fourth, by earning increased income through VP, women are able to take a more active role in their children's futures. For example, they can convey a positive image about women to their daughters, and they have the resources to provide their children, both boys and girls, with better educational opportunities. Fifth, due to the Grameen Bank's social agenda (conveyed in its 'Sixteen Resolutions'), women who participate in VP are praised for embracing modern values. For example, in order to qualify for loans phone ladies need to eschew the repressive custom of dowry and learn skills that instil self-discipline and appreciation for wellness (e.g. nutrition, sanitation and family planning are emphasized). Sixth, women are taught to appreciate the virtue of solidarity; in fulfilling the requirements for obtaining loans, phone ladies make pledges to look after one another. Seventh, by promoting 'entrepreneurialism', VP is said to do something that charity cannot; it instils pride and confidence, characteristics that ostensibly form the psychological foundation for enhanced civic participation.

For some economists, the empowerment narrative reviewed above risks idealizing microcredit. In response, several moderate criticisms have been offered, including the following from Jayati Ghosh (2006):

> It is a mistake to view microcredit as the universal development panacea which it seems to have become for the international development industry. It can at best be a part of a wider process that also includes working towards reducing asset inequalities, better and more egalitarian access to health and education services, more productive employment opportunities.

Beyond this general judgement, Ghosh highlights four contentious issues:

1. Microcredit operations, including the Grameen Bank's, 'depend substantially on subsidies ... because of high costs of transaction and monitoring'. Such subsidies may 'imply a transfer of public resources from other public spending, leading to cuts in public health, sanitation and education expenditure'.

2. Because microcredit provides small amounts of money and requires borrowers to repay their loans quickly, microcredit may merely function 'as a consumption stabilizer, reducing the adverse effects of shocks such as natural calamities or seasonal fluctuations, and provides means for taking advantage of very small business opportunities'. As a consequence, microcredit may 'amount to no more than a redistribution of incomes among the relatively poor, rather than an overall increase in incomes of the poor'.
3. Microcredit borrowers can find themselves in a state of 'microcredit dependency' in which they rely on loans for 'consumption' rather than 'productive use'. In some instances, 'peer pressure has forced women borrowers to take on expensive loans from moneylenders' to repay their bank loans.
4. Because microcredit institutions require high repayment rates to remain sustainable, they can enact policies that function as 'instruments' of 'stratification'. For example, there 'have been cases of women from the most destitute or socially deprived groups being excluded from membership of groups containing better off members, because of fears that their inability to repay will damage the prospects of other members'.

While these are all provocative criticisms, none address the following *phenomenological question*:

- What aspects of practice are occluded when quantified analysis, obtained through survey studies and neo-classical economic theories, only foreground selective consequences of participating in VP, notably the 'satisfied preferences' that can be detected from a 'bird's eye' perspective?

This question focuses on the implications that follow from the fact that advocates of the empowerment position scarcely address the social and cultural constraints that many Bangladeshi women experience when they apply for microcredit and maintain the behaviours required for being a borrower in good standing. Since a preliminary answer to this question concerning 'lived experience' can be found by consulting *qualitative anthropological* inquiry that does not *disembody* or *disembed* the subjects it studies, we will begin the next section by discussing an influential anthropological text.

12.4 Microcredit disempowers: anthropological perspective

Aminur Rahman's *Women and Microcredit in Rural Bangladesh* is perhaps the most well-known anthropological critique of the empowerment narratives reviewed in the last section. Rahman's indictment of how traditional Bangladeshi culture absorbs microcredit programmes is so scathing that it poses a challenge to numerous 'Women in Development' initiatives. These initiatives try to improve the quality of women's lives in developing countries by calling upon 'governments, development agencies and international financial institutions to provide aid and resources specifically for women, who would then be able to contribute substantively towards family welfare and national development' (Chowdhry, 2001).

Through participant observation and unstructured interviews, Rahman, a 'native' of Bangladesh, provides a qualitative 'worm's eye' study of the day-to-day lives of 120 women from the Tangail district in Bangladesh who borrowed money from the Grameen Bank (1999, p. 22). While Rahman's initial goal was to better understand 'the dynamics of the empowerment of women', his up-close observations of 'women borrower's lack of power' led him to change course (1999, p. 24).

Rahman discounts the empowerment narratives provided by indigenous theorists and functionaries because he views their judgement as compromised by national pride and personal ambition: 'The academics, researchers, and bureaucrats in Bangladesh ... produce and maintain the hegemonic discourse of the Grameen Bank to establish it is a development "icon" and to enhance their own reputations' (1999, p. 50). Contrarily, he depicts his own iconoclastic perspective as well founded because it is informed by four critical ideas.

First, Rahman creates a theory of 'disentitlement'; it is a modification of economist and philosopher Amartya Sen's notion of 'entitlement' and anthropologist Arjun Appadurai's concept of 'enfranchisement' (1999, pp. 40–2). Second, Rahman appropriates the distinction between 'public' and 'hidden' transcripts that political scientist James Scott articulates in *Weapons of the Weak* (ibid., pp. 42–4). Third, Rahman appeals to aspects of Pierre Bourdieu's sociological practice theory: 'habitus', 'field' and 'capital' (ibid., pp. 44–8). Finally, Rahman makes use of political theorist Antonio Gramsci's concept of 'hegemony' (ibid., p. 52). For present purposes, it is not necessary to discuss these ideas in detail. What matters is simply that we recognize that these tools of *ideology critique* incline Rahman to be suspicious of the typical testimony of Grameen Bank employees and borrowers, and the typical analyses of the Grameen Bank's programmes.

On the basis of his fieldwork, Rahman comes to see the Grameen Bank's accomplishments as being partially attributable 'to its ability to successfully utilize patriarchal structures in facilitating its goals and agendas' (Chowdhry, 2001). Rahman concludes (1999, p. 23):

> Most women borrowers are not the direct benefactors of the credit extended to them. Instead, these women appear to be mediators between their male household members and the bank. Thus the lending institution invests loans in the village to generate profit, but it uses the prevailing patriarchical norms of the village society and the positional

vulnerability of women (immobile, shy, passive) for timely repayment and distribution of loans.

In support of this distressing outlook, Rahman emphasizes three salient problems.

First, since the Grameen Bank targets its loans to women, some of the husbands who have been excluded by this policy have forced their wives to sign up for loans, only to forcibly appropriate the funds from them. Rather than addressing these loans-by-proxy, the Grameen Bank proclaims that women are empowered by becoming loan recipients (Rahman, 1999, pp. 40–1). By touting its commitment to providing opportunities for the most disfranchised Bangladeshi population without acknowledging what actually happens to that population when it pursues these opportunities, Rahman claims that the Grameen Bank generates an 'ideology' that obscures the connection between microloan practice and 'the larger structure of patriarchy'. Worse, because patriarchy becomes intertwined with the lending mechanisms, Rahman insists that the Grameen Bank is guilty of inaugurating 'new forms of domination over women in society' (ibid., p. 51).

Second, although orthodox narratives emphasize the Grameen Bank's success at instilling empowerment in women by teaching them to assist one another and to abandon detrimental domestic behaviours, Rahman contends that Bangladeshi women tend to present corroborating testimony about these reforms only as a 'strategic pose'; their goal is not to tell the truth, but to placate authorities and ensure that they can continue to qualify for funds (ibid., p. 43). Contrary to the overt testimony, Rahman claims that there are ample instances in which women do not follow through with their commitment to refrain from giving dowry, upgrade sanitation, or engage in substantive changes in how they eat (ibid., pp. 94–6). Additionally, he insists that vicious, but under-reported interactions have occurred among females themselves in the 'lending circles'. In these instances, 'power hierarchies' underwritten by classicism have prevented genuine solidarity from arising (ibid., pp. 124–7). Again, Rahman contends that some of women who witness these confrontations stay silent in order to avoid jeopardizing their own loans.

Third, Rahman claims that the Grameen Bank presents an ideological justification that hides the true basis for why it almost exclusively provides loans to women. Officially, the Grameen Bank makes two claims: (1) it promotes social justice by redressing Bangladesh's history of depriving women access to credit; and (2) it respects sexual difference by acknowledging the fact that Bangladeshi women are more fiscally responsible than men (ibid., pp. 71–2). For example, Yunus maintains that empirical observation establishes that men are inclined to waste their income on frivolous experiences and unnecessary commodities, while women typically prioritize their children's welfare and household necessities.

Contrary to this rationale, Rahman proclaims that the Grameen Bank really targets women because they are an easily manipulated population. More specifically, the Grameen Bank views women as more likely to repay their loans than men because they can be disciplined through purdah – cultural norms that emphasize the 'virtues' of 'submissiveness', 'modesty', 'purity', 'respectability', and 'humility' (ibid., pp. 73–5). Rahman notes that in some cases the Grameen Bank minimizes its transaction costs by threatening women with 'shame', and in others it uses or condones violence (both physical and verbal) as a mechanism for pressuring women to make timely payments (ibid., pp. 123–4). Beyond these scenarios, Rahman insists that the Grameen Bank does not effectively deal with the fact that the some husbands will resort to violence to force reluctant wives to sign up for loans.

Although these claims seem extreme when compared with the depictions of microlending espoused in the empowerment narratives, Rahman's central thesis resonates with historical precursors. In this context, it is instructive to recall the uproar that occurred over Bangladesh's reliance on child labour.

In the mid-1990s, discussions took place in the US about boycotting Bangladeshi goods produced by child labour. In response to congressional consideration of the Child Labor Deterrence Bill and public outcry over a documentary on Wal-Mart importing clothing made by underage labourers, 'nervous' Bangladeshi factory owners fired 50,000 children, '75% of the total then employed' (Pierik, 2007, p. 48). Contrary to the 'dramatically naïve' perception that these kids would return to school, none of them actually did (ibid., pp. 48–9). Instead, some remained unemployed despite looking for work; others took jobs – including prostitution – at reduced pay and settled for less adequate nutritional and health care conditions (ibid., p. 49).

The lesson to be learned from this incident and Rahman's observations is that long-standing social norms in Bangladesh cannot effectively be challenged without first addressing the primary cultural forces which give rise to and sustain them. Thus, economic reform cannot liberate Bangladeshi women until the patriarchal structures that disempower them are directly confronted. Unfortunately, this lesson is obscured by the implicit convictions about technology that underwrite narratives about VP.

12.5 VP: technological script and purdah

Although Rahman's analysis focuses on how patriarchical power permeates the Grameen Bank's microloan iniatives, he does not examine any of the *forms of labour* that women perform after they invest their newly acquired capital into businesses endeavours. Given Rahman's goal of calling attention to the general ways that patriarchy taints microcredit initiatives in Bangladesh, it made sense for him to restrict his focus. What I find disappointing is that none of the critical studies of the Grameen Bank, including ones written after Rahman's book was published, examine the *constraints that women experience when they do their job of renting calling time on mobile phones*.[6] Such occlusion is indicative of how deeply embedded the 'instrumental' conception of technology is in both the popular and scholarly imaginations. The persistence of this view suggests that while it is easy to grasp how technology can be put to moral and immoral uses, it can be difficult to appreciate how *technologies and technological practices themselves can be value-laden*.

When mobile phone use is instrumentally analysed in the context of VP, emphasis is typically given to the salutary ends that the indigenous customers use the technology to pursue (Bayes, 2001). For example, because Bangladeshi merchants use mobile phones to gain access to the price of commodities, they can avoid being exploited by middlemen. Additionally, when illiterate Bangladeshis use mobile phones to contact expatriated relatives, they can avoid having their exchanges mediated by religious imams. Also, mobile phones provide an opportunity for people who are ill (or who own sick livestock) to obtain medical advice without losing valuable working time or experiencing the hindrance of inefficient transportation systems.

In the rare instances when problems with mobile phone use are addressed, the framework remains instrumentalist; emphasis stays on the salutary consequences that follow when normative human decision-making has more authority than technological or economic influence. For example, the popular coverage that was given to the matter of Bangladeshi parents complaining that their children were being corrupted by the conversations occurring at night (when free calling time was available) focused on how the Bangladesh Telecom Regulatory Commission was petitioning phone vendors to cease providing this service.

While these scenarios are significant, it is a mistake to treat how VP customers use phones as the only technologically relevant consideration. For if Rahman's analysis is accurate, we should *expect to find patriarchy tainting all of the major opportunities that the Grameen Bank provides*, including opportunities for women to work with mobile phones. Indeed, given Rahman's reliance on ideology critique, it is surprising that none of the theorists who have been influenced by his views have discussed how the hybrid human–technology phrase 'phone lady' evokes Karl Marx's insight that the material conditions which constitute forms of labour can impose identities upon the labourers whose consciousnesses are shaped by the work they perform. While interminable debates continue over Marx's so-called economic and technological determinisms, it is harder to reject his *phenomenology* of what it was like to be a typical nineteenth-century factory worker. Marx provides this phenomenology when he discusses the ontological implications that followed from people working under alienating conditions – conditions where one performed a job that was regulated by a standardized regime that reduced human behaviour to a functional extension of outputs provided by machines.

To go beyond Rahman's analysis and determine if influence of purdah is present in VP, the following research questions need to be answered. Given the centrality of lived experience, *phenomenological considerations* are crucial:

- What opportunities for engaging with customers does VP facilitate as well as inhibit?
- What opportunities for engaging with technology does VP facilitate as well as inhibit?
- What opportunities for engaging with technical professionals does VP facilitate as well as inhibit?

To address these questions concerning VP's *techno-economic script*, it helps to begin by considering the *embodied dynamics of phone use*. In order for phone ladies to present their customers with optimal conditions for conversation, they need to be *silent* and *unobtrusive*. For if the phone ladies speak while their customers engage in discourse, disappointment will likely result and the prospect of repeat business will be compromised. Customers probably will be disappointed because they will find it difficult to concentrate on the very task that motivated them to rent phones in the first place. Additionally, customers can become disappointed if phone ladies engage in extended conversation with them about their calls after the calls are completed. In this instance, the violation of social etiquette may provide a disincentive for customers to return.

The next consideration to address is the matter of *skill* and *judgement*. Unlike merchants who offer multiple goods and services, and who can provide skilled, if not expert, judgement concerning different consumerist options, phone ladies do not operate in a context where they can cultivate perspectives that their clientele will value. Rather, the Grameen Bank provides them with the opportunity to offer only one type of service, and that service invariantly requires a default protocol to be followed – a simple, yet strict script in which a phone is traded for a fee. By contrast, customers who enter mobile phone shops in developed nations can talk with employees about the advantages and disadvantages of procuring different phones, different phone peripherals and different calling plans. Thus, the *very practice of renting mobile phone time is so restrictive* that if phone ladies deserve to be considered 'entrepreneurs', it is only in a qualified sense.

Further insight into VP's script can be obtained if we broaden our considerations so as to reflect upon the *available options* that phone ladies have with respect to *working with the technology* they loan out. The mobile phones that Grameen Telecom provides to the phone ladies are devices designed to fulfil *one single function*; they allow people to communicate with one another in real time over potentially vast geographic differences. Although the history of technology is replete with instances in which technologies come to be used in ways that have little relation to what an artefact's designers initially intended, those instances are occasions in which emergent practices could arise because the technologies came to be used in contexts that are less restrictive than VP. In this sense, it is instructive to recall that while the telephone's history can be traced back to visions of the device being used as a prosthetic by the hard of hearing, it became inserted into contexts that rewarded innovation; as a consequence, the telephone transformed into a device that revolutionized how people who do not have hearing disabilities communicate.

Thus, while it must be admitted that phone ladies could, in principle, put their phones to use in innovative ways, it is hard to imagine that such uses would be sustainable, given economic constraints. Because phone ladies are primarily interested in using mobile phones to earn income, and because it is difficult to conceive of impoverished Bangladeshi customers paying to use mobile phones as paperweights, jewellery, or any other non-traditional service or item, it is hard to imagine that phone ladies can do anything other than hand the phone over, without modification, to a customer who is paying to use it to place a call. The techno-economic script simply restricts the phone ladies' degrees of freedom to such an extent that they cannot take creative liberties with the artefact they spend considerable time each day with.

Additionally, given the phone ladies' pervasive illiteracy and lack of advanced formal education, they cannot be expected to understand the scientific and engineering principles that underlie mobile telecommunications. Nor can they, given the limited resources at their disposal, be expected to have the opportunity to learn about these principles, should they so desire. In light of these limitations, phone ladies need to *rely upon and fully defer to the skilled technicians* who are charged with keeping the phone systems operative and fixing malfunctioning equipment. Since almost all professions rely upon some division of labour, deference to other peoples' expertise is not objectionable in itself. But what is important to note, here, is that the particular web of dependence at issue places phone ladies in an especially vulnerable position. Although phone ladies are depicted by the empowerment narrative as essentially being self-employed entrepreneurs, the fact remains that they can exert little authority when dealing with their business 'partners' who are consistently more highly educated. In this context, it is important to acknowledge that the limited authority phone ladies have at home, and the limited authority they have when they meet the requirement of addressing the predominantly male staff of Grameen Bank as 'sir', is extended to their limited authority at work.

Furthermore, even if phone ladies run a business that attracts a sizable clientele, *none of their work will lead to skills that can enable them to minimize their future dependence on technical professionals*. Even the prospect of adding additional technological services presently requires external authorities to contribute further input. To this end, when Yunus boasts that in the future phone ladies will have a chance to become 'Internet ladies', what he has in mind is the idea that, in *top-down fashion*, *his staff* will find a way to provide impoverished women living in rural areas with working computers that have voice-operated functions that illiterate populations can find user-friendly (2003a, p. 254).

Final insight into the restrictions that limit how the phone ladies can use phones can be obtained if we compare their labour with traditional craft labour – a topic that, admittedly, has been the subject of overly romanticized accounts. Romanticism aside, it remains the case that labourers who produce traditional crafts typically transform raw materials into goods by skilfully using tools. Because such skilled action tends to require discipline to cultivate, it is a form of engagement that humans can be *proud of*. As Marx's philosophical predecessor G.W.F. Hegel notes, the creation of tangible goods can be rewarding because crafts contain an imprint of the artisan's handiwork; this reflection of the human in the thing lessens the gap that, most of the time, separates subject from object. And yet, as the previous remarks in this section suggest, the script that VP provides is not conducive to phone ladies cultivating skill. Consequently, it does not provide an environment for them to view their professional activity as a *personal achievement worthy of pride*.

All these considerations suggest that when VP is understood as a concrete practice, it turns out to be a profession that is predicated upon female labourers embodying many of the characteristics that purdah requires. *When phone ladies do their job, they are passive, invisible, deferential, and unremarkable*. The respect they gain is not accorded to them because they are viewed as peers. Rather, since the value of being a phone lady is associated only with an instrumental utility, they are viewed *more as a service than a human being*. And since mobile phones are predominantly rented by men, phone ladies essentially provide a service that is synonymous with male consumption (Aminuzzaman et al., 2003, p. 335). Any account that only considers what phone ladies can do with enhanced income, but which glosses over the experience they endure in order to obtain this income is, therefore, incomplete.

12.6 The politics of disempowerment

Having extended Rahman's views on patriarchy to the *experience of being a phone lady*, the question remains as to whether VP is in principle disempowering. While nobody appears to be advancing a position that strong, some have come close, at least with respect to the underlying microcredit issues. For example, in his essay 'The Micro-Credit Cult', libertarian theorist Jeffrey Tucker (1995) claims the mandatory changes in lifestyle that the Grameen Bank imposes are tantamount to a cult's demands:

> So let's say you're a borrower in Bangladesh…your private life is gone. The Grameen staff is in charge of your family size and the workings of

> your latrines. Your friends must be Grameenites. You chant the Sixteen Decisions *ad nauseam* and attend tedious exercise sessions and parades. If you're single, the prohibition on dowries limits your marital prospects. If you're married with children, your children are farmed out to Grameen Day Care. You can't have any more if you want to. Plus, you must periodically abandon your primary occupation to dig around in the dirt planting tree seedlings to please international agencies.

Perhaps the most indicting political argument can be found in Aradhana Parmar's (2003) essay, 'Microcredit, Empowerment, and Agency: Re-Evaluating the Discourse'. Although Parmar does not address VP, her interpretation of Rahman coupled with her commitment to a particular version of feminism, leads her to express concern that the Grameen Bank's microlending practices risk disempowering women by 'co-opting' their struggles and leaving them 'disserviced' and deprived of *political agency* (Parmar, 2003, pp. 466–77).

Parmar offers several premises to support her case, beginning by noting that since the Grameen Bank's microloan iniatives are founded by men and predominantly run by male employees, they reduce women to 'welfare objects' of reform (ibid., p. 465). Under such patronizing conditions, Parmar claims that institutional norms provide women with little 'ownership' over the programmes they participate in. As we have already discussed, when husbands are not controlling their wives' lives, male development workers and other professionals are authorized to be domineering over female borrowers. Given these patriarchal constraints, Parmar insists that the Grameen Bank's policies are predicated upon viewing women as 'incapable' of 'identifying their own needs and priorities', and as unable to exercise their own 'rationality' for the purpose of developing positive 'strategies' and 'visions' for combating oppression (ibid., p. 471).

Parmar further insists that the Grameen Bank engages in questionable acts of discipline by treating social reform as a matter to be addressed primarily through practices that equate capitalist values, such as individualism and consumerism, with moral values. Because women only obtain new familial and social opportunities by participating in competitive commercial practices, their emancipation is not truly rights-based; instead, it remains contingent on continued financial success. By rewarding Bangladeshi women for believing that they are worthy of respect because they can earn money, the *intrinsic value of human dignity goes unrecognized* and the capacity for women to *experience a form of solidarity that is based on a principled commitment to combating injustice goes unnurtured*. Indeed, from a practical perspective Parmar observes that as women socially advance for reasons related to 'labour and capital', they come to seek better material conditions, but do not feel motivated to examine the systematic structures of their oppression (ibid., p. 465).

Ultimately, in contrast with the Grameen Bank's imposition of an externally imposed conception of the good life, Parmar argues that a proper empowerment programme would assist women to discover their own capacity to create the conditions under which they can act as agents who make 'principled choices' (ibid., pp. 473–4). With empowerment defined in this way, Parmar admonishes the Grameen Bank for failing to appreciate that when properly understood, empowerment is about inner strength, inner conviction, and the inner motivation to create a world where everyone regardless of race, class or sex has the capacity to exercise autonomous agency. 'Empowerment', Parmar concludes, 'is based not on "power over", but on "power with" or "power within"' (ibid., p. 474). 'Power within' is the gold standard for political agency because it increases 'confidence' and 'assertiveness' and thereby motivates agents to eliminate 'all exploitive structures' (ibid., p. 475).

Conclusion: does VP disempower?

How should we interpret Parmar's claims and all the supporting evidence that she draws from (and, as per Section 12.5, could draw from)? Is VP an empowering programme, a disempowering programme, or is the empowerment–disempowerment debate predicated upon a poorly posed problem?

To answer this question, let us review the two main critical points discussed so far. First, when phone ladies are characterized as empowered, such depictions are primarily based upon survey data that measure how well individual 'preferences' are 'satisfied'. Such surveys are constructed from a 'bird's eye' perspective that does not adequately register *several aspects of lived experience*, including:

- Whether the women are at liberty to provide honest answers to the questions they are given, or whether patriarchical constraints bias the responses they can provide;
- Whether the women need to endure oppressive encounters in order to remain borrowers in good standing, and in order to obtain income by renting calling time;
- Whether the women achieve better social and familial standing at the expense of having their intrinsic dignity respected;
- Whether the women achieve a comparatively better quality of life at the expense of developing the characteristics that political agency requires.

Second, when VP is characterized as an empowering programme, *technocratic assumptions* about *technique* and *technology* are typically made. The Grameen Bank's approach to microcredit can be understood as a technique for instilling social change, and the empowerment narratives erroneously suggest that such a technique is culturally transcendent – that it can be imposed on traditional Bangladeshi culture without becoming complicit in its patriarchical norms. Similarly, when the empowerment narratives depict mobile phones as weapons against poverty that challenge patriarchy, they tend to ignore the ways in which certain uses of phones, such as renting them out, become complicit in patriarchical norms. In this case, the mistake consists of viewing technology as culturally transcendent, and not as what Don Ihde (1990) calls a 'cultural instrument'.

While these considerations give us good reason to be sceptical of the idealizations present in the empowerment narratives, they do not justify the conclusion that phone ladies should be characterized as fundamentally disempowered. If that conclusion were justified, then the only relevant accounts of women's lived experience that future analysts should provide are ones that capture the persistent – if not augmented – presence of patriarchy. In that hypothetical context in which hegemony is all-encompassing, phenomenology would remain a slavish adjunct to ideology critique: only predictable and repetitive patterns of oppression would be emphasized; and gains in independence would consistently be treated as less consequential than the adverse effects of techno-economic scripts that induce relations of dependence.

Ultimately, in order for the unqualified disempowerment conclusion to be valid, three premises would need to be true: (1) the women who believe they have gained significant independence as a consequence of accruing the benefits reported in the empowerment narratives would have to be experiencing 'false consciousness'; (2) subversions of disempowerment (that differ from the behaviours detailed in the empowerment narratives) could not be occurring at present; and (3) the future would need to be closed. From my perspective, each of these premises is contestable.

With respect to the first premise, even if some of the phone ladies suffer in ways that the empowerment narratives fail to acknowledge, and even if, in some instances, phone ladies are unaware of the extent to which their behaviour is compromised, the fact remains that new possibilities for enhancing agency are arising due to access to credit and mobile phones. Without, as Bruno Latour might say, enrolling phones as 'allies', these opportunities would not exist. For even if Parmar is right, and 'power within' can be meaningfully distinguished from 'power over', such a differentiation remains tenuous. Over time, the latter can, as Yunus suggests, become a catalyst for the former. Of course, the latter can also, as Parmar suggests, inhibit the former. But that outcome is an empirical matter; without the assurance of technological or economic determinism, it can only come to light as history unpredictably unfolds.

With respect to the second premise, forms of solidarity between phone ladies may already be occurring, even if they have escaped the attention of analysts. For example, it is possible that in striking a 'strategic pose' by pretending to adhere to the 'Sixteen Resolutions', Bangladeshi women are cultivating solidarity around their partial subversion of top-down authority.

In order to determine if collective consciousness is being formed in this way, anthropologists cannot be content to follow Rahman's lead and treat each instance of women breaking a promise to the Grameen Bank as merely proof of the bank's hypocrisy.

With respect to the third premise, the techno-economic script discussed in Section 12.5 is temporally bounded. Unlike the enduring values embedded in material artefacts, such as speed bumps ('slow down') and disposable coffee cups ('throw me out'), the form of phone lady labour can readily change given shifts in a number of conditions, including alterations to supply and demand (Verbeek, 2006). For example, if mobile phones proliferate and become more sophisticated, and if competition arises in villages, phone ladies may have the opportunity to engage in certain forms of skilled behaviour. They would need to create incentives for customers to use their phones, and this goal could inspire them to arrange their homes in inviting ways, prepare interesting food, etc.

In the final analysis, the problem with 'empowerment' and 'disempowerment' is that they are modern terms that evoke strong cognitive and emotional responses. They readily conjure images of autonomy and servitude and incline the analysts who use them, even in a qualified sense, to tilt their inquiry in an extreme direction. As a consequence, techno-utopian and techno-dystopian images and rhetoric abound.

What programmes like VP do is instil *simultaneous relations of independence and dependence*. As techno-economic reforms, they can create independence only by capitalizing on, and possibly perpetuating, a variety of dependency relations. Indeed, at present, phone ladies only acquire some independence because of a double dependency; they are dependent on the VP script, and their villages are dependent on their services. In order to create better metrics for assessing these *hybrid relations*, more nuanced accounts of lived experience are necessary – accounts that are sensitive to the impulses towards idealization and ideology critique, but which place *ambiguous experience* in the foreground of the analysis. Attention to this matter will not only improve understanding of VP, but considerations of this sort can provide a new wave for philosophers of technology to interface their analyses with a range of development theorists and practitioners.

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Notes

1. The analysis of the Village Programme that begins in Section 12.2 is reprinted from my forthcoming *Human Studies* article 'Does Microcredit Empower? Reflections on

the Grameen Bank Debate'. I am grateful to Lenore Langsdorf, editor of the journal, for allowing me to reprint the essay here, and to Don Ihde for deciding to guest-edit a special issue on postphenomenology.
2. The foundation for many of the issues addressed here can be found in three previous articles: Selinger (2007, 2008, forthcoming).
3. The Village Phone Programme began in 1997 as a collaborative venture between the Grameen Bank and two companies, a private for-profit company, GrameenPhone Ltd, and a not-for-profit one, Grameen Telecom.
4. For more on postphenomenology, see Selinger (2006).
5. Phone ladies are also referred to as 'mobile calling offices'.
6. Having restricted my attention to articles and books written in English, I may be overlooking relevant inquiry in other languages. I also may be overlooking sources that fell outside the scope of my searches. These caveats are important for two reasons. First, in so far as I am relying upon secondary literature and not a personally conducted case study, I do not want to overstate the strength of my conclusions. Second, in so far as I am relying upon phenomenological concepts that were developed by Western thinkers, the analysis risks distorting non-Western lifeworlds. This risk is amplified by reliance upon studies that were written in English, for Western audiences.

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13

Philosophy of Technology as Empirical Philosophy: Comparing Technological Scales in Practice

Casper Bruun Jensen and Christopher Gad

Throughout its history, science and technology studies (STS) have been inspired by continental philosophy in various guises. In this essay we argue that inspiration does not have to be one-way but that philosophy might likewise learn from STS. Engaging philosophy through STS enables us to develop the notion of empirical philosophy proposed by STS scholar Annemarie Mol (2002). Empirical philosophy takes seriously the ways in which actors deal in practice with what are usually considered philosophical concerns: what is good, what is right, what is true, and so on. Thus John Law and Annemarie Mol have argued that:

> Most everyday practices make use of, or try to create, scales to measure or contrast 'goods' and 'bads'. This opens a space for an empirical philosophy. An ethnographic interest in practice can be combined with a philosophical concern with 'the good' to explore which 'good/bad' scale is being enacted, and how this is being done. (Law and Mol, 2002, p. 85)

In this view the many interactions with technologies encountered in empirical studies are taken as more than illustrative input for philosophical deliberation. Instead, such activities are considered central features of situated ontological work and as having philosophically important content as such. In this respect empirical philosophy follows the increasing STS and social anthropological interest in exploring the world as multiple; not in terms of perspectives as in multiculturalism, but in terms of ontological multiplicity as in a *multinaturalism* (Viveiros de Castro, 2004), where technologies are seen as active ingredients in shaping reality itself.

The first part of the chapter sets the stage for this discussion by reviewing the agenda of Don Ihde's philosophy of technology as part of a recent trend towards considering technology in practice. This is also an eminently anthropological concern and we situate the philosophy of technology in relation to some ideas within contemporary anthropology and to a critical discussion about the increasing emphasis on practice. While there is substantial overlap and resonance between empirically oriented philosophy of technology and the anthropology of material culture (e.g. Appadurai, 1986), we find that more analytical work is required to facilitate understanding of the fluid and variable roles of technology in action. Such attentiveness is not a purely theoretical demand. It is also a methodological requirement, to ensure that analysis of how technologies function in specific circumstances is not overdetermined by a general framework, which views technologies, for example, as autonomously imposing their 'logic' on practice.

Because we expect specific empirical settings to provide philosophically important material, we are required to engage local work with, and conceptualization of, technologies in an open-ended manner, while our own concepts must likewise remain open for change. This follows because we expect specific empirical settings to provide material which is just as important as philosophical arguments for the task of understanding technology. With this symmetrical stance it must be assumed that general analytic rubrics will be imprecise and may be irrelevant when brought to bear on specific technological subject matters. A high degree of analytical openness is required to be able to learn from the discrepancy between the philosophical assumptions one brings along and the situations encountered during empirical investigation.

It is, perhaps, important to emphasize that empirical philosophy does not entail a reversal from (pure) theorizing to (pure) description. Instead, it suggests that the development of philosophical concepts should be practice-driven (and sees philosophy itself as a set of practices). However, since practice is not conceived as pre-theoretical and doing theory is seen as constituted by concrete activities which effect the formation of concepts, we should expect to deal in hybrid forms of thinking and acting. As this is the case, we are not faced with a demand to extrapolate, for example, the theoretical essence of an empirically based argument. But we are also not obliged to purify analysis by removing the 'metaphysical vestiges' so abhorred by positivist-inspired social science and analytical philosophy. Instead, the strengths and weakness of any argument must be found in the specific links and associations they provide between materials, whether these are traditionally conceived as philosophical and conceptual or empirical and practical.

Our view of the practice of philosophy and social science is therefore precisely analogous to our view of technology. Just as we do not start out with a clear-cut notion of what is the relation between theory and practice and how they inform each other in any given instance, so also we do not know a priori what technologies must be like or what they can do. This is made particularly vivid in our first illustration, which follows Annemarie Mol and Marianne de Laet's analysis of the ontological fluidity of the Zimbabwe bush pump. Our second illustration is from Marilyn Strathern's anthropological work on the cultural implications of new reproductive and genetic technologies. Finally, we are taken onboard a Danish fishery inspection vessel, in a further discussion of both ontological fluidity and technological enablement, with the purpose of understanding the assemblage of new and old technologies that are present on the bridge. This case highlights how specific scales of the old and new, the trustworthy and suspicious, are configured in a pervasive technological setting.

Although our very different cases invite us to take a number of commonsense categories (notably between the high-tech and the low-tech) about technology for granted, we decline to do so. Instead we examine the high- and low-tech as empirically variable *scales,* which are always constructed in relation to specific networks, with the purpose of figuring out how to think about and work with technologies and thus produce new worlds. We analyse and contrast these examples to make the argument that empirical philosophy holds innovative potential for philosophy of technology and opens up avenues for rethinking the relations between theoretical analysis and empirical inquiry.

13.1 Philosophy and anthropology on technology

What are the concerns of philosophy of technology? Obviously multiple answers can be given to the question, but we can start out by referring to three sets of questions, which the prominent phenomenologist Don Ihde has defined as central for the field. The first relates to the question 'How like or unlike is life within our techno system from previous or other forms of life that humans have taken up?' (Ihde, 1990, p. 3). An argument is here often made that the modern world is radically different from the past. An example of this argument can be taken from Albert Borgmann's *Technology and the Character of Contemporary Life* (Borgmann, 1984), referring to the changing circumstances in the work of wheelwrights. Commenting on an account by Sturt, Borgmann (1984, p. 46) notes that it

> is remarkable not only for its portrayal of the strength and character of a pretechnological world of things. It is also painfully aware of the rise of technology and the destruction of the pretechnological setting. This process too becomes visible at the reference points of nature, materials, and social relations. Accelerated by the demands of the First World War, a 'sort of greedy prostitution desecrated the ancient woods [...] I resented it', Sturt says, 'resented seeing the fair timber callously felled at the wrong time of the year, cut too soon, not "seasoned" at all'. The conquest of nature is not confined to the treatment of the forests but moves into the wheelwright's shop too, replacing skill with mechanical power which can 'drive', with relentless unintelligence, through every resistance.

Borgmann argues that technologization necessarily leads to deterioration of traditional culture and values. As we shall see below, the view of Ihde, as well as of empirical philosophy, are simultaneously more ambivalent and nuanced.

Ihde's second question 'revolves around whether technologies are neutral' (Ihde, 1990, p. 4). Are they inert objects, for example, or do they affect human perceptions, understandings and ways of acting? To answer this question both Don Ihde and Bruno Latour (1994) have made use of the well-known controversy on whether guns kill people (technical determinism), or people kill people with guns (social determinism and technical instrumentality), which in the American context is related to the contested issue of whether it should be allowed to carry weapons. This controversy is often seen as exemplifying the themes of human or technological autonomy and determinism.

Contrary to what is suggested by Borgmann's analysis of 'mechanical power', driving with 'relentless unintelligence, through every resistance', both Ihde and Latour reach the conclusion that technologies are neither autonomous nor deterministic. Yet, this does not mean that humans are in control of technology. Latour suggests that the associations of technologies and humans form new actors, and this allows for the emergence of new properties, which neither technology nor humans had individually. In a similar vein, Ihde proposes to view technologies as multi-stable (e.g. Ihde, 2002, pp. 106–7). In this view a gun may be turned into a hammer or a decoration on a wall, as well as it may become an instrument for killing people.

Ihde's third guiding question for philosophy of technology is 'What does high technological development portend for our species' future?' (Ihde, 1990, p. 7). Answers to this question can be given utopian as well as dystopian inflections. Both, however, are refused by Ihde and others involved in the 'empirical turn' in the philosophy of technology. Proponents of this turn see such overall characterization as founded on an inadequate idea of technology as an all-encompassing framework or a prime mover. In contrast with both critics of technology such as Borgmann who laments the 'device paradigm' and enthusiasts who celebrate technological progress, these philosophers propose to view technologies (in the plural) as unpredictable and complex (Achterhuis, 1999, pp. 2–8).

Exemplifying this viewpoint Ihde takes a 'navigational perspective'. While navigating, he reminds us, one 'is quite self-consciously aware of being in the midst of what is occurring, but the navigational problem is to locate reference positions through some means of variations' (Ihde, 1990, p. 10). Variation refers here to the analytical strategy of phenomenology, originally outlined by Husserl, according to which the essential structures of a given phenomenon could be captured by analysing a variety of mental or experiential illustrations of the phenomenon, and subsequently reducing these to their shared features or common core. Consequently, the greater part of his key work *Technology and the Lifeworld* aims to develop a typology of human–technology relations. The general aim of this analysis is to formulate a 'radically demythologized story of the structures and limits of human-technology and of the non-technological possibilities of relation to an environment, or "world"' (Ihde, 1990, p. 17).

13.2 Empirical matters

Ihde's discussions rely on a plethora of examples. Philosophically, this exemplifies the strategy of phenomenological variation. In terms of empirical reference, it means that he often relies on material that social scientists would also claim for themselves. These range from mundane everyday examples from the Western world, to what, from a philosophical point of view, might be seen as rather esoteric illustrations. Precisely such cases, though, would often be the home turf of anthropologists. Indeed, these might agree with several of Ihde's overall conclusions, including the idea that 'cultures embed technologies' (Ihde, 1990, p. 124) and the suggestion that problems of 'technology transfer' are due to the fact that successful 'transfer' requires 'reception of a set of cultural relations' (Ihde, 1990, p. 126), which do not naturally accompany the technology (see also Selinger, 2007).

From an anthropological viewpoint there is thus merit in Ihde's analyses. Nevertheless these analyses are also quite different in both form and content from most ethnographical analyses of material culture. One important difference is in the understanding of what counts as an appropriate level of empirical analysis.

Ihde certainly shows much more interest in empirical matters than some of his ancestors (for instance Martin Heidegger, 1977). Yet his examples are treated precisely as such; that is, with little interest in detailed contextual features, which are often seen as central from an anthropological point of view. From the point of view of the phenomenology of technology there is an excellent reason for the relative scarcity of contextualizing description, since the ambition is not to understand the specific instance, but rather to develop a typology of human–technology relations. In this sense the analysis starts and ends with conceptualization, whereas the empirical becomes an intermediary point of support for the theorizing effort. This, however, is not usually the direction taken by ethnographic studies of material culture, in which theory is often developed with the purpose of understanding specific technological settings.

It is crucial to underline that this does not place the anthropologist in the role of a mere microphone holder, who describes empirical material, for which the philosopher might provide an adequate conceptual grounding. For one thing, ethnographic observation is thoroughly theoretically informed. Thus, while ethnographers certainly report observations, the purpose of this is still to construct a *different kind of knowledge* about culturally specific ways of handling technology, say, or kinship relations (Hastrup, 2004). The same argument could obviously be made for philosophers, who do not characteristically pick their empirical examples at random, but rather choose them with specific analytical problems in mind. It is thus also important to note that the implication is not that philosophy is superfluous and can be subsumed under empirical disciplines such as anthropology. However, it does imply that philosophically relevant concerns are also dealt with outside of university departments.

This is not a new argument, but rather a way of bringing Michel Foucault's approach to the question of 'representation' to bear on the questions of technology. Foucault denied that the problem of representation should be viewed as specific to the history of ideas, and he proposed to see it instead as a problem which had 'informed a multitude of social domains and practices, ranging from disputes in botany to proposals for prison reform' (Rabinow, 1986, pp. 239–40). In Paul Rabinow's gloss it is therefore not the case that the problem of representation 'happened to pop up in philosophy and dominate thinking there for three hundred years'. Instead, it was 'linked to the wide and disparate, but interrelated, social and political practices that constitute the modern world' (Rabinow, 1986, p. 240). Accordingly, while multiple practices have shared the 'problem of representation' they have defined the contours of that problem differently and, consequently, have also handled such epistemological problems in multiple and often contradictory ways. In Foucault's analysis the question of representation can therefore not be understood as an infra-philosophical concern. Instead it should be seen as related to a set of historical events and social practices.

What follows from this realization, argues Rabinow, should not be the construction of new epistemologies (one for each 'domain' of practice). The important point is rather that Foucault's analysis allows us to recognize 'our historical practice of projecting our cultural practices onto the other' (Rabinow, 1986, p. 241). This viewpoint is both anthropologically pertinent and philosophically relevant since it indicates how concepts produced at a specific time and place easily turn into unquestioned assumptions on which other inquiries are based. For example, Edward Said (1978) argued that almost all literature on 'the Orient' says more about the Orientalism of the anthropologist than about life and practice in the places designated by the term. A similar argument can be made about ways of conceptualizing technology. Thus, Marilyn Strathern has argued that Western assumptions about 'enablement' deeply infuse everyday as well as theoretical understandings of technological capacity (Strathern, 1996). We will return to her argument in our second example.

Transported into the realm of technology, what follows from this relativization of the problem of technology, is not a requirement to develop *regional* theories of technology use based on geography or developmental *stages* or cultural habits. Rather, it requires the philosopher to become attentive to the ways in which specific Western conceptualizations of technology inform philosophical analysis. Analogous to the reflexivity which follows the disclosure of Orientalism in anthropology, it becomes important to consider how concepts of technology that are produced in philosophical settings are subsequently put to use elsewhere. While scholars such as Evan Selinger (2007) have argued for the centrality of the problem of 'technology transfer' for the philosophy of technology, we argue therefore that it is of equal importance to bring into view problems attending 'technological concept transfer'.

In spite of the differences, phenomenology of technology and the anthropology of material culture share some broad concerns. For one thing, much of anthropology and philosophy are based on an interest in what could be called 'the human condition'; for instance, Ihde is concerned with why and how human beings are able to co-inhabit lifeworlds with multi-stable technologies. Although anthropologists may be less enthusiastic about conceptualizing 'humanity' in general terms, a focus on the variety of human life forms is also at the heart of its knowledge production.

Even more importantly, newer approaches in both anthropology and philosophy accept that technologies are neither autonomous nor fully determined by their users. The technological essence evaporates, and in its stead the analyst encounters culturally embedded technologies. For this reason empirical philosophy aims to simultaneously retain a strong 'praxiographical' emphasis and a commitment to philosophical elucidation. Following the Foucauldian analysis, empirical philosophy can obviously not aim to define any general technological structure. However, it might well concern itself with inventorying some of the many ways in which issues relating to technologies are handled in different settings, with the purpose of getting a better analytical or, indeed, philosophical grasp of the multiple overlaps and disjunctions, resonances and connections between technologies in action.

From the point of view of STS and empirical philosophy, this means that they cannot be analysed out of context. Instead technologies as well as concepts of technology must be analysed as part of practice.

13.3 Practice, epistemology and technology

Indeed, in recent years both philosophy and STS have seen an increasing interest in technology in 'practice' (e.g. Pickering, 1992; Schatzki et al., 2001). The turn to practice has been seen precisely as a solution to the problem of how to avoid overly abstract and generalized characterization. Nevertheless practice analysis, in itself, does not solve this issue. Indeed, it may instead simply displace the analytical problem. This is the argument of Stephen Turner's *The Social Theory of Practices* (Turner, 1994), which criticizes a whole series of practice-oriented concepts, many of which have their roots in phenomenological thinking. In Turner's view 'tacit knowledge', 'taken for granted knowledge', 'communities of practice', 'epistemic practices', 'local knowledge', 'forms of life' and so on all exhibit similar analytical problems. The problem identified by Turner is that although these terms promise to take the analyst closer to the real world of practice, they are often simply 'plugged into the explanatory place previously occupied by the now-discredited teleological agencies of Reason, Nature, Moral Sense and Will' (Lynch, 1997, p. 338). In his review of Turner, sociologist of science Michael Lynch draws the lesson that 'it is easy to overthrow "traditional" metaphysics by replacing one prime mover with another, but it is not so easy to set aside what Wittgenstein called the "craving for generality" which tempts philosophers (and also social theorists) to turn vernacular concepts into transcendental agents' (Wittgenstein, 1958, p. 18). When Lynch refers to a 'temptation to turn vernacular concepts into transcendental agents' he is criticizing the same 'craving' for generalization that the new philosophers of technology also problematize in the case of their determinist ancestors. Yet, Turner and Lynch also argue that the urge to abstract is not necessarily diminished by relying on a vocabulary of practice.

This problem echoes the peculiar tension between a philosophy-driven analysis using preconceived concepts to explain what is going on in practice and a bottom-up approach aiming to derive its specific concepts from empirical material as proposed by the ethnomethodological programme defined by Harold Garfinkel (1967) or by grounded theory (Glaser and Strauss, 1967).[1] At the same time Lynch's own prioritization of the production of *local* order has its limitations in turn. For one thing, such a focus prevents the researcher from analysing how local orders are interlinked. This is an especially crucial consideration with respect to the study of technologies, which often form the concrete links between otherwise dispersed practices; for example in the cases of 'technology transfer' referred to by Don Ihde and Evan Selinger, or in cases where technologies function as 'boundary objects' (Star and Griesemer, 1989). Additionally, it also fails to consider that local actors, if prompted, will often make use of non-local modes of accounting for their technological urges, goals and ambitions, for example by relating their own agendas to globally circulating narratives (Tsing, 2005) or by referring to general aesthetic, ethical, economical, scientific or technological values and criteria (see Boltanski and Thevenot, 2006). Such cross-local linkage and local modes of accounting in terms of the global suggest that simply studying action is not satisfying, since the 'whole situation' is never revealed by analysing the behaviour of any particular set of actors (Clarke, 2005). In turn, this suggests that so-called bottom-up approaches need to be rethought in a way that enables them to analyse links and connections distributed between practices. But this has to be done without reinstating 'social structures' or explanatory devices as 'transcendental agents' (see also Jensen, 2007).

Lynch also notes that 'ethnographers (not unlike investigative journalists and spies) can make a living out of the fact that by trafficking across barriers between "insiders" and "outsiders" they are likely to find newsworthy items to convey to relevant audiences' (Lynch, 1997, p. 341). Indeed, one merit of empirical philosophy would be its capacity to move between different places and in that process simultaneously 'learn technology' from actors there and 'teach technology' to others in turn. The point in empirical philosophy is therefore neither to produce general analytical concepts nor to glorify the local. It is rather to develop a vocabulary in which analytic scales such as the local vs the global or the high-tech vs the low-tech do not pre-empt the analytical work of understanding technologically mediated situations.

We suggest such a project might allow the philosopher of technology to obtain a different kind of philosophically interesting knowledge about technology. This would require taking an interest not only in the ontological fluidity of technology but also in the scales that are being enacted in relation to technologies. These considerations take us into the territory of empirical philosophy.

13.4 Empirical philosophy

As noted, the radically de-essentializing approach to the question of what technology is and does, means that no specific site can function as a privileged or generic exemplar. Rather, several illustrations allow us to identify some important themes which run across these cases but are expressed differently in each. Although our examples are empirically diverse, then, we do not analyse these differences as due to an underlying structure, which would explain them (e.g. that they are high-tech versus low-tech or that the cases are from industrialized versus developing countries). Nor are we interested in developing a typology of human–technology relations. Instead our main concern is to elucidate aspects of the particular networks of which these technologies are part.

Our first example is taken from Marianne de Laet and Annemarie Mol's analysis of the Zimbabwe bush pump. The case exemplifies the analytic mode of empirical philosophy and specifically directs our attention to the ontological fluidity of the technology under consideration.

The second example is taken from social anthropologist Marilyn Strathern's analysis of the cultural consequences of new genetic and reproductive technologies. This example supports the notion of fluid technologies, but it also highlights a Western understanding of technology as *enabling*. Strathern suggests that technologies have rather more ambiguous effects than often assumed. They cannot simply be understood in terms of their modernizing potential, but rather as devices which create simultaneously more *and* less of *both* modernity and tradition.

In the third example, we move to a quite different setting, as we explore the configurations of technologies on a Danish fishery inspection vessel. The ship is viewed as a technological conglomerate which is regularly tinkered with by adding new technologies. In this case the fluidity of technology is made visible through the observation that the capacities of any technology are only understandable in relation to the entire configuration of technologies. We also show that determining how, why and when different technologies can be trusted to represent reality is an ongoing (philosophical) concern onboard.

We use the similarities and contrasts between these three illustrations to highlight some distinct analytical foci of empirical philosophy: the ontological fluidity of technology; the theme of technological enablement; and use of local scales in determining the specific characteristics of their technologies.

The Zimbabwe bush pump and the fluidity of technology

Mol and de Laet's analysis of the Zimbabwe bush pump is an attempt to develop a certain kind of philosophical engagement with the analysis of technology. The authors are especially interested in the theme of 'technology transfer', which, they note, 'goes to the question of the "nature" of technology' (Mol and de Laet, 2000, p. 256 n. 4). The term 'technology transfer' suggests a stable and fixed technical object, which can be moved in geographical space and used in new settings without transformation. Given this basic understanding, technology transfer has traditionally been of little interest in the philosophy of technology, except to the extent that it could be subsumed under more general questions such as 'the impact of technology on society and the ethical questions surrounding such impact' (Mol and de Laet, 2000, p. 256 n. 4). What happens if one instead studies technology transfer as an empirical issue of importance for the philosophy of technology?

Mol and de Laet do not study the impact of technology on society but neither do they approach technology transfer as a general analytic rubric. Much more specifically, they explain that their 'paper is about water pumps. Even more precisely, it is about a *particular* hand water pump: the Zimbabwe Bush Pump 'B' Type' (2000, p. 225). Precisely this exceeding specificity with respect to the technical object enables the authors to make an analytical argument about the fluidity of the technology. As we shall see, the fluidity of the bush pump is not an epistemological fluidity relating to the many perspectives one might adopt in viewing it. It is rather an embedded, ontological fluidity, which 'is built into the technology itself' (Mol and de Laet, 2000, p. 225). If this argument can be made, they suggest, then it might be of use in other settings, where 'artefacts and procedures are being developed for intractable settings which urgently need working tools' (Mol and de Laet, 2000, p. 226). The reason is that when travelling to such out-of-the-way settings, 'an object that isn't too rigorously bounded, that doesn't impose itself but tries to serve, that is adaptable, flexible and responsive [...] may well prove stronger than one which is firm' (Mol and de Laet, 2000, p. 226). The argument therefore goes on to show that the bush pump is in a deep sense a variable object and that its ontological variation depends on the specific ways in which it becomes entangled with other objects, subjects, practices and agendas in the process of what is quite unadequately referred to as 'technology transfer'.

In attempting to understand the scope of the bush pump, Mol and de Laet make use of both a temporal and a spatial argument. The pump is variable in time, because it has existed for over half a century, yet has been under constant revision: 'the current model results from restyling and improving an older manually-operated water pump that was first designed in 1933' (2000, p. 228).

But the fluidity of the bush pump has not to do simply with its transformation in time. Crucially, it also relates to the multiple operating principles guiding any one pump. Operation refers here not only to its hydraulic or mechanical principles. Instead operation must be taken as a rather broad term, which allow Mol and de Laet to show that the pump must do much more than simply pump to work well in its intended setting. For one thing, the pump is meant to 'convey messages', which influence its chances of being adopted by users.

Thus, it is cobalt coloured because this signals the clear and pure water, which it is meant to help procure. Experience has taught the producer that the pumps 'work better that way'. In action, it appears, colours are not insignificant 'secondary qualities', which have no bearing on understanding the technological itself. Instead, they might be quite crucial constituents in making technology work. But of course they do not work alone. An obvious aspect of the bush pump has to do with what would usually be seen as its technical parts. Thus, it consists of a 'pump head or water discharge unit, a base or pump stand, and a lever' (Mol and de Laet, 2000, p. 228), which along with numerous other components gather the forces that allow it to pump water out of the ground. Hydraulic principles, however, do not specify what makes the pump special in comparison with numerous other kinds of pump. Among pumps it belongs to a family with 'lever activated lift pump mechanisms' (Mol and de Laet, 2000, p. 231) and within this group it is recognized by having more powerful and efficient strokes than most others, enabling it to lift water up from wells up to 100 m deep. Here, the relevant quality is its lifting capacity.

Each of these features is a necessary but not a sufficient requirement to understand the multiplicity of the Zimbabwe bush pump. They are insufficient because the technology can only be understood in relation to other actors in the network in which it operates. A key actor here is *E. coli*. Thus, a prominent reason why the pump is such an important actor in Zimbabwean villages is because it ideally ensures a flow of water uncontaminated (or less contaminated) by *E. coli* bacteria than would otherwise be available. In short, then, the pump is not only a water- but also a health-providing technology. Yet again the capacity of the pump to produce health is thoroughly integrated with the implementation of the pump in specific villages. To function as a health-creating actor it is crucial that the headworks of the pump are installed properly, since 'poorly made concrete headworks can crack, and will allow leakage of waste water from the surface back into the well or the borehole' (Morgan, quoted in Mol and de Laet, 2000, p. 233). And proper installation of the headworks requires cooperation between the pump and many more technical and non-technical actors. Crucial among these is the tubewell drilling device, among which the Zimbabwean-manufactured Vonder rig is an increasingly popular choice in African countries. The reason for its popularity, again, is in its specifics: it is 'hand-driven, durable and bright yellow. It is designed so that the boring of the water hole [...] can be almost entirely "community-based"' (Mol and de Laet, 2000, p. 233).

In turn, community-based well-drilling is an activity which integrates more than narrowly technical features of the rig and the pump. Thus the instruction manual states explicitly not only how to operate the equipment, but also that local diviners, *nganga,* must be consulted to decide where drilling should take place. Their advice is followed even when it goes against the understanding of Western engineers, because this is a precondition for village adaptation of the pump. This integration of engineering and divinatory, technical, aesthetic and hygienic concerns into the technology itself facilitates the emergence of a situation in which villagers can and will take on joint ownership and collective responsibility for the pump. For Mol and de Laet this suggests 'yet another way of describing and setting boundaries around our object. In critical ways, the Zimbabwe bush pump includes the villagers that put it together [...] Thus the boundaries around a community pump may be widely drawn. Indeed, they embrace the community' (2000, pp. 234–5).

We are now in a position to say something about the fluidity of this particular technology, for as the authors state: 'it is not clear where this pump ends'. It is not clear what it is:

> a water-producing device, defined by the mechanics that make it work as a pump? Or a type of hydraulics that produces water in specific quantities and from particular sources? But then again, maybe it is a sanitation device – in which case the concrete slab, mould, casing and gravel are also essential parts. And while it *may* provide water and health, the Pump can only do so with the Vonder rig – or some other boring device – and accompanied by manuals, measurements and tests [...] And what about the

> village community? Is it to be included in the Pump – because a pump has to be set up by a community and cannot be maintained without one?

It might even be that the boundaries 'coincide with those of the Zimbabwean nation', since 'in its modest way this national Bush Pump helps to make Zimbabwe as much as Zimbabwe makes it' (Mol and de Laet, 2000, p. 237).

In Mol and de Laet's argument the main component in the successful adaptation of the Zimbabwe bush pump is that its ontological fluidity allows it to be connected to widely varying settings in rural Zimbabwe. The pump, in short, can contain multiplicity without being compromised by it. So should our analysis of it.

Enabling technologies

While the specific argument about the fluidity of the bush pump may appear surprising, it should come as no surprise that one might do anthropology in Zimbabwe. It may, however, appear more counter-intuitive to follow Paul Rabinow's recommendation that we must also 'anthropologize the west'. Nevertheless this is an important theme in the work on technologies done by social anthropologist Marilyn Strathern.

Strathern argues that technology in Euro-American culture is seen as 'enabling' in the sense that Euro-Americans primarily perceive technology as a facilitator of action, or:

> quite simply, that *given the technology* they can do anything. If technology is society made durable, it is at the same time ability made effective. The enabling effect of 'technology' is a guarantee of that. Choice comes afterwards. Sever ourselves from our disabilities, and then we shall see how we want to live, and how we want to create the certain identity we feel, like children severing themselves from unsatisfactory parents. (Strathern, 1996, p. 49)

The concept of enablement offers a contrast to a utopian vision, which views technology in terms of human empowerment as well as of the reverse notion that technology is a dehumanizing force. Rather than evaluating technological effects on this one-dimensional scale, Strathern aims to display how Europeans attach value to their technologies and how pervasive is the value of enablement itself.

Strathern's mention of 'unsatisfactory parents' refers to a 1992 case in which a boy and a girl were reported to have 'divorced their parents'. This and other controversial cases connected to surrogacy all indicate that the question of what is entailed by family relations has been opened up in new ways due to reproductive and genetic technologies. These technologies have definitely offered 'a cultural enablement of a kind' (Strathern, 1996, p. 47) as it has become increasingly possible to view one's family as a matter of 'choice' rather than 'blood'. However, biology has not become any less important for envisioning kinship.

As specific technologies become part of a culture we may begin to think differently about the possibilities and limits, certainties and uncertainties relating to kinship. For example, doctors can now help their patients by genetic testing but this may require them to also collect genetic samples. Through this process, however, the doctor might obtain knowledge that a presumed father is not the genetic parent of the patient-child. Genetic testing can (re)confirm an existing kinship tie as biological, but it can also disconfirm it. For instance, it can also be used to argue against *Pater est, quem nuptiae demonstrant,*[2] which has been a core rule in family law in many Western countries. Genetic testing therefore simultaneously produces more and less certainty about kinship ties. The same is the case with reproductive technologies which both render kinship ties more certain (cryo babies can be more certain who their biological parents are, and that they are really wanted) but at the same time more uncertainty is produced (eggs, sperm or embryos could always have been (mistakenly) swapped at the clinic; and cases of surrogacy dispute what constitutes motherhood).

Indeed, it is one of Strathern's general arguments that whereas technologies do not create a negative or positive cultural condition as such, they do help to shape a cultural situation in which there is *more of everything* (Strathern, 1996, p. 39). Contrary to the common argument that tradition is rapidly replaced by modernity, then, Strathern argues that in the case of genetic and reproductive technologies the present state of affairs is far more ambivalent, because it simultaneously produces tradition and modernity.

The concept 'modern' is commonly used by Westerners to designate what they at any given moment consider to be new in their world, while 'tradition' is used to designate what people take for granted. However, if the new technologies infuse kinship ties with both less and more certainty, the relationship between tradition and modernity cannot be understood in terms of linear progress or deterioration. Technologies may be considered modern in the sense that they are 'new', but the promise of innovation they summon is ancient and can, indeed, be viewed as very traditional. Likewise, technologies can be seen to bring along more tradition since people take more things about kinship for granted (as indicated by the pleonasm 'biological kinship ties') and more modernity, since people recognize that many specific things about kinship are new, contested or changeable.

Strathern notes that the observation that there is 'more of everything' could also be understood in terms of a notion of 'cultural exaggeration'. She does not suggest that technology is the sole cause of this cultural predicament. However, she does argue that the situation is facilitated by the prominent value attached to the idea of technological capacity: 'Euro-Americans imagine that they can do "more" things than they once did, crystallized in the hypostatization of technology as "enabling"' (Strathern, 1996, p. 46).

The analysis suggests that reproductive and genetic technologies involve important cultural displacements. But do they have any import for philosophy as such? An example shows how directly entwined philosophical conceptualization may be with its cultural environment.

In 1982, the Danish philosopher Jan Riss Flor exemplified 'analytic concepts' (that are undisputably true due to their self-evidence) in the following manner: 'a rectangle is a square and I am the child of my mother and father' (Flor, 1982). However, only 25 years later this self-evidence can no longer be taken for granted, since it is now technically possible to dispute parenthood, as controversies around genetic testing and surrogate parenting demonstrate. It appears that indisputability is not given in an unalterable order of things, but is rather shaped by cultural assumptions and technical possibility. Indeed, the idea that something is philosophically 'indisputable' appears directly linked to the fact that we always do take certain things (in this case precisely about kinship ties and technologies) for granted.

Strathern does not conclude that the proliferation of technologies has led to a situation of constantly increasing uncertainty. Instead she suggests that we inhabit a world of simultaneously more and less certainty. Since the scales of risk and certainty are not mutually exclusive, this poses the challenge of how to describe and theorize how technologies are everywhere infused with variable scales of valuation. This is highlighted in our final example.

13.5 Fishery inspection and technological scales

Following Strathern's argument we can imagine that new technologies do not simply produce more or less certainty. In the case of the final example, from an ethnography of fishery inspection on the vessel *Vestkysten* (*West Coast*), we also find that there is 'more of everything'. The fluidity of technology noted by Mol and de Laet and the value of enablement attached to technology is also visible here but in a particular guise that has to do with the conglomerate nature of the vessel.

West Coast was built in 1987, to be put to use as a fishery inspection ship, a rescue vessel and as an assisting unit for fishing vessels. A few years ago the rescuing and assistance were the predominant tasks of the ship but today almost all work has to do with inspection.

A first impression upon entering the ship's bridge is that it is a technologized environment.[3] There are five panels for manoeuvring the ship, each of which has three different levels of automation; there are GPSs, radar, gyro, Global Maritime Distress Safety System, an electronic sea chart, paper charts, signal flags, echo sounder, magnetic compass, phones of various sorts (satellite, radio, internal) and also large panels for controlling the lights, anchor and so on. Several PCs are also present on the bridge, including a server, one used for the electronic sea chart, and one which displays the present whereabouts of fishing vessels in a surveillance application called V-track. Another PC is used for multiple purposes including administration. In this setting it would be possible to follow Mol and de Laet and explore a single technology in detail in order to demonstrate its fluidity. For instance, GPS positioning is connected to a network of satellites, the electronic sea chart and to a range of culturally important issues (see Parks, 2005) such as surveillance. Thus GPS, like the bush pump, does not seem to end at any specific place. But the fluidity of technology is also seen in the conglomerate nature of the entire situation. Thus we aim to show how the fluidity of technology is manifested relationally, both with reference to work practice and other present technologies, previous and present.

Functionally many of the technologies overlap. Positioning, for instance, can be done in many ways. It is possible to take bearings using radar, compass or even landmarks and paper maps (Hutchins, 1995). However, positioning is very rarely done this way any more. Rather the position is displayed and updated automatically by GPS on the electronic sea chart. The electronic sea chart is thus an important technology for positioning. Yet, it is striking that none of the older technologies have been discarded as the electronic sea chart was introduced a few years ago. Indeed, it appears that the new does not simply replace the old onboard. This was expressed when the captain picked up a telephone handle connected to a now obsolete communication system and called out: 'hello is anybody there?' In this case the technology was dysfunctional but the interface remained. Similarly, a positioning system based on receiving FM waves from towers on land, fills out an entire panel on the bridge although it is never used. And the ship still carries a sextant and a magnetic compass, as, indeed, it is obligated to by law. However absurd these technologies may seem in the light of the 'much smarter' electronic sea map, they also indicate how technologies do not in any simple sense replace each other. Instead they are added to the existing network of technologies and tasks onboard.

One obvious reason for such technical redundancy is the cost of replacement, another is security. Old, trustworthy technologies are available as a back-up in case other technologies fail. However, the relationship between old and new technologies cannot simply be stated in terms of more or less security. The new electronic sea chart, for example, is not always considered as 'trustworthy' as the older radar. When queried about the difference between the two (since both display the position of the ship relative to land and other vessels) the crew refers to the radar as displaying how reality 'really' is. First, they emphasize that the electronic sea chart contains more invisible layers of data interpretation than the radar and these many mediations remove the representation from reality. Second, they point out that the sea chart is presented through a software application running on a PC, which means that it is vulnerable to the errors and breakdowns that are common with computers. The radar, on the other hand, has proven through the years that it reliably displays reality 'out there'.

Paper charts are still present on the bridge and play an important role in case of power cuts, juridically in case of accidents, and when entering a harbour, where maps of good detail are required. But their representational merits seem altered with the introduction of the electronic sea chart. New technologies do not simply replace but they do affect displacements throughout the network.

Furthermore, old technologies are also not automatically perceived as more trustworthy. For one thing, one may easily forget how to use them when new technologies are introduced. Thus, crew members do not consider themselves equally equipped to use every kind of available technology. For example, not everyone can use a sextant today or do positioning by use of paper charts.

Furthermore, the specific configuration of trustworthiness, which might be referred to as the perception of technological enablement onboard, also changes according to the unstable sea environment. Thus, when the weather is good, looking out of the window using binoculars is considered to bring one closest to reality. In this situation binoculars are considered an enhancement of human perception, much as in Ihde's analysis. The point might seem mundane; however, binoculars are not always considered in this way. In bad weather, where one can hardly see anything, the radar picture is considered a far better representation of reality; among other reasons because it can be set up to more or less ignore deflections due to weather conditions.

A different and more complicated example refers to the common task of fishery inspection. During inspection and registration of fishing vessels, observations are double-checked both with the fishery surveillance system V-track and by at least one other crew member. Here perception with binoculars is considered error-prone, because it can be very hard to distinguish registration numbers on distant fishing vessels and it is crucial not to make a wrong registration. Successful perception is here enacted as a distributed and collective achievement among binoculars, humans and the V-track-system. Relating this discussion to the question of what counts as high-tech and low-tech, it is also worth noticing that when monitoring the movement of fishing vessels, confirmed visual contact rather than systemic representations establishes the certainty of representation. In these cases, again, binoculars are more central actors than the satellite-based surveillance system.

The technologies onboard *West Coast* are thus fluid both in relation to particular circumstances, such as weather, and also historically, as technologies are slowly added to an existing technical configuration. We think this situation also accounts for sailors' philosophically inflected discussions about how different technologies relate to the environment. Since sailors put their trust and sometimes their lives into the hands of technologies it is no surprise that they show a serious and ongoing concern with their environment of representational technologies. Concern and even care for these technologies is a central dimension of their working attitude.

Further, the ship is presently a part of many other negotiable networks involved in fishery inspection. The surveillance system V-track has profoundly changed the planning and organization of everyday life on board. Earlier, the role of the inspection vessel was mostly preventive and it sailed wherever it was thought fishing boats might be. Since paper files were almost impossible to keep up to date, the crew could not really check anything at the time of boarding a ship. Today, however, permits and catch records can be checked via the Internet even before boarding. Inspection vessels have thus been provided with a concrete way of measuring deviations from fishing quotas, although it is still difficult to determine illegality. Furthermore, the V-track system updates a display of the whereabouts of fishing vessels, making easier the decision of where to sail. This means, though, that the everyday inspection work is now entirely dependent on satellite connection.

Similarly, making new administrative IT systems accessible on board, has allowed the ministry to move the planning of fishery inspection to a land-based 'risk assessment' unit. So here the enabling value of the V-track system also makes it possible for other actors to interfere in the everyday planning of work onboard. We are considering, then, a technological setting which simultaneously enables and disables numerous actors and activities.

When asked to assess the introduction of a future IT system, the electronic catch record, one captain said that this 'technology will be good if it works' (see also Lützhöft, 2004). Clearly the value of enablement itself is not at stake in this pronouncement. However, another captain held the opposite view. As he saw it, the fact that tasks can now be planned from land also affords politicians with an argument for cutting down sailing time and crew in the name of efficiency. Thus, V-track is not under local control but links *West Coast* to other parts of the network of fishery inspection in such a way that distant actors can control its activities more easily. According to several crew members, this situation puts at risk the traditionally valued independent and ad hoc planned practice of fishery inspection. If new technologies enable gains in efficiency this may make them disabling in terms of job autonomy and security.

Hence in contrast to the captain who picked up the old phone and laughed about it, another captain is less amused since he is aware that 'the good old days' will never return. Yet, even he views the future as bringing interesting challenges and notes that sailing has also become much safer than it used to be. Apparently the continual addition of technologies on *West Coast* has not led to a situation of more *or* less certainty. Instead it seems there is more and less certainty with respect to work tasks, job security and many other issues. This confusing situation accounts for the proliferation of comparative scales put to use by sailors. And it indicates why an important task for empirical philosophy is to make sense of such scales.

13.6 Ontological fluidity, scales and enablement

Technological fluidity has been a prominent theme in each of our cases. This was most obvious the case of the Zimbabwe bush pump, which, indeed, defined this idea for us. In that case, the central question was where to locate the fluidity of technology. A main conclusion was that fluidity was a feature of the bush pump and its relations to other human and non-human actors, not of human perceptions of the pump. People certainly did have different perspectives on the pump, but the technology itself also shrank and expanded, stabilized or destabilized through the links that were forged with a heterogeneous set of actors, including headworks, tube-drilling devices, *ngangas*, paint and *E. coli*.

Through processes of temporal as well as spatial transformation the pump, in its own way, contributed to the production of health no less than the construction of community, and perhaps even nation-building in Zimbabwe. It is because technologies can have such far-reaching and unforeseeable effects in the shaping of nature no less than society that we find Viveiros de Castro's notion of multinaturalism far more enticing than the multicultural idea of different appropriations of technology. This notion takes us directly onto ontological territory by emphasizing that technologies, people and 'natural' objects become tied together in assemblages, which produce different versions of communities, water accessibility, rural health or African nations: multiple natures which do not always fit as neatly as seems to be the case of the Zimbabwe bush pump.

In the case of the inspection vessel such fluidity was also manifest, not least in the way in which the addition of new IT and other advanced technologies changed both local work practice onboard the ship and the relation of the ship to administrative practices on land. The case offered an illustration of how new technologies, rather than simply replacing older ones, are implemented in and transform existing networks of technologies and humans. In such situations technologies can only with difficulty be understood as free-standing devices. Instead it encourages us to consider technical landscapes, where older and newer technologies coexist with older and newer working tasks.

In turn, it is because of such (everyday) complexities that crew members were involved in an ongoing work to develop evaluative scales. How do technologies compare under different conditions? Which are better for which kinds of tasks, given different kinds of constraints? This non-abstract yet conceptual endeavour to measure and contrast 'goods' and 'bads' is brought into focus by empirical philosophy. We might be interested not only in defining our own scales (and aim for them to be the 'correct' ones) but in understanding the locally produced scales which actors bring to bear on their situations when dealing in technical environments.

Several things follow from such a focus. While the scales of 'good' and 'bad' technological representations could likely be problematized from any given philosophical position, they are nevertheless workable in native settings. For this reason it is not the ambition of empirical philosophy to evaluate the adequacy of those scales by means of an externally produced philosophical criterion. Rather, it is to try to understand what such scales might teach philosophy. However, as noted earlier, this cannot entail a simple reversal from a focus on philosophical conceptualization to ethnographic description of local practice. For one thing a number of analytical distinctions, which have their origins elsewhere, are also regularly set in play onboard *West Coast*. For example, although the common-sense scale of the high-tech and the low-tech is not simply accepted on the ship, it is still operative in many ways, as when the vessel is compared to others. The notion of high-tech is brought into play in a way reminiscent of how Strathern describes usage of the term 'modern'. High-tech like 'modern' is used on the ship to designate brand new things at home, but mostly it refers to new things that are taking place *elsewhere*, such as some recently built fully automated and reportedly captain-free Japanese vessel. Nevertheless the crew does not simply consider their technologies (old or new) 'low-tech'. Instead, the 'low-tech' is used to describe practices that are not seen as purely technological, such as positioning, which uses paper maps. The scale from high- to low-tech is invoked comparatively in local statements, and not as a designator of any definite technical feature.

For this reason we have argued that, just as the activities on the ship are technologically linked to multiple other settings, which it is our job to investigate, so they are conceptually linked to many other locations and practices, which take part in shaping assumptions guiding technology use onboard. Further, we have suggested that this concept transfer calls for analytical attention. This is why we called for studies of 'technological concept transfer' to complement analyses of technology transfer. Another implication follows, which allows us to generalize the problematic of scaling encountered onboard the inspection vessel. Even in this delimited situation the new and the old, the low-tech and the advanced appear difficult to delineate and certainly to evaluate. Mol and de Laet recognize that different scales help to construct technological potential and danger, and to make technologies work differently in practice. This is why they praise the designers of the bush pump for not taking for granted the superiority of accepted scales of development, which prioritize the supposedly high-tech, modern and standardized at the cost of the low-tech, backward and uncontrollable technology uses in developing countries.

In Mol and de Laet's view it is precisely because of the adoption of alternative scales of technical worth among the developers of the bush pump, that this technology has become capable of effectively participating in the work of multinaturalism. Hence follows the conclusion that although the pump is a relatively low-tech and simple device when analysed in terms of its technical principles, this may be precisely what facilitates its ontological fluidity. This situation is the more striking when juxtaposed to many advanced and putatively fluid technologies, notably information technologies, which are popularized precisely due to their flexibility, but nevertheless, in practice, are implemented with a rigid and rule-bound ambition. The built-in 'fluid mechanics' of the bush pump may thus exemplify a better development practice than many modernizing projects aiming to develop Third World countries. Yet we should obviously not expect to be able to make this into a general model for technical development, which can be easily transferred to other practices.

In the case of seafaring, for example, advanced and flexible technologies may exhibit their main strengths in the way they ensure that security measures are rigidly adhered to. Yet, this situation, in which the simple is flexible and the advanced rigid, itself suggests how empirical philosophy may unsettle our notions of the high-tech and low-tech. And although no transfer can be guaranteed, it also leaves room for the possibility that ontological fluidity may be worth striving for in some Western settings.

Finally, in terms of the relationships between new reproductive technologies described by Strathern, it is clear that these are also fluid. Strathern further shows how they are tied to a specific cultural conception of technology as enabling. This argument both extends and strengthens the idea that studies of technology might focus simultaneously on the hybrid assemblages created through the implementation of new technologies and on the assumptions concerning technological capacity guiding attempts to build new technologies. Strathern analyses technological development not in terms of prominent scales, which indicate that they give rise to 'more or less' risk or uncertainty (Beck, 1992) or 'more or less' tradition (Albert Borgmann). Instead she argues that the specific relational features of the use of technology, for example in relation to understandings of kinship or disease, give rise to simultaneously more and less certainty. In this process, she sees potential for a dramatic change in our capacity to make decisions about what it is 'rational' or 'good' to do. A certain kind of relativity emerges in this analysis but it does not have its basis in an epistemological or moral pluralism. Rather, a Western belief in technological enablement combined with the ontological fluidity of technologies creates situations in which unequivocal determinations of fact and value are increasingly undermined. We provided one small illustration of this situation by bringing Strathern's argument to bear on the philosophical definition of analytical statements provided by Flor. The example suggested that even basic building blocks of philosophical conceptualization may be up for grabs due to continuing technological change. Thus technological ambiguity poses as an important analytic concern.

This concern is not related to celebrations or lamentations over the fact that we live in technological societies. Empirical philosophy suggests a different kind of intellectual engagement, which does not presume its own scales, concepts and assumptions to be working everywhere. It does not try to provide explanations of structures or mechanisms ineluctably guiding technical development. Empirical philosophy instead aims to add to reality its articulation of the ways in which technologies function and are worked with in different settings.

Empirical philosophy assumes that we are often faced with technological situations of ambivalence, danger and possibility, in which indigenous and academic forms of action, value and conceptualization are associated and often at stake. In such cases we believe that this analytical mode offers a viable and interesting point of entry for a nuanced engagement with pressing technological matters of concern.

Notes

1. Grounded theory and ethnomethodology are major methodological positions in STS.
2. Literally: the father is whom the marriage shows.
3. Gad conducted fieldwork onboard the ship in the winter of 2006 and the spring of 2007, focusing especially on technologies and work practices on the bridge.

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