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Chapter 5

CYBERNEUROETHICS



Because of an increasing understanding in the way in which the brain functions, the development of ever more powerful computers, and advances in neuronal interface systems, direct interactions between the brain and computers, and between the mind and cyberspace are slowly becoming a reality.

Of course, some of the present technology remains relatively crude and significant improvements will be required before more advanced neuronal interface appliances become available. But these will eventually be developed, which means that an anthropological and ethical examination of these appliances is necessary in the light of potential benefits for either therapy or enhancement while seeking to understand and address possible future risks or harms.

As the Parliamentary Assembly of the Council of Europe stated in 2017:

The pervasiveness of new technologies and their applications is blurring the boundaries between human and machine, between online and offline activities, between the physical and the virtual world, between the natural and the artificial, and between reality and virtuality. Humankind is increasing its abilities by boosting them with the help of machines, robots and software . . . A shift has been made from the ‘treated’ human being to the ‘repaired’ human being, and what is now looming on the horizon is the ‘augmented’ human being.¹

In this regard, it is recognised that any innovative biotechnical procedures will always involve new ethical challenges, such as seeking to balance the

possible advantages against eventual drawbacks. These ethical hurdles will also have to consider the way in which a decision is made to use such procedures. These include whether legitimate reasons exist to limit individuals from making their own decisions, the manner in which they consent to unidentified risks to themselves and to others, and the consequences that the procedures may have for the whole of society. This may especially be the case with any procedure interfering with the brain, since it is closely associated with a person's sense of identity and self. In other words, any inadvertent changes to an individual's brain may have an effect on how he or she understands who he or she really is.

Moreover, since the short-term and long-term effects of such new interfaces are unknown, their personal and societal implications need to be carefully examined before being considered as ordinary applications.² In addition, because some benefits and harms may be more significant than others, the way in which these are balanced against each other may not always be straightforward. On this account, it is crucial to examine what importance should be given to each possible benefit and harm, while then making a judgement about their relative merits.

When considering harms, it is essential to note that terms such as 'minimal risk' may be understood in different ways. For example, it may imply a small risk to a large number of persons or a small risk of very serious harm to a few individuals. This means that it is not just the seriousness of the risk that matters, but also the probability of the harm actually occurring and whether a large number of persons would be affected.

Of course, with an increase in understanding of the brain and its functions, it may also become possible to better quantify and minimise any risks. However, some residual uncertainty will always remain about long-term use, though this is no different from other forms of biological interventions.³

One final aspect which should be considered is the way in which perceptions concerning a procedure, such as neuronal interfaces, may change over time. At first, they may be seen as new and ethically controversial, but over the years may become increasingly seen as normal, more commonplace and acceptable.

In the following sections, some of the individual and societal ethical challenges already arising from traditional interfaces with computers and cyberspace will be examined in order to put into context some of the new future possibilities that may arise from the development of direct neuronal interfaces. However, as will become evident, these new interfaces will give rise to far more sensitive ethical questions than actually exist with present technologies. For instance, in addition to the concerns over privacy that are already present with information technology, neuronal appliances may actually affect the very manner in which humanity may be understood as *Homo*

sapiens. Moreover, these new questions may prove far more meaningful in framing the extremely important implications and consequences being suggested by the integration of the mind with cyberspace.

General Ethical Considerations Relating to Neuronal Interfaces

When new procedures such as neuronal interfaces are being considered for use, one of the first stages in examining their ethical aspects is to gather as much information as possible, while seeking to consider both the advantages and risks for all those involved, such as the individuals concerned and those in society.⁴

Individual Ethics

The first level of ethical examination may be related to the individuals who may be considering the use of neuronal interfaces for either therapeutic or enhancements reasons. In both of these categories, different risks and advantages will need to be balanced relating to how the appliance is used.

Advantages for Individuals

In examining the ways in which individual persons may benefit from neuronal interfaces, it is not only the number of benefits that should be considered, but also how these are perceived by the relevant person, which may be a more subjective affair and may vary according to his or her goals and aspirations.

Within this context, the first kinds of advantages that may be considered relating to such interfaces are 'positional benefits' and how a person may improve his or her position in a competitive society. In such an environment, any interface that may give a person an edge over his or her peers may be seen as beneficial. However, if everyone ends up using the same interface, no personal competitive advantage may remain, though benefits may still exist for society from such an overall improvement.

At the same time, more 'intrinsic benefits' may exist for individuals using neuronal interfaces that may go beyond what may be considered as purely competitive advantages. These may be life benefits that would be seen as being positive in themselves, such as being able to remember enjoyable past experiences. Similarly, 'instrumental benefits' may exist with neuronal interfaces, such as in term of being able to resolve complex problems that arise in a person's life or being able to remember facts and figures for work.⁵

Risks for Individuals

Any biomedical or biotechnological intervention generally involves some degree of risk, even if this may be relatively small. But when a treatment for a medical condition is being considered, these risks are generally seen as proportionate in light of the benefits.

In this respect, the first kind of risks that may arise from neuronal interfaces may be possible side-effects that should be carefully assessed, since some can be hidden, rare or long-term. Particular side-effects that may be relevant for children and young people should be thoroughly and meticulously examined since their brains are still developing. Indeed, they may benefit in the short term, but very real negative consequences may then appear later in their lives.

Furthermore, unintended consequences may exist. For instance, once a benefit is achieved using an interface, there may be increased pressure on the individual to continue using the appliance to maintain the same level of performance, leading to a likely increase in dependency and even addiction. Another possible unintended consequence is that pressures may increase on individuals to be connected all the time, to work harder, longer and more intensively. As a result, it could actually make life even more difficult than before. Thus, the risks of unanticipated negative side-effects may be significant, making it difficult to provide appropriate information to individuals so that they can make an informed decision.

Finally, when an individual considers using a neuronal interface, it may not just be a question of personal autonomy or consent alone that matters, since society may decide to limit informed and competent individuals taking certain risks. This may happen through, for example, setting standards, licensing practitioners and prohibiting procedures that are demonstrably dangerous.

Societal Ethics

The second level of consideration is related to the prospective risks and advantages to society. Again, an appropriate balancing of these will need to be carefully examined, which may not always be straightforward.

Advantages for Society

Because all individuals live in society, what may happen on a personal level may affect others in both a positive and a negative manner. This means that any individual use of neuronal interfaces may have an impact on society, for good or for ill.

In this regard, one possible societal benefit arising from such interfaces is the development of a more interactive and informed society. Of course, an individual linked to cyberspace in a more intimate way may not necessarily be more content with life and may still be socially inept. Nevertheless, if many in society have access to interfaces, this may enable them to have a better social life and be able to contact more people, while having access to immeasurable amounts of information.

Another benefit of neuronal implants for society is that they may support many traits of day-to-day life, such as concentration and memory, thereby addressing the limitation of human nature. A fairer society may also result from such appliances that may be used to reduce some of the inherent inequalities that may exist between individuals.

Furthermore, neuronal interfaces may enable individuals to achieve their full potential. Those with more limited access to information or those from deprived backgrounds could then begin to develop new skills.⁶

Risks for Society

But in the same way that potential societal benefits may arise from neuronal interfaces, risks may also exist that require consideration, such as their unintended effects on a community, in that individual risks may impact on society as a whole. For instance, an increased dependence on interfaces may sometimes cause psychological illnesses, which may go beyond the individual to his or her family and to the wider community in terms of the increased risks for social problems as well as costs. In the same way, any increase in expectations to work harder and longer has implications beyond the individual and may give rise to family discord and lead to conflicts. Thus, even though neuronal interfaces may be seen as very useful to many individuals, a society also needs individuals to be caring, cooperative and attentive to the needs of others.⁷

Another concern about the use of such interfaces relates to the risk of coercion and experiencing pressure in a community to use a device, in that what may begin as an individual and free decision may very quickly become expected and even demanded by society. Vulnerable individuals may then be subject to peer pressure to use the devices in order to become part of the social group, with the possibility of experiencing stigmatisation if they refuse.

Such risks of coercion are especially important in the context of interventions on the brain that may affect aspects of an individual's personality and even the very nature of society if there are a large number of users. Neuronal interfaces may then alter the basic fabric of human life.

If certain interfaces came to be seen as essential for public life, some political leaders may also be tempted to consider them for use at the

national level or may even impose their use if they believe they could bring greater benefits to society. This has already happened, for example, with certain immunisation programmes in some countries.⁸ There might even be a strong public interest argument in making neuronal interfaces compulsory if it could be demonstrated that such appliances may lead to a more stable society.

It is also worth noting that the potential military use of neuronal applications is already of interest to national defence agencies seeking to maximise the performance of soldiers. As a result, this may mean that if such interfaces are available to one side in a conflict, pressure will mount for others to have them as well.⁹

The Risk of Increasing Inequality in Society

A final risk for society arising from neuronal interfaces that may need further discussion is that they may actually increase inequality. Indeed, whilst such interfaces may bring certain benefits to individuals, they may also accentuate a competitive and individualistic success culture, which may be detrimental to the cohesion of a fair and decent society within which everyone can flourish. Moreover, at least initially, it is likely that the appliances may only be available to those who are willing and able to pay.

The fairness argument focuses on the future of society and recognises that, for good or for ill, financial resources are not usually spread evenly across the general public.¹⁰ Consequently, some individuals may be unable to afford any or only certain neuronal interface enhancements. As with all technological developments, the cost would certainly exceed what some people could afford. Thus, unless limited to those who had the appropriate means, the interfaces could become a serious financial drain on the resources of an already fragile economy. Moreover, the financial intervention of healthcare providers introduces other interested parties into the already complex web of professional bodies with a stake in interfaces.

More seriously, however, the cost of the neuronal interfaces may lead to inequalities amongst future individuals. But in some respects, this unfairness already exists in many other areas of public life. Any individual who accepts the right of parents to put their children into an expensive private school or hospital cannot really use the fairness argument as a reason for rejecting the use of neuronal interfaces. Nevertheless, the central point of this fairness argument emphasises that these inequalities should not be strengthened or encouraged in any way. Indeed, the sufferings of the poor may be multiplied by the use of neuronal interface enhancements, since they would have to contend with technological discrimination in addition to the limitations that they already experience because of their economic situation.¹¹ An example of

such an outcome was presented by the American author Matthew Anderson in his 2002 science-fiction novel *Feed*, which depicts some of the forms of discrimination and limitations that may exist for those who do not have the latest versions of neuronal interfaces.¹²

In response to this form of the fairness argument, it has been suggested that inequality is not necessarily always detrimental to society, since a measure of unfairness may actually give rise to some advantages, such as a sense of competitiveness. In short, a certain measure of inequality should not always be the basis for alarm.¹³ Yet, in pleading for an acceptable disparity, this proposal may mean limiting certain neuronal interfaces, which should be available for all, to only a few privileged individuals, which would no longer be seen as beneficent.

Another response to this form of fairness argument recognises that humanity is already divided. For example, people are already categorised on the basis of whether they are infected with HIV/AIDS or whether they have clean drinking water. But it is difficult to imagine a compassionate and rational person objecting to providing help for the sick unless a treatment were available to all who needed it. For instance, if a cure for HIV/AIDS became available, with enough doses for only 10 per cent of the over 30 million people with the disease, only very few (if any) would object to distributing this treatment to only this 10 per cent of patients. In other words, even though an action may seem unfair, it may still help some individuals. By this reasoning, the fairness argument is weakened because aiding individuals through neuronal interfaces is preferable to not helping anyone.

The increasing costs of producing new neuronal interfaces may also exacerbate the differences between individuals who can afford to acquire advantages in a competitive environment and those who are too poor to afford them. But, as already indicated, this situation is not new, since the wealthy already have a number of real advantages. Yet, a lot depends on the rest of the assumed social and political contexts. This means that the introduction of neuronal interfaces into a society may only be of concern if it did not already have procedures in place seeking to redress any inegalitarian tendencies. If neuronal interfaces eventually gave rise to a small elite group of privileged persons who flaunted and enjoyed their superiority, disregarding the rest of society, then it is doubtful whether the majority (those not in the elite) would assess the situation positively.¹⁴ Moreover, this form of unfairness may be compounded, since the resources devoted to the enhancement of the elite would very likely be diverted from aiding the poor. In order to address this imbalance, society may decide to restrict neuronal interface enhancement, though creating and justifying feasible mechanisms for such restrictions may pose significant challenges.

Online Humans

In an interesting short science-fiction story entitled ‘The Machine Stops’,¹⁵ written in 1909, the English novelist Edward Forster (1879–1970) described a world in which most human individuals live underground in nearly complete isolation, each within his or her own small standardised room. Nearly all real face-to-face communication between individuals is avoided and seen as uncomfortable.

An omnipotent, global Machine takes care of every physical and spiritual requirement, while enabling communication to take place between individuals through a kind of instant messaging and video monitor. This is constantly being used by all the solitary persons, in their cells, to recount experiences that none of them has ever lived, first-hand, in the real world above ground. But eventually, and even though religion is frowned upon, the Machine slowly becomes an object of worship, with those rejecting its deification being threatened with ‘Homelessness’. However, very few are willing to acknowledge that the Machine is beginning to break down.

In a way, this story can be seen as a predictive parable of what is already beginning to happen in modern society. Here as well, it is now possible to find many persons in front of their computers with their earplugs in their ears, completely isolated from face-to-face relationships while increasingly spending large amounts of time online.

The web and social media both increase and decrease the directness between persons. An individual can now communicate with someone, or even with many people, he or she would not otherwise have been able to reach. But this communication may often just be characterised as an ‘interaction’ rather than a ‘relationship’. It may be somewhat superficial and may lack the quality of a face-to-face, physical encounter, including voice tone, body language and expression.¹⁶

Moreover, it is a trend that is unlikely to stop. Thus, some of the first elements of cyberneuroethics that may need to be examined are the real risks and also advantages of hyper-connectivity.

Hyper-connectivity

The term ‘hyper-connectivity’ characterises the use of multiple communication systems and devices enabling a person to remain highly connected, in real time, to social networks and streams of information. It also includes the possibility of being able to record a person’s communications or exchanges, enabling him or her to document his or her life.¹⁷

Ever since the beginning of the twenty-first century, an increasing number of persons have been able to access the Internet.¹⁸ At the same time, the growing use of mobile smartphones has meant that individuals can, if they so wish, be constantly connected to each other and to this network. Already by 2011, there were more devices connected to the Internet than there were people in the world.¹⁹

In this regard, younger people seem more likely to make use of Internet-based communications, with a 2011 survey in the United Kingdom noting that, amongst 16–24 year olds, 45 per cent indicated that they felt happy when they were online, 86 per cent felt that the new technology helped them communicate with people and 96% said that they accessed another media device such as a mobile phone while using the Internet.²⁰

But in spite of these trends in hyper-connectivity, a number of households are choosing not to access the Internet for various reasons. There is also a minority of about 10 per cent (aged 17–23) who define themselves as lapsed Internet users by limiting home access and restricting resources.²¹

However, it is worth noting that things can get out of control in some rare instances. For example, a young 28-year-old South Korean man was reported to have died in 2005 after playing the online computer game *Starcraft* at an Internet cafe for fifty hours with very few breaks. The police indicated that the man had not slept properly and had eaten very little during his marathon session.²² This reflects a real risk that players may no longer contemplate doing anything else, which they consider less interesting, than their games – an outlook that may represent a real challenge for an appropriate integration into society.

Because of such risks, and in order to address the dangers of hyper-connectivity (and especially amongst young people), the South Korean Parliament eventually enacted the Shutdown law (also known as the Cinderella law) in 2011. This prohibited children under the age of sixteen playing online video games between midnight and six in the morning on the next day.²³

Coping with the Amount of Information Available

Since many more people are spending increasingly more time on the Internet than before, new adverse consequences are beginning to develop. For instance, individuals may no longer be able to cope with the amount of information available, thereby increasing stress and leading them to abandon certain tasks. Questions can be asked as to whether individuals in society need to know so much. Uncertainty also exists about the manner in which pupils in schools will process the amount of information they are given and how education systems may have to change. Indeed, it may be impossible to compartmentalise the information received so that a person can use it in an appropriate and ordered way.

Individuals may have to become increasingly selective and disregard what they cannot use or understand. They may need to learn to prioritise and develop their reliance on others for potted versions of information, while at the same time remembering how to access that information when it is needed.

For individuals who spend a large proportion of their time connected to the Internet, various further challenges may arise. For example, quickly flicking between many topics may undermine an individual's ability to concentrate. A 2009 Stanford University study in the United States concluded that individuals who are regularly confronted with several streams of electronic information cannot pay attention, control their memory or switch from one job to another as well as those who prefer to complete one task at a time.²⁴ The American academic and communication expert Clifford Nass (1958–2013) explains that 'They're suckers for irrelevancy' and 'Everything distracts them',²⁵ with Nass' colleague, the psychologist Anthony Wagner, explaining: 'When they're in situations where there are multiple sources of information coming from the external world or emerging out of memory, they're not able to filter out what's not relevant to their current goal . . . That failure to filter means they're slowed down by that irrelevant information.'²⁶

Individuals who spend a lot of time online may also find it increasingly difficult to compartmentalise different parts of their lives, such as work and family life. As such, it may be more difficult for them to maintain boundaries between online and offline identities. Because of the amount of time needed to access all the websites, some have even suggested using the web to support other activities, such as using audio electronic books to tell stories to their children in order to save time for themselves.

Another challenge is the use of email to contact individuals about work matters during leisure time. This breakdown between a person's professional and private life could make it more difficult for employees to set limits and may be one of the most important and transformative consequences of social and technological changes.²⁷ For instance, if individuals decide not to switch off their work mobile phones at home, they may end up working all the time. Because of this, France decided to introduce new rules in 2016 to protect people working in the digital and consultancy sectors from work emails outside of office hours. The deal signed between the employers' federation and trade unions indicates that employees will have to switch off work phones and avoid looking at work email, while firms cannot pressure staff to check messages.²⁸

However, an advertising professional who moved from London to New York describes a different email culture from that found in France:

I remember on my second day seeing an email from a work colleague sent very late that evening. To my surprise someone replied to it, and then the interac-

tion continued online. And lo and behold we ‘were working’. By contrast, in the UK, if I worked late I would often draft emails but save them in my inbox and send them first thing the next morning. That now seems ridiculous and archaic to me. Emails are constant here. It’s not that they expect you to answer out of office hours. More that everyone is ‘switched on’ all the time – that’s the culture and pace of New York. I never really heard the concept of work/life balance when I got to the US. There wasn’t much complaining as people’s expectations were different. It’s not just in the corporate world. When my family were moving here and trying to get an apartment I remember being surprised and delighted that our realtor was calling and emailing us late on a Saturday night.²⁹

Concern also exists about the overwhelming effects of a constant stream of information. The apparent need for some persons to be permanently online in order to interact with programmes and other persons through social networks is increasingly becoming a problem. Experts are worried that addiction to new technology is having a negative psychological impact, causing anxiety when a device is not accessible.³⁰

In 2008, the U.K. Post Office commissioned a research study that coined the term ‘nomophobia’ (short for ‘no mobile phobia’) to describe the stress and panic arising from a lack of mobile connectivity. The study found that 53 per cent of mobile phone users developed significant anxiety when their phone was lost, out of network coverage or out of battery. However, it was suggested that this obsession with new technology may be reduced as the novelty wore off,³¹ although, more recently, a new type of social anxiety called ‘Fear of Missing Out’ (FoMO) has been described. This is defined as an individual’s fear that others may be having rewarding experiences that he or she is missing out on. It is also expressed in a desire to stay permanently connected to sources of information about what others are doing. As a result, there seemed to be an inability by some affected by FoMO to commit to anything out of a fear of having to change their plans in order to not miss out.³²

It is further recognised that some games can be somewhat addictive to certain players when they are constantly being challenged and rewarded while moving through the skill levels that reinforce the player’s attention. But, at the same time, being permanently immersed in a fictional virtual world may reduce a player’s interest in dealing with people in the external real world and may even encourage him or her to escape the difficulties of this world.

On a more calamitous note, concerns also exist that the whole electronic system may eventually shut down in a catastrophic collapse, making it impossible for individuals to access their information on which they have become so dependent. If ever a future cyber-attack took place, with all cyber-communication breaking down, the consequences would be monumental.

But, of course, there are also advantages in being connected to cyberspace. The Internet gives access to a large volume of useful and practical

information, such as books and articles. Some may even feel a sense of reward from gaining an ever-increasing amount of such information. Improved access to the Internet may also allow individuals to keep in touch more easily and frequently with family and friends.³³ This means that events that occur elsewhere in the world can have an immediate impact on persons.³⁴

In short, when considering the possible risks and advantages of hyper-connectivity to the Internet, it should be recognised that this is already part of modern life. This means that if a direct neuronal interface eventually becomes available, accessing cyberspace through the mind of a person may just continue on a trend that has already started. Many more individuals may then increasingly spend ever more time in cyberspace, which may eventually become the 'normal' space in which to interact with others because it may be far more attractive than the 'real' space of reality.

Virtual Worlds

As already mentioned, an increasing engagement in virtual worlds is already developing in modern society. This makes it possible to define three general types of virtual reality, depending on how much the user may perceive and engage with the virtual world:³⁵

- fully immersive (with head-mounted and other devices attached to the body);
- semi-immersive (with large projection screens); and
- non-immersive, such as using a personal computer.

The above classification is characterised by the level of immersion in the virtual world, with non-immersive virtual worlds influencing a larger proportion of the population, at present, than more immersive forms of virtual reality.

Within virtual worlds, it is also possible to recognise two categories, with ludic virtual worlds describing rule-based games involving direct competition between players, and paidic worlds promoting free play and creativity, with less emphasis on rule-constrained competition.³⁶

One of the most popular examples of the paidic type of virtual worlds is the already-mentioned *Second Life*. Although joining this world is free, users often need to purchase items using a virtual currency called Linden dollars. In this way, it is possible to buy clothes or sell houses for other people's avatars. There is even an exchange rate with the U.S. dollar.³⁷

The attraction of spending time on *Second Life* is that persons are able to set aside their problems in the real world and instead change their reality,

such as their looks or buy a house, car and clothes that they could never afford in real life. *Second Life* also enables users to make meaningful relationships that may be based on a projected self and common interests. In real life, individuals are subject to many experiences that are outside of their control. In the virtual world, on the other hand, they are delivered from these limitations and success is easier to attain.

Already, for certain individuals, the virtual world may develop into an end in itself – the preferred place in life. It has even been predicted that the real world will have to change if it wants to lure these people out of their virtual worlds and back into being fully participating members of society.³⁸

But there are also challenges for the future of *Second Life*.³⁹ For example, the Linden Research, Inc. company that created *Second Life* has now downsized and is focusing on users selling virtual goods to each other.⁴⁰ Nevertheless, increasing numbers are still using the website, demonstrating that many individuals find their experience in the virtual world to be beneficial. Indeed, a person who plays a virtual reality game and who feels a sense of unity and interaction with other players may see this as being far more positive than just passively watching television on his or her own.

That being said, nobody is certain in which direction all this will go. By examining the way in which real and virtual realities may interact in the future, the American author Michael Heim indicated that: ‘With its virtual environments and simulated worlds, cyberspace is a metaphysical laboratory, a tool for examining our very sense of reality.’⁴¹ However, it is worth noting that virtual worlds are not in any way new, since many individuals have often sought refuge in the fantasy world of books. Therefore, there may not be any serious consequences as a result of spending time in cyberspace – it may just be a question of balance.

Social Media

In contrast to traditional communication technologies, social media enables a person to create, share, consume and collaborate in many new ways.⁴² Online social media has seen a surge in usage in recent years, becoming one of the most commonly used activities for a majority of those in countries such as the United Kingdom.⁴³

However, in the future – and though it is difficult to predict – the nature and use of online appliances may change radically,⁴⁴ creating concerns about how online identities could be controlled and how ownership can be regulated. Further questions relating to the use of personal content and whether this can remain a private matter may be asked.⁴⁵

One possible use of social media, for example, is the development of more political activism using networks that may become influential in

‘spreading the message’ and allowing instant feedback and commentary.⁴⁶ Recently, social media has been used to facilitate political movements such as the revolution in Tunisia in 2011 and in mobilising dissent in Egypt and Libya, though the extent of its influence in these countries has also been questioned.⁴⁷

Responses to These New Technologies

In 2012, a discussion article between the British scientist, writer and broadcaster Baroness Susan Greenfield and the Bulgarian writer, blogger and critic Maria Popova was published in the *New York Times* entitled: ‘Are We Becoming Cyborgs?’ This considered the relentless development in the use of the Internet, which had already reached one-third of all human beings on the planet, with the average amount of time spent online by all persons of the world representing about 16 hours per week and rising. Thus, human beings are continuing to change the way they interact and, as a result, their very characteristics as social beings.⁴⁸ This means that as neuronal interface systems create new associations between the real and virtual worlds, ethical and anthropological questions can be asked in relation to whether they will eventually encourage a ‘dematerialisation’ or even a ‘virtualisation’ of human life.⁴⁹

Greenfield expressed concerns that the current electronic appliances were now dominant in the lives of children in contrast to other technologies. On this account, it was not the technologies in themselves that created anxiety, but the degree to which they were becoming a lifestyle rather than a means to improving a life.

Human brains are exquisitely evolved to adapt to the environment in which they are placed. Greenfield notes that every hour spent sitting in front of a screen is an hour lost talking to someone or being outside in the sunshine. She is concerned about how this may impact on social relationships arguing: ‘If virtual friends replace flesh-and-blood ones, we shall not need to learn social skills, not think about the unwanted and unpredictable reactions of others.’⁵⁰

Popova, on the other hand, expressed unease about the tendency to conflate information and knowledge, indicating that ultimately knowledge is an understanding of how different elements of information fit together. There is an element of correlation and interpretation. But while it is possible to automate the retrieving of knowledge, it may not be feasible to automate the making of moral decisions based on this knowledge and giving it meaning.

However, at this stage, the consequences of neuronal interfaces on the cognition of a person may need to be examined.

Changing Cognition

The term ‘cognition’ originates from the Latin verb ‘to learn’ and reflects a group of mental processes that includes attention, memory, producing and understanding language, learning, reasoning, problem-solving and decision-making. This means that in examining the concept of cognition, it is usually necessary to have an interdisciplinary perspective, including aspects of psychology, cognitive science, neuroscience and sometimes also computational neuroscience, artificial intelligence, autonomous robotics, computer vision and other areas.

In other words, the cognitive components of systems, such as neuronal interface systems, cannot be designed and studied in isolation; they have to be examined in the light of their potential association to sensorimotor systems and by the adaptation of cognitive systems to particular physical and task environments.⁵¹ In this respect, artificial cognitive systems are usually considered to achieve human-like cognitive competences, such as making sense of the world through perception, organising thought and acting in the world in meaningful ways.⁵²

Moreover, what is often examined are the possible positive changes to the cognitive faculties of an individual. These are generally termed cognitive enhancements and can be defined as ‘any augmentation of core information processing systems in the brain, including the mechanism underlying perception, attention, conceptualization, memory, reasoning and motor performance’.⁵³

Of course, such enhancements include some of the oldest forms of human improvement and are generally seen as attractive. But while chemical cognitive enhancers such as caffeine are already being used widely by many societies,⁵⁴ new technologies are now being considered, particularly in the realm of neuronal interfaces with computers and artificial intelligence.

In this context, neurocognitive appliances would be able to sense or modulate neuronal function in order to physically augment cognitive processes such as executive function, attention and memory. Neuronal interface systems may also be able to improve wakefulness, perception, moods and social or moral cognition.⁵⁵ Similarly, eliminating the retention of distressing memories could be considered as a kind of functional advancement.⁵⁶

At this stage, it is important to remember that many of the ethical questions raised by cognitive treatments and enhancements using neuronal interfaces may be similar to those that already exist in, for example, the use of certain pharmaceutical drugs. As the Presidential Commission of the Study of Bioethical Issues indicated in 2015:

The debates about cognitive enhancement include many of the ethical concerns raised by neural modification more generally, including the importance

of facilitating healthy development and wellbeing; respecting moral agency; informed consent to medical procedures and research; minimization of risk; public education and deliberation; equity and access across all demographic groups; and the reduction of disadvantage, suffering, and stigma associated with neurological disorders.⁵⁷

Using neuronal interfaces to change the cognitive aspects of a person is only just beginning to be considered by neuroscientists, and the following chapter can, therefore, only be seen as an introduction to this complex area. But the important areas of intelligence and free will necessitate further examination, as these have important implications on many other areas of cognition. Moreover, it should be remembered that knowledge, understanding and intelligence are not synonymous.

Changing Intelligence

The term ‘intelligence’ originates from the Latin verb *intelligere* ‘to choose between’ or ‘to discern’. But no single definition of intelligence exists and it has been described in many different ways. However, it does include concepts of logic, abstract thought, understanding, self-awareness, communication, learning, emotional knowledge, retaining, planning, and problem-solving. In this context, many of the tests measuring general intelligence include the following ten characteristics:⁵⁸

1. Fluid intelligence: includes the general ability to reason, form concepts and solve problems using new information or procedures.
2. Crystallised intelligence: includes a person’s acquired knowledge, the ability to communicate this knowledge and the ability to reason using already learned experiences or procedures.
3. Quantitative reasoning: the ability to understand numerical concepts and relationships and to manipulate numerical symbols.
4. Reading and writing ability: includes basic reading and writing skills.
5. Short-term memory: includes the ability to understand and keep information in the present time so that it can be used in the immediate future.
6. Long-term memory: includes the ability to store information and retrieve it quickly in the longer term.
7. Visual processing: reflects the ability to perceive, analyse, synthesise and reason using visual patterns, including the ability to store and recall visual images.
8. Auditory processing: includes the ability to analyse, synthesise and distinguish sounds, such as the ability to process and distinguish speech sounds that may be presented under distorted conditions.

9. Processing speed: the ability to perform cognitive tasks quickly.
10. Decision and reaction speed: reflects the speed in which an individual can react to stimuli or a task.

In many of these areas, it may be possible for a person to improve his or her intelligence if it became feasible for a neuronal interface to be appropriately used with a computer. However, this then raises the question whether this should be considered and for whom. For example, it may be suggested that a responsibility exists for all individuals to increase aspects of their intelligence. But, on the other hand, it is possible to accept that only an increase in the mental faculties of persons who have a mental disability (though it may also depend on the disability) should be contemplated. This is because individuals should only be able to make progress in certain areas to the level that is considered normal (with the concept of 'normal' having to be defined).

As a result, it has been suggested that access to neuronal implants for certain cognitive functions should be used, in priority, for:⁵⁹

- bringing children or adults into the normal range for the population, if the appropriate consent is obtained; or
- improving health prospects that should be based on need rather than on economic resources or social position.

With the possible development of neuronal implants for cognitive functions, another ethical concern is the risk of a two-class society emerging or an increase in the gap between industrialised countries and the rest of the world.

Changing Memory

Memories are vital in the life of individuals and enable them to function from a personal and societal perspective. In many ways, these memories seem to be solid objects in the minds of these persons similar to documents that can be called up and investigated, though at the same time they can be considered as ethereal. Memories are also central to personal identity, enabling persons to have a sense of self while remembering past experiences and building on them. It provides them with the continuity of self-awareness across their lives. The English philosopher John Locke (1632–1704) suggested something similar in his book entitled *An Essay Concerning Human Understanding* (1690). In this he indicates that a person is 'a thinking intelligent being, that has reason and reflection, and can consider itself as itself, the same thinking thing, in different times and places; which it does only by that consciousness which is inseparable from thinking'.⁶⁰

Thus, for Locke, because consciousness of different times can be equated with memory, the existence of memory in an individual is a necessary condition of personal identity. For him, 'as far as this consciousness can be extended backwards, to any past action or thought, so far reaches the identity of that person; it is the same self now, it was then; and it is by the same self with this present one, that now reflects on it, that that action was done'.⁶¹

However, what a memory is in terms of its physical reality in the brain remains elusive. Psychologists can demonstrate how memories can be manipulated, created and falsified, but understanding the biological science behind these memories is still in its infancy, although it is accepted that they are made up of many elements, which are stored in different parts of the brain.

As already indicated, neurons propagate signals through a combination of electrical pulses that are sent down fibre-like extensions to the point where each neuron touches and connects with another neuron (a synapse). All the action in the brain of an individual occurs at these synapses, where electrical pulses carrying messages are transferred across the gaps between cells. This means that although a memory begins with perception, it is encoded and stored using the language of electricity and chemicals with the connections between brain cells being readily created and changed. They are not fixed and, as messages are sent through these connections, the fine structure of the brain changes slightly. In other words, as each new experience is recorded in a brain, it is slightly rewired. This plasticity is a key part in the brain's normal daily work, but it can also help the neurons rewire themselves if they are damaged.

Furthermore, if the same message is repeated a number of times in the brain, more signals are sent between the neurons and the connection grows. When, for example, a person hears a song, he or she may remember some part of it. If, on the other hand, the song is played repeatedly, it will be more firmly lodged in the memory of the individual. In this way, memories are stored in innumerable cells and synapses, with the brain organising and reorganising itself with every new experience.

Neurons in the brain analyse all of the inputs from a person's sensory organs, such as eyes, ears, taste buds and touch sensors. Their first 'decision' is whether or not the input is worth remembering. Indeed, the brain deliberately ignores vast amounts of information that it receives so that a person does not quickly become overwhelmed.⁶² Different types of sensory input then get directed to different parts of the brain where each is stored. How they are pulled back together is, at present, poorly understood.

In short, it is very important at this stage to not exaggerate scientists' understanding of the functioning brain. It is one thing to recognise that neurons reconfigure their network and reposition their synapses as a way of

storing information, but it is quite another to look at an interconnected set of neurons and make any deductions about the information stored.

Certain mental disorders reveal that there are two basic types of memory: short and long term. Some older people may be unable to remember the present date, forgetting the answer almost as soon as it is given, but though their short-term capability has all but gone, their long-term memory may still be functioning. Many find the loss of short-term memory deeply frustrating, but the loss of long-term memory could be far more distressing, since it may be associated with a loss of identity and a failure to keep hold of a sense of self.

Certain past memories may also help a person shape and form responses to similar situations in the future. This means that if certain memories are removed, the person may lose the necessary information that would enable him or her to react to future situations. For instance, with a mental disorder, such as Alzheimer's disease, certain areas of the brain become damaged. Their function is often difficult to define, though they are recognised as being crucial for long-term memory and the process of learning.⁶³

In such situations, scientists are proposing that an electronic memory chip could be implanted into the brain in order to replace damaged memory functions.⁶⁴ In the future, it is even suggested that individuals could consider such memory implants in a positive manner because of their ability to bring back lost thinking processes.⁶⁵

Whether such a direct neuronal interface system would ever be successful is an open question, but millions of dollars have already been invested by the U.S. Defense Advanced Research Projects Administration (DARPA) to undertake research into restoring such lost memory functions.⁶⁶ But DARPA has also expressed a need to restrict the memories of soldiers during horrendous combat situations in order to put them beyond the reach of post-traumatic stress disorder. Such interfaces could then eliminate or strictly control negative emotions, enabling the training of 'guilt-free', remorseless soldiers.⁶⁷

In this regard, one of DARPA's main projects with neuronal implants is the Reorganization and Plasticity to Accelerate Injury Recovery (REPAIR) programme, which has the aim of using computer chips implanted in the human brain to directly alter its information-processing functions.⁶⁸ In this way, a person's memories, thoughts and especially emotions could be modified by direct neuronal control.⁶⁹

DARPA's mission in this area began under the leadership of the American Tony Tether, who headed the agency from 2001 to 2009.⁷⁰ He unashamedly invited society to seriously consider such an enhanced soldier by exclaiming: 'Imagine a warrior with the intellect of a human and the immorality of a machine.'⁷¹

But neuronal interfaces affecting memory are not only being restricted to medical or defence considerations. This is because human beings know that

their memories are often limited by the amount of information that can be stored. As a result, many are becoming ever more dependent on other means, such as technological devices, to retain their data. The American futurologist Ray Kurzweil even notes that ‘we have already largely outsourced our historical, intellectual, social and personal memories to our devices and the cloud’.⁷² It has also been suggested that individuals should be entitled to control their emotional life by eliminating or restricting negative emotions, such as guilt, sadness, fear and grief.⁷³

Yet, when such memory chip implants are considered, real conceptual and ethical concerns arise as to their effects on personal identity if an individual wants to forget or remember some memories. For example, it may be possible for memory prosthetics to store information that a patient may not want to keep.⁷⁴ As already mentioned, memories support the very identity of persons and the way in which they see themselves, which means that any modification of these memories may result in serious questions being asked by these individuals about who they really are!⁷⁵ This was the idea behind the 2004 science-fiction film *Eternal Sunshine of the Spotless Mind*, directed by the Frenchman Michel Gondry, which tells the story of an estranged couple who sought to erase each other from their memories.

Network Intelligence

With the development of direct neuronal interfaces, another outcome that may arise is the eventual combination, in some way, of the intelligence of a multiple number of persons in a form of network intelligence or hive mind. This could happen if it was possible for individuals to directly communicate their thoughts and memories using an interface or if human beings could upload the full contents of their minds and combine them in cyberspace.

Though such an outcome should be viewed with considerable scepticism, Kurzweil indicated that humanity could then reach the ‘Singularity’. This is where the intelligence arising from a network of human minds, supported by computers, would lead to advances so rapid that the pace of change would dramatically increase to almost an instant.

Kurzweil presents the Singularity as an event taking place at about the year 2045, which is sucking humanity towards itself, much as a black hole sucks in matter and energy.⁷⁶ He describes this Singularity as a point in time in the future that ‘will represent the culmination of the merger of our biological thinking and existence with our technology, resulting in a world that is still human but that transcends our biological roots’. In this world, ‘there will be no distinction . . . between human and machine or between physical and virtual reality’.⁷⁷

Kurzweil further indicates that at this Singularity, there will be ‘a future period during which the pace of technological change will be so rapid, its impact so deep, that human life will be irreversibly transformed’.⁷⁸ This would mean that individual biological brains, as such, would no longer be necessary, since most of the ‘intelligence’ would be transferred into computers and much of the ‘thinking’ into cyberspace.⁷⁹ Kurzweil predicts that by the end of the twenty-first century, ‘human’ computer intelligence will be comparatively more powerful than its unaided biological equivalent.⁸⁰ Neuronal networks will have been replaced by electronic circuits that are far more efficient than the workings of a biological brain, while being entirely immune from disease.⁸¹ However, he does admit that this massively intelligent mind will remain human, though it will be non-biological. At the Singularity, Kurzweil further explains that:

We can imagine the possibility of our future intelligence spreading into other universes . . . This could potentially allow our future intelligence to go beyond any limits. If we gained the ability to create and colonize other universes . . . our intelligence would ultimately be capable of exceeding any specific finite level.⁸²

He adds that:

Ultimately, the entire universe will become saturated with our intelligence. This is the destiny of the universe. We will determine our own fate rather than having it determined by the current ‘dumb’ simple, machinelike forces that rules celestial mechanics.⁸³

The language is full of hope and sounds victorious, but it is possible to question whether such an unlikely reality would actually be so positive. The English theoretical physicist Stephen Hawking indicates in this regard that:

The danger is real that this computer intelligence will develop and take over the world. We must develop as quickly as possible technologies that make possible a direct connection between the brain and computer, so that artificial brains contribute to human intelligence rather than opposing it.⁸⁴

What this would then mean for anthropology and the way in which ‘humanity’ would be defined in the future will be considered later in this book.

Free Will and Moral Responsibility

Progress in brain research is enabling scientists to better understand the way in which connections in the brain affect higher brain functions, such

as decision-making. These studies suggest that the development of complex nervous systems is the result of a continuous, self-organising process, with close relationships existing between particular brain structures and specific brain functions.⁸⁵

These close relationships have been demonstrated in clinical studies through the loss of specific functions following structural damage. In addition, noninvasive neuroimaging has shown that personal decisions and emotions are preceded by the activation of defined networks of neurons.⁸⁶ This means that both at the subconscious and conscious levels, human perceptions, reasoning, decision-making, planning, thoughts, arguments and value assignments are influenced by neurological states and developments.⁸⁷

But does this then mean that all the thoughts of an individual are only caused and controlled by his or her brain? Or do human beings still have free will?

The debate relating to free will, and what this represents, has been around for millennia, having been of interest to philosophers, theologians, lawyers, ethicists and many others in various disciplines. One of the first times this was expressed was in the story of the mythical Greek king Oedipus recorded by the ancient Greek tragedian Sophocles (ca. 497/496 BCE – 406/405 BCE). In the legend, Oedipus seems to have been imprisoned by his destiny to fulfil a prophecy that predicted that he would kill his father and marry his mother, thus bringing disaster on his city and family.

Another example where free will was examined was in the 1956 book *The Minority Report* written by the American science-fiction writer Philip Dick (1928–82), which was made into a film of the same name by the American Steven Spielberg in 2002. This recounted the way in which the police sought to arrest individuals before they had committed a crime by reading their minds.

For a person to be a free agent with free will means that he or she has the ability to initiate and execute plans of action. More specifically, this includes motivational, cognitive, affective and physical capacities that enable a person to shape and translate mental states such as desires, beliefs, emotions, reasons and intentions into voluntary actions. The person experiences a sense of being in control of what he or she does.

The concept of persons being free agents is also at the heart of how human beings understand themselves as persons and what it means to be conscious, thinking and moral agents.⁸⁸ In 2015, the U.S. Presidential Commission of the Study of Bioethical Issues defined such moral agents as ‘individuals capable of acting freely and making judgments for which they can be praised, blamed, or held responsible’.⁸⁹

At the same time, however, agreement exists that free will experiences necessarily depend on human brain functions and that when some functional

abilities are limited, for whatever reason, this can diminish or influence the will of a person. In addition, it is important to consider the significant environmental, cultural and historical influences that affect the brain and the mind.⁹⁰ For example, a person's behaviour and free will can be influenced by having a clinical depression that may affect his or her ability to frame and enact his or her intentions.⁹¹

More generally, it is worth noting that no human person has complete control of his or her actions. This is because many effects, including unconscious biological processes in the brain, are involved when a decision is made.⁹² For instance, it is only when the brain becomes aware of the feeling of hunger that a person begins to behave in a certain way by looking for food.

It is also accepted that the mechanics of the nervous system can sometimes have a real effect on a person's decision-making capacity. If a person commits a serious crime in order to obtain some benefit and a tumour is then discovered in his or her brain, extenuating conditions may be accepted by a court. A brain tumour has indeed been demonstrated to disrupt certain neuronal pathways associated with moral behaviour and inhibitory centres that would normally prevent inappropriate actions. This means that free will may be affected by neurobiology, even though the persons themselves may believe that they are totally in charge and that their behaviour is not being influenced by any effects in their brains.

Research suggests that persons are aware of only a minuscule fraction of the neuronal activities that regulate their behaviour. Some signals are, in fact, always ignored by the conscious person, such as those that manage blood glucose levels. Similarly, other brain signals that control certain forms of behaviour are processed without the knowledge of the person.

In parallel to this unconscious form of performance, conscious reflection and deliberation can take place. This happens if a person gives reasons for an action for which he or she is consciously aware. However, a significant amount of brain activity that actually prepares and determines the decision remains outside of conscious recollection.⁹³ This means that the subconscious and conscious parts of decision-making are both acting together in determining behaviour.

In a similar manner, a memory device implanted in the brain of a person who remains unconscious of its operations may not necessarily undermine any concept of this person's free will and agency. If an individual is not in total control of his or her thoughts and behaviour, this does not mean that he or she may not be acting freely.

Though no unanimity exists, philosophers generally believe that three overall conditions are necessary for persons to have free will, namely, that they must:

1. have different alternative possibilities from which to choose and to act;
2. have a responsiveness to reasons for appropriate actions; and
3. be the original and internal source or authors of any actions.⁹⁴

It is also important that persons have the possibility to bring about whichever of the options they will, when they want, for the reasons they want, without being coerced or compelled in doing so, or otherwise controlled by other agents or mechanisms.⁹⁵ Likewise, the American legal philosopher Robert Kane indicated that free will involves 'the power of agents to be the ultimate creators (or originators) and sustainers of their own ends and purposes'.⁹⁶ This entails the ability for persons to critically think through their desires, beliefs, reasons, as well as their intentions, and either reject or endorse them as the free authors of their actions.⁹⁷ The will is then the effective desire that moves a person all the way to action without further consultation with any possible higher-order desires.⁹⁸

In this regard, the political scientists Robert Blank explains that: 'Rationality has come to mean the conscious, goal-oriented, reasoned process by which an individual, expressing and thus also revealing his or her preferences, chooses a utility-maximizing action from among an array of alternative actions.'⁹⁹ However, it is also possible to consider free will as a concept whereby at the moment that a decision is made, given everything that has happened in the past, it is possible to reach a different decision. Some commentators even believe a nonphysical 'soul' is directing decisions.¹⁰⁰

In light of these perspectives, developments in neurosciences have given weight to discussions relating to the existence of free will between two different groups: those who support a physical and mechanistic explanation (that persons can be compared to machines controlled by their brains) and those who believe that human beings cannot be reduced to material bodies.

As such, a number of different positions can be taken, which will now be examined.

Incompatibilists

Those who have an incompatibilist position believe that determinism (which accepts that all decisions are predetermined by the brain) is not compatible with free will. These include two further groups called Libertarians and Determinists.

Libertarians

Libertarians believe that free will exists and that determinism must therefore be false. Their basic position is that a person can only be free if he or she

genuinely has the ability to do otherwise. Many who hold this position also believe that freedom underpins all social morality.

Determining whether this strong sense of a genuine ability to do otherwise cannot be reduced to chance is one of the main debates between Libertarians and other positions. Indeed, some supporters of Libertarianism maintain that a strong argument supporting indeterminism can be derived from quantum mechanics, including the unpredictability of the behaviour and location of subatomic particles. This, it is argued, demonstrates that at the most fundamental level, the universe cannot be seen as being determined.

However, the relevance of quantum mechanics to the free will debate can be questioned, since even if quantum-level events were demonstrated to have an effect on brain-level functions, this would not necessarily offer any endorsement of free will. This is because any appropriate understanding of the concept of free will cannot be reduced to just another way of understanding uncertainty.

Of course, many Libertarians recognise that other influences, such as mental disorders, can influence free will. They also note that the free will of a person may be influenced by his or her character, which was formed after many free-will decisions. This implies that the character of an individual may have become such that he or she is simply no longer able to freely choose certain courses of action and that it would first have to change for this individual to be able to make another decision.

Determinists

With Determinism, all mental processes are the consequence of neuronal activations. This can generally be defined as neuroessentialism, which reflects the notion that mental states, behaviour, notions of self, and personal identity can be reduced to neurobiology.¹⁰¹

In other words, decisions are the end result of neuronal processes that come together into the most likely stable state in the given conditions,¹⁰² which are themselves generally constructed from numerous variables and influences, such as the environment of the person. These neuronal processes are also influenced by the particular functional architecture of the brain, which is different in all individuals.¹⁰³ Thus, according to Determinism, at the moment of having reached a decision, a person could not have decided otherwise. As a result, neither free will nor responsibilities actually exist.

If Determinism is accepted as the sole reason for a decision, it would have significant repercussions for any legal system, since it would question the very concept of responsibility and make sanctions for any inappropriate behaviour meaningless. Determinists are convinced that there must be a neuronal cause for any deviant behaviour, whatever its exact nature.

As a result, it is possible to argue that any individual who commits a serious crime is affected by an abnormal and even dysfunctional brain, even if this has not yet been scientifically demonstrated. For example, genetic predispositions or other biological variables may have affected the construction of the networks associated with moral behaviour or may have led to weak control mechanisms for the inhibition of certain actions. In addition, these neuronal dysfunctions may have been caused by environmental conditions, such as an insufficient moral education or deficiencies resulting from a lack of training during brain development. It is also suggested that a brain's normal dynamics could have been affected by metabolic disturbances.¹⁰⁴ This all means that when a person decides to commit a crime, this may just have been the result of the activation state of the brain immediately before the decision was made.

Interestingly, Determinism is a position supported by many scientists, including neuroscientists Francis Crick (1916–2004), the British Nobel Prize winner and co-discoverer of the structure of DNA, who famously stated:

The Astonishing Hypothesis is that 'You', your joys and your sorrows, your memories and your ambitions, your sense of identity and free will, are in fact no more than the behaviour of a vast assembly of nerve cells and their associated molecules. As Lewis Carroll's Alice might have phrased it: 'You're nothing but a pack of neurons.'¹⁰⁵

It has even been claimed that the very belief in free will is responsible for much of the world's misery and is quite immoral.¹⁰⁶ Interestingly, however, researchers have demonstrated that when people do not believe in free will, they are more inclined to act in antisocial manners. They even found that their disbelief was associated with lenient attitudes towards cheating among tested students. As a result, the study suggested that the public should be encouraged to believe in free will, since, whether or not it actually exists, people seem to act more morally if they believe in it.¹⁰⁷

Compatibilism

Another position in the free will debate is that of Compatibilism, whereby free will is compatible with Determinism. This position was supported by medieval scholars, such as the Italian St. Thomas Aquinas (1225–74), and by more modern individuals who investigated free will, such as the British philosophers David Hume (1711–76) and Thomas Hobbes (1588–1679). However, there is much discussion about the manner in which free will can be compatible with Determinism, and a number of theories exist that will not be examined in this study.

At this stage, it is also important to emphasise how the concept of predictability can exist alongside both Determinism and free will. Of course, if neuroscience can demonstrate that a human brain can be completely explained mechanistically, then it would, theoretically, be possible to completely predict what will happen. But the concept of predictability may also be compatible with free will if, for instance, it is possible to predict which choice a person will make, even though he or she retains a genuine freedom to do otherwise.

The concepts of predictability and free will are indeed quite different in nature. This implies that being able to predict a certain decision in a person does not mean that he or she is not responsible for this decision.

State of the Current Debate

A number of scientific results have been used to make the claim that free will may be an illusion. This included a series of experiments performed by the American scientist Benjamin Libet (1916–2007), in which individuals were asked to indicate, as exactly as they could, the moment when they were first aware of their intention to initiate a movement action.¹⁰⁸ At the same time, the researchers examined the moment when the brain actually started to prepare the movement (the so-called ‘readiness potential’) measured by EEG.¹⁰⁹ The experiment demonstrated that the occurrence of the readiness potential preceded conscious awareness of the intention to move by up to half a second. In another similar experiment, scientists were able to use fMRI to predict simple decisions made by research participants up to 11 seconds before they seemed aware of their decisions.¹¹⁰

In these investigations, the research participants appeared to be unaware that their behaviour was the result of automatic, unconscious processes that were controlling their actions.¹¹¹ Other researchers have described a whole range of situations, from facilitated communication to automatic writing, where persons believe they are not the authors of actions they have initiated and controlled.¹¹²

Though these results have been reproduced and confirmed, the discussion as to what they actually mean remains open. Some contend that they provide strong evidence that individuals do not consciously initiate actions and that a person’s sense of conscious deliberation, agency and autonomous decision-making is illusory.¹¹³

Then again, others believe that the research results may in fact be more complex, since the experiments are very simplistic in nature. While there is no reason to question that the brain may begin to prepare a person for action, this does not mean that a person does not have an ability for conscious deliberation and action that builds upon his or her sub-intentional acts.¹¹⁴

Libet himself did not believe that these findings demonstrated that free will did not exist; instead, he argued that a person's ability to make free decisions rested on his or her ability to exercise a conscious veto on any unconsciously generated action – a so-called 'free won't'. If the 'free-won't' veto existed, it would give the conscious self the final say in whether an unconsciously generated decision is acted upon.

The Inexplicable Nature of Free Will

Although neuroscience has made great progress during the last century in terms of understanding the human brain, its contribution to explaining the human mind remains limited. The minds of human persons transcend their brains or bodies and it is therefore impossible to reduce these minds to a purely scientific perspective. This means that free will may not be something that can be reduced to neurobiology.

Albert Einstein (1879–1955), the German-American Nobel Prize winner in Physics, wrote in 1933:

Honestly, I cannot understand what people mean when they talk about the freedom of the human will. I have a feeling, for instance, that I will something or other; but what relation this has with freedom I cannot understand at all. I feel that I will to light my pipe and I do it; but how can I connect this up with the idea of freedom? What is behind the act of willing to light the pipe? Another act of willing?¹¹⁵

For Einstein and many other scientists who endorse this view, there seems to be a difficulty in understanding the distinction between the physical manifestation of human thoughts, beliefs and ideas in the brain, and the manner in which the thoughts, beliefs and ideas come to exist. They fail to accept that a difference in kind exists between the brain and the mind, and that any attempt to completely explain mental experiences solely in physical terms is doomed to failure.

Though humans are psychosomatic unities, in which the brain and the mind are united, this does not mean that the mind can be reduced to biology; indeed, these aspects of the human being are all interdependent and mutually irreducible.

Of course, human beings become aware that they are persons by means of the body, which, in a way, reveals the person. Moreover, many influences, both biological and environmental, will always have direct or indirect effects on the mental state, and consequently on the free will, of a person. Even concepts such as sentimental love are likely to have a strong biological basis. But free will cannot be reduced to biology, the social environment of a person or the effects of direct neuronal interfaces if these become more developed in

the future. Generally, a conscious person will always be aware when he or she retains free will or when he or she is being coerced, whether in real or virtual reality. As the American neurologist William Cheshire explains:

A brain-based neuroethics ultimately is a paper ethics, a morally thin construction that tears under the stress and collapses under pressure. A genuinely human neuroethics, by contrast, rises beyond its stature and reflects a wisdom not entirely its own.¹¹⁶

In legal and moral matters, total and complete freedom to make a free will decision may not exist, since all actions are conditioned to some degree by both biology and the environment. But at the same time, a completely material cause of free will cannot be accepted if the capacity of an individual to self-transcend exists. Moreover, juries or judges in court trials are usually very capable of distinguishing between degrees of responsibility arising from free will decisions.

In this regard, it is interesting to note how troubled and offended human persons often become when they are compared to zombies, biological robots or puppets. This is noteworthy because it emphasises how much human beings seek value in being able to make free will decisions without being determined by, or reduced to, factors such as neurobiology or computers. Free will defines them for who they are. It gives them purpose, meaning and hope. This is because if free will did not exist, any moral edifice would collapse, since trust, sacrificial love and many other concepts that make human life worthwhile would become irrelevant.

At the same time, it is recognised that a better understanding of free will is certain to arise from scientific advances in neurobiology, which will also help clarify the philosophical and ethical debates regarding freedom, autonomy and moral responsibility. Research may also eventually address behavioural burdens resulting from some brain dysfunctions.¹¹⁷ But the characterisation of human persons and their responsibility in this world confers on them a value and dignity that cannot simply be reduced to biology. Even though humans are physical beings, they cannot be explained by mere scientific concepts, since they can transcend the concept of physicality. According to this view, self-awareness and consciousness are mysteries that scientists and philosophers will never be able to fully understand and are, in this regard, similar to the concept of free will. In fact, consciousness is related to free will, in that it is conscious reflection and deliberation that enables a decision to be made between alternatives, thereby generating moral responsibility.¹¹⁸

But the fact that consciousness and free will remain a mystery does not mean that these concepts do not exist or that they are unimportant. As such, the very notion that individuals have a capacity to make free decisions, without being unduly influenced by deterministic factors beyond their control,

is central to the concept of ethics in a civilised society and of democracy. This accepts that citizens have responsibilities and the capacity to make free decisions without being unduly influenced by any external and internal constraints. For example, without such an assumption, voting in democratic elections would become meaningless.¹¹⁹

Moral Enhancement

It has long been acknowledged that the behaviour and even the frame of mind of an individual can be modified through neurological interventions.¹²⁰ Because of this, some ethicists, such as Julian Savulescu and the Swedish philosopher Ingmar Persson, have suggested that it may be possible in the future to consider moral enhancements that would enable a person to better decide what is right as opposed to what is wrong.¹²¹ This way of thinking has its origins in Greek philosophy, with Plato writing: 'For no man is voluntarily bad; but the bad become bad by reason of an ill disposition of the body and bad education, things which are hateful to every man and happen to him against his will.'¹²²

In this regard, the Swiss-American bioethicist Fabrice Jotterand explains that moral discernment includes:

- a moral capacity that can be defined as an 'ability or disposition to respond morally and involves the motivational, cognitive, and affective mental process determining how one behaves when confronted with moral dilemmas'; and
- a moral content that can be characterised as 'the set of particular beliefs, values, and ideas shaped by environmental, cultural, and historical factors in addition to rational and moral deliberation and moral theorizing'.¹²³

In other words, moral discernment reflects questions about the role of reasoning in moral deliberation, including how this is grounded on the neurobiological as well as psychological makeup of the person and the manner in which what is believed to be good, right and just is defined from a rational perspective.¹²⁴

For some, moral enhancement seeks to improve moral capacity such as empathy, solidarity, justice, shame, and forgiveness. For others, however, such an enhancement would just seek to address moral dysfunctions such as psychopathy.¹²⁵ But whatever the understanding of moral enhancement, it may generally be seen as an attractive proposal, since morality is often considered as being desirable and something to which individuals and society should aspire. This means that if it is possible for neuroscientists to identify parts of the brain that seem to be associated with moral decision-making,

it may then be an attractive proposition to consider morality as something that can be identified and improved through technology.¹²⁶ In this respect, it may be appealing to see how moral enhancement may be influenced by direct neuronal interfaces; in other words, how it may be possible for such technology to help make a person 'a better person' by enhancing their moral thinking, behaviour and decision-making, while remembering that that any discussion about morality cannot take place without a conception of what is considered rational and good in a specific social environment.

However, there may be some significant difficulties with such a proposal. In the first place, moral enhancement cannot simply be reduced to applying constraints to control behaviour because having a genuine moral character is not associated with the use of enhancement technologies that result in particular outcomes. This means that enhancing morality cannot merely mean the use of interventions in the brain.¹²⁷

In the future, some governments may even consider the possibility of 'social enhancement', which can be defined as the use of biomedical technologies for the common good of societies.¹²⁸ Indeed, it has already been suggested that by using neurofeedback or deep brain stimulation (DBS), there may be a possibility of making certain people more empathic, which opens up possibilities for the rehabilitation of certain criminals.¹²⁹ But this could also be seen as being closer to a form of authoritarian control by the state than a way of making a person more moral in character.

Second, those who understand the concepts of virtue, insight and sympathy, as well as empathy, and who may know what is right and good are not necessarily the same persons who decide to do good – for example, they may have a weak will.

The difference between knowing the good and doing the good is entirely dependent on free will. Without free will, good cannot be a choice and virtue becomes meaningless.¹³⁰ But if a person makes it impossible for himself or herself to do what is considered to be bad, questions may then be asked as to whether this can even be seen as a form of moral enhancement; instead, it could just be compared to some kind of mental prison.

This means that caution is necessary with respect to any claims for moral enhancement. In other words, it is very unlikely that a better understanding of the biological foundation of human behaviour may enable applications to the brain that may significantly improve the morality of a person.¹³¹

Free Will, Moral Responsibility and Cyberspace

If a fusion of the human mind of persons with cyberspace is made possible through the development of neuronal interfaces, this may eventually affect their free will and the way in which they are considered to be responsible.

In this respect, the influence of cyberspace on decision-making is already being reported, including with some websites encouraging persons to commit suicide or participate in fundamentalist warfare. Even computer games may restrict the choices of a person if they follow the rules of engagement (or the rules of the game). Because of this, individuals may become more susceptible to being controlled by others or computer programmes.

At the same time, it should be noted that the mind, including the free will of a person, can be influenced by a number of factors and experiences. Any increase in information, knowledge of language, geography, history, current affairs, science and medicine inevitably changes a person's mind and his or her attitudes.

In addition, it is recognised that a person's level of moral behaviour can be changed through experiences such as torture, alcohol, drugs and electroconvulsive therapy but also with positive constraints. For instance, children are capable of improving their mental faculties through external sources, such as educational activities, which are considered as being positive. The use of certain kinds of computer programmes could, in this regard, have a comparable effect to education.

Thus, it is likely that a direct interface between a computer and the brain of a person will, similarly, have both negative and positive effects. For example, a direct interaction between a human mind and cyberspace may enhance a person's imagination, though a computer program may be unable to create imagination as such.

Furthermore, some individuals may be tempted to use the virtual world because it may actually provide a degree of anonymity that may shield them from any unfortunate consequences. This implies that, in order to control a person's moral behaviour, it may be necessary to protect him or her from certain kinds of information, such as preventing children from accessing pornography.

Undoubtedly, however, the enhanced mind should help a person see things more clearly and weigh up alternatives with more reason. This means that having more information at one's disposal may enable a person to make better decisions, but it does not make a person more moral. Having access to more information can only help reflection on moral issues, since emotions and passions, for example, could still colour decisions. This means that enhancing the mental functions of a person through the use of neuronal interfaces would not automatically make a person more moral, though it may make him or her more informed and responsible for his or her acts. It would also partly depend on whoever or whatever is feeding the information through the neuronal interface. Caution is therefore required.¹³²

In this regard, freedom of thought, conscience and religion is considered to be very important in a civilised society. This is why the Council of Europe

Convention for the Protection of Human Rights and Fundamental Freedoms seeks to protect such freedoms by indicating in Article 9 that:

1. Everyone has the right to freedom of thought, conscience and religion; this right includes freedom to change his religion or belief and freedom, either alone or in community with others and in public or private, to manifest his religion or belief, in worship, teaching, practice and observance.
2. Freedom to manifest one's religion or beliefs shall be subject only to such limitations as are prescribed by law and are necessary in a democratic society in the interests of public safety, for the protection of public order, health or morals, or for the protection of the rights and freedoms of others.

This means that respect for human dignity and the integrity of the person implies an ethical prohibition on coerced alteration of the brain that could have adverse consequences on the flourishing of the person.

In other words, there is a right to freedom of thought and conscience in the face of persuasive and cognitive-altering technologies, such as those already in existence with subliminal advertising and certain other neuronal interfaces.¹³³

Changing Consciousness

Being aware of something is the state or quality called consciousness. It may be defined as the control system of the mind to which is attributed subjectivity, awareness, sentience, feeling, wakefulness and the sense of selfhood. As Cheshire explains:

Human self-consciousness includes the cognitive capacity for personal agency or the awareness of oneself as intentionally generating an action, as well as the sense of ownership over one's decisions and behaviors.¹³⁴

However, what consciousness actually is has presented a challenge to philosophers over the centuries. *The Blackwell Companion to Consciousness* indicates that consciousness is: 'Anything that we are aware of at a given moment forms part of our consciousness, making conscious experience at once the most familiar and most mysterious aspect of our lives.'¹³⁵ But a number of senior neuroscientists suggested that it may be too early to propose a definition. They explained in a 2004 book entitled *Human Brain Function*:

We have no idea how consciousness emerges from the physical activity of the brain and we do not know whether consciousness can emerge from non-biological systems, such as computers . . . At this point the reader will expect to

find a careful and precise definition of consciousness. You will be disappointed. Consciousness has not yet become a scientific term that can be defined in this way. Currently we all use the term consciousness in many different and often ambiguous ways. Precise definitions of different aspects of consciousness will emerge . . . but to make precise definitions at this stage is premature.¹³⁶

This follows what the British psychologist Stuart Sutherland (1927–98) wrote in 1989 in the *Macmillan Dictionary of Psychology*:

Consciousness – The having of perceptions, thoughts, and feelings; awareness. The term is impossible to define except in terms that are unintelligible without a grasp of what consciousness means. Many fall into the trap of equating consciousness with self-consciousness – to be conscious it is only necessary to be aware of the external world. Consciousness is a fascinating but elusive phenomenon: it is impossible to specify what it is, what it does, or why it has evolved. Nothing worth reading has been written on it.¹³⁷

However, philosophers have tried to understand some of the properties related to consciousness by asking the following questions:

- Does consciousness really exist?
- Can it be explained mechanistically?
- Is there such a thing as nonhuman consciousness and how can it be recognised?
- What is the relationship between consciousness and language?
- Can consciousness be understood other than in the dualistic distinction between mental and physical states or properties?
- Will computers and robots ever be conscious in the same way as humans?
- Is consciousness an all-or-nothing concept? In other words, as soon as an individual is conscious of others or of self, is it difficult to be more or less conscious of others or of self?

Many scholars also accept that consciousness is relational in some way and is dependent on interactions or communications;¹³⁸ in other words, it is associated with aspects that are self-relational and/or other person relational. In 1998, the British neurobiologist Steven Rose indicated that:

My own view, however, is that the issue of consciousness lies beyond mere neuroscience, or even psychology and philosophy. The point about brains is that they are open, not closed, systems, in continued interaction with their environments. And for humans, that environment is both the immediate present constituted by the society in which we are embedded, and the past, expressed in our individual and social histories. Consciousness is fundamentally a social phenomenon, not the property of an individual brain or mind.¹³⁹

In this context, and even though some scientists view the concept of consciousness with scepticism, it has recently become a research subject in psychology and neuroscience where biological, neuronal and psychological aspects of consciousness are investigated. These studies examine consciousness by asking people to report on their experiences such as: ‘Did you notice anything when I did that?’ They highlight aspects of subliminal perception, blind-sight, denial of impairment, the effects of psychoactive drugs and spiritual or meditative techniques.

Consciousness is further studied in medicine by examining a patient’s response to stimuli according to a scale encompassing full alertness and comprehension to disorientation, delirium, loss of movement and loss of meaningful communication.¹⁴⁰ But practical issues arise when considering the consciousness of severely ill, comatose or even anaesthetised patients, as well as the manner in which conditions associated with impaired consciousness should be treated.¹⁴¹

In this regard, a number of characteristics have been proposed as being necessary for the concept of consciousness to be experienced in a person, namely:

- A state of awareness of being awake: a person needs to be aroused, alert or vigilant and needs to be aware that he or she exists.
- Experience and attention: a person needs to be able to experience one moment leading to another.
- Having a sense of volition supported by a mind: this includes free will, beliefs, fears, hopes, intentions, expectations and desires.¹⁴²

Neuroscientists have also investigated the perceptions inside the brain of the conscious individual. In this way, Greenfield suggested that an appropriate theory of the way in which physical brains may trigger certain subjective experiences would need to include the following questions:

- Can the theory describe how consciousness relates to the body as the boundary of self? In other words, if consciousness is generated in the brain, a credible theory should be able to account for the way in which individuals experience their bodies as the boundaries of themselves. This is important in a far more networked society where the dangers of feeling part of a greater collective, which breaches the limits of a person’s sense of individuality, may exist.¹⁴³
- Can the theory explain how different neuronal applications, such as drugs, may produce different states of consciousness?¹⁴⁴
- How can the theory be verified? As yet, there are no objective ways of assessing the transcendent component of consciousness. Indeed, it is very

difficult to verify theories about how consciousness emerges from the brain of a person, since only this individual is aware of such an experience.¹⁴⁵

Because of this, it is very likely that conscious beings will never be able to fully understand consciousness.¹⁴⁶ Maybe a greater or deeper consciousness will lead to a better understanding of the concept, but perhaps human beings are actually limited by their own consciousness in understanding consciousness.

This enigmatic aspect of the concept is also related to its very existence, something that the English evolutionary biologist Richard Dawkins noted in his 1976 book *The Selfish Gene* when he wrote: 'The evolution of the capacity to simulate seems to have culminated in subjective consciousness. Why this should have happened is, to me, the most profound mystery facing modern biology.'¹⁴⁷

Interestingly, it is easier to determine the lack of consciousness than to understand its presence. Moreover, since it is already possible to reduce consciousness, an increase in consciousness may well become feasible. For example, in the same way as some amphetamines and other psychotropic medicines can enhance awareness and awaken the brain, it may be possible in the future to enhance the consciousness of a person through a direct interface with cyberspace. In this regard, Greenfield writes:

We can, then, think of consciousness as a phenomenon that deepens or lightens, expands or contracts, is more or less from one moment to the next; it would be a phenomenon that is essentially variable and ranging in quantity from the here and now, the 'booming, buzzing confusion' of an infant or the flimsiness of a dream or a drunken moment to the deep self-consciousness of introspection of the adult human. We could then see how such ever-changing levels of consciousness match up with an appropriately changing landscape in the brain. But what might the something be, that we could measure, that was ever changing in the brain?¹⁴⁸

In short, many questions remain unanswered with respect to the concept of consciousness and some may even be unanswerable.

Primacy of the Mind over the Body

Interestingly, some individuals (including many young people) already seem to be so absorbed by their laptops, with their earphones in both ears, that only their bodies appear to be present. In a way, their minds are so far away in cyberspace that it becomes difficult to communicate with them in any traditional manner, such as using gestures or speech. Therefore, a kind of dissociation may be taking place between the mind and the body (a form of

dualism), with the mind being seen as far more superior, in its capabilities, to the body.

This partly resonates with some of the ancient beliefs, such as Manichaeism, which were present in Europe between the third and sixth centuries. It taught an elaborate dualistic worldview in which a struggle existed between a good, spiritual world of light and an evil, material world of darkness, with salvation representing an escape from the body.

These beliefs were themselves based on Mesopotamian Gnosticism, which held that the world of the Demiurge is the lower, imperfect and ephemeral world associated with matter and time. On the other hand, the world of God is the upper eternal world, which is not part of the physical world, and is instead associated with the soul and with perfection. To reach this world, the Gnostic had to find the 'knowledge', from the Greek *gnose*, which is a mix of philosophy, metaphysics, curiosity, culture, and knowledge, as well as the secrets of history and the universe.

Network Consciousness

In a similar manner to what has already been considered when examining the concept of network intelligence, it may be possible to contemplate the concept of network consciousness or hive mind in the context of neuronal interfaces. In this manner, it may be useful to examine the possibility of bringing together a number of minds in cyberspace and how this may significantly affect the very concept of individual consciousness. A network of consciousness may then come into existence, which may transform itself into a super meta-consciousness. However, this will be further examined in a later section.

Escaping Reality

Reality is the state of things as they genuinely are rather than as they appear to be, are imagined or are theorised. It is the actual circumstances and the truth of humanity's existence. But at the same time, Hobbes famously argued that the real life of a human person was a significant challenge, being 'solitary, poor, nasty, brutish and short'.¹⁴⁹ As a result, seeking to escape such a physical reality, with its associated suffering, has always been attractive to humankind since the dawn of history. The reduction of suffering is still one of the greatest aims of modern society.

In the 1993 book *The Giver* written by the American author Lois Lowry, the story is told of a society where suffering no longer exists and where everyone is always content. However, when a young man, named Jonas, becomes an adult, he is chosen to be the community's 'Receiver of Memories' and

enters into training with an elderly man called the 'Giver'. Through this Giver, Jonas learns about pain, sadness, war and all the unhappy truths of the 'real' world. But he also begins to understand that his community is a sham and extremely shallow in its understanding of the values of life. The book goes on to explain that having at least some capacity to suffer is necessary for a person to experience genuine compassion and friendships. This is interesting, since it can be argued that true happiness may simply be a byproduct of other things, such as work, discipline, sacrifice – even pain – and cannot be a goal in itself. The English philosopher John Stuart Mill (1806–73) noted: 'Ask yourself whether you are happy, and you cease to be so.'¹⁵⁰

Escaping Reality in Cyberspace

One of the first times that the possibility of completely escaping reality was considered was when the American philosopher Robert Nozick (1938–2002) presented a thought experiment of the 'Experience Machine' discussed in his 1974 book *Anarchy, State, and Utopia*. In this, an individual would be floating in a tank while neuropsychologists stimulate, through the use of electrodes attached to his or her brain, wonderfully pleasurable experiences. Nozick then discusses whether individuals should choose such an existence of pleasure, happiness and bliss instead of living in reality. He asks what else would matter to a person apart from what he or she experiences 'from the inside'.¹⁵¹

The possibility of making such a decision is also presented in the already mentioned 1999 Film *The Matrix*, when the main character, Neo, is given the choice between two different pills. The blue pill would allow him to remain in the fabricated imaginary cyberworld of the Matrix, thereby living the illusion of an imaginary but easy existence, while the red pill would enable him to escape from the Matrix and into the real world, thereby living the harsh truth of reality. Interestingly, Neo eventually decides to take the red pill, even though he is aware that this will make life a lot more difficult.

However, the need to escape reality for a while may be considered a good thing when it becomes harsh or difficult. It may enable 'survival' or increase coping strategies. This may happen through different means, such as with a good fiction book, film and comedy. Rest from duties can also allow a person to sit back and contemplate his or her reality or enable dreams to be formulated based on difficulties and unmet needs. Indeed, it is possible to suggest that some fictional stories may help individuals address, process and think through real reality.

In this regard, entering into a virtual world can be seen as a kind of recreational experience. It may also enable a person to become an idealised extension of his or her own being, experiencing a new kind of freedom and

even power that he or she would not otherwise have. For example, cyberspace computer games give players the possibility to do new things – even extraordinary things – that they would not otherwise be able to do in real ordinary life.¹⁵²

This was reflected, for instance, in the 2011 science-fiction novel *Ready Player One*,¹⁵³ written by the American author Ernest Cline and made into a film of the same name by Steven Spielberg in 2018, which presents a society in which the principal aim of many people is to escape the real world. The story is set in the 2040s, where an overpopulation, energy and global warming crisis has given rise to significant poverty. In the midst of this harsh real world, many people seek refuge in the virtual and far more attractive world of the OASIS, a setting that is made even more real through the use of visors and haptic technology, which re-creates the sense of touch in the body of the user through the use of gloves and body suits.

However, the further individuals become immersed in the virtual world, the harder it may be for them to cope with the problems and challenges of real life. As a result, the desire to escape from the real world to a virtual one becomes increasingly stronger. Accepting present reality in a spirit of humility and service may seem more and more difficult.

Many people also have ambitions and aspirations, but find it difficult to implement these in real life. By escaping reality, they may be able to create their own world, which they can control. The adventure survival video game *No Man's Sky*, released in 2016, developed and published by the British studio Hello Games, involves bringing into being a new universe by enabling a person to quickly create planets and change things at the push of a few buttons.¹⁵⁴

But such cybergames are still based on aspects of reality, enabling players to recognise the virtual environment. One of the ways in which this is done is by using the following three existential characteristics:

1. Defining the beginning and ending of an existence: birth and death delineate an individual's existence and without these attributes, it would be difficult to place a virtual existence.
2. Creating a context of time: this enables a sense of continuity between past, present and future – for example, future consequences are based on past events.
3. Enabling a sense of fragility and suffering: this reflects the finite and vulnerable aspects of life.¹⁵⁵

If these three features are simply ignored or dismissed in virtual reality, it may eventually not represent any reality at all.¹⁵⁶ But merely replicating these reality features in cyberspace would only re-create a situation from which persons

are seeking to escape. Thus, virtual reality seeks to support the creation of new, alternative and imaginative realities. The greatest benefit of virtual reality is that it suspends and improves the existential threats, concerns and constraints of real reality.¹⁵⁷ It then becomes a place where finite experiences are transformed into an infinite set of imaginative possibilities that a person can explore.

However, if the chain grounding virtual reality is broken from the basis of real reality, cyberspace could quickly become something far more threatening. This would happen if persons begin to reject the real world and seek to spend their whole existence in virtual reality. Instead of presenting a safe place in which exploration is made possible, it may become, as Brent Waters explains, 'a Gnostic and Manichean inferno whose inhabitants loathe the very existential features that anchor humans to the real world'. He adds that: 'It will be a state populated by cyborgs, who, in loathing the finitude and frailty of the body see it as rancid meat to be discarded.'¹⁵⁸

Hopefully, such an experience can be avoided so that virtual reality may instead become a sanctuary in which it is possible to find a temporary release from the cares and limitations of the real world. But the best that virtual reality can offer is only a temporary rest from a world where difficulties are present. Any long-term or permanent existence in such a world would mean a life in which the heavy burdens of finitude and temporality would have no real meaning.¹⁵⁹

Nevertheless, the wonders of cyberspace may tempt some individuals to become disillusioned with the real world, while others become so completely absorbed in virtual reality that they no longer pay attention to the real world, forgetting even to sleep, eat or drink. A previously mentioned example was the young South Korean man who died while constantly playing computer games for nearly fifty hours.¹⁶⁰ In such a context, it could be argued that, due to his vulnerability or obsessive-compulsive nature, his freedom had been taken away.

Moreover, seeking to always escape reality may be detrimental, in that reality is what human beings normally inhabit. It helps to define and shape them into who they are, while enabling them to be genuine. It offers the unexpected and the chance to grow and develop in ways that had never been imagined.

On the other hand, increasingly living in an imaginary reality may create difficulties for communities such as families. Indeed, existing in a pretend world may turn human beings into pretend persons. In this way, the development of avatars may represent an escape from the real self. Questions can then be asked about whether this is always right. Should individuals not instead learn to accept themselves as they really are and not live a lie?

There is responsibility, courage, nobility and even beauty in reality that enables individuals to become real persons confronting the real joys and

hardships of real life. It is what gives real human beings real value. This means that, in some circumstances, the ethical appropriateness of escaping reality may be dependent on a number of factors and situations. For instance, the experiences of a person in the imaginary world may have a real impact on the real person. This can have both positive and negative aspects. If a person is violent in the imaginary world, this may enable him or her to calm down in the real world; however, the reverse may also be true.

Generally, any violence in the imaginary world may not have any real consequences with respect to responsibility in the real world. But it can also numb the sense of violence in the real world. The more the imaginary world seems real, the more dangerous this world may become. Maybe this is because individuals may no longer be able to discern between the imaginary and the real.

For a little boy to kill imaginary enemies may be inoffensive as long as the imaginary element of this game is quite strong – fictitious films, literature and video games can all be violent. But when real decisions are made (instead of being passive as in the cinema) relating to violent actions that seem very real, this could have a negative psychological impact on an individual. Indeed, the difference between ‘active real’ and ‘active game’ may become blurred for some individuals.

Research has confirmed that playing some violent video games is associated with changes in the behaviour of some users. The report by the 2015 American Psychological Association Task Force on Violent Media indicated that: ‘The research demonstrates a consistent relation between violent video game use and increases in aggressive behaviour, aggressive cognitions and aggressive affect, and decreases in prosocial behavior, empathy and sensitivity to aggression.’¹⁶¹

However, there is insufficient evidence as to whether this then leads to criminal violence or delinquency. As the Task Force chair, the American psychologist Mark Appelbaum, explained: ‘Scientists have investigated the use of violent video games for more than two decades but, to date, there is very limited research addressing whether violent video games cause people to commit acts of criminal violence.’¹⁶²

The report suggested that playing such games may just be one of a number of factors involved in turning someone into an aggressive or violent person, stating that: ‘No single risk factor consistently leads a person to act aggressively or violently.’ Adding: ‘Rather, it is the accumulation of risk factors that tends to lead to aggressive or violent behaviour. The research reviewed here demonstrates violent video game use is one such risk factor.’¹⁶³

In this context, the effects on a player experiencing violent, imaginary and very realistic settings could be similar to those experienced by soldiers coming back from a combat zone in which they have seen real (and not

imaginary) horrors. These soldiers are sometimes deeply disturbed and find it difficult to adjust afterwards. In the same way, a person may be deeply upset when awaking from a nightmare in which the setting seemed very real. But the opposite experience may also be true when an increasing number of soldiers live out the experience of war as if it were a virtual reality computer game. For example, through the use of drones, the seriousness and the horror of what is really happening may be taken away. In this case, reality may seem to become just a game.

One instance where this may have been encouraged was in the 2002 computer game *America's Army*. This was available as a free download provided by the U.S. Army in order to encourage young Americans to become new recruits. It enabled them to virtually explore Army life, including battle actions in which they killed the enemy. In the game, of course, the fighting and killing were only virtual, but the aim was to encourage would-be soldiers to do the same in reality with the U.S. Army. A further example of the risk of mixing virtual with real reality was reflected in the 2013 film *Ender's Game* directed by the South African Gavin Hood. In the film, young boys were trained in simulated war games with unforeseen consequences when the imaginary suddenly became reality.

In summary, a person seeking to escape reality with his or her imagination in cyberspace may end up in an easier or more fulfilled reality, but some caution is necessary when losing touch with reality. As with any adventure or experimentation, there may be risks where tools are used that are not fully understood or controlled, giving rise to dangerous unforeseen situations.

The manner in which the imaginary world is increasingly becoming similar to the real world may also create new challenges for some. Moreover, care should be taken when persons pretend that the real world is an imaginary world or the reverse. Few would deny the need for some leisure and rest; however, when the 'unreal' becomes just as real as the 'real' for a particular person, this may be cause for concern. Maybe virtual reality should be clearly delineated? Yet, once again, it is often difficult to separate reality from the imaginary in children and this does not generally result in any untoward or negative effects.

Changing Mood

Good health, it has been suggested, leads to happiness, but disorders can lead to sorrow. Given this, each of the basic emotional states (happiness, sadness, anger, fear and disgust) could be associated with consistent, identifiable and discernible patterns of brain activation.¹⁶⁴

On this account, one the most-studied emotional states is depression because of its prevalence amongst the general public. When physicians seek to implement a treatment for a depressed patient, they do this not only as a result of their desire to help, but also because of the patient's expectation of receiving a tangible form of treatment. This may include a prescription for antidepressants, for which both the risks of known and unknown adverse effects must be balanced against the benefits. Medicines are often easier to use than counselling, behavioural therapy and getting rid of life's stressors or creating a more favourable environment in which to live. This means that rather than looking at the causes, medicine may sometimes look for a quick solution that may result in a dependence on the medical and pharmaceutical professions.

In this respect, 'mood enhancers' can represent a number of psychoactive drugs now available in medicinal and recreational contexts. They can enhance the mood in the sense of intensifying whatever emotions the user is experiencing or of improving the mood towards some 'more positive' state. But concerns already exist that human beings may eventually be reduced to being doped in a world of permanent euphoria and contentment.

This may imply that there is something inherently dishonest in seeking to always alleviate distress and negative emotions through artificial means, since, as already noted, human beings may need a capacity to suffer in order to be really themselves. Being unable to suffer would relegate persons to the state of happy robots who are unable to experience compassion in its truest sense. However, this argument is in many ways analogous to the claim that hard work is a virtue when enhancement could result in the same ends,¹⁶⁵ and is susceptible to the same criticisms.¹⁶⁶ Moreover, unease about the authenticity of an experience may no longer really matter if human beings find a way of permanently controlling their emotions and reacting to experiences.

With new developments in brain research, it is expected that more effective treatments of psychological or psychiatric disorders will eventually be developed. For instance, if it is possible to use brain-scan technology to locate and map stored memories in the brain, traumatic memories could then be removed and more pleasant ones enhanced or even created.

More generally, while still in its infancy, developments in neuronal interfaces seeking to manage a person's moods and wellbeing seem likely within the short to medium term.¹⁶⁷ When persons are clinically depressed, some are already being given therapy, such as electroconvulsive therapy (ECT), when this is considered appropriate. In other words, improving the moods or feelings of individuals could help in a healing process, provided it is done with their consent, is a short-term measure and is not manipulative. But it would be unacceptable to advocate antidepressants, or procedures such as ECT, for someone who was not clinically depressed because of the fear of causing inappropriate harm.¹⁶⁸

Already, brain implants delivering electrical pulses regulated to a person's feelings and behaviour are being studied. Two research groups funded by the U.S. Defense Advanced Research Projects Agency have started to examine 'closed-loop' brain implants, which include: (1) the participant; (2) signal acquisition; (3) signal analysis; and (4) signal feedback. Such implants are also used in association with algorithms to identify mood disorder patterns that can decide when to stimulate the brain back to a normal state. At present, only individuals with epilepsy who already have electrodes implanted in their brains to address their seizures are being studied. Indeed, these implants can be used to record what happens when they are stimulated intermittently instead of permanently, as with other older implants.¹⁶⁹

But one of the ethical concerns with artificially exciting certain parts of the brain associated with mood disorders is the possibility of also creating extreme happiness, which may overcome all other feelings. Another ethical consideration is that such procedures could enable certain persons to access, to some extent, an individual's inner mood and feelings, even if these remain hidden from visible behaviour or facial expressions.¹⁷⁰

Thus, the ethical acceptability of using neuronal interfaces to address or improve a person's mood or feelings would depend on a number of factors, such as possible side-effects, the amount of time a person uses such a procedure, the consequences that it may have on others and the extent to which it alters a person's understanding of reality. The kind of applications being used would also need to be considered and whether they are invasive or noninvasive, since the person may become psychologically, rather than just physically, inseparable from a device.

Changing Personality

Evidence that changes to the brain can modify a person's personality or moral behaviour have been known about for some time, with a number of famous cases. One of the most notable being that of an American man, Phineas Gage, who was a railroad construction foreman. In 1848, while using an iron-tamping rod to pack explosive powder into a hole, the powder detonated, projecting the rod through Gage's left cheek, penetrating his brain and exiting through his skull. Remarkably, Gage survived this accident but became, according to certain accounts, a different person. As, Edward Williams, the American physician who treated Gage, indicated:

He is fitful, irreverent, indulging at times in the grossest profanity (which was not previously his custom), manifesting but little deference for his fellows, impatient of restraint or advice when it conflicts with his desires . . . His mind

was radically changed, so decidedly that his friends and acquaintances said he was 'no longer Gage'.¹⁷¹

Although some accounts of Gage's life after 1848 were not always accurate,¹⁷² his case became a widely used example of how changes to the brain could have effects on personality and moral behaviour.

Another famous case, which was described in 2003, is that of a forty-year-old married schoolteacher who slowly became obsessed with child pornography, started to solicit prostitutes and sought to molest his step-daughter. Eventually, his wife evicted him from the family home after discovering his sexual advances towards her daughter. He was then accused and found guilty of molesting children. However, just before he began his prison sentence, he was admitted to hospital for headaches and an uncontrollable sex drive. An MRI scan indicated that he had an egg-sized brain tumour in the frontal lobe, which is important in regulating judgement, social behaviour and self-control. The tumour had also affected the hypothalamus, which plays a role in controlling sexual impulses. Interestingly, when the tumour was removed, the inappropriate sexual drive vanished and the patient was able to behave normally. But after a number of months, the man secretly started to watch pornography again. Another MRI scan revealed that the tumour had regrown and was subsequently removed. As a result, the new inappropriate sexual drive disappeared once more.¹⁷³

Intentional, though coarse, personality-altering technologies have also been in existence for some time, such as ECT, castration, psychoactive drugs and behavioural therapies. Even experiences of violence, containment and torture have been considered in seeking to change the behaviour traits of a person.

In the past, treatments of personality disorders were usually considered for persons with behavioural problems, such as 'irrational criminals' or sexual perpetrators, and – in the rationale of authoritarian and totalitarian political regimes – certain political dissidents (who were also seen as criminals, mentally ill or both).¹⁷⁴ An example of such procedures was presented by the English writer Anthony Burgess (1917–93) in his 1962 book *A Clockwork Orange*, in which a violent sexual attacker is subjected to a correction treatment in which he is forced to witness violent crimes in order to inhibit his violent tendencies.¹⁷⁵

From a less fictional perspective, Deep Brain Stimulation (DBS) in patients suffering from neurological disorders, such as Parkinson's disease, has also been reported to sometimes have personality-altering effects that may be significant, immediate, surprising and dramatic,¹⁷⁶ but these appear to be reversible when the DBS equipment is turned off. On the other hand, for some patients affected by Parkinson's disease, the changes in personality

resulting from the disease or drug treatment, themselves, have actually been seen to be reversed through the use of DBS.¹⁷⁷

As such, this confirms the possibility of using neuronal interface technologies for dramatic nondisruptive personality-altering effects.¹⁷⁸ These may then raise some serious ethical dilemmas in terms of the way in which a person considers who he or she is.¹⁷⁹ As Cheshire explains:

Technologies that stimulate, inhibit, or modulate highly personal brain functions might render assessments of personal authenticity less certain. The person under the influence of the technology might ask with good reason, which is the ‘real me?’ – how I perceive myself and am inclined to think and act when the switch is turned on, or when it is turned off?¹⁸⁰

Similarly, in its 2007 report entitled *Boosting Your Brainpower: Ethical Aspects of Cognitive Enhancements*, the British Medical Association indicates: “There is something startling and potentially worrying about interventions designed to alter the healthy brain which controls such facets of personality, individuality and our sense of self. If we tamper with it, is there a risk we may lose our sense of who we are.”¹⁸¹ But the report then goes on to note that a person’s sense of identity changes, naturally, throughout his or her life, with different aspects of this identity developing over time.¹⁸²

Nevertheless, it is accepted that any changes of identity using neuronal interfaces should only be considered after careful ethical consideration and only when seeking to restore, but not artificially modify, the genuine personality of a person. Moreover, in the same way as plastic surgery may not always be a remedy to the image problem of a person, the creation of a ‘plastic personality’ through neuronal interfaces may not always be the best experience for a person who wants a genuine personality.

Finally, it worth noting that the way in which changes to the brain affect personality are complex and not well understood. This means that a too-simplistic, one-to-one connection between changes in certain brain areas and specific personality modifications should be avoided.¹⁸³

Changing Identity

Dictionary definitions of ‘identity’ are sometimes related to the work of American developmental psychologist Erik Erikson (1902–94) in the 1950s, who coined the term ‘identity crisis’.¹⁸⁴ His concept of ‘ego identity’ suggested that the interaction of a person’s biological characteristics, psychology and cultural context shaped his or her identity.¹⁸⁵ Given this, an individual’s identity can be defined as the characteristics that determine who a person is.

Personal identity, on the other hand, can describe the way in which individuals perceive attributes that they consider as being uniquely their own. These merge to form an experience of embodied self in contrast to external reality.

Erikson also highlighted the consistency of identity over time, so that in different times and places, a person continues to have an innate sense of being the same person, although changing circumstances can still cause a shift in the sense of identity.¹⁸⁶

The concept of identity is now essential in a wide range of disciplines and a number of definitions have developed accordingly.¹⁸⁷ For example, the notion of identity has been explored from a sociocultural perspective, or with an emphasis on discovering self-identity, such as in the transition from adolescence to adulthood.¹⁸⁸

Generally, however, it is accepted that a person may reflect several aspects of identity that can best be understood as socially constructed, complex, multifaceted and highly contextual, reflecting the following points:

- The way in which individuals perceive themselves and their place in society, together with how they are seen by others. In this way, human beings may have coexisting, multifaceted, overlapping identities, which may vary depending upon the context. For instance, the same individual may be a parent, a company employee or a sports athlete.
- The choices of an individual when he or she becomes, for example, a member of a social group.
- The inclusive nature of identity when a person belongs to groups such as a family, team or religious community. However, there may also be an 'exclusive' angle when a person is rejected by a particular group.¹⁸⁹

A previously discussed example is the Deaf community, in which some families develop a certain identity because of a congenital inability to hear. Being Deaf may indeed form a key part of someone's identity, especially when such a condition manifests itself at a young age. Any attempt to 'resolve' the condition, as though it is inherently problematic, can undermine the experience of identity of a Deaf person who does not view his or her Deafness as a disorder. A number of individuals go so far as to stress that they may lose part of their identity if they are no longer part of this Deaf community.

In discussing the concept of identities, it is also important to first emphasise the different ways in which these can be distinguished. Though a degree of overlap may exist and there is no consensus in the literature, it is possible to differentiate between the following:¹⁹⁰

- Numerical identity, which examines the number of persons who exist and whether they are distinct. For example, it considers whether the continuous

sense of a living being remains one and the same being throughout his or her life trajectory in the three dimensions of space and over time. In this case, two perspectives are generally presented, namely:

- a biological perspective that reflects the continuous biological being remaining one and the same whole being over time as a biological entity in space, despite some qualitative changes, such as those arising from the replication and division of cells making up this being;¹⁹¹
- a psychological or biographical perspective that reflects the relationship a living being has to itself as remaining one and the same whole individual over time, despite some qualitative changes. This generally includes continuity of consciousness, experiential contents or the maintaining of psychological connections or capacities, such as memories.

These different perspectives can, of course, be examined separately or together, enabling the living being to be considered a psychosomatic unity.

- Qualitative identity, which examines similarities between the same individual in different settings or between distinct individuals. For example, two beings may be similar from a biological perspective, but may exist in different settings of space and/or time. In this way, identical twins are qualitatively but not numerically identical. Each twin exists in a different setting of the three dimensions of space, though they generally live at the same time.¹⁹²
- Narrative identities, which are based on how individuals might describe or perceive themselves (or be described by others), comprising aspects of memories, experiences and details that define the question: ‘Who am I?’¹⁹³ Narrative identities concern aspects of self-conception instead of persistence over time. This means that numerical identity could remain the same, despite significant changes in narrative identity.
- Social identities, which are generated through roles and relationships between people and the wider social as well as cultural contexts. These include family relationships, friendships, membership of communities and attachment to particular places.

Interestingly, from a philosophical perspective, because human beings are always changing over time and are not exactly the same at any two moments, questions can be asked as to whether some of the above identities remain the same. This is especially important if a person is put on trial for a crime that ‘he’ or ‘she’ committed many decades beforehand, since it is possible to ask whether the same person is still present. In response, it can be stressed that a person may consider himself or herself to be a whole person, in a continuous sense, since the beginning of his or her existence and until the present time.

Such questions relating to a person's identity demonstrate why ethical dilemmas resulting from the potential use of neuronal interfaces need to be carefully considered, since challenges may arise if an appliance significantly changes some of the different identities of the person.¹⁹⁴ Questions can then be asked as to who the real person actually is and whether he or she would still be free to be who he or she really is, both before or after the appliance is used. For instance, in certain cases, narrative identities may be changed by affecting a human being's self-conception, while in other situations, the numerical psychological identity may change, even though the biological identity may remain the same.

Yet, as already mentioned, to a certain extent, changing and reshaping the different aspects of the identity of a person is something that is continuously taking place in every person.

Identity and Autonomy

The identity of persons is usually recognised to be closely associated with their sense of autonomy, which reflects an ability to act for specific and understandable reasons rather than just following instructions given by others without reflection. This ability enables individuals to develop a sense of 'who they are' and be 'true to themselves', while also determining the way in which others may recognise these persons.

Many cultures place a high value on the sense of self and the ability to exercise autonomy because it enables the development of a meaningful identity, while allowing relationships with others that are generally seen as important to living a fulfilling human life.¹⁹⁵ This means that an adequate ethical framework must be sensitive to this identity arising from the autonomy of a person existing in the setting of an interdependence of individuals.¹⁹⁶

Identity and the Human Brain

The human brain is central to any discussion of identity because it is often characterised as the organ enabling the person, as such, to be integrated as a whole and over time through his or her capacity to be self-aware, decide actions and pursue relationships with others.

Unfortunately, however, some brain dysfunctions may interfere with a person's ability to form and maintain a connected sense of self over time at the most fundamental level. For instance, when persons experiences serious permanent memory loss, this may, to a certain extent, have serious consequences on their sense of identity and who they are.¹⁹⁷

As already mentioned, a person's memories play an important role in his or her psychological identity, even though it may not always be possible to

understand the various ways in which this occurs. The mind does not recall past experiences simply on an objective basis, but constructs interpretive memories to make these events meaningful as they are associated with other relevant and similar experiences.

Thus, as the benefits of neuronal implants are considered, it is important to be clear about the potential effects on identity-formation.¹⁹⁸ This is because neuronal interfaces and virtual reality technologies may have a powerful influence on storytelling tools, while enabling an improved level of control over memory formation which are both crucial parts in forming identity.¹⁹⁹

As such, if individual memories that are relevant to a person's self-recognition are removed, altered, added to or replaced, this will have a crucial impact on his or her identity.²⁰⁰ This is an important factor when brain interventions may cause unintended alterations in the mental function of persons. Indeed, this may have an effect on the psychological continuity of the individuals and the way in which they experience themselves as persisting through time as the same persons.²⁰¹

The bioethicists Marcello Ienca at the University of Basel and Roberto Andorno at the University of Zurich in Switzerland have thus suggested that a right to psychological continuity exists that should protect personal identity from unconscious and unconsented alteration by third parties through the use of invasive or noninvasive neurotechnology.²⁰²

But neuronal implants could also impact on identity in other ways. Even if prosthetic cortical implants were originally developed to restore aspects of sight to visually impaired individuals, they could eventually enable them to also access information directly from a computer. As a result, if they can only 'see' through a computer, this may have unforeseen and even disturbing consequences on the manner in which they perceive their identity and sense of self.²⁰³

Another way in which implants could have an effect on identity is the already mentioned Human Brain Project, supported by the European Union, which aims to bridge the boundary between a human and virtual or robotic surrogate bodies. Interestingly, this is very similar to what was represented in the 2009 American science-fiction film, *Surrogates*, directed by the American Jonathan Mostow. This was based on the 2005–6 comic book series of the same name in which human persons live out their lives, in the comfort of their own homes, by embodying humanoid remote-controlled robots.

Yet, in the future, it may also be possible for an existing human person to live his or her life through the lives of other human beings if they all use neuronal interfaces. In this way, an individual may be able to experience all the sensory, emotional and cerebral experiences of other individuals of both sexes in a very real and 'direct' manner. A person could thus plug himself or herself

into the brains of other men or women having a sexual relationship and live the same pleasurable experiences, which could have huge implications for the sex industry. It may even be possible for a single person to experience, for the first time, both the male and female orgasms.

However, the use of such robotic, virtual or human surrogates may have very important consequences in relation to how a person may consider his or her own identity. Thus, neuronal interfaces should be carefully considered in terms of their impact on identity and the associated, anthropological, social, ethical and psychological questions that arise.

Online Identities

As already noted, many people now spend a substantial proportion of their waking lives online or interacting with the digital environment, and future generations may experience even less of real life than was the case before the advent of computers. In recent years, social networking has expanded to include professional networking sites and other forms of expressions such as blogging, Twitter, avatars, gaming, personal webpages or membership of various Internet discussion groups. Mobile technologies are playing a role in driving change, with new formats and applications (apps) being launched to run on smartphones. This may mean that the notion of computers being separate from people is changing, since many individuals now keep a personal networked computer, in the form of their smartphone, with them all the time.²⁰⁴

Online platforms are also being changed both radically and rapidly in a proliferation of communication technologies that can be described as a 'poly-media' environment.²⁰⁵ Individuals now use different appliances simultaneously or to complement one another.²⁰⁶ Identities across online support systems may be broadly similar or may shift in emphasis, such as from a professional to a social identity, and shift between media, such as text messaging versus face-to-face conversations via a webcam.

The poly-media environment also requires an individual's identity to perform different functions at different times in a digital networked world, such as when a person uses an online bank, makes purchases from an online retail website or participates in social media.²⁰⁷

It is difficult to speculate on the likely impact of growing hyper-connectivity on identity. People may find it harder to disconnect themselves or to maintain distinct identities in different situations. The increasingly networked state of many people's lives could blur the boundaries between online and offline identities, as well as between work and social identities. The advent of widespread mobile technology and email has also led to an increasing number of persons remaining connected to their work during

the evenings, weekends and other leisure times. This blurring of identities through social and technological changes could have significant transformative consequences for future individuals in society.²⁰⁸

Yet, while it may not always be easy for individuals to have multiple identities all at the same time, it is possible that modern generations may develop coping mechanisms to address these challenges.

Creating New Identities Online

Cyberspace is part of the new culture and is developing at such a rapid rate that, in the same way that some may watch a TV series in order to experience a fictional world, others may now increasingly live in cyberspace.

In the early years of Internet usage, there were concerns that it could diminish 'real' identity and reduce face-to-face human socialisation, with online identities being seen as very different from those in the offline 'real' world.²⁰⁹ But it was also noted that being online made it easier for people to explore new forms of identities, such as through the use of fantasy avatars, and to change or secure multiple identities with relative freedom.

As individuals have become accustomed to switching seamlessly between the Internet and the physical world, they have also begun using social media to pursue friendships, continue conversations and make arrangements in ways that dissolve the divide between online and offline.²¹⁰ In this manner, the Internet may not have produced new kinds of identities,²¹¹ but may instead have demonstrated that identities are more complex, culturally contingent and contextual than was previously thought.²¹² For example, if a person of a certain nationality and cultural identity in real life develops an avatar in cyberspace that has a completely different national and cultural identity, the whole notion of belonging to a certain national group may then be questioned. This undermining of nationality could even be seen as a positive development, especially in places where violent conflicts exist between cultural groups in the real world.

That cyberspace identities are increasingly important to individuals can also be reflected in the way in which persons brag about how many followers or 'likes' they have on the social media online service Facebook. Some individuals in modern society seem to need to be connected and show that they are connected. There is a kind of existential requirement to be in relationships ('I am connected therefore I am'). The British social commentators Ed Brooks and Pete Nicholas indicate that when being connected becomes a priority, "connection" becomes all-important, "sharing" becomes essential, our life is reduced to our place in a global grid where "I am who I am connected to".²¹³ However, the use of Facebook can also be seen as very positive in the manner in which it can open up new contacts with other persons or organisations.

Creating Fake Identities

Sometimes, different identities may place conflicting demands on individuals that may be detrimental to their health or wellbeing and may cause them to act in ways that have implications for the wellbeing or safety of others. Certain individuals may even lose touch with reality and the responsibilities they have towards themselves and others.

One concern in this regard is the manner in which the Internet makes it possible for a person to create fake online identities,²¹⁴ though social media sites generally seek to stop any deliberate deception as part of their terms and conditions.²¹⁵ Facebook revealed in 2012 that it had 83 million fake accounts (8.7 per cent of the total), though the majority were considered to be duplicates or misclassified rather than 'undesirable' accounts (only 1.5 per cent of the total).²¹⁶

Individuals may create fake accounts to protect themselves from unwanted intrusion, to divide their work and social lives, or because they are required to have a unique user name,²¹⁷ though fake identities can also be created in order to perpetrate a crime.²¹⁸ However, over the next few years, technologies including facial recognition and other means of tracking digital 'footprints' may reduce the potential for fake identities remaining undiscovered.²¹⁹

An example of the way in which the Internet can influence a person's identity was demonstrated when a married couple from Central Bosnia was reported to have begun divorce procedures after they unknowingly chatted each other up on the Internet using fake names.²²⁰ Apparently, Sana Klaric, twenty-seven, and her husband Adnan, thirty-two, poured their hearts out to each other online over their marriage troubles. Using the names 'Sweetie' and 'Prince of Joy' in an online chatroom, the pair thought they had found a soulmate with whom to spend the rest of their lives. But there was no happy ending after they turned up for a secret date and realised their mistake.

Now the pair is seeking to separate after accusing each other of unfaithfulness. Sana explained: 'I was suddenly in love. It was amazing, we seemed to be stuck in the same kind of miserable marriages. How right that turned out to be.' But when it dawned on her what had happened, she said: 'I felt so betrayed'. On the other hand, Adnan indicated: 'I still find it hard to believe that Sweetie, who wrote such wonderful things, is actually the same woman I married and who has not said a nice word to me for years.'

Reflecting a More Positive Identity

As already indicated, it may be possible for persons to create completely new identities through avatars in cyberspace or surrogate robots in real reality²²¹ in order to make themselves more acceptable or attractive. It has also enabled

some individuals to reflect what they felt were their 'true' identities as never before.²²² For certain persons with various forms of disability,²²³ such as autism and muscular dystrophy, being online or having an avatar was the first time, they believed they could be seen by others as 'normal' human beings. Similarly, some people who may feel shy, lonely or less attractive may discover that they can socialise more successfully and express themselves more freely online.²²⁴

The 2009 American science-fiction film *Avatar*, directed by the Canadian James Cameron, set in the mid twenty-second century on a distant moon, recounts the story of a disabled man who can remotely control, through his mind, the synthetic body of a native avatar, which he uses to interact with the real natives. Slowly, however, this man begins to prefer living through his avatar, which seems a lot more interesting and attractive to him than his 'real' world.

Creating new identities online therefore allows people to find out how they might act/react in different situations and settings, or they may want to escape and discover new prospects if they are trapped in a real harsh reality. However, they may then find that they prefer their new virtual lives.

Dominance of Certain Online Identities

In the 1969 book *To Live Again* written by the American author Robert Silverberg, an entire worldwide economy is developed around the buying and selling of 'souls' (personal lives that have been tape-recorded at six-month intervals). This allows rich consumers to bid against each other for the opportunity to upload into their minds the most recent recordings of archived personalities. But federal law prevents people from buying a 'personality recording' unless the owner has died; similarly, two or more buyers are not allowed to own a 'share' of the same persona.

Such stories are mirrored, in part, in the real experiences of persons suffering from psychosis, where one identity seems to dominate another. Individuals hear voices that are often deprecating and have a negative impact on their health and wellbeing. Similarly, if a number of identities were present together in virtual reality, it might be possible for a dominant identity to take precedence, which could have a very negative impact on the other identities. But again, this will be examined more in depth in the context of network consciousness or hive minds in a later section.

Blurring of Online and Offline Identities

Another ethical problem that could arise is that the distinction between online and offline identities could become blurred. This was considered in

the 2013 science-fiction film *Her*, directed by the American Spike Jonze. It tells the story of Theodore, a lonely man in the final stages of his divorce, who eventually falls in love with his computer program, which is advertised as the world's first artificially intelligent operating system. But it is not just an operating system – it is a consciousness called Samantha. As they start spending time together, he grows increasingly closer to Samantha and eventually finds himself in love. This reflects the problem that if truth and reality are lost, concerns and confusions may then arise.

Thus, the online and offline identities of an individual may converge into one single identity in some activities and diverge in others. This may depend on whether some individuals would increasingly prefer to live through their avatars and whether there is a deliberate attempt to keep them separate.

One example of how the online and offline identities of an individual may converge is in the use of the Internet for sex, with reports from 2013 suggesting that about 14 per cent of all searches and 4 per cent of websites are devoted to sex.²²⁵ Cybersex is also possible in which a virtual sex encounter may take place between two or more people, connected remotely via a computer network, who send each other sexually explicit messages and/or images describing sexual experiences. In this case, the online sexual imagery and events may have direct and worrying effects on real vulnerable persons.

Conflict between Online and Offline Identities

In the future, the take-up of social media is likely to increase even further and may enable people to express different aspects of their identities. Maintaining an online presence could become normalised to the point where refusing to participate in online media could appear unconventional and may result in exclusion. Moreover, individuals may increasingly find that their online identities are created or mediated by others. The persistence and availability of data on the Internet means that social and biographical identities may also increasingly be merged to a greater degree across social and professional spheres.

This means that as societies engage with emerging technologies, there is a need to consider the potential impact on malleable self-identities and ensure there are no unintended or unnecessary detrimental consequences. However, it is impossible to be certain whether the modification of the identities of persons through the availability of virtual realities is positive, negative or neutral. For example, neuronal interfaces may be useful if they help people engage in more outgoing and positive behaviours or take on more challenging roles. On the other hand, it may encourage antisocial or pathological behaviour, or result in increased affiliation with subversive elements.

The Concept of Humanity

Though it has always been very difficult to define what is so special about humanity in the context of anthropology, with new developments in technology this is becoming even more difficult. Elaine Graham observes that: 'New technologies have complicated the question of what it means to be human in a number of ways.'²²⁶ This includes the reality that the clear boundaries of the *Homo sapiens* species are increasingly coming under pressure, with ever more uncertainty developing about the exact limits of humanity. Graham explains this hesitation about what it means to be human as 'a dissolution of the "ontological hygiene" by which for the past three hundred years Western culture has drawn the fault-line that separate humans, nature and machines'.²²⁷

However, as already noted, discussions have always taken place during the long history of anthropology and philosophy about what it means to be a human person. Even in Greek mythology, for example, a number of chimeric human-nonhuman interspecies monsters were considered, such as the Minotaur, who/which had the body of a man and the head of a bull. These were generally seen as being special, but also disturbing and sometimes needing to be destroyed. In fact, the Minotaur was eventually killed by the Athenian hero Theseus.

In other words, real threats of species disorder have often been seen as resulting from the very existence of individuals who bridge the boundaries of humanity. The sixteenth-century French surgeon Ambroise Paré (ca. 1510–90) actually considered such beings as monsters and as a clear indication of moral disorder.²²⁸

Even after the Enlightenment, and modernity's rationalistic discussion of humanity, monsters were still being considered as moral frontier-markers. Graham explains that genuine humanity may be delimited by considering the monstrous 'boundary-creatures' who/which may also 'feature as indicators of the limits of the normatively human'.²²⁹ At the same time, she explains: 'The limits of morality, represented by the monster, indicated in an inverted form the qualities of reason and benevolence by which the quintessentially human could be recognised.'²³⁰

This means that if the very concept of humanity is ever being questioned, some reassurance could be obtained by recognising that genuine humanity is, at least, not monstrous. But as a result of such arguments, there is a risk that those who do not consider themselves as monsters may find value and reassurance in their humanity at the expense of those who do not neatly fit into certain categories. Graham argues that it is then all too easy for those whose physical attributes are different from the norm to be considered as deviants.²³¹

At the same time, with an ever-growing number of individuals reflecting new forms of bodies or neuronal interfaces, the norm may change. It follows that what may have been considered as monstrous in the past may eventually be accepted as a new normal. Moreover, it is worth noting that there is always something mysterious about humanity that resists definitions and any scientific reductionism. Even in the U.K. Parliament and the European Parliament, for instance, no definition of humanity exists in law, though all legislation enacted in these parliaments is based on a certain understanding of what it is to be human.

Humanity, the Human Brain and the Human Mind

Ever since ancient times, it has generally been assumed that some spiritual element in the physical human body must exist that brought it into life. The organs, by themselves, did not make all that much sense, but blood did, and clearly a substantial amount was required for a person to remain alive. Thus, blood was considered to be the key to life in antiquity, though the 'breath of life' was also seen as important. For centuries, the point in time when a person stopped breathing and his or her heart stopped beating was seen as determining the time of death.

However, with an increasing understanding of genetics, new insights into existence and nature were offered. The quest for the human genome became a kind of search for the book of life. Genetics seemed to explain why humanity was so unique and, as such, was seen to be useful in defining human beings. But this had its own problems once it was realised that about 50 per cent of human genes were found in bananas and more than 98 per cent were shared with chimpanzees. It was only when science moved from examining genetics to the brain, at the beginning of the twenty-first century, that a new emphasis became possible. This then discussed the nature of humanity as being associated with neurology and, more particularly, with the cerebral cortex – the part of the brain giving rise to thoughts.

Interestingly, this 'corticalistic' view of humanity reflects, in some way, the seventeenth-century idea of a small intelligent being, a homunculus, locked inside the biological brain-machine. Of course, the existence of such a being has now been dismissed, but questions about how a network of connected neurons can create consciousness, thoughts, intelligence, desires and other similar concepts remain intractable.

Within this context, one suggested path used to explain these abilities reflects the idea of emergence. This begins by observing that once a simple brain exists, such as the neurons in a worm, it can perform basic functions, but when a more complex brain, such as that of a bird, is considered, it can begin to conceive basic tools, while also adapting to different settings. If

brain complexity is further developed, it is proposed that entirely new phenomena may emerge. It is thus implied that the human brain has evolved to such an extent of complexity that it has emergent personality.

However, this focus on self-awareness and thoughts, as the very basis for defining human beings, may signify that a machine operating with similar thoughts could be considered as having the same worth and value as a human being. From this perspective, the only requirement to create an artificial person is a computer with an appropriate processor capability, plenty of memory and a well-written program. The human body could then become redundant. In fact, the machine could also become redundant in terms of defining who this technoperson is, because it may eventually be possible to transfer the data and code to another machine and carry on as if nothing had occurred. Such a concept is interesting because, in a way, it introduces a new form of dualism whereby the person can be considered as data and code running in a physical machine. Yet, most people recognise that the idea that human beings are just thoughts and memories, with the body being seen as unimportant, is less than satisfactory.

Human Dignity

Though the notion of human dignity is complex, it generally describes elements of worth, value and respect recognised in, and by, others. For example, Article 1 of the EU Charter of Fundamental Rights, which was solemnly proclaimed in 2000, not only states that ‘Human dignity is inviolable’, but also that ‘it must be respected and protected’.²³²

This implies that inherent human dignity is an international cross-cultural concept that binds all humanity together, while giving human beings a fundamental and universal value. However, it is important to clarify the meaning behind the word ‘dignity’ in such a document. Indeed, it can be used to emphasise respect for a person’s autonomy and rights, but also to inhibit the choices of some in order to protect the dignity of others. Authorities are therefore required to provide an environment where the dignity of all its citizens can be recognised and respected.²³³

As such, inherent human dignity is usually considered as the basis for the rule of law in a civilised society. It is for this reason that it needs to be upheld and defended. Indeed, it was because of the concept of dignity that a decision was taken by a German court in 2004 to stop the commercialisation of laser guns used for ‘killing’ games by a company called Omega. This decision was considered lawful because games that simulated the killing of human persons for commercial purposes infringed human dignity – a fundamental value to the national German constitution.²³⁴

With respect to neuronal interfaces, a number of questions may be asked as to their possible effect on human dignity. It is even possible to ask how

far neuronal interfaces can be used before some aspects of human dignity are undermined. This means that such interfaces may challenge previous notions of human nature and how many human functions can be substituted or even enhanced by technical devices before aspects of humanity are lost.²³⁵ But since no definition of a human being exists, it will always be difficult to decide at what point a partially human cyborg may not be a human being.

However, what is certain is that devices that enforce unnoticeable personality alteration on human persons without their consent are a threat to their human dignity.²³⁶ Furthermore, if such appliances could contribute to the creation of a network of persons who are always connected to each other while being controlled by others, this would be little different to slavery.

On the other hand, the human dignity of a person could perhaps be strengthened through his or her ability to connect with many others around the world. Such relationships may then encourage human beings, of all origins, to come closer together by emphasising their shared humanity over any differences of nationality or accidents of geography.²³⁷ Thus, not all forms of neuronal interfaces should be seen as undermining dignity.

The Human Body: The Human Hard Drive

Generally, the way in which society considers and understands the human body helps to shape its understanding of new technologies and their applications. In this regard, the French physician and philosopher Julien Offray de La Mettrie (1709–51), who was one of the first French materialists of the Enlightenment, suggested in his seminal work *L'Homme Machine* that not only do human beings exhibit more similarities than differences with the rest of the animal kingdom, but that human beings are nothing but machines made out of flesh and controlled by the same physical mechanics that are found in a clock.²³⁸ Thus, the body is nothing but material organised in a very complex and integrated manner. Sometime later, in the nineteenth century, the human body was then compared to a hydraulic system, with capillaries, circulatory systems and pumps. At present, with the development of computers and software, it is often compared to a biological computational machine, with the DNA acting as the software.

These representations of the human body initiated a number of conceptual questions in philosophy and anthropology, such as whether it may be possible to enhance humanity without the use of an agreed external reference framework of what it means to be human. Questions also existed between the functional and holistic concepts of humanness, between the external and internal changes as well as between any gradual and radical alterations. In addition, it may be difficult to distinguish between changes primarily related to medicine and those seen as personal preferences, since there may be a

substantial overlap and ambiguity between the two. This means that every change to the human body must be examined on the basis of ethical theories and principles in order to consider whether it may be seen as acceptable, while considering its potential impact, including its consequences on society.

In this regard, in 2005, the European Group on Ethics in Science and New Technologies to the European Commission indicated that: 'The ethical notion of the inviolability of the human body should not be understood as a barrier against the advancement of science and technology but as a barrier against its possible misuse.'²³⁹

As such, it may also be important to consider whether a relevant difference exists when a device is present inside or outside the human body. Indeed, from a psychological and social perspective, human beings consider the human body as the defining boundary and entity of the human person on which many of society's customs and laws are based.²⁴⁰ For example, if a mechanical heart is placed inside a person, this could then be seen as an integral part of his or her human body. No one would then be entitled to take it out against the will of the individual. On the other hand, if the same heart was placed outside the body of a person, a different perspective may arise from an ethical, anthropological and legal standpoint.²⁴¹

This becomes even more complex when neuronal interfaces are considered. As the American theological ethicist Ronald Cole-Turner indicates: 'We are embodied creatures, and any use of technology that affects any part affects the whole being, including the very core of identity and personality, our mental powers of memory, understanding, and will.'²⁴²

Moreover, if a direct neuronal interface was used to fuse a human being's brain to a computer, enabling him or her to think online, then the element of consciousness within the computer would become an extension of the human being's own consciousness, which had been enhanced through the interface to the computer. In other words, the person's own consciousness would be controlling the extended consciousness within the computer so that the person remains human and the computer remains a machine.

However, if the consciousness in the computer begins to exist without any input from an external human brain through an interface, the computer consciousness could then be considered as a computer person who would be completely different and independent from human life as such. This would mean that the personal psychological identity of an individual, his or her self, could slowly and indistinguishably evolve to become another being through his or her interface with a computer and cyberspace. A clear demarcation line would no longer exist between the computer and the human person. In this respect, Cole-Turner argues that 'as we turn technology on ourselves so that we change our own bodies and brains, the "I" is swept up in the change and modified through its own action. When these technologies of human enhancement get

inside us, they become part of us, turning us into our own products and blurring the lines we once drew between subjects and object, agent and effect'.²⁴³

This, in a way, also reflects the philosophical idea of 'mind extension' which suggests that the mind cannot simply be seen as something that is resident in the brain since it can, in various ways, spread out instead into its surroundings, merging with other things, places and other minds. As such, Andy Clark, who is one of the leading philosophers of mind extension, indicates that:

New waves of almost invisible, user-sensitive, semi-intelligent, knowledge-based electronics and software are perfectly posed to merge seamlessly with individual biological brains. In so doing they will ultimately blur the boundary between the user and her knowledge-rich, responsive, unconsciously operating electronic environments. More and more parts of our worlds will come to share the moral and psychological status of parts of our brains.²⁴⁴

The Canadian computer scientist and futurologist Hans Moravec even indicates that it may, in the future, be possible to connect a human brain to a computer in such a way that 'in time, as your original brain faded away with age, the computer would smoothly assume the lost functions. Ultimately your brain would die, and your mind would find itself entirely in the computer'.²⁴⁵ This means that when the human body eventually decays, this brain-computer information exchange may be able to preserve the essence of self-consciousness, personal histories and creative abilities.²⁴⁶

Another interesting area of research is computer-based brain simulation, whereby neurobiological systems are used as models to create a computer imitation of the entire brain, making it possible for a new digital mind to emerge. As the U.K.-based bioethicists Sarah Chan and John Harris note: 'The question is whether a computer that simulates the whole human brain to a sufficiently realistic degree would become, in some sense, a human mind or indeed any other sort of mind.'²⁴⁷

But could a nonbiological entity lacking any of the human physical attributes ever be considered a 'human' being? Kurzweil believes that any new human-like artificial intelligences that could evolve through such a process will be 'human even if they are not biological'²⁴⁸ and suggests that the term 'human-machine intelligence' should be used to highlight this fact. In this way, Kurzweil's main argument for the humanity of machine intelligence is that it has evolved very slowly from beings who are undoubtedly human.²⁴⁹ There would then be 'a world that is still human but that transcends our biological roots' in which 'there will be no distinction . . . between human and machine or between physical and virtual reality'.²⁵⁰ Yet, as already indicated, no definition of what is human exists and it is therefore difficult to set any limits to what is human.

Similarly, it is difficult to say whether or not persons are human if they are conscious inside a computer. They may certainly be persons with a consciousness but may not be categorised as human persons. Their bodies would be computers, but would their minds be similar to those of human beings? It would also be difficult to state, with any certainty, whether such computer persons are alive.

Another possibility is to just consider the new being as a nonhuman person if it is able to think like a human being. But, of course, this comes back to asking how it is possible to know whether a computer has become conscious, especially since, as already indicated, it is very difficult to even quantify consciousness.²⁵¹

It is also important to ask whether the value that is accorded to human bodies, including the human brain, may be diminished with such technology. This raises the question whether the human brain can simply be compared to a machine that has little value in comparison to the mind of a person – a mind that could also exist inside a computer hard disk.

In short, whilst there is much to celebrate in terms of advances made in the field of science and technology, it is becoming increasingly apparent, particularly in the field of neurotechnology, that human bodies and brains are quickly becoming projects to master, take control over, design and fuse according to humanity's own desires. Therefore, it is crucial to consider how far such neuronal interfaces can challenge and impact concepts of human integrity and dignity.

The Transhuman and Posthuman Body

It is now possible to envisage a future in which parts of the human body are substantially replaced or upgraded by machines (generally defined as transhumanism) or where the body no longer even resembles, in any way, that of a human person (generally defined as posthumanism).

This of course will have significant repercussions on biological or physical anthropology and may even completely transform the whole discipline.

Transhumanism

The proposal that humanity should use technology to go beyond the restrictions of the present human body, including the brain, was described as 'transhumanism' by the British biologist Julian Huxley (1887–1975), who was the brother of Aldous Huxley (1894–1963), the author of the 1932 book *Brave New World*.²⁵² He used the term for the title of an influential 1957 article, though the word itself derives from an earlier 1940 paper by the Canadian

philosopher William Lighthall (1857–1954).²⁵³ In this article, Julian Huxley described the aims of transhumanism as follows:

Up till now human life has generally been, as Hobbes described it, ‘nasty, brutish and short’; the great majority of human beings (if they have not already died young) have been afflicted with misery . . . we can justifiably hold the belief that . . . the present limitations and miserable frustrations of our existence could be in large measure surmounted . . . The human species can, if it wishes, transcend itself – not just sporadically, an individual here in one way, an individual there in another way, but in its entirety, as humanity.²⁵⁴

Julian Huxley explored developments in ecology, genetics, palaeontology, geographical distribution, embryology, systematics and comparative anatomy, which he outlined in 1942 in *Evolution: The Modern Synthesis*.²⁵⁵ However, the ideas behind transhumanism and the enhancement of humanity can be traced back to the Enlightenment ideology of promoting technological changes as the engines of human progress. This included writers such as the French encyclopaedist Denis Diderot (1713–84), who was a leading member of the Enlightenment.

In more specific terms, transhumanism can be characterised as a multidisciplinary cultural phenomenon consisting of beliefs, norms, literature and social practices addressing not only scientific and technological changes but also deeper human existential concerns. In fact, it can be considered as an ideology of ultimate progress aiming at delivering humanity from the limitations of human nature, including the biological, mortal body. In other words, it welcomes technology as the main driving force of cultural change.²⁵⁶ It offers a vision of the right moral ordering of self and society in relation to a technology-driven global transformation. This means that transhumanism signals a shift from the human to the transhuman existence, as well as actions and beliefs that will promote and influence the optimal transhuman future.²⁵⁷

It follows that transhumanism is different from the concept of enhancement in that it seeks to create beings who have never previously existed in the history of humankind. But these beings would retain some human characteristics, such as with human-nonhuman interspecies beings or cyborgs that combine the human with the robot. For instance, the Cybermen of the BBC fictional television series *Doctor Who* used a process called cyber-conversion that involved replacing the human flesh of a person with cybernetic upgrades in order to increase their numbers rather than using biological reproduction.²⁵⁸

Similarly, the 1952 science-fiction novel *Limbo*, written by the American Bernard Wolfe (1915–85), depicts a challenging future where human body parts are replaced with cybernetic limbs, while examining what happens when the limits of the body and what is natural are overcome.²⁵⁹

In other words, transhumanists agree that human nature is not fixed and that the human species can change over time beyond its biological limitations. Some would also accept a future where sexual reproduction becomes obsolete because it is replaced with technology.²⁶⁰

However, it is difficult to know where to draw the line between humans and machines if a person has been changed through technology. Indeed, it is possible to ask whether a human being with an important artificial neuronal implant is still a human.²⁶¹ These are dilemmas that will continue to evolve in modern society in the light of new possibilities.

But even if a human brain eventually becomes mostly nonbiological, humanity is likely to retain an overall notion of what constitutes beauty with regard to the human body, as this is deeply embedded in human values. Until now, when persons are considered to be physically good-looking, this is generally seen as a measure of their biological health, intellectual competence and even moral balance, which may be useful in increasing their reproductive chances and of having descendants. Yet, given that the human body may change over time, ideas of what is considered beautiful may also change.²⁶² In other words, if reproduction becomes nonsexual or even nonbiological in the future, a different sense of beauty may emerge.²⁶³

Transhumanism can also be compared to an understanding of the 'end times' when the human species will both transcend itself and bring about its own planned obsolescence. As Julian Huxley indicated, transhumanism is a 'religion without revelation'.²⁶⁴ But there are significant differences between his beliefs and those of contemporary transhumanists, who are usually only interested in using technology to develop the human species.

Transhumanism also offers an ethical vision in which technological innovation is the central human achievement and thereby becomes the medium for achieving authenticity, liberty and justice.²⁶⁵

However, transhumanists may be somewhat disingenuous when claiming that they strive for immortality and, at the same time, see themselves as the descendants of humanists. This is because humanists generally consider humanity as a 'good' and would not accept the transformation of the human species into something that is no longer human. Many humanists believed that being human is the pinnacle of evolutionary achievement and would not want to replace this humanity with anything else. With transhumanism, on the other hand, the state of being human is merely a stage in the evolutionary process towards a higher 'good', though there is often no indication about what this actually represents.²⁶⁶ This implies that transhumanists cannot be compared to humanists in any meaningful way.

Posthumanism

Possible future posthumans may be distinguished from transhumans in that they would have evolved from humanity, but their basic capacities so radically exceed those of present human beings as to no longer be considered as human in any significant degree or form.²⁶⁷ In other words, though cyborgs may be characterised as transhumans, since some parts of their bodies remain human or resemble those of humans, with a posthuman nothing of the human body is usually left.

Generally, however, it is difficult to accurately describe the posthuman. In her 1999 book *How We Became Posthuman*, the American author N. Katherine Hayles characterises such a subject as ‘an amalgam, a collection of heterogeneous components, a material-informational entity whose boundaries undergo continuous construction and reconstruction’.²⁶⁸ In this regard, she suggests four different aspects of a posthuman future:

1. The prioritisation of information pattern over material substance.
2. The acceptance that consciousness is simply a mere product of the physical.
3. The recognition that the human body is just an original form and substance of a being that can be upgraded or replaced.
4. The acceptance that human beings can just be compared to intelligent machines, making the two interchangeable.²⁶⁹

It is also unclear how a specific identity is formed in the posthuman. As Hayles indicates:

[T]he presumption that there is an agency, desire, or will belonging to the self and clearly distinguished from the ‘will of others’ is undercut in the posthuman, for the posthuman’s collective heterogeneous quality implies a distributed cognition located in disparate parts that may be in only tenuous communication with another.²⁷⁰

As such, Hayles accepts that the posthuman body has become difficult to define, while noting that William Gibson characterises such bodies as ‘data made flesh’ in his 1984 book *Neuromancer*.²⁷¹

The combination of pop science and science fiction in the spread of posthumanism was persistent throughout most of the twentieth century and has helped to drive forward much posthumanist thought.²⁷² But it is still impossible to really know what a posthuman future will look like. It will, apparently, have its origins in the aims of transhumanism and will continue to build on the belief that, through science and technology, humanity can take charge of its evolutionary destiny by redesigning itself in its own way.

Science commentators, such as Kurzweil,²⁷³ Moravec²⁷⁴ and the Australian artificial intelligence expert Hugo de Garis,²⁷⁵ hypothesised that the merging of human and machine would herald further evolutionary changes in the human species in which technology, in particular super-intelligent machines, will not only enhance the physical and mental capabilities of, but will eventually replace, the humans who designed them. These commentators postulated that the posthuman 'Mechanical Age' will begin after an irreversible turning point takes place caused by an increasing acceleration of technological growth. This has been called the Singularity, which the American science commentator Robert Geraci explains is 'a point of the graph of progress where explosive growth occurs in a blink of an eye' when machines 'become sufficiently smart to start teaching themselves'.²⁷⁶ When this happens, 'the world will irrevocably shift from the biological to the mechanical' and the 'Mechanical Age' will inaugurate the 'New Kingdom': the 'Virtual Kingdom'.

²⁷⁷

According to Moravec, the human race will then be replaced by self-aware computer-robotic beings who will be able to escape this earth.²⁷⁸ In his 1999 book *Robot: Mere Machine to Transcendent Mind*, he explains that:

Our artificial progeny will grow away from and beyond us, both in physical distance and structure, and similarity of thought and motive. In time their activities may become incompatible with the old Earth's continued existence.²⁷⁹

He adds that:

An entity that fails to keep up with its neighbors is likely to be eaten, its space, materials, energy, and useful thoughts reorganized to serve another's goals. Such a fate may be routine for humans who dally too long on slow Earth before going Ex.²⁸⁰

Kurzweil's predictions of the technological Singularity occurring at about the year 2045 could not be more significant: 'The Singularity will allow us to transcend these limitations [such as slow information processing] of our biological bodies and brains. We will gain power over our fates. Our mortality will be in our own hands.'²⁸¹

In this scenario, technical imagination promises the preservation of humanity while putting an end to the main problems associated with the biological human body.²⁸² This also means that those promoting a posthumanist future would generally welcome the demise of the *Homo sapiens* species so that it can be replaced with posthuman beings.

At the heart of the posthuman dream is the use of technology to discover and master, in precise detail, how the mind works and what memories represent. Using this information and data, it is then proposed to capture

every bias in opinion and effectively catalogue every mood. This could subsequently be transferred onto some yet-to-be-developed supercomputer in which the person could continue to exist.²⁸³

This change from biological humans to super-intelligent machines, capable of making decisions, will progress slowly. To begin with, it is suggested that humans will upload the most important parts of their minds and personalities into supercomputers, which will look after the physical needs of humanity. Eventually the machines, in the words of Geraci, 'will tire of caring for humanity and will decide to spread throughout the universe in the interest of discovering all the secrets of the cosmos'.²⁸⁴

Similarly, Moravec postulates that machines will convert the entire universe into an extended thinking entity.²⁸⁵ Eventually, when the 'Age of Mind' replaces the 'Age of Robots', machines will create an environment for a 'subtler world'²⁸⁶ in which only calculations continue to exist. The Virtual Kingdom will eventually make earthly life futile and will ultimately be engulfed by cyberspace.²⁸⁷ This is the ultimate goal of the metamorphosis of the human to the posthuman. Technology will enable humans to successfully bring about what established religions have sought for thousands of years: immortality.²⁸⁸ According to Kurzweil, '[o]ur mortality will be in our own hands. We will be able to live as long as we want', which, interestingly, is not quite the same as immortality.²⁸⁹

Cyber-immortality is especially supported by the American sociologist William Bainbridge, who presents posthumanism as a kind of religion for the 'galactic civilisation'.²⁹⁰ He also asks humanity to be creative so that the current virtual world 'could evolve into extrasolar homes for posthuman beings'.²⁹¹ In this context, he defends the notion of technologically based immortality, predicting that it 'will put religions largely out of business, and [therefore] religious fundamentalists would condemn activities in these directions'.²⁹²

Of course, the dream of cyber-immortality is currently more science fiction than fact. But it does emphasise the desire in the technological sector to consider computers as a way to break free from the constraints of bodily existence.²⁹³ Because of this, Bainbridge considers that if the contents of any personality archives were to be 'erased', this could be a form of murder, an 'infocide', because it would kill people in their pure form.²⁹⁴

Hayles also examines how posthumanists have asserted the importance of freeing themselves from the limitations of nature to build a more favourable posthuman future with a new social and political order.²⁹⁵ The vision is of a perfect world, free of suffering, where freedom is the dominant value and where persons would have unlimited opportunities for individual and community development.²⁹⁶ On this account, virtual reality is often seen as the future for a posthuman world – not as a means of escape from the real world, but rather as a means to change what is real for the better.²⁹⁷

It is interesting that the posthumanists use a language of tolerance and open-mindedness. But Hayles argues that the transition from human to posthuman may not be consistent with these liberal principles.²⁹⁸ The philosophy of autonomy, freedom and rights relies on the reality that the individual is a distinct being with clear and lasting boundaries separating one individual from another, particularly in the case of a biological human with a distinct identity. But in a posthuman future, it may be necessary for these borders to become moveable and immaterial. In fact, for posthumanists, technological change requires that all boundaries be easily altered.²⁹⁹ For example, in a posthuman existence, there is no fixed boundary between a bodily brain existence and any other kind of existence that can be supported by a computer. There is also no separation between humans and their environment, between the entity that thinks and the entity that is being thought about, and no inherent division between mind and matter.³⁰⁰ A biological brain is not seen as necessary and configurations of information are more important to the state of being.³⁰¹

But how can this moveable network of information maintain an individual's identity? What exactly remains of an individual when these networks are constantly changing and developing? Indeed, many new identities would be created if the entire minds of human beings are copied on to a computer. Will they then merge into a single conscious being? Within this arrangement, the posthuman is not simply an extremely enhanced autonomous being, since the very existence of posthumanity may require destroying the actual basis of autonomy, individuality and personal freedom, which determines liberal, humanistic agency.³⁰²

Ethical Consequences for Human Persons

In this context, it is very important to seek to determine what the ethical implications of such profound changes may be. Many of the posthumanist values are similar to those found in the already mentioned second-century religious movement of Gnosticism, where followers rejected the material world to only concentrate on what was spiritual.

But St Irenaeus, a second-century Christian bishop of Lyon (central France), argued that the Gnostic position of disdaining the body, including the brain, led to two conflicting ethical positions. The first was that a moral stance of liberty to physical experiences could develop because a human body was no longer considered as really belonging to a person. Thus, if it was no longer seen as being an important part of a person, then it did not really matter what a person did with it. The second position was one in which extreme austerity could be demonstrated towards the body. A person would then be able to express or reveal the insignificance of the body by neglecting it.

In more modern times, societal positions may not be all that different, with a sense of scepticism developing towards the human body and the belief that it may not be an important part of who a person really is. This is because either persons have full control over their bodies or these bodies have full control over them.

As the British theologian Geoffrey Wainwright writes: 'We live in a very sensate and sensualist society. We are in some ways absorbed in our senses, a people defined by materialism and sexuality. Yet in other ways, we are curiously detached from our bodies, as though we were not really affected by what happens to us in our bodies or what we do in them.'³⁰³ He goes on to draw the conclusion that: 'If our bodies are not us, then we are not responsible in and for them; and that irresponsibility may assume the character of either licence or, indeed, of withdrawal. The same phenomenon occurred in the gnosticism of the second century.'³⁰⁴

If this is the case, then persons may not need to worry about the way in which their bodies are used. But an alternative perspective can be suggested, which considers the body (including the brain) as being very important to the psychosomatic whole human person and should therefore be treated with respect and dignity. Indeed, it is through the body that human beings identify themselves with other similar beings and are the holders of rights. As a result, human bodies can be considered in a positive manner, which implies that human beings should seek to respect, care and look after them.

This view emphasising the integrity of the psychosomatic person is supported by the Council of Europe Convention on Human Rights and Biomedicine, which indicates in Article 1 that:

Parties to this Convention shall protect the dignity and identity of all human beings and guarantee everyone, without discrimination, respect for their integrity and other rights and fundamental freedoms with regard to the application of biology and medicine.

This means that if the whole concept of what it means to be human, as such, is undermined, it may jeopardise the protection for the dignity, integrity and identity of all human beings, meaning that the very basis of civilised society would be endangered.

Uploading a Mind

The possibility of uploading a mind has often provided inspiration for science fiction. The 2014 film *Transcendence*, directed by the American Wally Pfister, is one such example. The film's storyline centres around Dr Will

Caster, a researcher in the field of artificial intelligence whose work focuses on creating a sentient machine that combines both the collective intelligence of everything ever known alongside the full range of human emotions. Not surprisingly, such work brings him much applause but also criticism from anti-technology extremists, who eventually attempt to kill him. However, this only makes Caster more determined to succeed in uploading and transcending himself into a computer. As his thirst for knowledge develops into a seemingly omnipresent quest for power, the key question in the minds of his fellow researchers is not whether omnipresence can be achieved, but whether it should even be attempted.

The film is interesting because at the very heart of the posthumanist philosophy is a vision of a future in which human (or transhuman) beings will be able to copy human minds into a new setting and transcend human biology. As already indicated, it was Kurzweil's critically acclaimed 2005 book *The Singularity is Near* that presented a detailed scientific explanation for how this may one day be achieved. He suggested that such a move would involve re-instantiating the mind's state in a different, much more powerful computational substrate. Kurzweil then perceives that human beings 'will continue to have human bodies, but they will become morphable projections of our intelligence'.³⁰⁵ He goes on to explain:

Combining human-level pattern recognition with the inherent speed and accuracy of computers will result in very powerful abilities. But this is not an alien invasion of intelligent machines . . . we are creating these tools to make ourselves smarter. I believe that most observers will agree with me that this is what is unique about the human species: We build these tools to extend our own reach.³⁰⁶

As a result, it is suggested that the severe limitations of being human will be superseded and overcome. Rather than just existing in the physical dimension, these 'software-based humans' will be able to leave human bodies behind and live out their lives or even attain immortality in virtual reality by having the potential to project their existence whenever and wherever this becomes necessary.³⁰⁷ In a way, such an understanding of the self is similar to the one developed by John Locke, who wrote that the 'self is not determined by Identity or Diversity of Substance, which it cannot be sure of, but only by Identity of consciousness'.³⁰⁸

For Kurzweil, attaining the goal of uploading human minds into human-made machines is a significant milestone in reaching a posthuman future. Whilst the finite, limiting body will die, the software of a person's life, his or her personal 'mind file', will continue to survive in silicon format, while holographic avatars could interact with other bodiless posthuman entities.³⁰⁹

Practical Challenges

Before attempting to grasp the process of mind uploading and brain simulation, it is necessary to appreciate how the human brain transmits and processes information. As already mentioned, neurons are cells that transmit electrical nerve impulses, carrying and processing information from one part of the body to another. Their spider-like shape of a central body with spindly legs, formed by axons and dendrites, is crucial to their function. The legs branch out repeatedly until they create up to 10,000 endings, which reach out and make contact, at a point known as a synapse, with other parts of the same neuron or with other neurons.

A fully developed healthy human brain has around one trillion (10^{12}) neurons. If each of these has 10,000 synaptic contacts, this gives the brain 10 quadrillion (10^{16}) possible connections. Through the ageing process, some of these will be lost so that by adulthood, an individual would only have about one quadrillion connections. Though there remains much debate upon the exact figures at stake, engaging in the process of simply counting these connections would be a task that any computer would find impossible to achieve either at present or in the near future.

If this was not difficult enough, synaptic connections are also constantly forming, strengthening, weakening and dissolving. This permanent state of flux helps create a complex web of connections that clearly challenges any replicating procedure.

Kurzweil estimates that the brain's billions of interconnected neurons can perform 10^{16} calculations per second (cps).³¹⁰ In order to capture in detail all the connections between neurons required to successfully upload a human mind into a computer, represented by a single binary number (0 or 1), called a bit, Kurzweil boosts his estimates to 10^{19} cps.³¹¹ Thus, with the eager anticipation of being able, one day, to successfully copy a human mind into a computer, he proposes that 10^{18} bits should suffice to represent all the inter-neuronal connections required. The scale of the numbers is fantastic, but Kurzweil perceives these to be achievable based upon the law of accelerating returns, whereby he predicts that supercomputers will eventually match the computational power of the human brain.³¹²

However, in order to reach Kurzweil's goal, engineers will require not just the ability to make machines that think, but think as well as humans.³¹³ This requires the software of human thought to be mastered, which is something that has only just begun to be considered through advances in computational power.

In addition, it is possible to ask whether simply matching the human brain's neuronal network and computational power is the only challenge to copying a human mind into a machine. What about perceptions, memories,

sensations and intentions? How do these relate to the neuronal network and how can they be successfully replicated?³¹⁴ Indeed, a full description of the human brain would be required, which must take into account the many different levels of activity. For example, it is possible to imagine a scale where perceptions, memories, meanings, sensations and intentions are found at the top levels of activity and where neuronal maps and circuits comprising collections of neurons are found at the lower levels. Within this scale, a level of organisation would also be necessary, consisting of individual neurons and the connections between them.³¹⁵

Achieving Mind Upload

Kurzweil's belief in transcending biology presents a view of humanity's essential properties being maintained post-uploading. According to the concept of 'patternism', human beings are essentially patterns that can be realised either biologically or electronically.³¹⁶ Preserving the relevant patterns of the individual ensures that memories, beliefs and other mental states are transferred from the biological brain to the electronic medium.³¹⁷ This would also require a computer that is capable of genuine thought to support the uploaded mind.³¹⁸

If this eventually becomes possible, it has been suggested that uploading could then be similar to undergoing surgery, whereby a person temporarily loses consciousness under general anaesthetic, but then awakens afterwards. In the case of mind uploading, a similar break in conscious experience could occur, whereby the person would subsequently recover his or her existence in virtual reality.³¹⁹

Kurzweil indicates:

My leap of faith on identity is that identity is preserved through continuity of the pattern of information that makes us us. Continuity does allow for continual change so whereas I am somewhat different than I was yesterday, I nonetheless have the same identity. However, the continuity of the pattern that constitutes my identity is not substrate-dependent. Biological substrates are wonderful – they have gotten us very far – but we are creating a more capable and durable substrate for very good reasons.³²⁰

But how is it actually possible to copy human minds into virtual reality environments? One answer that Anders Sandberg proposes for nondestructive data acquisition uses the potential of nanotechnology and nanomachines. The brain could then be flooded with these nanomachines, which would, individually, plug into each neuron, allowing them to find out what that neuron is doing. This information would then be fed back through a wireless or optical network to an external appliance, where the information and

data would be collated and processed. Though only a theoretical proposition, experts in molecular nanotechnology believe that this could eventually be feasible.³²¹

Plans are also in preparation to create a human brain atlas as an important starting point for interpreting data from other brains.³²² This would involve freezing a brain with liquid nitrogen and then carefully slicing it and scanning each slice with an extremely powerful microscope. These scans would subsequently be fed into a computer alongside extensive image analysis, which would help determine the activity and processes of the neurons.³²³ But, once more, extensive computation power would be necessary to process this level of complexity.

Interestingly, in 2013, an international group of neuroscientists were reported to have already sliced, imaged and analysed the brain of a 65-year-old woman to create the most detailed map yet of a human brain in its entirety. Named 'BigBrain', the atlas shows the organisation of neurons with microscopic precision, which could help clarify or even redefine the structure of brain regions obtained from previous anatomical studies. Such a method may completely change the stakes relating to the possibility of identifying very fine structural and physiological differences in the human brain.³²⁴

Should the full procedure described by Sandberg ever be achieved, one significant question still being debated by experts is whether the system would experience consciousness in the same way as the original human individual. Sandberg believes that if everything is done properly and all the science is well integrated, it may be successful.

On the other hand, Moravec considers that, initially at least, mind uploading efforts would require a gradual destroying of the brain. But as the process continued, an increasing amount of an individual's thinking would be undertaken by the computer until it would completely replace his or her old thinking in the brain.³²⁵

In addition, if brain scanning ever became possible, it would be necessary that no changes or mistakes occur during the procedure, otherwise the original mind would not be replicated into the computer. Another mind would be created. But maybe making such amendments to a scanned mind could also become deliberate if there was a perceived advantage for this to happen.³²⁶

In the light of all this, Geraci indicates that: 'Whether digital technologies can live up to their utopian promises is an open question, and not one subject to empirical analysis.'³²⁷ However, he notes that advocates of mind uploading, and other technologies, rely upon what they consider to be indisputable guarantees for such a possibility, such as through evolution or a law of accelerating returns.³²⁸ In the end, the only actual demonstration that technology may eventually address human limits will be for that event to actually occur.³²⁹

The Existence of Uploaded Minds

In the very unlikely event that the information making up a mind could be scanned, copied and uploaded into a computer, new possibilities arise that need to be discussed.³³⁰ For example, it may become feasible to download this mind into various biologically engineered, robotic or virtual settings. Human persons, as human embodied creatures, would be a thing of the past! They would then become virtual persons whose minds would no longer be supported by biological brains and for whom spatial and temporal constraints would no longer exist.³³¹

In this respect, if the end result was virtually immortal personalities processing an infinite number of experiential inputs, the price may be worth paying for some. Different virtual persons could then be combined and/or new ones formed. These new minds would then be able to control their own destiny while also contemplating the possibility of creating their own virtual children.

If individualities were to remain in existence in this virtual setting, they would form what has been described as monads – in other words, self-contained and secluded nonmaterial entities with no spatial or physical properties expressing rational or autonomous activities. These monads would then exist as independent points of vital willpower and as surging drives to achieve their own goals according to their own internal dictates. This implies that the monads would remain as individuals, whatever such a concept means in a cyber-setting. The mental life of the solitary monad (which has no other life) would then express a procession in a series of internal representations,³³² while still interacting with other monads because otherwise it would have no projects and inputs to process.

Monads, therefore, would exist within a network of interactions that do not include any kind of objective realities. They merely interface with various representations or interpretations and experiences that can be stored, simulated, manipulated and discarded. As Brent Waters indicated:

The monad is a composite of surrogate experiences based on sensual perceptions that must be interpreted, reconstructed and projected back. Strictly speaking, there is no physical contact among monads, for physicality as such is also a projected construct, and thereby illusory. Consequently, there is nothing but perception on the rapidly changing monadic landscape.³³³

In this context, the activities and existential experiences of autonomous monads could be coordinated and brought together by a central and infinite monad that could be known as God. This would represent, and be comparable to, a central nervous system in a complex organism, enabling each monad to pursue its separate life according to the free will decisions of

its own deliberative nature, while remaining harmonised with all the other monads online.³³⁴

As a result, each monad would be a microcosm making up a macrocosmic individuality through a meta-network.³³⁵ But the way in which these two levels of individuality would work remains uncertain. Indeed, questions remain whether monads in a meta-network could be considered as individuals as such, and whether individuality would even persist.³³⁶

Moreover, if they do persist in cyberspace, any distinction between reality and virtuality would disappear. As a result, cyber-individuals could even be trapped in an existence in which virtual dangers and nightmares become as real as their own reality. This was developed in the already-mentioned science-fiction film *Tron*, in which a computer programmer becomes trapped in a terrifying cyber-existence.

Something close to the notion of mind uploading and monads is very briefly mentioned by the American writer and biochemist Isaac Asimov (ca. 1920–92) in his 1956 short story *The Last Question*, in which: ‘One by one Man fused with . . . [the supercomputer], each physical body losing its mental identity in a manner that was somehow not a loss but a gain.’³³⁷

A universal consciousness, or a kind of hive mind, could then emerge, which would only be limited by the universe itself. This could be considered as a form of super- and supra-intelligence with a wonderful breadth and width of capacities. But this will be further examined below in the ‘Network Consciousness’ section.

Identity Questions

With mind uploading, it is possible to ask how it would be feasible to demonstrate that what had been created was really a human in a computer. For many, the Turing test remains the experiment of choice for such a conundrum. Proposed in 1950 by the British mathematician Alan Turing (1912–54), the test sets out a means to assess whether a computer could imitate a real human being.³³⁸ A machine is said to have passed the test if a human judge cannot tell whether he or she is having a conversation with a person or a machine. However, the key problem with this test is that one will always be left wondering whether there was not one more question that could have revealed a distinction. A final conclusion may thus never be achievable.³³⁹

Ethical concerns relating to uploading a mind into a computer also include the fact that mechanical decision-making by the computer may be considered far superior to the decisions made by human beings.³⁴⁰ Moreover, such uploading would certainly challenge the concept of personal identity and have implications for the meaning of personhood.

Finally, because the loss of the individual human body would have a significant impact on the way in which an individual interacts with other human beings, various sets of ethical questions may be considered:

- Since backups of a person would need to be created to protect against viral attack or sudden catastrophic failure of a main drive, how can an individual be sure that these are safe and secure?
- Could the backups, themselves, be considered as persons brought into existence through a copying procedure of the original person?
- Who has access to these backups then becomes a significant question as a breach of security would be cyberspace's equivalent to a forced entry or personal trespass. The lack of privacy and of informed consent to the involuntary disclosure of information would also become a real problem. Hacking, in this scenario, would be a personal invasion on an altogether new level, perhaps putting it in the same category as other violent invasive crimes such as rape.
- Questions can also be asked about what would happen if the backups and the files expressing a person were irreversibly lost. Would this then represent a form of death of the individual?
- Backing up could, in addition, enable a person to relive certain experiences. If one day did not turn out quite how he or she had planned, the individual could return to the beginning of the day and go through it again. However, this would require the person remembering that he or she had chosen to relive the day, otherwise he or she might become trapped in a never-ending loop. Moreover, if an individual was able to return to happier versions of his or her life, would it really matter? Would anyone actually know? And even if they did know, would they care?
- Reliving in a computer may be meaningful only as long as the person does not interact with another uploaded being. Otherwise, this first person's existence and electronic actions would become part of the timeline and experience of the second individual's memory and cyber-experience. In other words, it would not be possible for the first person to delete his or her experience without requiring the second person to delete his or her own memories as well. This means that existing in a computer might enable a person to stop ageing, but this cannot assume that the clocks of cyberspace have stopped.³⁴¹
- How would concepts such as compassion ('suffering with' in Latin) and empathy ('feeling in' in Greek), which make existences meaningful, be able to be expressed in digital persons, since these notions require a capacity to suffer? It is also possible to ask how such a capacity to suffer in computers could be developed. This is especially relevant for higher levels of suffering, such as that arising from existential fear, which may be necessary if life is

not to become a dystopia of programmed, meaningless and robotic happiness. Being able to suffer with others is maybe what makes human beings most interesting!

As already noted, these are not necessarily new philosophical questions. The idea of having a material, physical body and disembodied thoughts is a concept much loved by dualist philosophers such as the seventeenth-century philosopher Descartes, but criticised by many since.³⁴²

Finding Meaningful Virtual Existence

A meaningful existence in a posthuman cyberspace future may be considered as natural and even necessary if it is accepted that evolutionary selection will favour artificial intelligence over human intelligence and if the spread of computational technology is declared inexorable. As the religious commentator Hava Tirosh-Samuelson emphasised, the 'saviour' of this new 'religious order' is clearly technology. However, this is rooted in the belief that human beings will benefit because computers will solve 'human problems, and when human beings upload their minds into machines, they will not only live longer, happier lives, but they will also attain immortality, the very end that traditional religions promised their adherents'.³⁴³

In theory, virtual worlds and spaces will then create the context within which to outwork this kind of posthuman life, ultimately evolving into the first real afterlife. In a way, aside from the simple fact that they are fun, video games already espouse the transcendent benefits that posthumanism promotes. Whilst, for many, these virtual spaces may just be games, for some, they are of crucial importance and value, helping to provide a template for the future. As Geraci indicates: 'Every player who acclimates to operating within virtual worlds, controlling a character that is simultaneously both identical to and distinct from herself, moves a tiny step toward a future in which mind uploading looks both more reasonable and more plausible'.³⁴⁴

In a survey of players of the virtual reality *EverQuest* game, it was reported in 2007 that 22 per cent would choose to live in its fictional world if this was possible,³⁴⁵ with the American sociologist William Bainbridge noting: 'I would consider a continued existence for my main [*World of Warcraft*] character, behaving as I would behave if I still lived, as a realistic form of immortality'.³⁴⁶

Among posthumanists, it was reported in 2001 that 51 per cent would find it appealing to upload their minds into *World of Warcraft* or a comparable game.³⁴⁷ This is not to say that all who currently engage in video games and virtual reality simulations are wholeheartedly pursuing the posthumanist

vision, but many can see the appeal of being able to 'escape' reality and live within such a system.

Nevertheless, the American computer game developer Jason Rohrer is sceptical about the immortality aim suggested by posthumanism. Because of this, he created in 2007 the virtual game *Immortality*, where players can choose immortality and then build structures with blocks. If they grow bored, however, they can quit voluntarily by choosing death. Rohrer openly admits that the game plays with the 'faith' espoused by posthumanism and acts as a thought experiment, while asking questions about the aim and meaning of immortality. He notes: 'We generally assume that immortality is good, just as we assume that death is bad. Of course, universal immortality (all six billion of us) would be physically impractical. But what about individual immortality? What about for you? If you could become immortal, would you?'³⁴⁸

The game initiated much online debate including on the Internet site *The Escapist* in 2008, where it was released. Interestingly, many commentators were not so negative about the prospect of immortality and the many options that might be available to those with eternal youth. In fact, some who played the game believed that it strongly supported the case for choosing immortality. But most commentators found that the game failed to fully illustrate the many options that may be available to those with eternal youth, which was the declared preference of a considerable majority. Among the thirty-eight posts in which a position on immortality was taken, twenty-eight favoured it.³⁴⁹

Whether or not mind uploading or posthumanist immortality is a realistic possibility, such aspirations did appear to have been important to the online virtual world *Second Life*. Its American creator, Philip Rosedale, suggested that to be limited by the confines of the human skeleton is not something to be embraced³⁵⁰ and that there was also value in trying to figure out how to escape death.³⁵¹ This resonates with his willingness to believe that some posthumanist dreams might be realised. Indeed, he appears to accept, with reservations, the basic premise of mind uploading, claiming that: 'There's a reasonable argument that we'll be able to leave our bodies behind by uploading into virtual reality.'³⁵²

Body-Mind Questions in Computers

Given the different perspectives and interpretations relating to personal identity, the very possibility that some identities may change if their material supports were modified should also be considered. Bostrom indicates in this regard that: 'Substrate is morally irrelevant. Whether somebody is implemented on silicon or biological tissue, if it does not affect functionality or consciousness, is of no moral significance. Carbon-chauvinism is objectionable on the same grounds as racism.'³⁵³

But this again leads to questions about how personal identity should be defined. Even if a computer is programmed to indicate that it is self-aware, how would it be possible to know whether it is a fake, an imposter or another representation that bears only a passing resemblance to an original individual?

Experts such as Sandberg dismiss this question, arguing that personal identities are complex. They cannot be clearly and precisely defined and are subject to many changes as a person develops over time. In what appears to be a giant leap of philosophical thought, Sandberg comments that ‘if we can handle growing older we can probably handle being translated to a computer’.³⁵⁴

A more detailed exploration of the idea, and one in which individual identity is preserved, was described by the British science-fiction writer Arthur C. Clarke (1917–2008) in his 1956 novel *The City and the Stars*.³⁵⁵ The story is set in a city one billion years in the future, where the minds of inhabitants are stored as patterns of information in the city’s Central Computer. These can then be infused into cloned bodies to be relived in cycles of about a thousand years. A number of commentators identify this story as one of the first (if not the first) to deal with the concepts of mind uploading, human-machine synthesis and computerised immortality.³⁵⁶

Interestingly, in addition to being downloaded into a body, an uploaded mind would also be able to copy itself into many (even a multitude of) of minds (its clones) as backups or create many new minds (its descendants in time) that are different from itself. But it would be impossible for a mind to be present simultaneously in multiple locations. Each mind location would be a different individual even if such an individual only existed for a few seconds.

In examining the paradox of multiple exact replicas expressing the same identity, the Scottish neuroscientist Donald MacKay (1922–87) indicated that it would seem ‘absurd to suggest that what identifies you is imply the information-flow pattern in your nervous system’.³⁵⁷ This is because a ‘conscious experience is embodied in our being activity: neither on the one hand identical with it, nor on the other hand quasi-physically interactive with it’.³⁵⁸ This means that, for MacKay, copying a human mind into a computer would be tantamount to creating a correlation, not a translation.³⁵⁹

Indeed, because the body of the virtual person would be different from that of the human person, it would actually be a different individual. In other words, seeking to upload a human mind into a computer would result in the creation of a new body-mind person who would be a completely different individual from the original human person.³⁶⁰ It would be like creating a virtual clone with a new body-mind.³⁶¹

A similar argument is given by the British philosopher Derek Parfit (1942–2017) in his 1984 book *Reasons and Persons*, in which he discusses the tele-transportation paradox. This is a thought experiment on the philosophy of

personal identity and consciousness. He describes a teletransporter machine that breaks up an individual into atoms, copies the information and then sends it to Mars at the speed of light, where another machine re-creates the same individual from local atoms, each one being in exactly the same relative position as the original. Parfit then asks whether the teletransporter is a method of travel for the original individual and whether the person on Mars is the same person as the individual who entered the teletransporter on Earth. Of course, the individual on Mars would have the same memories and mind as the original person back on Earth.

However, the thought experiment continues with an upgrading of the teletransporter on Earth so that the original individual is not broken down into atoms, but is simply scanned and a copy made in Mars. This would enable the original person on Earth to continue to exist and eventually see a copy of himself or herself coming out of the machine on Mars. Because of this, it is then possible to question who would be the original person. Moreover, if the original person on Earth subsequently died, should the replica on Mars care at all?

In a way, this kind of paradox is not new and was raised as far back as 1775 by the religiously trained Scottish philosopher Thomas Reid (1710–96), who indicated in a letter:

I would be glad to know your Lordship's opinion whether when my brain has lost its original structure, and when some hundred years after the same materials are fabricated so curiously as to become an intelligent being, whether, I say that being will be me; or, if, two or three such beings should be formed out of my brain; whether they will all be me, and consequently one and the same intelligent being.³⁶²

But of course, such questions only become relevant for those with dualist perspectives of the person and who do not believe that the body and the mind are one single whole. As such, they fail to recognise that it is impossible to retain personal identity when the body and the mind are separated.³⁶³ This means that if a biological mind is uploaded on to a computer, this could be seen as a form of 'mind-cloning', especially if the original biological mind remains in existence.

Given this perspective, it is interesting to note that Sandberg prefers to use the term 'whole brain emulation' rather than 'uploading'. There is a shift of direction away from translating a person into a new realm, to moving towards an attempt to build something that emulates or imitates a brain. The goal is no longer to enable an existing person to live forever in digital form, but to create a new being based on a more generalised human template – something that is neither human nor transhuman, but certainly highly capable and intelligent.

Network Consciousness

The idea of a collective consciousness was first proposed by the French sociologist Émile Durkheim (1858–1917)³⁶⁴ in his 1893 book *Division of Labour in Society*. He defined this collective consciousness as the set of shared beliefs, ideas and moral attitudes that operate as a unifying force within society, which includes the concept of the collective memory of the social group. For Durkheim, society is not a group of individuals living in the same geographical place; instead, it is primarily a set of ideas, beliefs and feelings of all kinds, which come into being through the individuals.³⁶⁵ It expresses a reality that is produced when individuals act on each other, resulting in the fusion of individual consciousnesses. In a social group, each individual's mind is in a relationship with another person's mind, forming a whole interconnected network of all the minds in the social and cultural assembly. Consequently, each person becomes part of his or her own social group, which expresses a sort of cooperative consciousness. In this way, individuals produce a collective consciousness, or a kind of hive mind, through their interactions and this consciousness results in, and holds together, a society.

At the same time, social groups are formed as a kind of multi-individual social organisms in which communication generally takes place through visual or oral means. The cohesive force holding the group together results from a combination of the collective consciousness and the collective memory. A kind of organic solidarity results where individuals become ever more integrated and interdependent, while specialisation and cooperation are extensive.

This reality is also irreducible to its component parts and impossible to explain, except through its own means. In other words, the social group is more than the sum of its parts. It transcends in every sense the existence of any individual and is of a completely different order from the parts of which it is composed. This implies that society and social phenomena can only be explained in sociological terms.

One of the first to suggest a further integration and development of this concept of network consciousness was the French Catholic Jesuit priest and palaeontologist Pierre Teilhard de Chardin (1881–1955), who was a colleague of the British scientist Julian Huxley.

Teilhard de Chardin maintained that human persons were evolving from a state of being individuals to becoming a global consciousness or meta-mind super-intelligence. The 'Noosphere' (from the Greek *nous*, 'mind' or 'reason', and *sphaira*, 'sphere') would then come into existence.³⁶⁶ In other words, he suggested that when human individuals become ever more connected to this global Noosphere, to which evolution is developing, they would then merge into ever greater and united collectives in which individuality would

increasingly be limited in favour of the communion. An emergence of a collective mind of humanity would subsequently take place, which would increasingly integrate the thoughts of all individuals around the globe.³⁶⁷ This means that the Noosphere would not only be formed by each individual's connected mind, but would represent a greater union as an entity in its own right, a kind of planetary mind.³⁶⁸ Eventually, this would culminate in an 'Omega Point', which Teilhard de Chardin believed is the goal of history. This is the stage in which a universal mind has been reached,³⁶⁹ representing the proposed maximum level of complexity and universal consciousness of the Noosphere.³⁷⁰

In an essay on the 'Planetization of Mankind', Teilhard de Chardin writes:

Whether we like it or not, from the beginning of our history and through all the interconnected forces of Matter and Spirit, the process of our collectivization has ceaselessly continued, slowly or in jerks, gaining ground each day . . . It is as impossible for Mankind not to unite upon itself as it is for the human intelligence not to go on indefinitely deepening its thought! . . . Instead of seeking, against all the evidence, to deny or disparage the reality of this grand phenomenon, we do better to accept it frankly. Let us look it in the face and see whether . . . we cannot erect upon it a hopeful edifice of joy and liberation.³⁷¹

According to Teilhard de Chardin, everything within the cosmos is actually converging its purposes through the 'push' of evolutionary forces and the 'pull' resulting from the Omega Point expressed by the affinity that persons have for one another in mutual love.³⁷² Moreover, for him, this Omega Point at the end of history can be referred to as a person, whom he represents as the Ultra-Human or the Trans-Human³⁷³ and in whom there are global and complex systems of collective self-consciousness³⁷⁴ that he likens to a 'stupendous thinking machine'³⁷⁵ – a kind of union with God.

This Noosphere was one of Teilhard de Chardin's most controversial claims and his views were eventually censured by the Catholic Church. Indeed, in a system where each person is completely subsumed by the greater collective consciousness, the notion of independent individuals, with their private lives and their own thoughts, knowledge and opinions, could no longer exist.

However, though there are certain passages in Teilhard de Chardin's writings that seem to suggest that human beings are merely a means to the eventual existence of the Ultra-Human, or a super-organism made up of all human individuals, some vagueness in relation to his thoughts seems to exist at this stage. Teilhard de Chardin's fellow Jesuit, the Frenchman Henry de Lubac (1896–1991), who eventually became a cardinal and defended some of his ideas, admits that this seems like the destruction of personality. But he believed that Teilhard de Chardin was not actually suggesting that individual

persons would be swallowed up with the development of the ultra-person; instead, a union of individuals would take place 'centre to centre'.³⁷⁶

A number of futurists have sought to compare Teilhard de Chardin's ultimate realm of personal being, the Noosphere, with the World Wide Web as an emerging global electronic brain where each individual represents a neuron.³⁷⁷ Indeed, because an ever-increasing amount of personal information is being uploaded to the World Wide Web, this could be considered as a significant step in the evolution suggested by Teilhard de Chardin. The Web could then become the first universal setting of intellectual exchange providing the basis for a complete transformation of the human condition.³⁷⁸

A similar idea to Teilhard de Chardin's Noosphere was presented by the British author Peter Russell in his 1982 book *The Global Brain*,³⁷⁹ where he discusses the prospect of humanity becoming a fully conscious super-organism in a universe that becomes conscious. He suggests that the Earth is itself a living being of which every cell in the planetary nervous system is an individual.

In the *Global Brain* scenario, Russell indicates how telecommunications and computer networks can be considered as connecting all human beings to one another and to machine intelligence, leading to the formation of a collective intelligence. This, in turn, could influence every aspect of culture, politics, business and medicine. He then demonstrates how this convergence of powerful trends is creating the required conditions for an evolutionary shift in consciousness from egocentrism to geocentrism.

This collectivist form of existence was further described in 1993 by the American author Gregory Stock in his book *Metaman: The Merging of Humans and Machines into a Global Superorganism*.³⁸⁰ In this, he shows how the symbiotic union of machines with humans, combined with increasingly interdependent global communications, trade and travel, is coalescing civilisation into 'Metaman', which again can be represented as a planetary super-organism. With *Metaman*, Stock explains how such an organism can support a positive future when, for example, it responds to emergencies such as global warming and overpopulation, while at the same time expanding future possibilities, such as in genetic engineering, space exploration and medicine.

It can further be noted that the Noosphere has similarities with the 'Borg', which recurs as a supervillain in the American *Star Trek* science fiction film series created in 1966 by the American Gene Roddenberry (1921–91). As such, the Borg is a collection of personal individualities originating from different galactic species who have been turned into a network of cybernetic organisms (cyborgs) functioning as drones for a hive mind called the 'Collective'. Accordingly, all the identities of the different individuals are destroyed when they become absorbed and integrated into this Collective or supra-person. The principal aim of the Borg is to 'assimilate' by force

ever more identities into the Collective by violent injection of microscopic machines called nanoprobes. The Borg's ultimate goal is achieving unemotional 'perfection', while indicating in its motto that 'resistance is futile'.

A more realistic development of such collectives has been suggested by the Dublin-based ethicists Fiachra O'Brolchain and Bert Gordijn, who explain that with programmes such as the Silent Talk DARPA programme, 'it is possible to envisage a scenario in which people would collectively participate in a joint emotional/psychological experience'.³⁸¹ In such a situation, distinguishing the individual and determining personal agency may become challenging.³⁸²

Therefore, one important ethical challenge in retaining individual personal agency is making sure that consciousness is maintained, which may itself be limited by the body as the boundary of self. In other words, if consciousness is generated in the brain, a credible theory should be able to account for the way in which individuals experience their bodies as the three dimensional expression of themselves. The bodies of human beings are finite and limited in space, making them specific entities or units. Self-aware individuals are then able to understand that it is possible to transcend their bodies and that others can exist around them.

But if human beings begin to be connected in a very intimate way through neuronal interfaces to become part of a greater collective, their specific bodily limits could be breached. The very ability for persons to understand the possibility of transcending their original bodies would then be undermined. This is important since it would also threaten the limits of a person's sense of individuality.

Another significant ethical challenge arising from a possible communion of minds is that this may only be achievable by the inappropriate mistreatment or abuse of some minds. In addition, a corresponding risk relating to privacy would exist, including a possible undermining of the protection an individual would expect towards his or her past memories, which would be important if he or she wants to retain a sense of self. Thus, such a communion may result in the loss of individuality, which could even mean a loss of individual personal identity.³⁸³ This is something that has already been examined when Greenfield discussed the body of a person, including his or her brain, as 'the boundary of self'.³⁸⁴ In this manner, a self-aware person with his or her body has, so far, represented the 'centre' of his or her free will. But if this 'centre' with its boundary of the self is lost, the person ceases to exist. Alternatively, if this 'centre' seeks power over others, it may then seek to become the centre of everybody else's free will.

Moreover, if neuronal interfaces do eventually enable minds to be connected together to perform certain tasks, then it may be important to determine whether any decisions are an aggregative phenomenon resulting from

the combined decisions of the group or the imposition of one mind over the others. Alternatively, the decisions could be the result of some sort of whole mind system that transcends the contributions of individual members, but is nonetheless capable of intentionality.³⁸⁵

These comments demonstrate that it may be very difficult to know what a complete communion or merging of minds in cyberspace would represent. If a person is completely absorbed (and therefore ceases to exist) in the new communion of minds that may only have one consciousness (one new super-organism), then this may represent a form of death for the original person.

On the other hand, if the original person retains some form of individuality, he or she may remain in existence, although this individuality may be permanently violated and exploited by the new super-organism expressed by the communion of minds. In other words, the original person may retain his or her individual identity, but may be forced to conform to what is accepted by the 'communion of minds'.

In a way, this last scenario would be similar to what is already happening with certain human beings when they are controlled, almost digested, by the identity of dominant others, resulting in their free will being entirely overpowered and suppressed (but not integrated out of existence). The stronger, more powerful spirit would then really and irrevocably 'suck' the weaker into itself and permanently gorge its own sense of being on the weaker person's outraged individuality.³⁸⁶

Power is indeed about wanting to control the free will of others. There may even be an 'either him or me dominating' concept – a fear of being controlled by, and not in control of, the free will of the other. In other words, a person may want power because he or she is afraid of being vulnerable and suffering at the hands of others, and having total control enables him or her to be protected from vulnerability. This may be one of the reasons why a person may want to have power over others and concentrate all free will into himself or herself.

Alternatively, for some people, the only thing left for them to value may be their very existence and a longing for this to be recognised through having power over all others. Such authority may then represent a search for the esteem of others and thereby a source of self-esteem and self-value. In a way, they want to force all others to recognise their unique existence. Individuals may also be attracted to power for the sake of freedom so that they can do whatever they decide without being restricted by the views of others. Thus, power enables a person to overrule these other views.

This resonates somewhat with the concept of the 'Will to Power' suggested by the German philosopher Friedrich Nietzsche (1844–1900), which is usually understood to mean that the ultimate driving force of a human being is

to assert his or her will upon others, though Nietzsche never clearly defined his concept.³⁸⁷ He indicated:

My idea is that every specific body strives to become master over all space and to extend its force (its will to power) and to thrust back all that resists its extension. But it continually encounters similar efforts on the part of other bodies and ends by coming to an arrangement ('union') with those of them that are sufficiently related to it: thus they then conspire together for power. And the process goes on.³⁸⁸

In summary, the communion of minds into a network consciousness could become the ultimate power (the ultimate Ultra-Human) that one meta-identity could have over many other identities if their free will remains. Alternatively, if the personal identities and free will of a number of individuals are completely subsumed into an existing person or a totally new person (it may be difficult to ever be sure which alternative has taken place), then these original persons would cease to exist.

Issues of Privacy

Even though no consensus exists relating to a general definition of privacy, it can be described as a claim by persons to determine for themselves when, how and to what extent information about themselves can be communicated and used by others.³⁸⁹

Privacy is thus important in the context of the kind of relationships or interactions that a person has with people, places and things. People manage relationships with other people through selective disclosure of information, with any breaches in the management of such information having the potential to undermine confidence in the system. Privacy is also about protecting persons from being controlled by others, since having knowledge and information about a certain individual (lack of privacy) can be associated with having a certain amount of power over this person.

In addition, being able to communicate anonymously can be seen as a prerequisite for freedom of expression and can act as an important control mechanism to the abuse of power. For instance, anonymous bloggers can provide an alternative version of the message being presented without the danger of any negative repercussions to themselves.³⁹⁰

The manner in which new neuronal interfaces may be able to track and record an individual's thought process may represent a fresh context within which to debate what constitutes private and public life. This is because the increased generation and storing of personal information and data has already proven to be a focus of concern with respect to privacy. For example,

questions can be asked about the amount of information being gathered by gaming companies about online players.

In fact, the concept of privacy may be one of the key ethical challenges surrounding advances in new applications of neurotechnology. Indeed, examining the brain and the mind through procedures such as neuroimaging may raise important questions about personal privacy and civil liberties.³⁹¹

However, these concerns are based more upon speculation at present than hard facts, due to the relatively primitive and early stages of development of many technologies such as neuroimaging techniques. Currently, only general mental states such as basic emotions can be detected, along with more specific conceptual/thought patterns. At most, these patterns can be interpreted to form general conclusions about individuals or tendencies within a population. But the end results are little different from other physical indicators of mood or mental state.³⁹²

With respect to the risks for persons when they increasingly accept to share their personal information, it is worth noting that a significant amount of data relating to many individuals, including children, is already publicly available on the Internet. This is because restrictions are not always present and, if they do exist, a number of individuals may not know how to use them.

As a result, persons who have a lot of information about themselves on the Internet may already have lives that are a lot less private. Consequently, they may become easily manipulated or even exploited by the information gatherers who may use this information against them. The present increased use of information technology is creating real risks of abuse and misuse of personal information, as well as breaches of confidentiality.³⁹³

But this privacy problem may not be new, since people knew a lot about each other even in the past, when they lived in small communities such as villages. However, in contrast to living in a neighbourhood, the Internet is a global medium and modern persons are not physically close in cyberspace, which may make the virtual world more isolating.

For example, there remains caution and apprehension in the United Kingdom concerning the National Health Service's Electronic Patient Record. In seeking to address these concerns, part of the solution was to ensure that individuals are appropriately informed about the technology, its uses and applications, and have access to the data that is generated. This means that patients must have given their informed consent to the use of personal and medical data. But it cannot be assumed that, when a patient gives an express consent for his or her data to be accessed by certain health-care professionals and for certain purposes, this consent includes an implied consent for the data to be used by other persons. Nor can it be assumed that it can be used for other purposes that may not be associated with the patient's care and treatment.³⁹⁴

Because of such concerns, the Parliamentary Assembly of the Council of Europe suggested in 2017 that transparency, regulation and accountability should be strengthened to address:

- the automatic collection, processing and usage of personal data;
- informing the public about the collection, processing and usage of their personal data;
- informing the public about their right to consent to the use of their stored data and the length of time they are to be stored.³⁹⁵

Thought must also be given to the use of personal data as a means of social control, such as in cases of dangerous patients and public health matters. Thus, there may be a need for improved data protection principles and data protection regulations if neuronal interfaces are to be used appropriately in society, such as in a healthcare setting.³⁹⁶

Reading the Mind

Despite many developments, what is currently known about the brain and how it works is not yet sufficient to enable a person's thoughts to be 'read'.³⁹⁷ But this does not mean that attempts are not being undertaken to reach a stage where 'mind reading' could eventually become a possibility. Moreover, transparent communication systems between persons who could then directly communicate between their brains could open up completely new applications. This is also an area of particular interest to military, intelligence and law enforcement communities, where having the ability to decode a subject's intentions, aims and strategies would be an advantage.

In this regard, the convergence of brain imaging techniques, such as EEG and fMRI, is already beginning to enable the identification of neuronal patterns associated with mental states. This is because every thought or perception experienced by an individual can be traced back to a unique and complex pattern of brain activity. By repeatedly tracking this process with the assistance of statistical and computational methods, a certain thought or perception can eventually be associated with a distinct pattern of brain activation in EEG or fMRI. Having identified this pattern, it can then be used to infer or predict future thoughts.³⁹⁸

However, significant challenges remain to be overcome. One such problem is that the technology is not currently sufficiently developed to distinguish some of the subtle differences between the vast numbers of brain states.³⁹⁹ Moreover, each person exhibits a certain degree of individuality and uniqueness in the way in which he or she thinks. This means that differences exist in the neuronal coding between each person's mental state, not

to mention the changes in his or her neuronal processing that will develop over time.

That being said, researchers are already able to reconstruct on a screen certain images that research participants are viewing just by examining their brain data. To do this, they created a dictionary of brain activity resulting from those images, which can be decoded in subsequent viewings by matching patterns of brain function with patterns seen in previous viewings.⁴⁰⁰

It is also worth noting that brain scans are increasingly being used in areas other than the medical settings for which they were originally developed. For instance, the commercial use of brain scanning in lie detection is a very profitable field.⁴⁰¹ There have even been repeated attempts to get fMRI⁴⁰² lie detection into courts (with some success in India).⁴⁰³ This includes the ‘concealed information test’, which makes use of EEG and the relative strength of certain brain waves to determine whether a test subject is familiar with a particular location, weapon or plot.

In the 2013 U.S. television documentary *Brains on Trial*, which explored the potential and the limitations of brain scans in the courtroom, an fMRI scanner was used to determine whether a person’s brain recognises photographs of certain faces. Whilst the results indicated that it could, the person was also able to play the machine by pretending not to recognise them.⁴⁰⁴

It is easy to be caught up in the hype surrounding lie detection, but it does warrant more detailed investigation as it remains to be extensively tested with subjects in real-life situations. It could well be that fMRI represents a more reliable form of lie detection than the old polygraph, but this conclusion cannot be proven due to a lack of reliable data. At present, however, fMRI for lie detection have been dismissed as being so error-prone and that it would be irresponsible to use it as reliable evidence.⁴⁰⁵

But other ethical challenges exist in the realm of privacy. The American legal academic and specialist in neuroscience Nita Farahany, though recognising the infancy of brain scan technology, believes that it is important to begin thinking through all the eventual implications. She indicates that her goal ‘is to establish a new lens through which to view privacy issues’.⁴⁰⁶ This is because there are new questions that demand fresh legal perspectives, since brain scans may eventually undermine traditional notions of privacy. As a result, more protection may be required to guarantee freedom of thought.

Questions also remain about the responsibilities of researchers if, when examining the brain of a person, they can establish that the individual has committed a murder or is thinking about it. Would they then feel obliged to report this information?

Another question that may be considered is whether a brain scan can be accepted as ‘physical’ evidence, such as a fingerprint, or ‘testimonial’ evidence. Farahany describes the following thought experiment:

A woman is murdered in her home by a masked man wielding a hammer – an act captured on videotape – but first she’s able to deliver a blow to his head with the tool. After that counterattack, an accomplice of the man spurs his companion to kill the woman by yelling, ‘Let’s go!’ The police (correctly) suspect that the killer was the woman’s husband.⁴⁰⁷

Carrying out brain scans on the husband could then help determine several key facts:

- Did the alleged killer suffer brain damage of the sort a hammer blow might cause?
- What were his automatic and physiological responses to photographs of his wife – disdain and loathing? Love and sadness?
- Could the suspect recall the ‘Let’s go’ urging?

Within the current framework of brain scan technology, it may be possible to accept that all of the scans undertaken on the husband should be permissible in court, which could then be regarded as more intrusive than a blood sample. To respond to such a scenario, Farahany proposes a new classification of information, which would capture the types of thought-data being discussed. Moving along a spectrum from the less to the more protected, her proposed categories are:

- identifying information;
- automatic information (produced by the brain or body without effort or conscious thought);
- information that has been memorised; and
- uttered information (including information uttered only in the mind).⁴⁰⁸

Recognising the limitations of these categories, Farahany acknowledges that the gap between how courts treat automatic information and people’s moral intuitions is problematic, but argues that the categories can be a tool to expose that gap. Her intention is to try to reconsider how to approach these questions, with the aim of establishing a framework that will give rise to a robust democratic debate about how various competing interests can be balanced. The intention is not to establish categorical results. Instead, Farahany indicates: ‘Truthfully, there are things that fall in between, and a better thing to do is to describe the levels of in-betweenness than to inappropriately and with great difficulty assign them to one category or another.’⁴⁰⁹

One example of such a difficulty is when a person gives appropriate consent for parts of his or her brain functions to be examined, without realising that it may be impossible to set limits on what is in fact being read. Thus, he

or she may misunderstand, or not realise, what is to be uncovered and what he or she may be giving up.

Because of such concerns (amongst other reasons), the U.S. bioethicist Paul Root Wolpe is not convinced that nonclinical brain scans are ethically appropriate. He believes, instead, that the skull should represent ‘an absolute zone of privacy’. In this regard, he mentions the French philosopher Jean-Paul Sartre (1905–80), who suggested that the ultimate power, or right of a person, is to say ‘No’. Wolpe observes: ‘What happens if that right is taken away – if I say “No” and they strap me down and get the information anyway? I want to say the state never has a right to use those technologies.’⁴¹⁰

But it should always be remembered, in this context, that investigators may already have personal information, such as physical evidence, which can be far more ‘personal’ than thoughts. For example, many individuals would probably expect greater privacy relating to the information found in their blood than in the content of their memories or other utterances on a variety of matters.⁴¹¹

Privacy and Surveillance

Mindful of the scope of developments in neurotechnologies, any understanding and appreciation of the concept of privacy in the future is still up for debate. In this respect, the U.S. journalist and entrepreneur Zoltan Istvan, who ran for U.S. President in 2016 for the Transhumanist Party, indicated:

Privacy is a relatively new concept in history, and while it might have served the wealthy for a few thousand years, it’s not a long term phenomenon. Machine intelligence doesn’t need to be so disconnected. It will discard with privacy. You’re seeing that already with how much tech is making people’s lives so much less private. Transparency will create a society of trust, openness, liberty, and most importantly, safety.

He added that:

I think life and evolution will probably take transparency all the way – where everything is known to everyone all the time. Some call this a mind hive. But understand, we won’t be human anymore. We’ll be far more machine, driven by logic and functionality.⁴¹²

Similarly, commenting on the future, Susan Greenfield predicts that the term ‘privacy’ will increasingly become arcane and a word that only very old people will occasionally use. Everything will then be public.⁴¹³ She suggests: ‘We would no longer have private thoughts; rather, we would effectively be part of a larger network, a mere node in a thinking, conscious system that

goes way beyond an individual mind.⁴¹⁴ Greenfield also predicts that future persons may be ‘most at home networked into the large, passive collective and therefore do not resent being scrutinized by others. It’s more as though they were part of you in any case – a kind of collective self’.⁴¹⁵

Even at present, in an age where privacy is maybe seen as less important than before, such as with the use of networking sites, it is difficult to predict what the future will hold. Moreover, while a person may accept to be on a networking site, the consequences of such a free decision may not always be well understood. In addition, O’Brolchain and Gordijn suggest that some developments may be on their way, in that: ‘The popularity of social networking sites such as Facebook might provide a clue as to how . . . [neuronal interfaces] may be used in the future. Rather than simply sharing photos, videos, and comments, people may in the future choose to share, via . . . [neuronal interface] connections, emotional states and experiences directly.’⁴¹⁶

Interestingly, research indicates that younger people are usually less concerned with their privacy than older persons and are more willing to share information online.⁴¹⁷ Why this is the case remains to be examined, but some may be less aware of the risks involved. For example, if young persons provide information about themselves on the Internet, it is possible that when they grow up and seek employment, this information could become available to others, such as prospective employers. Social media sites may also combine work and social identities within the same online space, leading to information being transferred from one sphere to another.⁴¹⁸

The American author Dave Eggers discusses some of the possible future challenges to privacy in his 2013 novel *The Circle*.⁴¹⁹ A society is represented in which anyone who is not linked to the cybernetwork web is considered to be an outcast and no longer part of the embrace of humanity. Privacy and individuality are seen as something negative – as something to be suppressed – and as inappropriate. The only hope of acceptance is to belong to this Circle of communion and unity, while anyone who rejects the technology is ostracised: ‘You reject the groups, the people, the listeners out there who want to connect, to empathize and embrace, and disaster is imminent.’⁴²⁰ What matters is to be accepted into the mass of the millions – to do like them, to be supported by them, to submit to them, to be subsumed by them, to be seen by them and to be known by them.

The aim of the Circle is ‘Completion’, when everybody knows everything about everybody else and when privacy ceases to exist. The open Circle is then closed. Circle membership would subsequently become mandatory – where all life is channelled through the network. Everything will be permanently recorded, tracked, logged and analysed.

Interestingly, this Circle also reflects to some extent the Panopticon, which was proposed by the English philosopher Jeremy Bentham (1748–47). This

is an institutional building and system of control designed to enable all (in Greek *pan*) residents to be seen (in Greek *opticon*) by a single observer, without them knowing whether they are being watched. However, the name also refers to Greek mythology, where Panoptes was a giant with a hundred eyes. In such an institution, because residents do not know when they are being observed, they are encouraged to behave as if they are being watched all the time. In other words, the Panopticon effectively coerces the residents to continuously control their behaviour. Such a system was taken up by the French philosopher Michel Foucault (1926–84) as an image of modern disciplinary societies and their pervasive tendencies to want to know and observe everything in order to control.⁴²¹

In this regard, the power relationships arising from structures such as the Panopticon result from an imbalance in privacy and the information or knowledge available between those who are being watched and those who are doing the watching in their secret and often inaccessible bases. Such an imbalance may even occur with very few observers who protect their privacy from all others. This is because a controlling power difference or discrepancy exists between these two groups, which is one of the real ethical challenges in such constructions.

The Panopticon can also be seen as a symbol of modern disciplinary power of domination, but where no chains are necessary. The mere possibility of being watched is what disciplines society into following the rules and expectations. As such, it may be suggested that certain technological developments are already encouraging panoptic observation and control. For instance, because users of social media may be aware that they are being permanently monitored, this may force them to behave in a manner that conforms to the norm and expectations. Indeed, if everything is known about everyone, this may encourage all members of a modern society to obey the rules and behave themselves. They all know that they are being watched by each other and as long as they are not doing anything wrong, they are safe. In this respect, Istvan explains:

[B]rain-to-machine interfaces will likely eventually lead to the hive mind, where everyone can know each other's precise whereabouts and thoughts at all times, because we will all be connected to each other through the cloud. Privacy, broadly thought of as essential to a democratic society, might disappear.

He adds that:

And I'm hopeful it will, if disappearing privacy trends continue their trajectory, and if technology continues to connect us omnipresently (remember the hive mind?). We will eventually come to a moment in which all communications and movements are public by default . . . We are approaching an era

where the benefits of a society that is far more open and less private will lead to a safer, diverse, more empathetic world. We should be cautious, but not afraid.⁴²²

But reality may be more complex and it is recognised that regulations governing the possession of digital information are very different from those of standard offline possession.⁴²³ Once an image has been posted online, it may be retained by the website (depending on its terms and conditions) or others could reproduce, share, adapt and use it in ways that may be troubling to the original owner.⁴²⁴ Since it is extremely difficult to permanently delete an online personal history, individuals may need to be very careful when sharing personal information online.⁴²⁵

A further challenge is the way in which persons are increasingly encouraged to disclose information about themselves through incentives such as access to services like social network sites or free WiFi. This happens because a financial value exists from the exploiting of customer data.⁴²⁶

Even individuals who do not choose to have an online presence may be identified through photos of themselves that are uploaded.⁴²⁷ This also means that individuals may no longer be the primary creators of their own online identities, which may have implications for their offline identities.⁴²⁸

Farahany believes that advances in neuroscience represent a challenge to the way in which society has come to understand privacy. She notes: 'We have this idea of privacy that includes the space around our thoughts, which we only share with people we want to . . . Neuroscience shows that what we thought of as this zone of privacy can be breached.'⁴²⁹ But social media may also facilitate connections between like-minded individuals creating niche communities of interest, which could be benign or malign,⁴³⁰ while reinforcing existing behaviours, normalising minority identities and broadening choices.⁴³¹

To the extent to which matters of privacy are being discussed, the corresponding issue of surveillance can also be raised. This has generally been defined as recording or storing information about a person's movements and activities, and then processing this information in some way. In this respect, privacy is only impinged if a person is not aware or has not assented to being surveyed.

The Right to Privacy

A right to privacy generally includes the right to not be exposed to unlawful and unethical surveillance by authorities and private enterprises. The UN's Universal Declaration of Human Rights indicates in Article 12 that:

No one shall be subjected to arbitrary interference with his privacy, family, home or correspondence, nor to attacks upon his honour and reputation. Everyone has the right to the protection of the law against such interference or attacks.

Similarly, the Council of Europe Convention for the Protection of Human Rights and Fundamental Freedoms indicates in Article 8 ('Right to respect for private and family life'):

1. Everyone has the right to respect for his private and family life, his home and his correspondence.
2. There shall be no interference by a public authority with the exercise of this right except such as is in accordance with the law and is necessary in a democratic society in the interests of national security, public safety or the economic wellbeing of the country, for the prevention of disorder or crime, for the protection of health or morals, or for the protection of the rights and freedoms of others.

Therefore, privacy should be defended, because it protects the dignity and integrity of the whole person and, in the context of neurotechnology, the right to mental privacy guards the information from a person's mind from unauthorised collection, storage, use or even deletion.⁴³² Such a right is important when persons may unconsciously be surrendering parts of themselves to others whom they do not know and have no way of knowing. This is one of the reasons why a right to be forgotten in EU law is seen as being crucial. This is a perceived right for individuals to determine the development of their lives in an autonomous way, without experiencing discrimination as a consequence of a specific past action.

In this context, Ienca and Andorno argue that 'current privacy and data protection rights are insufficient to cope with the emerging neurotechnological scenarios. Consequently, we suggest the formal recognition of a right to mental privacy, which aims to protect any bit or set of brain information about an individual recorded by a neurodevice and shared across the digital ecosystem'. They indicate that this right should protect not only neuronal information as data, but also the sources of such information, including whether it is obtained from a person when he or she was conscious.⁴³³

Such rights to privacy may mean that special software, enabling anonymous use of neuronal interface systems, may need to be developed for:

- circumventing censorship;
- anonymous activism and journalism;
- undercover online surveillance;
- protection from criminals;

- anonymous peer-to-peer file sharing; and
- whistleblowing.

However, it is worth recognising that such anonymity can also be used for negative purposes, for example, in criminal markets, such as in the selling and buying of illegal drugs, the sharing of indecent images of children, and for terrorism. This means that if neuronal interfaces continue to be developed and become ever more present in society, a corresponding risk assessment of potential threats to individual privacy and confidentiality may be required. For example, with the emergence of mass data collections, such as with 'Big Data' sets obtained through social media, the 'Internet of Things' and other devices or settings, new threats to private life may increase.⁴³⁴ This may imply that data protection principles and data protection laws may need to be revised and improved in order to reflect life in a digital and interconnected world.⁴³⁵

In other words, according to Ienca and Andorno, a right to brain privacy should 'protect people against illegitimate access to their brain information and to prevent the indiscriminate leakage of brain data across the infosphere'.⁴³⁶

It should finally be noted, however, that in an Edenic society where nobody is ever malevolent to anyone else, a person may not need to hide his or her thoughts through the means of privacy. But such a society, unfortunately, does not exist. This means that a right to privacy will always remain necessary for persons to protect themselves from the controlling power of others.

Notes

1. Parliamentary Assembly of the Council of Europe, *Technological Convergence*, para 2.
2. British Medical Association, *Boosting Your Brainpower*, 3.
3. *Ibid.*, 16–20.
4. *Ibid.*
5. *Ibid.*
6. *Ibid.*
7. *Ibid.*
8. *Ibid.*, 21–22.
9. *Ibid.*
10. Here, many of the arguments are similar to those relating to equality of access to eugenics. See MacKellar and Bechtel (eds), *The Ethics of the New Eugenics*, 146–48.
11. A fuller examination of societal inequality should include a substantial discussion on poverty as well as what it is, how it happens and how it may be overcome. Indeed, poverty is a complex phenomenon, encompassing financial, relational and emotional shortfalls. Thus, a more equal distribution of financial resources would be insufficient to counteract poverty. See, for example, Lister, *Poverty*, 36.
12. Anderson, *Feed*.

13. Green, *Babies by Design*, 147–53.
14. Nuffield Council on Bioethics, *Genetics and Human Behaviour*, 153–54.
15. Forster, 'The Machine Stops'.
16. Brandon, 'The Medium is the Message', 2.
17. Fredette et al., 'The Promise and Peril of Hyperconnectivity'.
18. Office for National Statistics, *Internet Access*.
19. Biggs, 'Emerging Issues'.
20. Hulme, *Life Support*.
21. Eynon and Geniets, *On the Periphery?*
22. BBC News, 'S Korean Dies after Games Session'.
23. Lee, 'South Korea Pulls Plug'.
24. Gorlick, 'Media Multitaskers Pay Mental Price'; Ophir, Nass and Wagner. 2009. 'Cognitive Control in Media Multitaskers'.
25. Gorlick, 'Media Multitaskers Pay Mental Price'.
26. Ibid.
27. Foresight Future Identities, *Final Project Report*, 22–24.
28. De Castella, 'Could Work Emails Be Banned after 6pm?'
29. Ibid.
30. It may even become such a significant part of life that three kinds of death may, at present, exist: cardiac death, brain death and disconnection from the network. See Mattei, 'Le corps sera-t-il encore humain?', 78.
31. Berg, 'Will Google Glasses Make Us Cyborgs?'
32. Blair, 'Mind Healing'.
33. Dade, 'Transnationalism, Foreign Assistance, Domestic Communities'; Vertovec, 'Trends and Impacts of Migrant Transnationalism'.
34. Bourn, 'Young People, Identity and Living in a Global Society'.
35. Gutierrez, Vexo and Thalmann, *Stepping into Virtual Reality*.
36. Bainbridge, *Online Multiplayer Games*.
37. Clark, 'Second Life Creator Linden Lab Downsizes'.
38. Castronova, *Synthetic Worlds*.
39. Wagner, 'Second Life CEO Looks to the Future'.
40. Clark, 'Second Life Creator Linden Lab Downsizes'.
41. Heim, *The Metaphysics of Virtual Reality*, 83.
42. Ellison, *Social Media and Identity*.
43. Dutton and Blank, 'Next Generation Users'.
44. Miller, *What is the Relationship between Identities?*
45. Foresight Future Identities, *Final Project Report*, 27–28.
46. Miller, *What is the Relationship between Identities?*
47. Harb, 'Arab Revolutions'.
48. 'Are We Becoming Cyborgs?'
49. Bocquelet et al., 'Ethical Reflections on Brain-Computer Interfaces', 261–88.
50. Greenfield, *Tomorrow's People*, 43.
51. EUCogIII Project Final Report, '3rd European Network'.
52. Ibid.
53. Luber and Lisanby, 'Enhancement of Human Cognitive Performance', 961, quoted in Braude, 'Enhancing Cognition in the "Brain Nation"', 137.
54. Chan and Harris, 'Cognitive Regeneration or Enhancement'; Greely et al., 'Towards Responsible Use'; Foresight Mental Capital and Wellbeing Project, *Final Project Report*.
55. Hamilton, Messing and Chatterjee, 'Rethinking the Thinking Cap'.

56. Farah et al., 'Neurocognitive Enhancement', 422. However, this might be considered as treatment if it is designed to alleviate the effects of recognised health impairments such as post-traumatic stress disorder.
57. Presidential Commission of the Study of Bioethical Issues, 'Gray Matters', vol. 2, 40.
58. Kaufman, *IQ Testing* 101.
59. This corresponds to the regulations in Opinion No. 20 of the European Group on Ethics (EGE) in Science and New Technologies to the European Commission: Secretariat of the EGE, *The Ethical Aspects of Information and Communication Technology Implants in the Human Body: Opinion No. 20*, 16 March 2005, 33–35.
60. Locke, *An Essay Concerning Human Understanding*, II, XXVII, 9.
61. Ibid.
62. The inability to distinguish useful from meaningless information is believed to be one of the features of autism.
63. Lagali, Corcoran, and Picketts, 'Hippocampus Development and Function'.
64. Graham-Rowe, 'World's First Brain Prosthesis Revealed'; Lagali, Corcoran, and Picketts, 'Hippocampus Development and Function'.
65. Lipsman and Glannon, 'Brain, Mind and Machine'.
66. Nsanze, 'ICT Implants in the Human Body', 145; Erden, 'Neural Implants'.
67. Baard, 'Guilt-Free Soldier'; Spezio, 'Human or Vulcan?', 146.
68. See DARPA, Reorganization and Plasticity to Accelerate Injury Recovery (REPAIR).
69. Spezio, 'Human or Vulcan?', 147.
70. Shachtman, 'Darpa Chief Speaks'.
71. Harlow, 'Meet the Cyborgs'.
72. Kurzweil, *How to Build a Mind*, 246.
73. Spezio, 'Human or Vulcan?', 146.
74. Secretariat of the EGE, *The Ethical Aspects of ICT Implants in the Human Body*, 61.
75. Presidential Commission of the Study of Bioethical Issues, 'Gray Matters', vol. 2, 36.
76. Kurzweil, *The Singularity is Near*, 23.
77. Ibid., 9.
78. Ibid., 7.
79. Agar, *Humanity's End*, 35.
80. Kurzweil, *The Singularity is Near*, 9, 136.
81. Agar, *Humanity's End*, 7.
82. Kurzweil, *The Singularity is Near*, 486.
83. Ibid., 29.
84. Greenfield, *Tomorrow's People*, 46.
85. Singer, 'A Determinist View of Brain, Mind and Consciousness', 41–48.
86. Frith and Frith, 'The Social Brain'.
87. Singer, 'A Determinist View of Brain, Mind and Consciousness', 41–48.
88. Rappaport, 'The Neuroscientific Foundations of Free Will', 3–23.
89. Presidential Commission of the Study of Bioethical Issues, *Gray Matters*, vol. 2, 43.
90. Jotterand, 'Moral Enhancement', 48.
91. Lipsman and Glannon, 'Brain, Mind and Machine'.
92. Damasio, *Self Comes to Mind*; Spence, *The Actor's Brain*.
93. Singer, 'A Determinist View of Brain, Mind and Consciousness', 41–48.
94. Walter, *Neurophilosophy of Free Will*; Meynen, 'Free Will and Mental Disorder'.
95. Kane, 'Rethinking Free Will', 389.
96. Kane, *The Significance of Free Will*. As a libertarian, Kane believes that free will is incompatible with causal determinism.

97. Mele, *Springs of Action*. See also Mele, *Motivation and Agency*.
98. Fischer and Ravizza, *Responsibility and Control*; Meynen, 'Free Will and Mental Disorder'; Lipsman and Glannon, 'Brain, Mind and Machine'.
99. Blank, *Intervention in the Brain*, 260.
100. Smith, 'Neuroscience vs Philosophy'.
101. Jotterand, 'Moral Enhancement', 45.
102. Singer, 'A Determinist View of Brain, Mind and Consciousness', 41–48.
103. Ibid.
104. Ibid.
105. Crick, *The Astonishing Hypothesis*, 3.
106. Miles, "Irresponsible and a Disservice".
107. Vohs and Schooler, 'The Value of Believing in Free Will'.
108. Libet et al., 'Time of Conscious Intention'.
109. Electroencephalography (EEG) is the recording of electrical activity through the scalp. EEG measures voltage fluctuations using multiple electrodes placed on the scalp
110. Soon et al., 'Unconscious Determinants of Free Decisions in the Human Brain'.
111. For example, in a series of experiments, subjects were primed with certain stereotypes or with people associated with those stereotypes, whereby it was found that they tended to display behaviour consistent with the stereotype. Thus, subjects primed with rudeness were later more interruptive with the experimenter, while subjects primed with the concept of the elderly when doing a simple task later walked more slowly when leaving the experiment.
112. Wegner, *The Illusion of Conscious Will*.
113. See, for example, Libet et al., 'Time of Conscious Intention'; Haggard, 'Human Volition'; Moser et al., 'Coordination in Brain Systems', 193–214; Soon et al., 'Unconscious Determinants of Free Decisions in the Human Brain'.
114. Nuffield Council on Bioethics, *Novel Neurotechnologies*, 75.
115. Planck, *Where is Science Going?*, 201.
116. Cheshire, 'The Origami Brain'.
117. Christen and Müller, 'Effects of Brain Lesions on Moral Agency'.
118. Levy, *Consciousness and Moral Responsibility*.
119. Blank, *Intervention in the Brain*, 131.
120. Jotterand and Giordano, 'Transcranial Magnetic Stimulation', 476–85.
121. Persson and Savulescu, *Unfit for the Future*.
122. Plato, *Timaeus*, (360 B.C.E), translated by B. Jowett, Provided by the Internet Classics Archive, <http://classics.mit.edu/>.
123. Jotterand, 'Moral Enhancement', 44–45.
124. Ibid., 43–49.
125. DeGrazia, 'Moral Enhancement'; Jotterand, 'Moral Enhancement', 44.
126. Persson and Savulescu, 'The Perils of Cognitive Enhancement'.
127. Jotterand, 'Moral Enhancement', 52–53.
128. De Jong, van Keulen and Quast (eds), *Van Vergeetpil tot robotpak*; Academy of Medical Sciences et al. 2012. *Human Enhancement and the Future of Work*.
129. Goebel, 'Beïnvloeding van hersenactiviteit met behulp van fMRI-neurofeedback en TMS', 59–64; Denys, 'Kansen en risico's van diepe hersenstimulatie', 47–51.
130. Chan and Harris, 'Neuroethics', 82–83.
131. De Ridder et al., 'Moral Dysfunction and Potential Treatments', 155–83; Shook, 'Neuroethics and the Possible Types of Moral Enhancement'; Persson and Savulescu, *Unfit for the Future*.

132. Dubljević and Racine, 'Moral Enhancement Meets Normative and Empirical Reality', 338.
133. Strand and Kaiser, 'Report on Ethical Issues', 36–37.
134. Cheshire, 'Ethical Implications of Transcranial Magnetic Stimulation for Personal Identity', 72.
135. Schneider and Velmans, 'Introduction'.
136. Frackowiak et al. (eds), 'The Neural Correlates of Consciousness', 269.
137. Sutherland, 'Consciousness'.
138. Singer, 'Consciousness from a Neurobiological Perspective', 242.
139. Rose, 'Preface', 14–15.
140. Güzeldere, Block and Flanagan, *The Nature of Consciousness*, 1–67.
141. Fins, Schiff and Foley, 'Late Recovery'.
142. Zeman, 'Consciousness'.
143. Greenfield, *Tomorrow's People*, 213.
144. *Ibid.*, 214.
145. *Ibid.*, 215.
146. The Australian philosopher David Chalmers explained that the 'hard problem' of consciousness arises because a complete objective interrogation of the brain cannot be used to understand the subjective experiences of the person to whom the brain belongs. In other words, all scientific measurements will only describe what happens from the outside and cannot be used to understand what is happening on the inside. See Chalmers, 'Facing up to the Problem of Consciousness'.
147. Dawkins, *The Selfish Gene*, 59.
148. Greenfield, *Tomorrow's People*, 209–10.
149. Hobbes, *Leviathan*, Chapter XIII.
150. Stuart Mill, 'Autobiography', 94.
151. Nozick, *Anarchy, State, and Utopia*.
152. Geraci, 'Video Games and the Transhuman Inclination', 740.
153. Cline, *Ready Player One*.
154. Inglis, 'Crafting the Endless Cosmos of No Man's Sky'.
155. Heim, *The Metaphysics of Virtual Reality*, 136.
156. *Ibid.*, 137.
157. Waters, *From Human to Posthuman*, 56–57.
158. *Ibid.*, 57.
159. *Ibid.*
160. BBC News, 'S Korean Dies after Games Session'.
161. American Psychological Association, 'Technical Report on the Review of the Violent Video Game Literature'.
162. Von Radowitz, 'Study Finds that Violent Video Games May Be Linked to Aggressive Behaviour'.
163. American Psychological Association, 'Technical Report on the Review of the Violent Video Game Literature'. However, because of such perceived risks, in 2009, Germany's sixteen regional interior ministers asked the Federal Parliament to ban the creation and distribution of games involving violent acts against human or human-like characters. See Aron, 'Online Petition Stalls Plan'.
164. Vytal and Hamann, 'Neuroimaging Support for Discrete Neural Correlates of Basic Emotions'.
165. Kass, 'Ageless Bodies, Happy Souls'.
166. Harris, *Enhancing Evolution*, Chapter 7; Chan and Harris, 'Neuroethics', 82.

167. Erden, 'Neural Implants'; Soekadar, Haagen and Birbaumer, 'Brain-Computer Interfaces (BCI)', 229–52.
168. Philpot et al., 'Barriers to the Use of Electroconvulsive Therapy in the Elderly'.
169. Reardon, 'AI-Controlled Brain Implants'.
170. Ibid.
171. Harlow, 'Recovery from the Passage of an Iron Bar through the Head'.
172. Macmillan, *An Odd Kind of Fame*.
173. Burns and Swerdlow, 'Right Orbitofrontal Tumor'.
174. Strand and Kaiser, 'Report on Ethical Issues', 4.
175. Ibid., 22.
176. See, for example, Schermer, 'Ethical Issues in Deep Brain Stimulation'; Schüpbach et al., 'Neurosurgery in Parkinson Disease'.
177. Schneider et al., 'Deep Brain Stimulation'; Demetriades, Rickards and Cavanna, 'Impulse Control Disorders'.
178. Strand and Kaiser, 'Report on Ethical Issues', 22.
179. Jotterand and Giordano, 'Transcranial Magnetic Stimulation', 476–85.
180. Cheshire, 'Ethical Implications', 76.
181. British Medical Association, *Boosting Your Brainpower*, 25–26.
182. Ibid., 26.
183. Christen and Müller, 'Effects of Brain Lesions on Moral Agency'.
184. Erikson, *Identity, Youth and Crisis*.
185. Cheshire, 'Ethical Implications of Transcranial Magnetic Stimulation for Personal Identity'.
186. Kroger, *Identity Development*.
187. Miller, *What is the Relationship between Identities?*
188. Kroger, *Identity Development*.
189. Foresight Future Identities, *Final Project Report*, 9–10.
190. For further discussion, see, for example, Schechtman, *The Constitution of Selves*; Schermer, 'Ethical Issues in Deep Brain Stimulation'; Foresight Future Identities, *Final Project Report*, 9–10; de Grazia, *Creation Ethics*, 70–73.
191. This reflects an 'animalism' perspective that was coined by Paul F. Snowdon. See Snowdon, 'Personal Identity and Brain Transplants', 109–26. For a discussion, see Olson, 'An Argument for Animalism', 318–34. See also Snowdon, *Persons, Animals, Ourselves*.
192. Even conjoined twins can be considered as distinct if they each experience their own specific identity.
193. Glannon, 'Identity, Prudential Concern, and Extended Lives', 269.
194. Mathews, 'Deep Brain Stimulation'.
195. See, for example, Mackenzie and Stoljar, 'Introduction'. For a discussion on relational autonomy in the context of respecting the interests of those with dementia, see Nuffield Council on Bioethics, *Dementia*, para 2.53.
196. Nuffield Council on Bioethics, *Novel Neurotechnologies*, 74.
197. This is not to suggest that memory loss and its effect on self-perception make those with dementia any less deserving of respect as persons. The Nuffield Council on Bioethics' previous report on dementia explores these questions, emphasising the importance of making sure that those living with this condition are not stigmatised and that it is possible to live a fulfilling life with dementia. See Nuffield Council on Bioethics, *Dementia*, 30. See also, for example, National Institute for Health and Care, *Dementia*, 4; Dworkin, *Life's Dominion*, 224–25; Nuffield Council on Bioethics, *Novel Neurotechnologies*, 74.

198. Erden, 'Neural Implants'.
199. Waters, *From Human to Posthuman*, 53.
200. Ienca and Andorno, 'Towards New Human Rights', 20.
201. Ibid.
202. Ibid., 24.
203. Nsanze, 'ICT Implants in the Human Body'.
204. Foresight Future Identities, *Final Project Report*, 25–27.
205. Couldry, *Media, Society, World*.
206. Madianou and Miller, 'Polymedia'.
207. Foresight Future Identities, *Final Project Report*, 25–27.
208. Ibid., 22–24.
209. Turkle, *Alone Together*.
210. Miller, *What is the Relationship between Identities?*
211. Briggs, *Will an Increasing Element of Our Identity Be 'Devolved' to Machines?*
212. Miller, *What is the Relationship between Identities?*
213. Brooks and Nicholas, *Virtual Humanity*, 105.
214. WikiHow, 'How to Fake Your Identity Online'.
215. Ellison, *Social Media and Identity*.
216. McCaskill, 'Filing Reveals 83 Million Fake Facebook Accounts'.
217. Jong, 'Why the Number of People Creating Fake Accounts and Using Second Identity on Facebook are Increasing'; Krotoski, 'Online Identity'.
218. Burnett, Consalvo and Ess, *The Handbook of Internet Studies*.
219. Foresight Future Identities, *Final Project Report*, 25–27.
220. 'Cyber Cheats Married . . . to Each Other'.
221. See the 2009 American science-fiction film *Surrogates*, directed by Jonathan Mostow and starring Bruce Willis.
222. Ginsburg, 'Disability in the Digital Age', 91–126.
223. Williams et al., *Experience and Expectation of Disabled People*.
224. Ouellette, 'My So-Called Second Life'; Miller, *What is the Relationship between Identities?*
225. Ward, 'Web Porn'.
226. Graham, *Representations of the Post/Human*, 2, quoted in Messer, *Respecting Life*, 133.
227. Graham, *Representations of the Post/Human*, 11, quoted in Messer, *Respecting Life*, 133–34.
228. Paré, *On Monsters and Marvels*. However, it should also be noted that for the early modern scientist and philosopher Francis Bacon, monsters were to be treated as natural phenomena whose study could yield insights into natural processes. See Bacon, *The New Organon*, 2.29.
229. Graham, *Representations of the Post/Human*, 13, quoted in Messer, *Respecting Life*, 134.
230. Graham, *Representations of the Post/Human*, 50, quoted in Messer, *Respecting Life*, 135.
231. E. Graham, *Representations of the Post/Human*, Chapter 3, mentioned in Messer, *Respecting Life*, 135.
232. Secretariat of the EGE, *The Ethical Aspects of ICT Implants in the Human Body*, 15–16. Clear guidance as to the importance of dignity can also be found in the UN's 1948 Universal Declaration of Human Rights.
233. Secretariat of the EGE, *The Ethical Aspects of ICT Implants in the Human Body*, 15–16.
234. Ibid.
235. Hildt, 'Brain–Computer Interaction'; Bell, Mathieu and Racine, 'Preparing the Ethical Future of Deep Brain Stimulation'; Giordano and Gordijn (eds), *Scientific and Philosophical Perspectives in Neuroethics*.

236. Strand and Kaiser, 'Report on Ethical Issues', 35.
237. Brandon, 'The Medium is the Message', 4.
238. See Offray de la Mettrie, *Machine Man and Other Writings*, 31.
239. Secretariat of the EGE, *The Ethical Aspects of ICT Implants in the Human Body*, 31.
240. Moor, 'Becoming a Cyborg', 43–44.
241. De Preester and Tsakiris, 'Body-Extension versus Body-Incorporation'.
242. Cole-Turner, 'Introduction', 7.
243. *Ibid.*, 7–8.
244. Clark, 'Natural-Born Cyborgs: Minds, Technologies, and the Future of Human Intelligence', 34.
245. Moravec, *Mind Children*, 4.
246. Joslyn, Turchin and Heylighen, 'Cybernetic Immortality'.
247. Chan and Harris, 'Neuroethics', 83–84.
248. Kurzweil, *The Singularity is Near*, 30.
249. Agar, *Humanity's End*, 53.
250. Kurzweil, *The Singularity is Near*, 9.
251. Chan and Harris, 'Neuroethics', 83–84.
252. It is likely that Teilhard de Chardin influenced the terminology of Julian Huxley in coining the term 'transhumanism' in a short chapter published six years later, as the two were close friends. See Huxley, 'Transhumanism'; Grumett, 'Transformation', 38.
253. Harrison and Wolyniak, 'The History of "Transhumanism"'.
254. Huxley, 'Transhumanism', 13–17.
255. Tirosh-Samuelson, 'Science and Human Betterment', 59.
256. Tirosh-Samuelson, 'Transhumanism as a Secularist Faith'; McNamee and Edwards, 'Transhumanism, Medical Technology and Slippery Slopes'.
257. Tirosh-Samuelson, 'Transhumanism as a Secularist Faith'.
258. Agar, *Humanity's End*, 29.
259. Wolfe, *Limbo*.
260. Tirosh-Samuelson, 'Transhumanism as a Secularist Faith'.
261. Kurzweil, *The Singularity is Near*, 374.
262. *Ibid.*, 310.
263. Agar, *Humanity's End*, 55.
264. Huxley, *Religion Without Revelation*.
265. Tirosh-Samuelson, 'Transhumanism as a Secularist Faith'.
266. Waters, *From Human to Posthuman*, 78.
267. Savulescu, 'The Human Prejudice', 214. Cf. World Transhumanist Association, 'Transhumanist FAQ'.
268. Hayles, *How We Became Posthuman*, 3.
269. *Ibid.*, 2–3.
270. *Ibid.*, 3–4.
271. Gibson, *Neuromancer*, 16; Hayles, *How We Became Posthuman*, 5.
272. Geraci, 'There and Back Again'.
273. Kurzweil, *The Age of Spiritual Machines*; Kurzweil, *The Singularity is Near*.
274. Moravec, *Mind Children*; Moravec, *Robot*.
275. De Garis, *The Artilect War*; de Garis, *Artificial Brains*.
276. Geraci, 'Apocalyptic AI', 149.
277. Tirosh-Samuelson, 'Transhumanism as a Secularist Faith'.
278. Moravec, *Mind Children*.

279. Moravec, *Robot*, 11.
280. Ibid., 146.
281. Kurzweil, *The Singularity is Near*, 9.
282. Tirosch-Samuelson, 'Transhumanism as a Secularist Faith'.
283. Moor, *Enhancing Me*, 42.
284. Geraci, 'Apocalyptic AI'.
285. Moravec, *Mind Children*, 116.
286. Moravec, *Robot*, 163.
287. Ibid., 167.
288. Tirosch-Samuelson, 'Transhumanism as a Secularist Faith'.
289. Kurzweil, *The Singularity is Near*, 9.
290. Bainbridge, 'Religion for a Galactic Civilization', 187–201.
291. Bainbridge, 'Trajectories to the Heavens', 5.
292. Ibid., 3.
293. Herzfeld, *In Our Image*, 73.
294. Bainbridge, 'Trajectories to the Heavens', 30.
295. Hayles, *How We Became Posthuman*.
296. Waters, *From Human to Posthuman*, 77–78.
297. Ibid., 58–59.
298. Hayles, *How We Became Posthuman*.
299. Waters, *From Human to Posthuman*, 78.
300. Pepperell, *The Post-human Condition*, 34.
301. Tirosch-Samuelson, 'Transhumanism as a Secularist Faith'.
302. Waters, *From Human to Posthuman*, 78.
303. Wainwright, *For Our Salvation*, 18.
304. Ibid.
305. Kurzweil, *The Singularity is Near*, 324.
306. Kurzweil, *How to Create a Mind*, 276.
307. Kurzweil, *The Singularity is Near*, 235.
308. Locke, *An Essay Concerning Human Understanding*, II, XXVII, 23.
309. Tirosch-Samuelson, 'Transhumanism as a Secularist Faith', 717.
310. Kurzweil, *The Singularity is Near*, 122–25.
311. Ibid., 126–27.
312. Ibid., 125–26.
313. Agar, *Humanity's End*, 39–40.
314. Ibid., 46–47.
315. Ibid., 50.
316. Kurzweil, *The Singularity is Near*, 386.
317. Agar, *Humanity's End*, 36.
318. Ibid., 58.
319. Ibid., 59.
320. Kurzweil, *How to Create a Mind*, 245.
321. Moor, *Enhancing Me*, 58.
322. Shen, 'Whole Human Brain Mapped in 3D'.
323. Moor, *Enhancing Me*, 58; Shen, 'Whole Human Brain Mapped in 3D'. In 2003, the Brain Atlas, comprised of digitalised high-definition structural maps collected from MRI studies of more than 7,000 subjects, was published on the Internet. Retrieved 19 October 2018 from <http://www.med.harvard.edu/aanlib/home.html>.
324. Shen, 'Whole Human Brain Mapped in 3D'.

325. Moravec, *Mind Children*, 108–10.
326. Ibid., 115–16.
327. Geraci, 'Video Games and the Transhuman Inclination', 737–38.
328. Kurzweil, *The Age of Spiritual Machines*, 33; Kurzweil, *The Singularity is Near*, 7–21; Moravec, *Robot*, 165–67.
329. Geraci, 'Video Games and the Transhuman Inclination', 737–38.
330. Kurzweil, *The Age of Spiritual Machines*, 101–31; Moravec, *Mind Children*, 100–24
331. Waters, *From Human to Posthuman*, 64–65.
332. Heim, *The Metaphysics of Virtual Reality*, 97.
333. Waters, *From Human to Posthuman*, 55.
334. Heim, *The Metaphysics of Virtual Reality*, 99.
335. Waters, *From Human to Posthuman*, 55–56.
336. Ibid., 64–65.
337. Asimov, 'The Last Question'.
338. Turing, 'Computing Machinery and Intelligence'.
339. Moor, *Enhancing Me*, 60–62.
340. There may also be some ethical questions about the possibility of downloading a computer person into the brain of a human biological person.
341. Moor, *Enhancing Me*, 43.
342. Ibid., 45.
343. Tirosh-Samuelson, 'Transhumanism as a Secularist Faith', 725–26.
344. Geraci, 'Video Games and the Transhuman Inclination', 748.
345. Castronova, *Exodus to the Virtual World*, 59.
346. Bainbridge, *The Warcraft Civilization*, 62.
347. Geraci, 'Video Games and the Transhuman Inclination', 737.
348. Rohrer, 'GameDesign Sketchbook'.
349. Geraci, 'Video Games and the Transhuman Inclination', 745.
350. Au, *The Making of Second Life*, 233.
351. Ibid., 232.
352. Guest, *Second Lives*, 273; Geraci, 'Video Games and the Transhuman Inclination', 745–46.
353. Bostrom, 'Ethical Principles in the Creation of Artificial Minds'.
354. Moor, *Enhancing Me*, 58.
355. This novel was a revised and expanded version of Clarke's earlier story *Against the Fall of Night*, but the earlier version did not contain the elements relating to mind uploading.
356. Geraci, *Apocalyptic AI*, 54. Note that although Geraci presents this as the first story to feature mind uploading, he incorrectly gives the publication date as 1953, which is actually the publication date of the novel *Against the Fall of Night*, of which *The City and the Stars* was a revised version. See Tofts, Jonson and Cavallaro (eds), *Prefiguring Cyberculture*, 253; Bainbridge, *Berkshire Encyclopedia*, 438; Dinello, *Technophobia!*, 172.
357. MacKay, *Behind the Eye*, 1–11, 262–66.
358. Ibid.
359. Cheshire, Jr., 'The Sum of All Thought', 139.
360. The reality that uploading memories into new supports would end up creating new persons who may believe that they are the original was used in several film scripts, such as *Moon* (2009), directed by Duncan Jones, and *The 6th Day* (2000), directed by Roger Spottiswoode.
361. If the virtual twin is considered as a kind of clone of the original, then existing legislation relating to the prohibition of reproductive cloning could come into effect.

362. Reid, *Letter to Lord Kames*, quoted in Humphrey, *Seeing Red*, 1.
363. Sutton, 'Transhumanism', 122.
364. Durkheim's idea on the collective consciousness are discussed in Giddens, *Durkheim*.
365. Durkheim, *Sociologie et philosophie*, 79.
366. Teilhard de Chardin, *The Future of Man*, 124–39; Teilhard de Chardin, *The Phenomenon of Man*, 191–212.
367. In this regard, Teilhard de Chardin may have been inspired by the telecommunications super-organism of H.G. Wells, characterised as the 'word brain'. See Rayward, 'H.G. Wells's Idea of a World Brain'.
368. Burdett, 'Contextualizing a Christian Perspective', 31.
369. Moravec, *Robot*, 201–2.
370. Teilhard de Chardin, *The Future of Man*; Teilhard de Chardin, *The Phenomenon of Man*.
371. Teilhard de Chardin, *The Future of Man*, 128.
372. Burdett, 'Contextualizing a Christian Perspective', 31–31.
373. Ibid.
374. Teilhard de Chardin, *Activation of Energy*, 380.
375. Teilhard de Chardin, *The Future of Man*, 172–73.
376. De Lubac, *The Religion of Teilhard de Chardin*, 208–16.
377. Greenfield, *Tomorrow's People*, 247.
378. Anderson, 'Argumentation, Symbiosis, Transcendence'.
379. P. Russell, First published in 1983 as *The Global Brain* and published in 1995 as *The Global Brain Awakens: Our Next Evolutionary Leap*.
380. Stock, *Metaman*.
381. O'Brolchain and Gordijn, 'Brain–Computer Interfaces and User Responsibility', 168.
382. Ibid.
383. This is a sort of Tower of Babel syndrome.
384. Greenfield, *Tomorrow's People*, 213.
385. O'Brolchain and Gordijn, 'Brain–Computer Interfaces and User Responsibility', 168.
386. Lewis, *The Screwtape Letters*, xi–xii.
387. The Austrian medical doctor and psychotherapist Alfred Adler (1870–1937) incorporated the 'Will to Power' concept into his own understanding of psychology by suggesting that it is an innate driving force behind every human being's behaviours and experiences, which he initially defined as 'striving for superiority', but which he later characterises as a 'striving for perfection. See Adler, *Understanding Human Nature*; Adler, *Social Interest*, 275–76.
388. Nietzsche, *The Will to Power*, s. 636.
389. Westin, 'Privacy and Freedom', mentioned in Ienca and Andorno, 'Towards New Human Rights'.
390. Brandon, 'The Medium is the Message', 3.
391. Presidential Commission of the Study of Bioethical Issues, *Gray Matters*, vol. 2, 90.
392. Chan and Harris, 'Neuroethics', 78–79.
393. Barker, 'Health Care/Medical Treatment', 69.
394. Ibid.
395. Parliamentary Assembly of the Council of Europe, *Technological Convergence*, para 9.
396. Barker, 'Health Care/Medical Treatment', 69.
397. Exceptions might be Brain Computer Interfaces, which record a user's brain signals with respect to an external stimulus or with a change in affective state. This could potentially reveal what it was that attracted the user's attention or could represent

- a crude reflection of the user's mood. See, for example, Martinovic et al., 'On the Feasibility of Side-Channel Attacks'.
398. Haxby et al., 'Distributed and Overlapping Representations of Faces and Objects'.
 399. Ibid.
 400. Shea, 'Watch What You Think'.
 401. At least two commercial companies offer such services in the United States.
 402. Functional Magnetic Resonance Imaging (fMRI) is a type of specialized MRI scan used to measure the haemodynamic response (change in blood flow) related to neural activity in the brain or spinal cord of humans or other animals. Its advantages include its relatively low invasiveness, absence of radiation exposure and relatively wide availability.
 403. Weisberg et al., 'The Seductive Allure of Neuroscience Explanations'. See also British Psychological Society, 'Will Juries Be Seduced by Brain Scans?'.
 404. Shea, 'Watch What You Think'.
 405. Bizzi et al., *Using Imaging to Identify Deceit*.
 406. Shea, 'Watch What You Think'.
 407. Ibid.
 408. Ibid.
 409. Ibid.
 410. Ibid.
 411. Ibid.
 412. DeVoe, 'Transhumanism and Crypto'.
 413. Greenfield, *Tomorrow's People*, 42.
 414. Ibid., 43.
 415. Ibid., 38.
 416. O'Brolchain and Gordijn, 'Brain-Computer Interfaces and User Responsibility', 168.
 417. Children and Online Privacy Survey, *The i in Online*.
 418. Foresight Future Identities, *Final Project Report*, 27–28.
 419. Eggers, *The Circle*.
 420. Ibid., 464.
 421. Foucault, *Discipline and Punish*.
 422. Istvan, 'Liberty Might Be Better Served by Doing away with Privacy'.
 423. Odom et al., 'Lost in Translation'.
 424. Harvey, *Can Histories of Previous Technological Breakthroughs?*
 425. Foresight Future Identities, *Final Project Report*, 27–28.
 426. Ibid.
 427. Ellison, *Social Media and Identity*.
 428. Briggs, *Will an Increasing Element of Our Identity Be 'Devolved' to Machines?*
 429. Shea, 'Watch What You Think'.
 430. Miller, *What is the Relationship between Identities?*
 431. Briggs, *Will an Increasing Element of Our Identity Be 'Devolved' to Machines?*
 432. Ienca and Andorno, 'Towards New Human Rights', 24.
 433. Ibid., 15.
 434. Strand and Kaiser, 'Report on Ethical Issues', 36–37.
 435. Barker, 'Health Care/Medical Treatment', 69.
 436. Ienca and Andorno, 'Towards New Human Rights', 15.

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