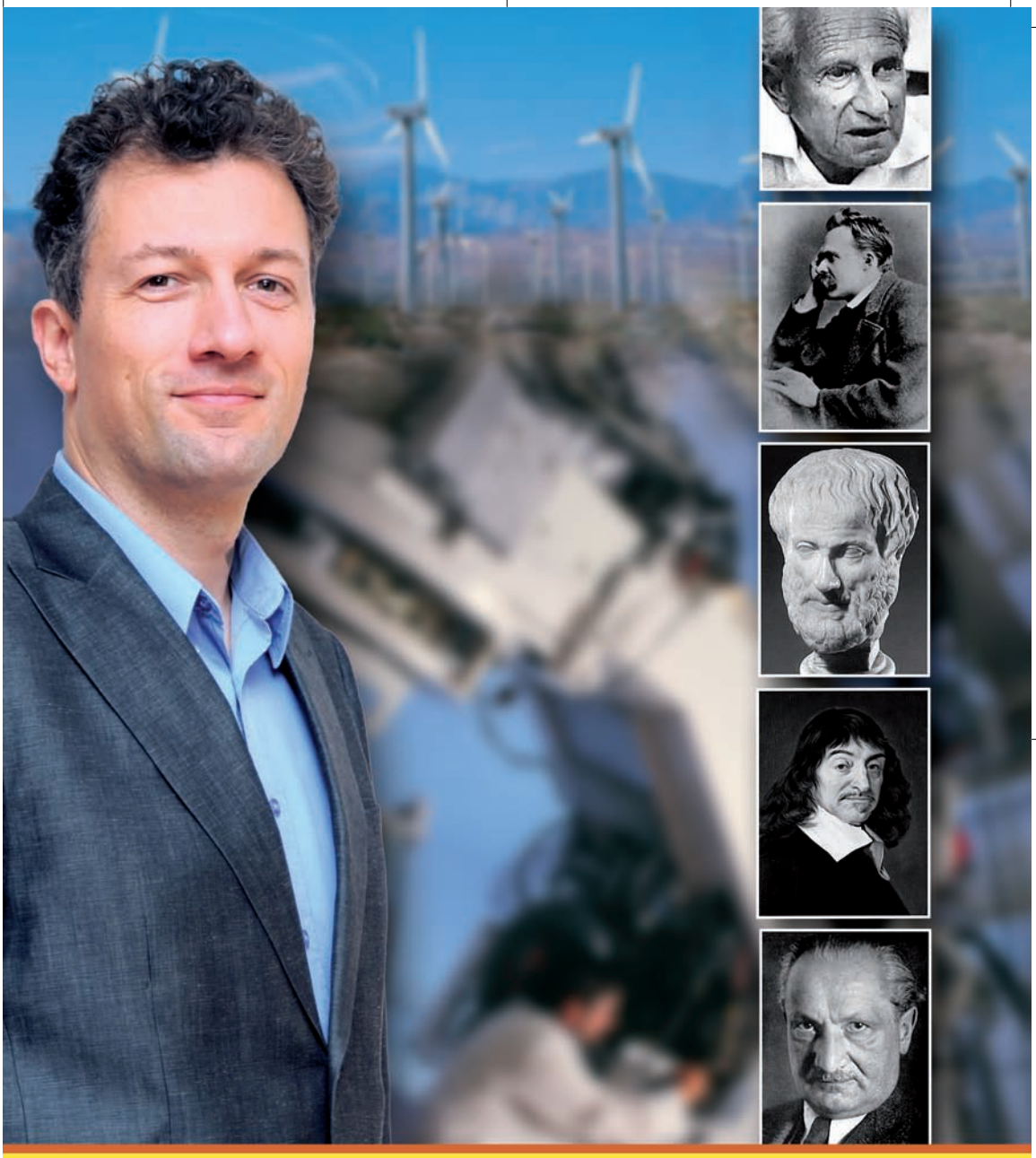


Technology and everything of value

by Prof.dr. Philip A.E. Brey

University of Twente
Enschede - The Netherlands

Technology and Everything of Value

Inaugural Speech delivered on the occasion of the acceptance
of the position of Full Professor of

Philosophy of Technology

at the Faculty of Behavioural Sciences
of the University of Twente
on Thursday October 9, 2008
by

Prof. dr. Philip A. E. Brey

For Elly

Introduction

Rector, Dean of the Faculty, family, friends, colleagues and students,

In what is only the first decade of the 21st century, we are still unaware and uncertain about what this century holds in store. If we look back at the 20th century, we see a particularly eventful era in which large-scale social and technological changes took place, changes that no-one could have predicted a century earlier. The difference between the world of 1901 and that of 2000 is astronomical in every respect and primarily attributable to a ceaseless series of innovations that has taken place in the Western world. Technological, social, ideological and political innovations have induced drastic changes in society, which have not only created significant wealth and prompted substantial improvements, but have also brought about ever-deepening social problems. Our challenge at the dawn of the 21st century is to develop and introduce innovations that enable us to solve these social problems and prevent new ones from emerging. But how do we go about it?

I will use this speech as a platform to argue that, in this process, a healthy understanding of the role that technology plays in society is essential. I will posit five major problems with which society is currently grappling and highlight that technology features in each of them, as both the cause and a potential solution.[1] If we want to solve these social problems, we therefore have to understand and appreciate the role of technology. I would then like to talk about the vital part that my area of expertise – philosophy of technology – plays in that understanding and appreciation. By philosophy of technology, I mean its contemporary manifestation, a dynamic, constructive field that positions itself at the heart of both society and technology. Only philosophy of technology is in a position to understand the mutual coherence of all aspects that are of importance to these problems – subjective and objective, political and cultural, moral and scientific. Only philosophy of technology is in a position to identify the values involved in technology and social problems and to ensure that these values are introduced in the early stages of development of technology and in solving social problems. Not all forms of philosophy of technology are capable of achieving this, but the philosophy we have developed in Twente most certainly is. And you are about to hear why.

1 *See also Rischard, J. (2002). High Noon. 20 Global Problems, 20 Years to Solve Them. Basic Books.*

Like its predecessor, the 21st century will be dominated by technical innovation. New revolutions are waiting in the wings in the fields of information and communication technology, gene technology, nanotechnology and neurotechnology and in the ever increasing convergence of these and other technologies. And this only concerns the next two or three decades. These technological innovations will bring about significant social change, because technology is one of the key drivers of change.

Technology's role in society carries with it an important challenge. If technology is a determining factor in society, how can we ensure that technologies are developed and introduced in such a way that they help to solve the problems of the 21st century, and how can we prevent them from contributing to these problems at the same time?

To answer these questions, we have to look at how technology features in social problems. This appears to take two forms. Firstly, technology can contribute to and deepen the existence of social problems. I call this the *negative role of technology*. A negative role in social problems can manifest itself in three ways. Firstly, when technology has significant negative side effects that contribute to a social problem, for example, combustion engines that emit greenhouse gases and thus contribute to the greenhouse effect. Secondly, a negative role can also occur when the technology is misused on a large scale or with considerable consequences, such as, for example, the widespread use of Viagra as a recreational drug. Thirdly, even if technology is utilised correctly, it may be done so too intensively or on too large a scale, thereby creating problems. Using the Internet too often can lead to Internet addiction, for example. As is apparent from these examples, it is often not the technology itself or the people responsible for developing it who are to blame for the social problems that arise as a result. But while the blame can be more easily attributed to the users, problems can keep on cropping up simply because the technology exists.

Technology can also help to solve or reduce social problems. I call this the *constructive role of technology*. The greenhouse effect is partly caused by CO_2 emissions. But new technology can ensure that the CO_2 is captured or processed, or that machinery no longer produces it. Next to negative physical factors, negative social, cultural or economic factors can often be counteracted by technology as well, in that technology can control or even create behaviour and can be used to inform and influence thinking. For example, CO_2 emissions can be reduced by introducing speed restrictors or CO_2 meters that advise drivers about their driving.

The negative and constructive roles that technology plays in social problems are not a given, they are the result of choices made individually and collectively whenever we develop and use technology. The challenge we are faced with is to ensure that the role of technology in the key issues of the 21st century is as constructive as possible. I would now like to outline five of the most pressing social issues of the 21st century, and show how technology plays a vital role in all of them. I will then argue that at present, we lack the knowledge to be able to thoroughly understand the role of technology in these problems, knowledge that we need to be able to effectively tackle them. This will be followed by an argument in which I will show the importance of the part philosophy of technology can play. However, to fulfil that, the profession must develop in a certain way. Technical philosophy must be oriented towards society, towards current circumstances. It must also be instrumentally useful for other disciplines, particularly engineering and social sciences. I will use the remainder of my speech to elaborate on an approach to the philosophy of technology that meets all these criteria.

Five social problems of the 21st century

Let us now look at the five key social problems we are currently faced with and the role technology plays in them. The first problem is that of the environment, the *environmental problem*, which is assuming alarming proportions in the 21st century. This applies in particular to climate change and global warming as a result of the emission of CO_2 and other greenhouse gases. Global warming results in the melting of the polar icecaps, which in turn causes rising sea levels, an increased incidence of extreme weather conditions, and shifting climate zones. Ecosystems become eroded, certain fauna and flora will become extinct, some areas are affected by flooding and extreme rainfall while other areas become more and more arid with inadequate water supplies, agricultural productivity decreases on a global scale and the spread of disease increases. Economic damages could run into the trillions world-wide.

Technology is a key factor in the emergence of the environmental problem. Greenhouse gases originate largely from the burning of fossil fuels used to generate electricity and motorised vehicles. Industrial production and intensive farming only add to the problem. However, technology will have to also play a key role in solving the problems relating to the environment. Technology can contribute to the development of sustainable energy and transport systems, production processes and agricultural methods as well as to directing and influencing consumers towards adopting a more sustainable lifestyle.

A second social problem, that can be linked to the environmental problem, is the *shortage of resources*, by which I mean basic economic commodities such as raw materials, energy, water and food. These resources are under immense pressure at the moment due to large-scale production and consumption patterns in modern society, advancing industrialisation and modernisation in more and more countries, and the growth of the global population. The demand for many resources is greater than the supply, prompting shortages and increased prices. In recent years, the price of fuel, basic foodstuffs and minerals such as iron and copper ore have risen dramatically, and we are now faced with the possibility that this pattern will continue.

In the coming decades, water will also become a scarcer commodity. The need for fresh water is growing, while available sources are increasingly prone to contamination, wastage and climate change. These shortages lead to lower living standards, economic losses and an increased risk of conflict.

Technology has contributed to the emergence of such scarcities, but can also contribute to reducing them. It can help to replace resources with alternatives that are more abundant and sustainable, extract and recycle raw materials more effectively and efficiently, improve the crop yield, enable agricultural crops to grow in more places and effectively distribute, purify and save water.

A third social problem is that of *social safety*, by which I mean the protection of society against external dangers and risks. Social safety is a difficult and urgent problem in the 21st century due to the many and often complex risks we are faced with. These risks are often linked to globalisation and the use of advanced technology. Crime is better organised, more international and hi-tech. We all know about emails that want you to log onto false bank websites. The risk of international terrorist attacks has also increased. Moreover, risks to public health and the environment are becoming more complex due to the increasing complexity of technology, production processes and society, making risks more difficult to assess. Examples in this context are the continual discussions on the risk of radiation via mobile phones and the safety of newly developed foodstuffs.

Vital infrastructure such as telecommunications, drinking water facilities and chemical and nuclear energy appear to be vulnerable to malfunctions, disasters and attacks, and need to be better protected. The challenge in increasing social safety is further complicated by the need to do this without causing more harm to civil rights and freedoms than is necessary. Increased social safety demands the effective application of technology. This could take the form of improved information and communication technology in the maintenance of law and order or disaster management, automatic warning systems, or new technology for measuring, determining and combating environmental and health risks.

A fourth social problem is that of *social cohesion and integration*, which refers to the extent to which citizens in a society are capable of working and living together successfully. Social cohesion assumes mutual solidarity and common identities, norms and values. Without social cohesion, mutual solidarity and a willingness to help cannot exist, social exclusion and conflict arise, and society's productivity and quality of life will decrease. In the 21st century, social cohesion is under extreme pressure. Globalisation and immigration are creating increasingly multicultural societies in which the differences in norms, values and lifestyles, as well as language barriers, are causing significant tension between cultural groups.

Social cohesion is also decreasing as a result of individualisation and the diminishing importance of existing social ties such as the family, the neighbourhood, professional organisations, churches and associations. People are less dependent on social structures in their immediate surroundings and create individual social networks that can spread throughout the country or even the world. This is partially due to information and communication technology and modern transport systems. Social cohesion is also becoming a global problem, given that people in a globalised world see themselves more as world citizens and the interaction between societies becomes even more intense. The existence of intensive political, economic, social and cultural relations with countries such as Turkey and China has become part of our society. A key challenge for the future lies in the application of technology that can promote social cohesion and integration. Technology does, in actual fact, already play a substantial role in social contacts. Think, for example, about the telephone, text messages, email and the World Wide Web. How can information and communication technology be utilised in the future such that it strengthens the communication between groups and encourages social participation? And how can the spatial layout and the development of an infrastructure be realised in a way that the 'we feeling' counterbalances social exclusion?

The fifth and final problem is *health care*, which is also an area that will present us with unprecedented challenges in the 21st century. The most important of these challenges involves the preservation of an adequate health care system. The Dutch Minister for Public Health Ab Klink, if no immediate action is taken, the increased shortage of personnel and the astronomical cost will plunge the Netherlands in a health care crisis.[2] As a result of past improvements to the health care system, many terminal diseases have become chronic ones, and treating them is expensive and labour-intensive. There is also the problem of an aging population, which has led to an even greater demand for care. This increasing demand runs the risk of becoming prohibitive, and, given the lack of personnel, impossible to provide. And the problem is not exclusive to the Netherlands. This situation would only appear to be salvageable with the help of the specific application of technology that increases the efficiency of the care system and relieves and adopts the workload. This could take the form of electronic patient files or robots that can carry out operations, for example. More attention must be

2 *Speech at the opening of the academic year at the University of Twente, Enschede, September 1, 2008.*

Negative role of technology

Contructive role of technology

paid to prevention and early diagnosis – areas in which technology can play a crucial role.

Naturally, this overview of 21st-century social problems is by no means exhaustive. There are other, equally important problems such as poverty, social inequality, war and conflict. And technology has an important role in these problems as well. Overall, we can conclude that technology plays a key role in many contemporary social problems, be that a negative one, a constructive one or a combination of the two. This brings me to the next phase, which concerns the demand for the knowledge that is necessary to understand the role of technology in contemporary social problems and the ability to apply technology constructively in the future.

The contribution of philosophy of technology

Because of the importance of technology for social problems, you might expect that substantial amounts of time and money are being invested in more effectively gearing technological developments to social problems, and that there is an abundance of knowledge regarding the factors that make the application of technology in such problems successful. In practice however, the opposite is true. All too often, the problem is over-specialisation. Engineers know all there is to know about technology but often lack scientific insight into social processes and human behaviour. By contrast, social and behavioural scientists often know little about technology. This creates a rift between the sciences (natural and engineering sciences) and the social sciences.

This rift is augmented by the lack of a common language to link technological and social developments. There is little interdisciplinary or transdisciplinary knowledge that goes beyond the sciences and the social sciences and that can utilise an unambiguous vocabulary to discuss technology, society and the interaction between the two. There is a similar lack of effective models for successful multidisciplinary collaboration between natural scientists or engineers and social scientists. As a result, large scale technological innovation projects often fail because of unanticipated social realities, the social consequences of technology are often misjudged, and opportunities in solving social problems are missed because those responsible do not know what the technological possibilities actually are.

We need, therefore, to develop more knowledge in the area of overlap between the natural and technical sciences and the social sciences. Knowledge that will enable us to discuss the relationship between technology and society, technology and culture, technology and norms and values, technology and human behaviour, and technology and social needs, knowledge that can give direction to the development and application of technology. *Philosophy of technology* is a field that develops this knowledge over a broad spectrum. It is certainly not the only field that is engaged in this. Others include technology policy, technology management, ergonomics, technology assessment and science and technology studies. Philosophy of technology, however, boasts a number of unique approaches, which I will now explain to you.

Philosophy of technology is a subdiscipline of philosophy in which philosophical studies are directed at technology and its relationship with different aspects of society. The roots of philosophy lie neither in the social sciences nor in the natural sciences. Historically speaking, the opposite is true – both are rooted in philosophy. Philosophy's maternal role in history perhaps provides us with the hope that it can reconcile its two estranged children. That is, at any rate, the ultimate goal of philosophy of technology. And it uses three general philosophical methods to achieve that goal.

The first method is *synthesis*. Philosophy investigates the relationship between fundamental and often abstract issues that cannot be easily investigated using empirical means. Think, for example, about the relationship between language and reality, between subjective and objective reality, between mind and body, between science and religion, or between nature and culture. Philosophy explores the common ground shared by these areas, whatever form that may take, and investigates differences and similarities, compatibilities and incompatibilities. The method of synthesis enables the philosopher of technology to investigate technology with a sweeping eye and a broad agenda and to identify the connection between issues within technology as well as between technology and society. Within technology, the philosopher of technology can investigate the relationship between engineering knowledge and engineering practice, between engineering models and engineering design, and between experimental and mathematical methods in the engineering sciences. In the relationship between technology and society, philosophers of technology investigate such issues as the relationship between technical products and cultural meanings, new technologies and political decision-making, technical action and social responsibility, and engineering sciences and social sciences.

The philosopher of technology unites a multitude of subjects and fields of knowledge and aims for an integration of perspectives that apply to different disciplines. This broad and synthesised view can provide philosophy of technology with a bird's eye perspective of the issues, and enable it to discuss the various issues with a unified vocabulary. In this way, philosophy of technology can help to determine how technology relates to society, and how the technical sciences relate to the social sciences. This increased understanding of the interrelationships can, in turn, help improve their quality.

The second philosophical method is *analysis*. Philosophical analysis is aimed at gaining a better understanding of the issues by subjecting our notions to a critical analysis and, where possible, improving them. The point of departure of philosophical analysis is that the ideas, notions and means of argumentation with which we think we know reality are frequently unsound. Philosophical analysis is aimed at tracing the shortcomings in these issues and improving them. One form of philosophical analysis is *conceptual analysis*. Terms in contemporary language usage and terms used in scientific language are often vague, unclear or ambiguous, or appear to be torn between two different ideas. Conceptual analysis enables these terms to be accurately investigated with the intention of clarifying and, where necessary, improving them. What, for example, does the term 'sustainable' mean? While it is *de rigueur* at the moment, what does it actually mean? The same can be said of other ambiguous terms such as health, safety or information. Relationships between terms are also investigated in this way. What, for example, is the relationship between information and knowledge, or between health and welfare? And what is the distinction between nature and culture?

A second form of philosophical analysis is the *analysis of statements, arguments and debates*, which looks critically at the presuppositions of expressions, and whether such presuppositions are true, or whether arguments logically apply, and what the rhetorical and logical structure of a debate is and whether it is correct. This may involve statements and discussions in philosophy, as well as, for example, science or politics. One unique form of analysis is *deconstruction*, which seeks internal contrasts and contradictions in texts and thought processes, and in their accompanying presuppositions, so that these contrasts can be problematised. In philosophy of technology, philosophical analysis helps to clarify the terms used by scientists and other users to discuss technology and society and to look critically at debates about both. With the help of analysis, we can better

understand what a word like 'technology' actually means and what it relates to, or what a mathematical model is in the technical sciences and what different types there are, or what errors in reasoning have been made in notions about technology that assume it to be morally neutral. Philosophical analysis can also be used to effectively analyse social problems and the debates about them.

Thirdly, philosophy has a number of *normative research* methods, which constitute a means of looking at how the world *should* ideally be and how people *should* conduct themselves. Normative research, therefore, does not describe reality, but *prescribes* how it should be. This is done on the basis of *values and norms* that prescribe what is good and why we should strive for it. In contrast to this, most scientific fields are *descriptive*: they describe or declare reality as it is. Normative scientific fields are an exception.

Philosophy performs a wide range of normative research, which predominantly focuses on fundamental norms and values according to which we should live. Ethics, for example, investigates how we should conduct ourselves in order to do the right thing. Research is also conducted into how we should live in order to have a good life. In epistemology and philosophy of science, research is done on how we should think, reason and research in order to accumulate knowledge. Aesthetics investigates the conditions that must be met in order to be beautiful or artistic. And theory of value investigates which values are most important to us and which ones we should give priority in our lives. This is what makes philosophy a unique field of study that develops systematic visions of what is good and valuable and – deriving from this – how people should conduct themselves. These methods do not look exclusively at economic or political value, but also at a wider notion of value. In this way, philosophy looks at *everything of value*.

A normative approach such as this can be exceptionally useful in solving social problems. In such cases, philosophy can investigate which value issues apply and which are threatened, as well as helping to assess solutions on the basis of the effects that they have on the realisation of desired values. This is also a means of normatively evaluating technology by investigating which matters of value are influenced by technology – positively or negatively – and by issuing normative recommendations for technical performance.

Next to these three methods, philosophy of course also commands a wealth of ideas, theories and approaches that have been developed by philosophers in past millennia. Looking for wisdom, we philosophers still regularly consult uncle Plato, nephew Nietzsche or brother Foucault.

We take into account the rich theories about science of Karl Popper and Thomas Kuhn, we make use of the ethical insights of Aristotle and Kant, and build on the political philosophies of Jean-Jaques Rousseau and John Locke. This philosophical tradition still informs our work, because as Isaac Newton said, we can see farther by standing on the shoulders of giants.

Let us now return to two earlier observations. I ascertained that technology plays a key role in important 21st-century social problems, but that we do not have sufficient understanding of that role and are, therefore, insufficiently equipped to steer technology. I also ascertained that to better understand and control the role of technology in society, we need more knowledge in the area of overlap between the sciences and the social sciences. I believe that, using methods of synthesis, analysis and normative research, philosophy of technology is a field capable of studying the cohesion between technology and society, clarifying and critically analysing social and technological problems, and normatively evaluating technological developments, and in so doing enabling a more effective development and application of technology.

This is philosophy of technology as I want to see it at the University of Twente. In the last 13 years at Twente, we have worked on developing our own approach to the philosophy of technology, that is characterised by its alignment towards the role of technology in society, the attainment of a good balance between synthesising, analytical and normative research, and an inclination towards collaborations with engineers and social scientists. This unique approach was first initiated by my predecessor, Hans Achterhuis, and elaborated on under his impassioned supervision. I have been involved from the outset and was fortunate enough to help shape it. The challenge that now lies before me is to elevate this approach to ever greater heights, which we will do by means of a new research programme that was completed last month. It is an ambitious programme in which we will break new ground in philosophy and focus fully on the value of our research for technology and society.

In order to explain this unique approach, it is perhaps a good idea to first tell you something about the approaches used previously in philosophy of technology. I will do this in the form of a short historical outline, after which I will explain the Twente approach. I will use this outline to indicate which aspects of the Twente approach build on previous approaches and which aspects are new.

Three stages of philosophy of technology

Historically speaking, philosophy of technology can be divided into three periods, each dominated by a different approach. These approaches form a response processes of technological change, on the one hand, and to other approaches in the philosophy of technology, on the other. Between the 17th and 19th centuries, the dominant approach was *optimism*, inspired by the Enlightenment, in which technology was almost universally seen as something positive. In the 20th century, between approximately 1920 and 1980, *pessimism* was the dominant approach, in which technology was seen as the cause of social problems and a threat to the quality of life. From the 1980s onwards, two approaches have dominated: a *descriptive* and an *applied ethics* approach. I would now like to discuss these approaches and highlight their limitations.

Optimism: The philosophy of technology of the Enlightenment

Philosophy of technology only developed as a field of study in the 20th century. Before then, technology was generally of so little interest to philosophers that they did not deem it worthy enough to write about. Nevertheless, we can discern a philosophical school of thought concerning technology in the early modern era, beginning in 17th century, more than a hundred years before the Industrial Revolution, when philosophers and philosopher scientists were already recognising, and developing an appreciation for, the enormous potential of natural science for the development of technology.

The 17th century was the century of the Enlightenment, a school of thought that championed a new worldview that was in large measure influenced by the scientific revolution of the 16th and 17th centuries. This worldview hinged on three ideas. The first was that the individual was the moral and political centre of the universe. The Enlightenment rejected the idea of God as the omnipotent force behind all meaning, as well as the idea that politics needed to be centred around the will of the king or the will of tribes or ethnic groups. Instead, it focused on the rights and liberties of the individual. The second idea was that nature was dead and predictable. The organic world view of the Middle Ages and the Renaissance – according

to which nature was animated and spontaneous – was replaced by a mechanistic world view in which nature consisted of soulless matter that was subject to external laws of nature. In this portrayal of mankind and the world in which it lived, humanity was deemed far superior to nature.

The third idea of the Enlightenment was that human reason was capable of fully comprehending reality. This idea went hand in hand with the concept that the scientific method was the most important intellectual method in gaining objective knowledge. It was also coupled with the idea that scientific knowledge could be applied to manipulate reality and used to the practical advantage of humanity. These days, we call such applied sciences technology.

We find these ideas in abundance in the writings of René Descartes, the founder of modern philosophy, in which he introduces a radical division between humanity and nature. According to Descartes, humans are *res cogitans*, thinking beings that have no physical characteristics. Everything else is *res extensa*, dead matter subject to the physical laws of nature. Humans can learn to know nature and control it through their reasoning and intelligence and by using scientific methodology. These ideas led Descartes to one of the first formulations of the modern idea of technological progress – the idea that humanity will have ever more control of nature as a result of the technological application of science, and thereby improve its own living conditions and well-being. Descartes enthusiastically declared that using the scientific principles that he had discovered, humanity could become master and possessor of nature, and by an infinite number of devices be able to enjoy without effort the fruits of the earth and all the commodities found in it.[3]

This ideology of progress and the philosophy of control that accompanies it are also prevalent in the work of the 17th-century philosopher and scientist Francis Bacon, who believed that the aim of science was to conquer nature. This could be achieved, he claimed, by learning the laws to which nature was bound and mastering them by means of the development of new inventions. This would enable humanity to regain the power it lost after its fall from paradise, and in so doing, significantly improve its living conditions and well-being. In his novel *New Atlantis*, Bacon outlined a utopian society founded on science and technology in which he elaborated on that idea.

We find similar optimistic visions in the writings of other famous 17th-century philosophers such as Hobbes and Leibniz. Whilst the philosophers of

3 *See Descartes, R. (1637/1994). Discourse on Method. Everyman Paperbacks.*

René Descartes

Francis Bacon

the Enlightenment primarily directed their admiration towards the new natural sciences, it is also clear that they saw the expected applications of technology as science's greatest asset. The optimistic view of technology that they developed rests on three notions: that humanity can control nature by applying scientific knowledge, that this control will become increasingly successful as science and technology develop, and that this power over nature would yield predominantly positive results such as individual freedom, affluence and well-being. This optimistic vision remained influential beyond the 17th century and still provides a framework for contemporary ideas of progress.

Pessimism: The classical philosophy of technology of the 20th century

The technology-driven society of which Francis Bacon dreamt in *New Atlantis* became a reality in the 20th century. Technology penetrated every sector of society and no-one could escape its influence. We see the widespread expansion of the industrial sector, the establishment of rationalised production processes and labour patterns, large-scale transformation of the landscape, rapid urban growth, the emergence of mass production and the birth of a consumer society.

However, this new society was not universally welcomed as a positive development. This is highlighted in the two most important utopian novels of the 20th century, *Brave New World* by Aldous Huxley and *1984* by George Orwell, both of which sketched a distinctly negative picture of technology, in sharp contrast to Bacon's optimistic image in *New Atlantis*. Huxley and Orwell portrayed societies in which technology is used as a means of social persecution, transforming people into spineless slaves. Technology does not contribute to the welfare of society but is merely a means of crude excitement and pleasure.

What the 20th century has shown is that technology not only brings predicated achievements but an important downside as well. It turns out that technology is not just used to control nature but to control people, too. Technology was used on a large scale for the purpose of war and persecution, and was responsible in part for the unprecedented destruction that resulted from the First and Second World Wars, including the atrocities of Auschwitz and Hiroshima. It has even made possible the threat of complete nuclear obliteration. In addition, our control over nature appears to have come at a cost. Many technological developments have proven harmful

to nature and have created environmental problems that are a threat to mankind. The enormous power that technology offers mankind hence seems to be capable of turning against humanity and bringing about its destruction.

The promised improvements in the quality of life often appear to be ambiguous as well. In a technological society, labour processes are rationalised and therefore often monotonous, impersonal and more stressful. Workers run the risk of becoming a cog in the machine, like the factory worker in Charlie Chaplin's *Modern Times*. While the consumer society has brought many benefits, it is also characterised by materialism and a loss of spiritual values and feelings of community.[4]

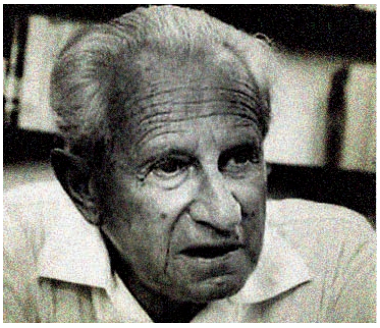
These developments put the optimistic image of technology from the Enlightenment under significant pressure. Between 1920 and 1980, an alternative image of technology arose in philosophy that was far more pessimistic. This approach is referred to as classical philosophy of technology. In it, philosophers focused on criticising technology and modern industrial society. They criticised the Enlightenment's philosophy of control and the idea that technology was predominantly good. They emphasised the negative and destructive nature of technology and posited that rather than providing freedom, mankind was now subservient to technology. They also declared that humanity had lost control of technology, which had now developed according to its own logic, and that rather than being improved, the quality of life was often worsened by processes of rationalisation, uniformity, alienation and shallow consumption.

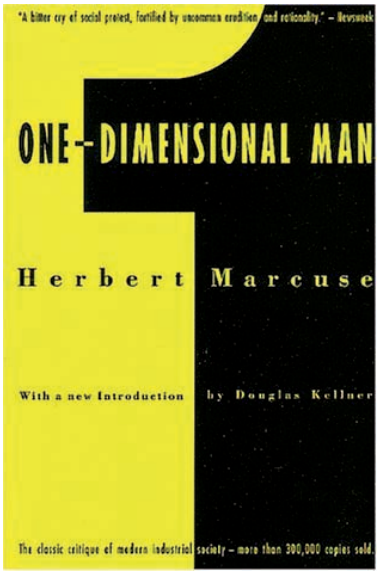
This negative attitude towards technology and the industrial society was strongly worded in critical theory, an influential philosophical movement and social theory that was forwarded in large part by the representatives of the so-called Frankfurt School, a group of German thinkers that, from the 1930s onwards, focused on widespread social criticism. They built on the work of Karl Marx and Max Weber, who, as the founder of sociology, was of the opinion that bureaucratic organisations built after the industrial revolution propagated a new form of suppression through their rationalisation of labour practices, an 'iron cage' that limited human potential.

In their 1947 publication *Dialectic of Enlightenment*, Adorno and Horkheimer argue that the Enlightenment led to a technical-rational philosophy in which both nature and mankind had become objects of

4 *See also Swierstra, T., (1997). "From Critique to Responsibility. The Ethical Turn in the Technology Debate," Techné. Research in Philosophy and Technology (1), 68-74.*

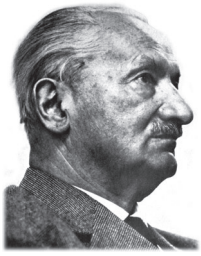
Herbert Marcuse





One-Dimensional Man
by Herbert Marcuse

Martin Heidegger



Big Brother is watching you

domination, which in turn led to fascist and totalitarian societies. In *One-dimensional Man* (1964), Herbert Marcuse argues that advanced industrial society has imprisoned mankind in a system of production and consumption in which people are held captive in monotonous jobs in order to buy ever more new products, and which has rendered critical thinking and conduct impossible. This work was one of the spearheads of 1960s counter-culture. Jürgen Habermas stated in his work that the Enlightenment had led to a one-sided emphasis on instrumental, scientific-technological rationality that has harmed the environment in which people lived and limited their potential to express themselves.

Martin Heidegger, one of the most influential philosophers of the 20th century and one of the originators of phenomenology and existentialism, argued that modern technology has infiltrated our entire way of thinking and feeling and had turned mankind and the world into standing reserves, commodities with a utility value. His vision was taken up in large part by neo-Heideggerians such as Albert Borgmann and Hubert Dreyfus. A similar vision is found in the work of Jacques Ellul, who portrayed technology as an unstoppable autonomous force that constructed social and political institutions according to its own logic and undermines the self-determination of humanity. Modern technology has also been seen as negative by other 20th-century post-modernist philosophers such Jean-François Lyotard and Jean Baudrillard.[5]

The current phase (1): descriptive philosophy of technology

In the 1980s, this pessimistic vision of technology prompted a response, which came at a time when philosophy of technology was already established as a field of study with its own journals and conferences. There was a growing chorus of scholars in philosophy of technology who argued that existing research was inadequate, and they generally agreed on the reasons why.[6] Their first criticism was that the 20th-century tradition sketched an image of technology that was too one-sidedly negative and

5 *Other 20th-century philosophers with a negative view of (modern) technology include a.o. Lewis Mumford, Ortega y Gasset, Hans Jonas, Ivan Illich and Jean Virilio.*

6 *See e.g. Achterhuis, H. (2001). "Introduction: American Philosophers of Technology," in H. Achterhuis (ed.), American Philosophy of Technology. The Empirical Turn. Indiana University Press.*

showed little interest in its positive achievements. The second criticism was that the traditional approach was too general and abstract. Technology was studied in its entirety, as a general way of thinking and doing. There was almost no attention to differences between technologies, nor were concrete technological practices, artefacts or decision-making processes looked at in any detail. This also made it difficult to justify the general pronouncements of the tradition.

The third and final criticism was that tradition had developed an overly deterministic image of technology. Technology was often described as something that developed autonomously, according to its own logic, regardless of the human choices, and that brought with it certain inherent, necessary consequences for society, irrespective of the context in which it was used. Empirical research did not support this image.[7] The overly abstract and determinist image of technology offered the tradition little with which to help direct and improve technology, and prevented the tradition from contributing realistic solutions for negative consequences that arose.

Some philosophers went on to claim that philosophy would do better to shift its focus towards the study of technology itself rather than evaluating its social consequences. In his much-quoted book *Thinking Through Technology* (1994), the American philosopher Carl Mitcham put forward the notion that philosophy of technology should focus on the development of sound descriptions of technology and its inner workings rather than external consequences.[8] This plea was echoed by renowned philosophers of technology like Joseph Pitt, Andrew Light, Peter Kroes and Anthonie Meijers. Kroes and Meijers, who have expanded this approach, stated that following research on technology in the social sciences, philosophy must open the black box of technology and describe what it finds inside.[9] They proposed that technology be arranged more in line with philosophy of science, directed at the analytical clarification of basic concepts and theories in engineering, with an emphasis on epistemological, ontological and

7 *See Bijker, W., Pinch, T. & Hughes, T. (eds.) (1987). The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology. Cambridge, MA: MIT Press.*

8 *Mitcham, C. (1994). Thinking Through Technology: The Path Between Engineering and Philosophy, Chicago: University of Chicago Press.*

9 *See Kroes, P. and Meijers, A., (2000). "Introduction: a discipline in search of its identity," In P. Kroes and A. Meijers (eds.), The Empirical Turn in the Philosophy of Technology. Amsterdam: JAI.*

methodological studies.[10] They also emphasised that any such descriptions should be well informed by empirical facts.

This descriptivist approach has since crystallised.[11] In different countries, analytical-philosophical research is now being conducted into the nature of technology and engineering sciences, and collaborations between groups also takes place. The philosophy groups at Delft and Eindhoven Universities of Technology, where Kroes and Meijers hold full professorships, are leading in this area. Research themes include the structure of engineering design processes, the nature of technical artefacts and functions of artefacts, the nature of engineering knowledge, the relationship between engineering sciences and natural sciences, and the methodological structure of engineering science.

The current phase (2): applied ethics of technology

Since the 1970s and 80s, a second development has arisen: applied ethical research in the field of technology. Two developments can be discerned. On the one hand, we see the rise of systematic ethical research into the professional responsibility of engineers. This is a type of professional ethics – called *engineering ethics* – that focuses on helping engineers shape their professional responsibility through the formulation of general ethical principles and professional codes and by providing methods and techniques for tackling the moral issues and dilemmas that they encounter in their work. On the other hand, we see the rise of ethical research into social-ethical problems surrounding technology. This relates to issues concerning how society in general has to deal with the application and use of technology in society. Examples include the question whether cloning should be banned or not, or to what extent internet users are entitled to privacy.

Ethics is a field of philosophy concerned with the distinction between good and evil and the question of how people should behave in order to do good. Good is mostly defined as that which does not harm others and

10 *Admittedly, epistemology is not only a descriptive but also a normative study. In the research mentioned however, the emphasis is often placed on the descriptive aspect, given that significant attention is paid to describing types of technological knowledge and their role in the technical sciences.*

11 *Mitcham, op. cit., makes it clear, however, that a longer tradition already exists in this field, which he calls Engineering philosophy of technology.*

respects their rights and dignity. Ethics is rooted in a number of ethical or moral values and principles such as freedom, justice, equality, dignity and moral responsibility. Ethical issues are issues that occur when moral values and norms come into conflict with one another. Ethics then endeavours to investigate how we should deal with these issues. In recent decades, there has been a significant rise in *applied ethics*, in which the focus lies on the entire spectrum of concrete moral issues faced by society. Applied ethics has many forms, including medical ethics, environmental ethics and computer ethics, some of which pay a considerable amount of attention to technology.

Applied ethics of technology maintains the normative orientation that descriptive philosophy of technology has abandoned. Rather than describing reality, it evaluates it and prescribes what we need to do. By retaining this normative approach and the attention it pays to the consequences of technology, it shows similarities with the optimistic and pessimistic approaches in philosophy of technology mentioned earlier. The difference is that ethics of technology does not attempt to determine whether modern technology is good or bad and whether we should reject or embrace it. Ethics of technology accepts that we live in a technological culture in which technology in general is seen as an achievement, and asks how we can deal with that technology in a responsible manner. This approach, therefore, is more pragmatic than its predecessors.

The need for a new approach

Descriptive philosophy of technology and applied ethics of technology are the two most influential movements within contemporary philosophy of technology, constituting a powerful response to the shortcomings in the philosophical approaches that preceded them. We use both of these approaches at Twente, with Dr Mieke Boon conducting descriptive research into the technical sciences, and almost every researcher doing ethics. At the same time, I observe that both approaches do not sufficiently contribute to the demands I posited earlier. These were the demands of being oriented towards society, being helpful in solving social problems and including a normative approach.

The descriptive approach most obviously does not meet these demands. Not only does it lack a normative side, it also lacks a focus on the social consequences of technology. That is not to say that this approach cannot be valuable for normative or socially oriented research. A clear and transparent

image of technology such as developed in the descriptive approach is very useful in this respect.[12]

Ethics of technology is a stronger candidate because it possesses a distinctly normative orientation and is vigorously focused on the social consequences of technology. My objection, however, is that the normative agenda of ethics of technology is too limited. Ethics of technology focuses solely on a *moral* evaluation of technology. I would like to see philosophy of technology assessing the consequences of technology on society in *general* as good or bad, rather than merely concentrating on its moral goodness or badness. The role of technology in social problems is not just good or bad because it is morally so, but for other reasons as well.

Let me illustrate this. Nowadays, people buy more and more products via the internet. This means that people have to travel into the city centre less often, which contributes to a reduction in social cohesion in cities. Is this a good or a bad development? Ethics is of little help here because it only looks at whether moral principles have been violated by purchasing products online – which appears not to be the case – before concluding that this development is morally neutral. However, I would like philosophy of technology to be able to pass a normative judgement here because it is important in the evaluation of the role of technology in the above-mentioned social problem regarding social cohesion and integration.

What I am saying, therefore, is that ethics only covers what is morally good and bad, but that goodness and badness are not confined to morality and should also be included in the evaluation of technology and the approach towards social problems. Many issues are valuable for reasons other than moral ones. In addition to moral value, we have cultural value, social value, political value, economic value, ecological value and prudential or personal value. In short, I want to work towards a philosophy of technology that heeds *everything of value*. Such a philosophy of technology should be able to distinguish between different positive and negative consequences of technology and provide reasons why they are good and bad. Such philosophy of technology should also be able to distinguish between the different values that play a role in social problems and weigh them up against one another.

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12 *The most relevant here is the research into technical functions and use prescriptions in technical artefacts, because it creates a link between technology and operational context. See Houkes, W. and Vermaas, P. (2006). "Use plans and artefact functions: an intentionalist approach to artefacts and their use." In A. Costall, O. Dreier (eds.), Doing things with things: the design and use of ordinary objects. (pp. 29-48) London: Ashgate.*

Some of my philosophy colleagues will now contend that what I desire is achievable within ethics as well. They will argue that ethics also focuses on goodness in the broadest sense and deals with all sorts of values. And there are indeed definitions of ethics that are as broad as this. However, the fact is that this broad notion hardly plays a role in applied ethics, in which ethics is often narrowly defined as the moral evaluation of actions with a view to preventing injury to third parties and a respectful association with them, with little attention being paid to broader issues of a social nature or the quality of life. Therefore, when I refer to an overly narrow ethical agenda, I refer to the agenda that is implemented in practice, if not in theory as well.

I would now like to mention a second limitation of applied ethics of technology, one that is more internal in nature. This is the fact that ethics of technology says too little about the way in which new technology can be developed in a morally responsible manner. On the one hand, ethics of technology focuses strongly on social-ethical issues concerning technology that already exists, and, on the other, on the general responsibilities of engineers. What is missing are effective models that will enable us to estimate how we can take accepted norms and values into account when developing new technologies and how we can anticipate moral and normative issues with regard to future applications. Therefore, this is also a challenge that requires more detailed research; a challenge we are happy to accept.

I conclude that the current approaches employed by philosophy of technology do not sufficiently accommodate the ideal of a socially oriented philosophy of technology that helps to solve social problems. They are of insufficient help in understanding the role that technology plays in society and in recognising, in their evaluation of technology, all the values that occur. We need a new approach, therefore, that goes beyond the current ones. I will now outline the contours of such an approach, which are based on the Twente philosophy department's new research programme entitled *Interpretive and Normative Investigations of Technology and Technological Culture*.[13]

13 *See http://www.utwente.nl/ceptes/research/.*

The Twente model: the descriptive dimension

The approach to philosophy of technology taken at Twente is a combination of a descriptive and a normative analysis of technology. In both cases, emphasis is on the role of technology in society. Descriptive research focuses on providing insight into the social roles of technology, and therefore meets my first criterion for a socially relevant philosophy of technology. Normative research looks into both ethical and non-ethical values, and focuses not only on the application and the development of technology but on social issues as well. In this way, these two approaches satisfy the criteria for a socially relevant philosophy of technology that can be applied to understand, evaluate and help solve social problems. I will now go on to discuss our descriptive and normative approaches.

Descriptive research in Twente differs from the descriptive approach mentioned earlier in that its descriptions are not aimed at technology but at the *relationship between technology and aspects of society*. The earlier descriptivism is an internal descriptivism that focuses on an internal description of technology and the technical sciences. In our research, we choose an *external descriptivism*, which describes technology in relation to different aspects of society such as users of technology, the context of use, cultural patterns and social structures. The challenge is to effectively and clearly conceptualise these relationships and to develop a vocabulary with which these different issues can be understood in their mutual relationships. This demands philosophical methods of synthesis (the combination of divergent issues in a common framework) and analysis (the study of the components in those relationships and their precise mutual relationship).

We borrow this vocabulary in part from philosophers who have already studied these relationships, such as Don Ihde, Bruno Latour, Langdon Winner, Andrew Feenberg and Helen Nissenbaum. We have also borrowed ideas from the interdisciplinary field of science and technology studies, such as the idea that the workings and consequences of technology depend in part on the functions and interpretations that users and others attribute to it, and the idea that technology and society develop in interaction with one another.[14]

14 *See e.g. Bijker, Pinch and Hughes, op. cit.*

Much of our descriptive research focuses on understanding the relationships between *technical products* and their environment. We endeavour to understand on a philosophical level how they influence the experience and conduct of users and what influence they have on their operational context. We also look at *technical practices* in this way, such as in-vitro fertilisation or prenatal screening[15], and attempt to understand the extent to which these practices introduce changes to the context in which they occur, and, for example, provoke new practices, norms or institutional change. We also sometimes look at the relationships between *broader technological developments* and changes in society such as the emergence of gene technology and changes in our perception of the human body.

Human-technology relations

The relationships between technology and aspects of society that we investigate occur at both micro and macro levels. At the micro level, we look at the relationships of technical products or practices with people, actions and operational contexts. At the macro level, we look at the relationships between technology and broad social structures and change processes.

Much of our research occurs at the micro level, and much of that research focuses on human-technology relations, specifically the relations between humans and technical products. This research is part of *Philosophical anthropology and human-technology relationships*, a line of research co-ordinated by Dr Peter Paul Verbeek, in which the research of Prof Dr Petran Kockelkoren also figures prominently. One of the themes in this research involves the way in which technical products change people's perception and experience. The research looks at different human-technology relations[16], including *embodiment relations*, where technical products are incorporated into our perception and we experience the world through them. For example, the spectacles that we wear on our nose are not an object of our perception but a part of our perceptive equipment. We do not see the glasses but see the world through them, and this alters our perception. An important aspect of

15 *See for example Boenink, M. (2007). "Genetic diagnostics for hereditary breast cancer. Displacement of uncertainty and responsibility," in G. de Vries and K. Horstman (eds.), Genetics from the Laboratory to Society. Palgrave/Macmillan.*

16 *See Verbeek, P.P. (2000). What Things Do. Philosophical Reflections on Technology, Agency, and Design. Penn State University Press.*

our research is how different embodied technologies change our perception and experience, and with it our image of reality.

Another interesting type of human-technology relation is the *alterity relation*, in which we interact with technical equipment that behaves in such an autonomous or intelligent manner that, in our experience, they manifest a resemblance to living beings. This applies, for example, to computers, robots and electronic toys, and, to a certain extent, to machinery such as ticket machines and cars. These products display unpredictable behaviour, communicate with us or enter into other interactions with us, which renders them almost living. An important aspect of our research is how these experiences, in turn, lead to changes in our self-image, our worldview and our relation to others.

Another theme in out research concerns the *operational capacity of technical products*, especially with respect to their users. Technical products appear to be capable of influencing how people think and behave, as well as manipulating their behaviour. This can sometimes occur very explicitly, but is often more subtle. An example of explicit behavioural manipulation is the alarm that is activated when people start their cars without putting on their seatbelt. The annoying alarm almost forces the occupants to fasten the seatbelt. A more subtle example is the effect induced by a round conference table, which stimulates those present to communicate in a more equipollent manner because no one sits at the head of the table, and also encourages total participation because everyone is equally visible. There are countless other examples in which technical products influence human conduct. We describe this in our research and investigate how designers can better incorporate it into their designs, via methods of anticipatory design.[17]

You can see that our research deals with the relationship between technology and society on a far more concrete level that classical philosophy of technology. Perhaps it is event too concrete for you. What do such studies have to do with solving social problems? But this is why they are so important. Many social problems are linked with the manner in which individual people use technology. Take the environment, for example. By having a better understanding of how individual people experience and are influenced by technology, we can introduce the necessary changes at an individual level by, for example, introducing a different technological design

17 *See incl. Verbeek, op. cit., and K.Waelbers (forthcoming). "From assigning to designing technological agency," Human Studies.*

or by influencing users. We have already done such studies, looking at how people can be encouraged to use technology in a more sustainable fashion.[18]

Relations at the macro level

We also conduct research at the macro level. This research focuses on understanding the relation between technological innovations and broad social changes. Many social issues include such a relation and it is important, therefore, to understand these relations thoroughly. This type of research also occurred in classical philosophy of technology, but the resulting theories were often vague and not substantiated with evidence. We try to improve on such research in various ways. Firstly, we aim for greater conceptual clarity and better argumentation than was often the case in classical philosophy of technology. Secondly, we try to link macro-level theories to analyses at the micro level so that they are more easily verifiable and applicable. In connection with this, we also try to use empirical research on the relationships we study. I attempted to create a framework for such research along with Thomas Misa and Andrew Feenberg in the book *Modernity and Technology*, which was published by MIT Press in 2003.[19]

18 *See Verbeek, P.P. and Slob, A. (eds.) (2006). User Behavior and Technology Development – Shaping Sustainable Relations between Consumers and Technologies. Dordrecht: Springer.*

19 *Misa, T., Brey, P. and Feenberg, A. (eds.) (2003). Modernity and Technology. MIT Press.*

The Twente model: the normative dimension

The normative research that we conduct focuses on both ethical and non-ethical values in relation to technology, employing a broad notion of normativity that goes beyond the approach taken by ethics of technology, which was deemed too limited. It also focuses on both the application and development of technology and involves the construction of models for the morally responsible development of new technology. This normative research is moreover used in evaluating and helping to find solutions to social problems. The development of a broadly normative approach occurs in the line of research that I co-ordinate, *The good life in a technological culture*. The development of methods for the morally responsible development of new technology occurs in two lines of research: *Ethics and political philosophy of emerging technologies*, coordinated by Dr Tsjalling Swierstra, and *Scientific philosophy for a technological society*, led by Dr Mieke Boon. I would now like to explain the character of this research.

Broad normativity and the good life

The first challenge we are faced with in our research is how we can conduct a broad evaluation of technology on the basis of both ethical and non-ethical values. We try to measure technology in light of *everything of value* by looking at how technologies in society add and remove value and how the different kinds of value can be weighed up against one another. The study of different types of value is the domain of *theory of value* or *axiology*, which is branch of philosophy different from ethics. The theory of value studies how and why people attribute value or should attribute value to things, and what kinds of value there are. The theory of value enables us to distinguish between the different types of values, including ethical, aesthetic, cultural, social, prudential and economic values, all of which play a role in the evaluation of technology.

In appraising technologies or social issues, we also have to weigh up such values. Is safety, for example, more important than privacy? Is a strong economy more important than a clean environment? These are the kinds of questions that relate to the social issues I outlined earlier. The challenge for philosophers is to provide substantiated answers to such questions or to create frameworks according to which they can be answered collectively.

Philosophers generally agree that there is one value that can be seen as the ultimate value against which all others are measured. This is the value of well-being, or the good life. Safety, privacy or a strong economy would have little value if they did not help to improve the quality of peoples' lives. We all want to live a good life, and in most cases, we wish that for others too. By weighing up the various values we can, therefore, continually pose the question which values are more important in realising good lives for all.

Of course, the definition of a 'good life' cannot be summed up easily. For some people, enjoyment and pleasure are important, for others it is strong intimate relationships, or power and status, and for yet others meditation and prayer. In a democratic and pluralist society, philosophers are well advised to include different notions of what constitutes a good life in assessing values. This is the path we have chosen at Twente. At the same time, philosophers also have to evaluate these different notions and be critical of their shortcomings. This is something we also do. In this way, we try to come to balanced evaluations of technology.

In addition to a good life, people also attach importance to a *good society*. After all, the quality of society determines to a large extent the quality of our lives as individual citizens, and a sustainable quality is also important for future generations. In addition to the values linked to the quality of life, we therefore also study values related to the quality of society, such as social, cultural, moral, political, economic and ecological values. We look, for example, at normative theories of cultural value, with which we try to show how changes in culture can be evaluated positively or negatively, or at normative theories of community that indicate how important strong communities are for society and why. We then try to relate these theories to technology and social problems.

As you will understand, this is a very ambitious line of research. Many different areas of value need to be studied and related to one another, and we must also include the plurality of ideas concerning a good life and good society. The largest proportion of our research in this line is conducted within a VICI project, a large, 5-year project financed by the NWO, the Netherlands Organisation for Scientific Research. This project involves six researchers and concentrates on the implications of information technology and new media for the quality of life and society, apart from also developing a more general framework.[20]

20 *See http://www.utwente.nl/ceptes/research/ and the core publication Brey, P. (2007). "Theorizing the Cultural Quality of New Media," Techné. Research in Philosophy and Technology 11 (1), 1-18.*

In this project, we try to study how different applications of new media technology can improve or reduce the quality of life. We try to evaluate how the Internet or the mobile telephone make our lives better or worse. We try to determine how such systems and products help to achieve or undermine specific values or valuable entities such as privacy, friendship or wisdom. The mobile phone has added value in that it contributes to personal freedom and autonomy as well as human connectivity. It also has economic value because it is used for business purposes. However, it has also harmed the peace and quiet of public spaces by ringing and due to the loud conversations that follow, and because it promotes a culture of total accessibility, which can increase stress.

Another subject that we study is the quality of virtual lives. People are spending increasing long periods of time at their computers and therefore invest significant time into building up their virtual social networks and going to virtual worlds in computer games such as *World of Warcraft* and lifestyle worlds such as *Second Life*. This pattern is much more defined in younger than in older people. More and more people are leading a virtual existence in this way. Our research focuses on the extent to which such an existence enriches or corrupts everyday life. Can virtual friendships, for example, be as good as real ones? Are virtual worlds made as forms of escapism or do they offer serious alternatives to normal life?[21]

We also try to understand how technology is appreciated differently by different groups with different value systems, and how we can relate to these differences more effectively. For example, non-Western cultures often place the welfare of the community or clan above the welfare of the individual. After all, non-Western cultures did not have a historical period resembling the Enlightenment, which focused on the individual. As a result, values such as privacy, freedom of speech and right of ownership do not occupy a central role in many Asian countries, which makes their attitude towards information technology completely different to ours. They place no importance on internet privacy, accept internet censorship as normal and do not think that software piracy is a problem. Understanding these kinds of differences in terms of value is essential to understanding social problems and a more efficient management of technological developments.[22]

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21 *These and other themes are researched in the VICI project by an international group comprising Johnny Søraker, MA, Dr Ed Spence, Dr Adam Briggle, Dr Omar Rosas, Pak Hang Wong, MA, and myself. See the above-mentioned website for publications.*

22 *Brey, P. (2007). "Is Information Ethics Culture-Relative?" International Journal of Technology and Human Interaction. 3(3), 12-24.*

Another project that we have implemented in collaboration with the 3TU.*Centre for Intelligent Mechatronic Systems* involves the introduction of robots in the health care industry. Many countries are seriously considering the future use of robots in nursing and geriatric care to help ease staff shortages. We are studying the extent to which this constitutes a desirable development that can contribute to the quality of life.[23] In the future, we also want to implement projects that look at the relationship between technology, the good life and environmental issues, in which we will study the role technology can play in creating sustainable societies that maintain a high quality of life.

I hope that it has become clear to you how this broadly normative approach can help in evaluating technologies and their role in social problems. In the evaluation of technology, the approach can help by indicating how technology can provide a positive or negative contribution to the things that people find valuable. This knowledge can also help direct technology development in order to ensure that technological applications are better prepared to satisfy the desired values. To this end, we also develop methods within the framework of Value-Sensitive Design, a new approach to design that incorporates social values into the design process.[24] Finally, our approach is useful in helping to create solutions to social problems by determining which values are involved in them and how their realisation depends on technology.

Normative research into technology development and new technologies

With our descriptive research into human-technology and technology-society relations and with the development of broad normative assessment frameworks for technologies and social problems, we already have two key ingredients for a socially oriented philosophy of technology at our disposal. A third ingredient that is still needed is a better understanding of normative and ethical issues in the development of new technology and ways of dealing with such issues. This is important because otherwise we can only

23 *See also Coeckelbergh, M. (forthcoming). "Personal Robots, Appearance, and the Good: A Methodological Reflection on Roboethics," International Journal of Social Robotics.*

24 *Brey, P. (forthcoming). "Values in Technology and Disclosive Computer Ethics," in L. Floridi (ed.), Handbook of Information and Computer Ethics. Cambridge University Press.*

control technology if it already exists, limiting us to making choices about how technology is used. It would be better if we could anticipate social and ethical consequences in the early stages of development of new technology so that we could gear the choices that we make in the development process accordingly.

In Twente, we endeavour to develop models and theories for the benefit of this process, and we also aim to help define social and professional responsibilities of technology developers. In addition, we try to contribute to the improvement of social and political debates concerning new technology. The new technologies that we look at are in the fields of biomedical and nanotechnology, as well as robotics and information technology. In evaluating these technologies and the debate that surrounds them, we again employ a broad view of normativity, whereby, alongside standard ethics, attention is also paid to problems surrounding the good life and the good society.

In this research, we pay significant attention to methods for the development of *ethico-technical scenarios*, which are future predictions about which normative and ethical issues will or could arise with regard to new technologies. This theme is primarily explored by Dr Tsjalling Swierstra and Dr Marianne Boenink. We try to learn a lesson from the past by being as meticulous as possible in identifying factors that lead to the occurrence of social and ethical problems in new technology. In this context, we pay particular attention to the role of expectation, because new technology is often subject to erroneous expectations that only serve to cloud the discussion. We are currently conducting a project regarding the ethics of expectations in molecular diagnostics with the *3TU.Centre for Bio-Nano Applications*. Molecular diagnostics is a technology under development that will extract genetic information from the human body to help with diagnoses and predicting health risks. We try to study how we can anticipate the social and ethical consequences of this new technology, and what the potential consequences could be for its development and application.

Another research theme involves the *ethical analysis of social debates surrounding new technology*. New technologies are often controversial, and have their advocates and their opponents. Examples include nuclear energy, genetic modification and clone technology. Scientists, politicians and people with a vested interest conduct debates that determine in part the development and social acceptance of these technologies. How can these debates be held in such a way that those involved can elucidate their moral position and consider every moral argument? To that end, Dr Swierstra has

developed a successful approach called *NEST-ethics*, which stands for 'ethics of New and Emerging Science and Technology'.[25] NEST-ethics shows that social debates of this nature display recurrent patterns that only serve to create impasses, and that presents ideas on how such debates can be better designed.

Current research being conducted by Dr Mieke Boon involves the *epistemological responsibility* of technical and natural scientists. According to Dr Boon, scientists carry an epistemological responsibility for the way in which they produce knowledge and transfer that knowledge to third parties. For example, they round off figures and decide whether deviations in measurements are significant or not, and as such alter the knowledge that is being produced, which can have significant consequences at a later stage. Dr Boon studies what moral responsibility scientists have with respect to such choices. In addition, she also conducts normative research into better methods of scientific practice that is based on the idea that knowledge is shaped in part by its intended use. If scientists were to have a better view of the intended use, they can develop knowledge that is both more effective and more valuable to society.[26]

Finally, I would like to once again mention the fact that in the lines of research mentioned earlier involving Dr Peter Paul Verbeek and myself, a great deal of attention is being paid to the way in which social and ethical aspects can be included in design processes. This relates to the above-mentioned anticipatory design and Value-Sensitive Design approaches.

I would now like to remind you of the promise that I made at the beginning of my speech to tell you how philosophy of technology as practised in Twente can play a key role in understanding and helping to solve the major social problems of the 21st century. I hope that I have made it clear to you what our contribution is.

In our descriptive research, we describe and analyse relations between technology and people, and between technology and society. This knowledge can be used to identify the negative and constructive roles of technology in social problems, and to better anticipate these roles in the development and application of technology.

25 *See Swierstra, T. and Rip, A. (2007). "Nano-ethics as NEST-ethics: patterns of moral argumentation about new and emerging science and technology," Nanoethics 1: 1, 3-20.*

26 *See also Boon, M. (2006). "How Science is Applied in Technology," International Studies in the Philosophy of Science. 20(1): 27-47.*

In our normative research, we develop an approach that enables us to identify all key values that are connected with technologies and that play a role in social problems and to weigh them up against each other. We also ensure that this happens at an early stage, when the technology is still being developed, so that socially responsible choices can already be made during the development phase. We then use this normative approach to clarify the values that play a role in social problems and to evaluate the extent to which the introduction of technology can help solve these problems.

Conclusion

I hope that I have convinced you that philosophy of technology as we approach it in Twente is capable of understanding and assessing the role technology plays in society, and can help to understand and provide solutions to those social problems in which technology plays a part. It is clear that we do not develop this philosophy in an ivory tower. We conduct our research in collaboration with engineers, social scientists, behavioural scientists and a large number of social organisations and companies. We are happy to philosophise amidst society and the world of technology. We are also happy to have found a great many engineering scientists who are prepared to observe society with us.

In conclusion, I would like to extend a few words of gratitude.

Firstly, I would like to thank the university's Executive Board and the dean of my faculty for the confidence they have shown in me.

I would like to thank my department for providing me with a stimulating environment since I arrived in 1996. The dean has dubbed us the Gallic village, after the Asterix stories, and it often feels like that. Let's hope it continues to be like this. I'm looking forward to it. In particular, I would like to thank my two senior university lecturers Tsjalling Swierstra and Peter Paul Verbeek for their help in deliberating about the direction the department should take and the sometimes difficult administrative puzzles that I have wrestled with. Without your support, all of this would have been infinitely less successful.

In the past two years, we have worked together with the philosophy groups in Delft and Eindhoven to establish the *3TU.Centre for Ethics and Technology*. This is one of six Centres of Excellence within the three universities.[27] Anthonie, Jeroen, Peter, Ibo, we have created something special here in establishing a Centre that is unique in the world. I eagerly await our future collaboration in the further development of the Centre.

I would like to thank the boards of directors of the *Centre for Telematics and Information Technology* (CTIT), *Biomedical Technology Institute* (BMTI) and the

27 *See http://www.ethicsandtechnology.eu/*

MESA+ Institute for Nanotechnology for their willingness to allow us – as a non-technical group – to join their technical institutes, and for their support over the years. I want to thank our partners within these institutes for their collaboration, which I sincerely hope will continue for many years to come.

I also want to thank the *3TU.Centre for Intelligent Mechatronic Systems* and the *3TU.Centre for Bio-Nano Applications* for their support in the joint projects that we carry out. Stefano and André, let's make these projects a success.

I would like to express my appreciation to my colleagues at the Faculty of Behavioural Science for the pleasant business relationship that I have with you, and my joy that we have built up a substantive relationship through our many research groups. Erwin, Jan, Willem, Ad, Jaap and others, thanks for your confidence and I look forward to exchanging ideas in the future.

Dear colleagues in the STeHPS research group within the Faculty of Management and Governance, dear Nelly, Stefan and Rob, I am delighted that we recently strengthened our ties again. We have always learnt a great deal from you about the development and social imbedding of technology and I hope that will continue in the future.

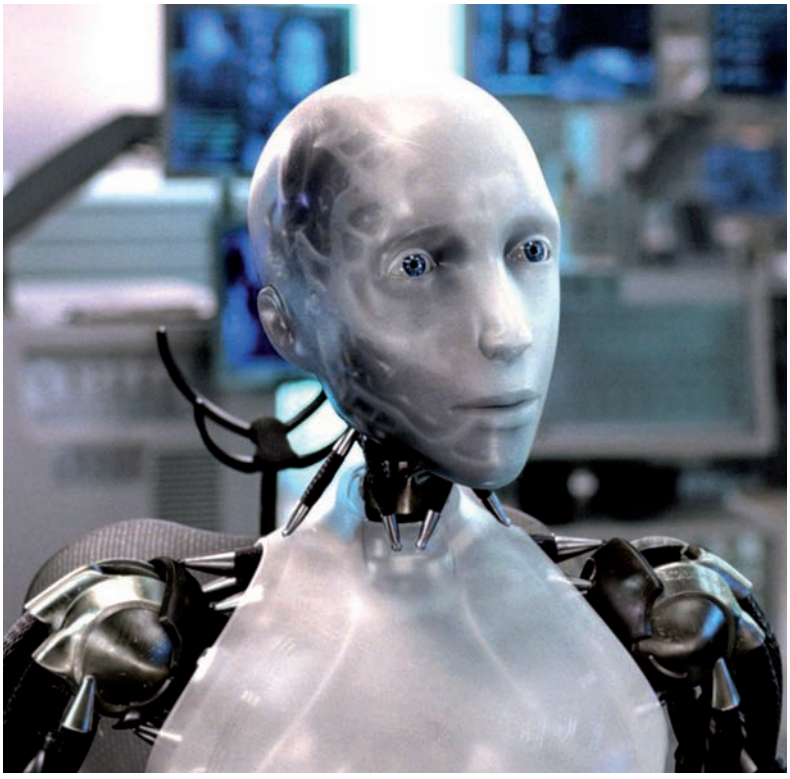
Every degree programme at the UT to which we provide philosophical education, thanks for your continued confidence in us. And to those who do not make use of our offering, I hope that you have feelings of regret after hearing my speech.

I would also like to express my hope that we will continue to have productive collaborations with our external partners including the *Rathenau Institute, SenterNovem, TNO* and the *Stichting Toekomstbeeld der Techniek*.

Dear Elly,

I would never have made it this far without your love and support, for which I am unutterably thankful. It is wonderful to see how, as graduates in philosophy, we are both now engaged with social issues, despite the differences in approach. And so we journey on.

I have spoken.



Scene from I, Robot, (®) 20th Century Fox

Curriculum Vitae

Prof. Dr P. A. E. Brey has been full professor of Philosophy of Technology with the Faculty of Behavioural Sciences at the University of Twente since October 1, 2007.

Philip Brey (1966) studied philosophy at Radboud University. Nijmegen, the Netherlands and the University of California, Berkeley, gaining his PhD in 1995 from the University of California in San Diego. He is now professor of Philosophy of Technology at the University of Twente and chairman of the Department of Philosophy. He is also a member of the executive board of the 3TU.Centre for Ethics and Technology, a Centre of Excellence of the three technical universities in the Netherlands that conducts research into ethical issues surrounding new technology. He is vice president and president-elect of the international *Society for Philosophy and Technology*, director of the European division of the *International Association of Computing and Philosophy*, and a member of the executive board of the *International Society for Ethics and Information Technology*. His research focuses on the philosophy of technology, with particular emphasis on ethical and social issues in relation to technology and on philosophical aspects of information and communication technology. He is currently in charge of an NWO-financed VICI project with a research scope of 18 person-years (FTEs) concerning the significance of new media for the quality of life and of society.

University of Twente
Enschede - The Netherlands