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 Are you a Cyborg? 2020[[1]](#footnote-1)

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 Introduction

In this talk, I’d like to focus **not** on external technologies like computers, smart boards, virtual experience, nor the Orgasmatron in Woody Allen’s movie Sleeper (1973), but rather on some of the possible social implications of bodily implanted devices on the future of human nature and society. In other words, I’ll leave the **science** underlying cyborgs to the boffins in engineering, computer science and artificial intelligence, and just focus on some conceptualizations of the word ‘cyborg’, along with possible social implications and concerns surrounding cyborgization.

The Israeli historian Harari in his best-seller Homo Deus (2016) contends the main project of the 21st century will be to upgrade humanity into a **new species** where our biological “neural networks will be replaced by intelligent software.” Indeed, an international movement called Trans-Humanism has already arisen to consider these possibilities. Wikipedia tells us,

In 2010, the [Cyborg Foundation](https://en.wikipedia.org/wiki/Cyborg_Foundation) became the world's first international organization dedicated to help humans become cyborgs. The foundation was created … as a response to the growing amount of letters and emails received from people around the world interested in becoming a cyborg.

 What is a cyborg?

With this in mind let’s mentally ‘pop some corn’ about cyborgs. In the first place, what, specifically, is a cyborg? Wikipedia defines a cyborg as:

**a theoretical or fictional being with both organic and** [**bio-mechatronic**](https://en.wikipedia.org/wiki/Biomechatronic) **parts.** The term [cyborg] was coined in 1960…In popular culture, some cyborgs may be represented as visibly mechanical (e.g. the [Cybermen](https://en.wikipedia.org/wiki/Cybermen) in the [*Doctor Who*](https://en.wikipedia.org/wiki/Doctor_Who) franchise or [The Borg](https://en.wikipedia.org/wiki/Borg_%28Star_Trek%29) from [*Star Trek*](https://en.wikipedia.org/wiki/Star_Trek) or [Darth Vader](https://en.wikipedia.org/wiki/Darth_Vader) from [*Star Wars*](https://en.wikipedia.org/wiki/Star_Wars)); or as almost indistinguishable from humans (e.g. the [Terminators](https://en.wikipedia.org/wiki/Terminator_%28character%29) from the [Terminator](https://en.wikipedia.org/wiki/Terminator_%28franchise%29) films, the ["Human-looking" Cylons](https://en.wikipedia.org/wiki/Cylon_%28re-imagining%29) from the [re-imagining of *Battlestar Galactica*](https://en.wikipedia.org/wiki/Battlestar_Galactica_%28re-imagining%29) etc.) The 1970s television series [*The Six Million Dollar Man*](https://en.wikipedia.org/wiki/The_Six_Million_Dollar_Man) featured one of the most famous fictional cyborgs, referred to as a [bionic](https://en.wikipedia.org/wiki/Bionics) man; the series was based upon a novel by [Martin Caidin](https://en.wikipedia.org/wiki/Martin_Caidin) titled [*Cyborg*](https://en.wikipedia.org/wiki/Cyborg_%28novel%29).[[2]](#footnote-2)

Note the wide Wiki definition does not include the use of drug or chemical enhancements, nor the straightforward physical replacements of bodily parts or functions. Hence, someone who uses doping to enhance physical skills, or drugs to enhance cognitive abilities would be ruled out as being cyborgs. For many of us, our intuitions would agree here. Recipients of genetic engineering and modifications to their genome as enhancements or augmentations would also be ruled out as being cyborgs (they might alternately be described as neo-humans or super-humans).[[3]](#footnote-3) Nor would body transplants, including head transplants, result in cyborgs on this definition. This means the type of **instigating mechanism**, not the resulting outcomes, would be what contributes to be being described as a cyborg or not. If either an electronic computerized implant or genetic engineering could change one from being a dour, ‘who stole my slice of pizza’ character to a happy clappy one, only the former would count towards one being called a cyborg.

Would augmentation by nanobots count, and how invasive would implants have to be to count as cyborg parts? Would any alternations have to specifically involve invasively interfacing with the brain or perceptual mechanisms (which may but need not have deleterious effects on emotional cognition)? [[4]](#footnote-4) Note also, the Wiki definition only includes bio-mechanical **electronic** implanted parts. This means, happily, that Uncle Clem with his false teeth and metal hips isn’t considered the family cyborg. We might also add to the definition that the electro-bio-mechanical parts should have some kind of working, integrated, useful function. After all, most of us would agree that walking around with nonworking computer parts, however artfully arranged on or in our body, would not qualify one as being a cyborg.

 Assuming the electro-technological parts have a purpose, how many artificial parts do you need to be labelled a cyborg? Having one or a few artificial parts may not make you a cyborg. If one has a pacemaker, are they a cyborg? I suspect most of us would intuitively say no. But we can keep adding to this list and keep asking the same question. This suggests a continuum approach. The extremes would be recognizable, from what cognitive scientist Andy Clark calls unsullied “electronic virgins” at one end [[5]](#footnote-5) and perhaps the Star Trek Borgs at the other end with fifty shades of grey in between. Alternatively, we might view things differently. Perhaps the continuum approach is not the best way of tackling the question.

Maybe having one or more **special, particular** bio-mechanical, electronic parts is more likely to have you labelled a cyborg than having other particular electro-mechanical parts? But which ones? What about an electro-mechanical arm? Would having a mechanical heart make you a cyborg? What about having a mechanical brain with neurons replaced by silicon chips? Or what about having particular **technological, computer-related** mechanical parts inserted into your body that might have different functions from natural body parts, or which greatly enhance the effectiveness of natural parts? [[6]](#footnote-6) For example, the Guardian tells us some bio-hackers “are installing USB drives in their fingertips, giving themselves night-vision eye-drops and growing third ears on their arms (that can go online).” Presumably in the early stages of cyborgization people will have more choice over what characteristics they want, such as having larger mechanical hands or being able to permanently see in the dark. Interestingly, are we coming back here to the continuum hypothesis (the more such technological parts you have the more likely you are on the way to becoming a cyborg), or as the Guardian article implies, does having even a few **special** devices in your body makes you a cyborg?

Could you be a part-time cyborg? Before you accuse me of smoking too much Colorado marmalade here, let me elaborate. Most of you probably missed something that happened in the fall of 2016 – the **First Cyborg Olympics (Cybathlon)** in Switzerland! Participants came from twenty-five different countries. Under the influence of movies such as X-Men, Transformers and Bridget Jones’s Baby, one might expect such Olympic events to comprise mainly events such as throwing cars, fights where arms, heads and legs are routinely ripped off, or candidates jumping lines of trucks. Not so. A number of bio-technology companies were demonstrating their latest technologies with disabled individuals in events such as bread-slicing, prosthetic leg races and brain-computer interface races. Many of the participants were using exo-skeletons which could be removed after events. While they **were wearing** such exo-skeletons they were considered cyborgs by the organizers. Others would not consider such athletes cyborgs because the exo-skeletons are not invasive and are removable.

So far, I’ve been largely talking within the wide Wiki definition of cyborg, which is admittedly, the most common way of thinking about cyborgs. Several of the boundary issues mentioned so far surrounding the word “cyborg” may be due to its recent origin (remember it was only coined in 1960) along with the influence of science fiction on our notions of what cyborgs supposedly look like.[[7]](#footnote-7) But the term “cyborg” has also been used in wider and metaphorical senses by others. Elon Musk contends that our digital, online connections already make us proto-cyborgs. This is a different, even wider way of using the word “cyborg” – does our largely external interaction with mechanical gadgets like TV’s, computers, cell phones, on-line profiles, etc., make many of us already cyborgs in a sense? This view would not be new to the philosophical community. For some, those with an “externalist view” of the mind, our mind should not be viewed simply as only what is going on inside the brain, but also should be seen as including external tools we use, since they are now indispensable to our thinking. Much of our memory is already external, stored in our cell phones and computers.[[8]](#footnote-8) More and more of our thinking is conducted while we are tied in with external devices such as calculators and computers.

A related and early thought-provoking view was expressed by the feminist thinker Donna Haraway. In her justly acclaimed 1985 “Cyborg Manifesto” Haraway claims that we can consider talk of cyborgs as a metaphor for going beyond many of our traditional concepts of gender, feminism and politics. Given that the possibility of cyborgs undermines the human-machine distinction, it can also lead us to rethink other binary distinctions: black vs white; left vs right; economic vs social; immigrant vs non-immigrant; human vs animal; Christian vs Muslim; elite vs non-elite; man vs woman; heterosexual vs non-heterosexual, etc. [[9]](#footnote-9)

Social Implications of Cyborgization

Okay, enough of the beard-stroking about words and definitions [[10]](#footnote-10), so let’s move on to talking about some possible social and ethical implications of our cyborg technologies. Among many in the technical field, the dominant view is that we are all on the road to becoming cyborgs. A question arises regarding **which** traditional human characteristics should be modified or replaced in the future with new technologies. It is unlikely that electronic bio-mechanical hairy lips are on the agenda for most of us, but what about implants resulting in cognitive and emotional modifications or enhancements? What if we could augment our emotions in an extreme way? The expression “I really hate/love X” could take on a new meaning.[[11]](#footnote-11) On a more serious note, could we make ourselves more empathic towards other people? [[12]](#footnote-12) Could we enhance ourselves morally? [[13]](#footnote-13) How far would we go – what about making students that would take a howitzer round for their professors? Things could go very differently. Could future cyborgs – perhaps more machine than meat – be morally blind to some of the things we now consider immoral or cruel? One philosopher has recently considered the possibility that psychopaths should not be described as being cruel (any more than lions are cruel) no matter what they do to people.*[[14]](#footnote-14)* Her view is that such people lack some basic human features and are no more immoral than lions and tigers.Could this be extended to future cyborgs that might lack our present-day moral sensibilities? Further, given that our notions of person-hood are at present tied to our **human** biological functions and bodily expressions, would very different abilities and sense experiences grounded in electronic implants result in new notions of ‘self’ and ‘person’? [[15]](#footnote-15) The issue is likely to be important since the concept of ‘person’ is tied to legal and moral categories.

The distinction between ‘person’ and ‘personality’ is also important here since a change in one doesn’t imply a change in the other category (the two are often wrongly conflated). [[16]](#footnote-16) While indeed, it is likely, over time, new implants and interactions with other electronic implants would produce new psychologies, interests and concerns and perhaps different personalities. Would some bio-mechanical changes make people view someone as a very different person (personality), only distantly related to the person before the major enhancements? (Think of Anakin Skywalker and Darth Vader of Star Wars fame). Much of what a person is, or who a person is, seems to be socially constructed, and therefore somewhat changeable. Whether changes might cause one to be viewed as a new person might depend on the type or number of changes in one’s cognitive, emotional or behavioral abilities. If I could, with new bio-mechanical parts, run a three-minute mile, most would still consider me the same person, albeit an upgraded version of myself in that one respect, but what if I could become a brighter light bulb with some bio-mechanical brain implants – say, in some Flowers for Algernon-like fashion---my IQ was increased ten-times to 500? [[17]](#footnote-17) (I know what I have just said.) I mention this because some of our attributes, for example, our intelligence, may have wide impacts on other interests and activities in our lives. Is it possible that a large change in **one** characteristic could make us a new person because of its widespread implications? What if several important features of our individuality could be modified, changed or greatly enhanced simultaneously?

What about the influence of fashion and fads on various notions such as **attractiveness** in a cyborg world? [[18]](#footnote-18) When it comes to ideas of attractiveness, would adding electronic bio-mechanical parts lead to some new ideas about who is attractive, or would notions of physical attractiveness disappear or become completely different from our present-day ideas? Would a neo-bio-mechanical Justin Trudeau with echolocation abilities and covered in implanted USB drives and plug-ins be on a future cover of People magazine? Before you chortle and burp at this, aren’t we influenced by the media and changing dominant cultural mores all the time? There is a fairly wide variation across history and cultures regarding what is considered attractive. How many men these days wear powdered wigs and high heels as the 1% did in the 16th century? While **perhaps some** particular features of people are found to be universally attractive, all bets are likely to be off **if** many of us end up looking something like the skinless Terminator.[[19]](#footnote-19)

And **how much credit** should be given to individual cyborg enhanced accomplishments? Having qualities or attributes in common with many others does not distinguish one as an individual. People don’t point us out in the street because we can read or do basic arithmetic. But what about uncommon enhanced abilities? It seems to depend on the particular enhancement and the context. Few would be interested if an implant allows me to pat my head and rub my belly faster than anyone else. The situation also matters: For relatively straightforward actions like running a 200- yard dash or swimming a particular distance, being under the influence of physically enhancing drugs is *already enough* to disqualify you from receiving a medal at the Olympics. But what about far more complex achievements such as those that are impossible with organic brains/bodies alone? Does the use of external aids such as computers erode our notions of individual achievements to some extent? [[20]](#footnote-20) The typical response is that human imagination and creativity are often still required to come up with ideas in the first place. But what if new bio-mechanical implants (or genetic enhancements) allow us to be far more creative or imaginative? While there will likely remain individual difference among people, what if these individual differences become largely due to some people possessing better enhancements (that is, they **far outstrip** any natural biological individual differences)?

Animal cyborgs?

 Do we also have moral responsibility to our fellow creatures – other non-human animals? Why not animal cyborgs? [[21]](#footnote-21) The onetime NASA scientist and science-fiction writer David Brin says,

In all my research I have concluded that cetaceans, primates, corvids (crows), parrots, pinnipeds (sea lions), and many other species on Earth appear to be stuck under a firm glass ceiling, roughly the same level of thinking, problem-solving, linguistic ability, and evolution seems stingy about letting any of them crash through (Brin cited in Dvorsky, 2012)

Brin contends that it may actually be selfish for us to deny **high-functioning** animals (e.g apes, dolphins, whales, etc.) our enhancement technologies. He imagines a possible Earth civilization enlightened by diverse voices: “Imagine [for example, he says] dolphin philosophers … raven playwrights and poets.” He adds, “How lonely [for us], if we turn away without trying” (cited from Dvorsky, 2012).[[22]](#footnote-22) However, **whatever** the assets of Bonobo sex-therapists and orangutan comedians, we need to think of other possible outcomes. I don’t want to be what our Australian brother and sister academics call a “whinger” here, but all might not go as well as we might like. We might have to face animal lawyers arguing for equal rights or reparations for past wrongs. Enhanced animal politicians and activists might have very different concerns and values than our human minds*.* Notions like “high functioning” might themselves be viewed quite differently from our human interpretations. Given our human track record on ecology and the treatment of other non-human animals, it is unclear whether newly enhanced intelligent non-human species would describe us in the glowing terms that many human beings use to describe themselves. The diversity within the community of human beings is challenging enough. Would complicating things further between **species** not contribute to more social and political problems? Not only might we face diverse conflicting demands between non-human animals and human beings but between different animal species as well (prey/predator relationships would be a sticking point.) And would we try to continue to prioritize human interests over animal interests (as we do at present)? [[23]](#footnote-23) [[24]](#footnote-24) A further issue concerns **which** animals would we enhance? While it would initially understandably be those animals such as mammals that are related to us and easier to upgrade, human interests would almost certainly play a large role (at least in the earliest stages of cyborgization). The pets of those who could afford the upgrades might be the earliest recipients [[25]](#footnote-25), but likely those species we find cute or useful would be next in line. It seems unlikely rattlesnakes or gophers would be prime candidates. Further, enhanced “beasts of burden” would be more likely than intellectually enhanced animals; maybe our future Mars colonists might have a use for somesuch. Considering these possibilities are what our Canadian prime minister, in Sherlock Holmes mode, would call three-reefer speculations.

Some concerns about cyborgization

Much of the popular writing on the topic of future modifications to human beings focuses on specific scientific/technological issues and their feasibility along with people’s fears of being taken over by amoral Star Trek Borgies. But other concerns need to also be considered, at least in the short term. (Advanced cyborgs in the more distant future may become closer to being fully robotic, replacing meat more and more as the technologies become available).[[26]](#footnote-26) **The cloven hoof in the contemporary picture may not be the robotic part but the human aspect of cyborgs. After all, cyborgs will for some time be largely human with parts designed by humans. Will the directions taken regarding what is technically developed be influenced by the social and cultural biases of those who generate and use such implanted parts? [[27]](#footnote-27)** Further, as John N Gray says in his book, The Silence of Animals (2014),“There are not two kinds of human being, savage and civilised. There is only the human animal, forever at war with itself.” The recent events following the 2016 US election and the European refugee crisis have shown that sexism and racism are widespread and still strong.[[28]](#footnote-28) Given this, the concern is that human biases (implicit and explicit) and self-serving desires will likely remain, cyborg or not, for the near future at least.

 Another social issue concerns who will have control over *who gets* what electronic implants, and *who decides* what technologies are developed? Relatedly, manufacturers or companies may add to their products information gathering programs or programs that, unknown to us, subtly influence our behaviours or thought patterns. [[29]](#footnote-29) While Harari in his book Homo Deus expresses concern that a very small group of business entrepreneurs and engineers will be in charge of the directions technology takes [[30]](#footnote-30), the philosopher John Gray (2016) casts a wider net and contends,

If such new species (including cyborgs) appear, they will be created by governments and powerful corporations, and used by any group that can get its hands on them – criminal cartels, terrorist networks, religious cults, and so on.[[31]](#footnote-31)

The implications for our lives, following this line of thinking, at least in the short term, are likely to be far-reaching. Consider the increase in social inequality, large financial disparities between the very rich and the rest of society; usually the better off and more powerful members of society can afford to acquire the most recent publicly available technologies first. [[32]](#footnote-32) To keep up with even the average status quo most people will have to make severe cutbacks in budgets regarding things they get enjoyment from such as food, hobbies, or Cialis. Some groups may, assuming human biases are still prevalent and dominant, continue to face additional obstacles. For one example, *LGBTQ* individuals desiring enhancing technologies could face not only bias in the wider community but also obstacles from institutions such as insurance companies. Political, financial, and social obstacles and biases would need to become part of the discussion as technological advances allow us to modify more and more of our attributes. It should also be mentioned that far from everyone is attached to the cyborg idea.

The futures suggested by Harari and Gray are indeed one possibility, but just that-- one possibility. Swain (2014), on the other hand, contends the dystopian futures of competitive hierarchies with some human-cyborgs at the top with non-augmented humans at the bottom (Harari and Gray) to be unlikely, as people won’t be competing for augmentive implants but rather, given the diverse interests and ways of life among human beings (given different personal histories), people will choose to augment themselves in a great variety of different ways. But this could result in other social problems. These different ways of life may also result in very different implants and associated differing ways of thinking about the world. Just as different species with different sensory organs may have different concepts and cognitive abilities than human beings, cyborgization may contribute to different kinds of post-human species.[[33]](#footnote-33) While adding artificial anatomical parts and implants that connect to the internet are one thing, larger, more far reaching changes are likely. [[34]](#footnote-34) For example, a change involving systems such as the visual system might allow recipients to experience time on a different scale than unaltered human beings.[[35]](#footnote-35) Along with such differing experiences of time that are tied in with implants modifying cognitive abilities, and likely associated changes in psychologies might greatly complicate our notion of differing species and notions of ‘the other’.

Hence, while in the early stages of cyborgization, social and financial inequalities might develop among individuals and groups, more serious issues may arise in the longer term. Dyson (2019) expresses the concern that our abilities to engage in genetic engineering (if poorly thought through) may threaten the “nurture of a brotherhood of man”---our slowly being brought together by the sharing of our arts and sciences across cultures with the ultimate goal of achieving “a human society that is manageable if not always peaceful”. Buchanan and Powell express a related view in their book The Evolution of Moral Progress (2018) [[36]](#footnote-36). These authors contend that an important aspect of what can be considered moral progress involves including more of ‘the other’ under people worthy of moral consideration. Dyson considers other conditions where the slow ongoing ‘brotherhood of man’ may reverse, namely, where cultural evolution conflicts with our biological evolution. If our cultural evolution supports large bodily implant modifications as suggested in the previous paragraph, central notions across areas such as the arts and sciences, morality and political arrangements may widen with unknown consequences. Further, talk of making a ‘more humane society’ will become increasing problematic in that human beings as we now know them will no longer exist as a single species.

Final Thoughts

Before I unplug myself, I’d like to just acknowledge the obvious, that we don’t have any solid ideas about any long-term future positives or negatives that may be associated with increasing cyborgization, or even whether cyborgization will even increase, despite its popularity and attention in the present-day media.[[37]](#footnote-37) History has also shown that predictions about the future (usually utopian or dystopian), [[38]](#footnote-38) are far from certain. It also goes without saying, so I’ll say it, even if cyborgian technologies become available and prevalent, it is likely that not all will buy into the technologies for political, philosophical, religious, or even personal reasons. A number of people would not even consider the super-powered ‘Six-Million Dollar Man’ of 1970’s TV fame a cyborg (even though he is considered one under the Wikipedia definition) since he retained largely **human** cognitive, emotional and moral abilities and concerns. Very different cognitive or emotional structures may be required for the label ‘cyborg’ for such individuals. The largest changes to human nature may likely involve genetic engineering rather than technological implants which may enhance our already-present human abilities rather than provide us with extensive totally new abilities, which will be reserved for robots and other artificial intelligences.

On the physical level, in the foreseeable future, all sorts of medical and engineering problems would likely arise with the addition of such foreign parts into our biological bodies (we would need things like 10,000 hour warranties and maintenance/servicing contracts). Just as unpredictable consequences occur today with drug interactions, we would want to avoid serious internal electronic implant interactions.[[39]](#footnote-39) We don’t know how having an increasing number of or types of implanted devices may interact with our **biological** body over time, or the implants with each other. Could implants eventually even change the brain structure itself in unanticipated ways in groups with particular implants? [[40]](#footnote-40)

We will just have to wait and see. It would seem however, that implants that enhance or modify or provide human beings with new cognitive possibilities would likely require us to modify our psychology textbooks, religious beliefs and philosophical insights.

Hopefully, this article, along with the wide variety of articles, with their differing views, in the references below may provide a start to such engagements.

**WHAT DO YOU THINK?**

 Further reading (organized by year of publication):

----M. Caidin (1972) Cyborg. Del Ray. In this science fiction novel a physically damaged person is given new strengths by new mechanical body parts. The popular 1970’s TV series The Six Million Dollar Man was based on this book. The human mind seems unaffected by the implants in both the novel and TV series.

-----D. Haraway (1985) “A cyborg manifesto: science, technology, and socialist feminism in the late twentieth century,” Socialist Review, 80, 65-108. Also, D. Haraway (1996) Simians, Cyborgs and Women: the reinvention of nature. Routledge. Haraway is a leading Feminist thinker on technology and suggests that the cyborg ideal will provide us with an escape from the rigid distinctions of gender in a coming post-gender world. More recently, Haraway has gathered many of her writings in one book. D. Haraway (2016) Manifestly Haraway. University of Minnesota Press,

-----A. Clark (2004) Natural Born Cyborgs. Oxford University Press. Philosopher Andy Clark contends we are already early cyborgs since we utilize mind-extending technologies all the time and, indeed, think and feel using these tools. Clark is a prominent advocate of the external mind thesis. See also A. Clark (2000) “Natural Born Cyborgs” Edge. https://www.edge.org/conversation/natural-born-cyborgs

-----K. Toffolett (2007) Cyborgs and Barbie dolls: Feminism, Popular culture and the Post-human Body. L. B. Tauris & Co Ltd. An examination of a set of popular, cultural icons (Barbie dolls, Goth Marilyn Manson, etc.) suggesting they are more ambiguous than our culture traditionally presents them. On Toffolett’s view, these icons can be considered in a post-modern spirit to undercut traditional, simplistic notions of gender, race and ethnicity. Not an easy read.

------K. Warwick. (2010) "Future Issues with Robots and Cyborgs," Studies in Ethics, Law, and Technology. 4/ 3, DOI:10.2202/1941-6008.1127. A very worthwhile framework for those interested in the potential uses of implants that can be used for therapeutic or enhancement purposes. The author describes four different, but overlapping, investigative possibilities in the field of implants. The use of implants for identity and security considerations; interfaces between robotic components and human neurons; deep brain stimulation technologies, and general-purpose brain implants that might provide human beings with some of the ‘advantages of machine/artificial intelligence.’ The author is aware throughout the article of social and moral issues that will likely arise with such advances in cybernetic technologies. A must-read for those interested in the topics of cyborgs and post-humanism.

----A. C. Madrigal (2010) ‘The man who first said ‘cyborg’, fifty years later.’ The Atlantic (online). <https://www.theatlantic.com/technology/archive/2010/09/the-man-who-first-said-cyborg-50-years-later/63821/> The word ‘cyborg’ was coined by Manfred Clynes in 1960 and the word firs appeared in the September issue of the journal Astronautics. Clynes considered the cyborg a cybernetic organism at the ‘interface between the organism and technology’. He considered cyborgs to be human and did not anticipate the flurry of competing new overlapping definitions that would arise in the coming years. He also did concern himself with future technological-human hybrids possibly resulting in new species or super-humans.

----G. Dvorsky (2012) “Should we upgrade the intelligence of animals.” i09 We come from the future. <http://io9.gizmodo.com/5943832/should-we-upgrade-the-intelligence-of-animals>

A positive view of animal enhancement. Addresses several bio-ethical concerns and concludes that, overall, animal enhancement should be seriously considered. The author prefers genetic and psychopharmacological therapies over mechanical implants in animals. A well-written, short introduction to the topic that could be read by middle and high school students.

----D. L. Smith (2012) Less than Human: Why we Demean, Enslave, and Exterminate others. St. Martin’s Griffin. A main concern with enhancing human beings is our human nature and our tendency to dehumanize others. Given that we seem to find ways of doing so whether based on appearance, ethnicity or cultural interests, this is an issue that will especially need to be addressed if we can make ourselves stronger, smarter, or more creative in abilities that can be used for good or ill. The author is optimistic that our biological traits are modifiable. It may be that bio-mechanical implants could make additional contributions here.

----J. Federer (2013) “Technology in the Classroom: Google, Cyborgs, and the Future of Education.” Teach Hub.com. <http://www.teachhub.com/google-cyborgs-and-future-education>

A short piece on how future technologies might impact education in a few decades. An enjoyable read.

----E. Anthes (2013) “Should we make animals smarter?” Boston Globe, March 31. <https://www.bostonglobe.com/ideas/2013/03/30/should-make-animals-smarter/zbW4LTWkP8TZgB93Mqw7QJ/story.html>

A readable, short, partner article to Dvorsky (2012). While enhancing animals (also known as “uplifting animals”) may help them survive better in natural environments, the article describes possible problems such as increased animal abuse, the issue of who is to judge what is best for other species, and increases in different forms of negative competition among enhanced species. (A more recent discussion of this issue can be found in M. Schultz-Bergin (forthcoming) ‘The dignity of diminished animals: species norms and engineering to improve welfare’ Ethical Theory and Moral Practice).

----K. Miller & D. Larson (2013) “Measuring a distance: humans, cyborgs, robots.” American Philosophical Association Newsletter, Fall, 20-24. <http://c.ymcdn.com/sites/www.apaonline.org/resource/collection/EADE8D52-8D02-4136-9A2A-729368501E43/ComputersV13n1.pdf> A philosophical examination of the concepts human, cyborg, and robot. Defends a continuum approach to the human-cyborg distinction. Asks important questions about how society might adapt to cyborgs. [Reprinted in APA newsletter: Philosophy and Computers, Spring 2020, 19/7, 69-74]. See also Ferrando (2013).

-----C. Lavigne (2013) Cyberpunk women, Feminism, and science fiction: a critical study. McFarland, & Co, Inc. An academic feminist book that corrects the common misperception that men dominate the best cyberpunk fiction. Many women have written excellent science-fiction addressing issues in connection with virtual reality and cyborgs, and have not neglected the use of queer characters in their writings.

----R. Braidotti (2013) The Posthuman. Polity Press. A feminist analysis of post-human ideas. Explores future issues on multiple identity, post-colonialism, gender and the environment. Not an easy read.

-----F. Ferrando (2013) ‘Posthumanism, transhumanism, antihumanism, metahumanism, and new materialisms’. Existenz, 8/2 (fall), 26-32. https://existenz.us/volumes/Vol.8-2Ferrando.pdf

Ferrando points out that the expression ‘post-human’ is ambiguous, encompassing disparate notions such as post-humanism, variants of transhumanism in all its own sub-variants, new materialisms, and post-humanities. The author describes the roots of these various conflicting and overlapping expressions and the similarities and differences among the evolving movements associated with these expressions.

----M. Carroll (2014) “Part human, part machine, cyborgs are becoming a reality.” Newsweek, July. <http://www.newsweek.com/2014/08/08/cyborgs-are-walking-among-us-262132.html>

This article describes several people who already consider themselves cyborgs with particular implants in their bodies such as a bionic implant that allows one to detect colors along with infrared and ultraviolet light. Another person claims to wear an earthquake detector and a third an implant that monitors biological functions. See also, Warwick (2010) Wainwright (2015) and Booton (2016).

-----A. Walker, K. Walker, & S. Carruthers (2014) Super You: How Technology Is Revolutionizing What It Means to Be Human. Que Publishing.

An optimistic, readable overview of how we are taking control of our own evolution and are already cyborgs. The authors advocate a non-continuum view of cyborg-hood. They believe that Cyborgian technologies will allow us to live longer, to acquire superhuman physical and cognitive abilities, and to reverse aging and eliminate death.

-----B. Wittes & J. Chong (2014) “Our cyborg future: law and policy implications.” Center for Technology Innovation, Sept. <https://www.brookings.edu/research/our-cyborg-future-law-and-policy-implications/> Our present-day laws do not recognize machine or cyborg rights. This intriguing article contends that as we become more cyborg, difficult choices will occur regarding our interpretation of legal policies respecting how closely connected to us we wish to view our machine parts. A very engaging article. See also Cabrera and Carter-Johnson (2018).

-----F. Ferrando (2014) ‘Is the post-human a post-woman? Cyborgs, robots, artificial intelligence and the future of gender: a case study. European Journal of Futures Research, Dec. <https://link.springer.com/article/10.1007/s40309-014-0043-8>

A very thoughtful article pointing out that technological developments have their seeds in the past and are not separable ‘from the social and cultural contexts in which they are generated and employed.’ The concern is that as we increasingly develop into cyborgs, sexist, racist, and ethnic notions may channel the appearance and abilities of these super-humans. Further, cultural beliefs will likely influence their initial reception by society. The article supports these concerns with the results of a questionnaire inquiring about the cultural perceptions of students in the field of cybernetics. See also, F. Ferrando (2012) ‘Humans, cyborgs, posthumans’. TED Talk

<https://www.youtube.com/watch?v=RGjMUw03Bv0>

----F. Swain (2014) “Cyborgs: the truth about human augmentation” BBC Future, Sept 24, <http://www.bbc.com/future/story/20140924-the-greatest-myths-about-cyborgs>

A down-to-earth view of technologies that might enhance human beings, including cyborgian ones. The author points out that for the foreseeable future there will be a ‘big gulf between the fantasy vision of cyborgs and the current reality of being dependent on implants” Rather than the dystopian future predicted by many techies, he contends that it is more likely people will allow people to augment themselves in a large variety of different personal ways.

----J. Wells (2014) “Keep calm and remain human: how we have always been cyborgs and theories on the technological present of anthropology”. Reviews in Anthropology, 43, 5-14. DOI: 10.1080/00938157.2014.872460. A very nice introduction to the emerging field of cyborg anthropology----the study of the two-way intersection between human beings and their technologies. For more information on this field check out http://cyborganthropology.com/Main\_Page

----Y. Harari (2015) “Dawn of the cyborgs: how humans will turn themselves into gods.” Guardian (UK) online. [www.theguardian.com/science/shortcuts/2015/may/26/cyborgs-how-humans-will-become-gods-yuval-harari](http://www.theguardian.com/science/shortcuts/2015/may/26/cyborgs-how-humans-will-become-gods-yuval-harari) The Israeli historian Harari contends that only the very rich will be able to afford the emerging cyborg technologies and will consequently enjoy far better health and happiness than the rest of us. See also Harari (2016).

----O. Wainwright (2015) “Body-hackers: the people who turn themselves into cyborgs.” Guardian online, August 14. <http://www.theguardian.com/artanddesign/architecture-design-blog/2015/aug/14/body-hackers-the-people-who-turn-themselves-into-cyborgs>. An overview of many of the devices people are now implanting into their bodies. See also B. Booton (2016), Carroll (2014), Klotz (2016), Hudson (2017).

-----M. Gray(2015)The Brain Electric: The Dramatic High-Tech Race to Merge Man and Machine. Farrar, Straus and Giroux. A readable overview of the technologies that are producing prosthetic limbs and are allowing us to manipulate computers using our minds. The author also describes applications of these technologies in other areas such as the military.

# ----P. Nowak (2015) Humans 3.0: The Upgrading of the Species. Lyons Press. Nowak presents a nuanced future of our increasing cyborgization and enhancement technologies. While he is aware of potential negative consequences of forthcoming technological and biological innovations, he emphasizes the positive improvements possible by the same technologies.

----S.Bateman; S. Allouche; J. Gayon; M.Marzano; & J. Goffette (eds) (2015) Inquiring into Animal Enhancement. Palgrave Macmillan. Chapters raise a number of conceptual and ethical issues in the field of animal enhancement. The goals, techniques, and strategies of those working in the field are covered. A thoughtful overview of the area of animal enhancement.

----R. Grusin (Ed.) (2015) The Nonhuman Turn. University of Minnesota Press. A most interesting book. Perhaps our focus on and privileging of human beings needs to be superseded. A wide variety of essays on emerging disciplines that focus on the non-human (animals, technologies of all kinds, geophysical systems, etc.) and their implications for fields such as the arts, social sciences, and humanities. This book will especially be of interest to transhumanists and those who view the future in a far wider way that most of us presently do.

----Transhumanism: Rise of the Human Gods & Humanoids (2015). You tube: <https://www.youtube.com/watch?v=Ho4761LsOgs>

----Transhumanism: Man Merging with Machine: Progress in 2016. You Tube.

<https://www.youtube.com/watch?v=U2UWkGfd7fg>

For those of you who like visual presentations, the above are video introductions to the ideas of those in the trans-human movement. These would be useful to students at high school or university level.

# ----W. Barfield (2015) Cyber-Humans: Our Future with Machines. Copernicus books. A very good overview of many present-day implants that extend the skills and abilities of human beings in various fields. The book covers a large variety of topics including future questions of law and policy. Topics covered include artificially intelligent brains, issues centering around freedom regarding brain reading and accurate lie detection, hacking the body, sensors, and future mergers with AI machines.

-----S. Gibbs (2016) ‘US military aims to create cyborgs by connecting humans to computers’. The Guardian, Jan. <https://www.theguardian.com/technology/2016/jan/20/us-military-cyborg-connecting-humans-computers>. Gibb describes a US program aimed at allowing soldiers to (ideally) connect individual neuros to computers. This would allow more specific control over movements and heighten hearing and vision. Those involved in the projects emphasize that we are still in the early stages of such applications.

----Y. Harari (2016) Home Deus: A Brief History of Tomorrow. Harvill Secker. The author, an Israeli historian, contends that we are, for the first time in history, on the edge of transforming human nature itself through our biological and artificial intelligence technologies. His concern is that we are not aware of the consequences, and that a small group of entrepreneurs (from Google, Facebook, and Silicon Valley) are making the decisions for us regarding the direction in which the technology is taking us. Well written and thought-provoking. Highly recommended.

-----J. Gray (2016) “Humanity Mk 11: Why the future of humanity will be just as purposeless as the past.” New Statesman, Oct 13. <http://www.newstatesman.com/culture/books/2016/10/humanity-mk-ii-why-future-humanity-will-be-just-purposeless-past> A pensive review of Harari’s (2016) view of the changes on the horizon that technology will remake human nature. Gray is even less optimistic about our future than Harari. Gray is bracing as always.

----M. Roach (2016) Grunt: The Curious Science of Humans at War. W. W. Norton.

A review of the new technologies that are being used to keep soldiers alive and combat ready on the battlefield. Roach actually tries out many of these technologies herself. If you are interested in where military thinking is going this book will be of great interest. Covers topics such as clothing, reconstructive surgery and relevant issues such as dealing with sleep deprivation.

----S. Gibbs (2016) “US military aims to create cyborgs by connecting humans to computers.” Guardian, Jan 20. <https://www.theguardian.com/technology/2016/jan/20/us-military-cyborg-connecting-humans-computers> This article claims the US military is hoping to turn near-future soldiers into cyborgs by implanting devices into their brains that allow them to directly connect with computers. While such devices could contribute to helping those with brain disorders, the main impetus for such research may be military applications.

----Elon Musk (2016) “We’re already cyborgs.” The Verge, June. <http://www.theverge.com/2016/6/2/11837854/neural-lace-cyborgs-elon-musk>

Musk (always worth listening to) claims we are already all cyborgs on account of our digital connections using smartphones and personal computers. He warns that if we don’t soon directly connect our brains with digital intelligence we could end up as pets of future AI (artificial intelligence/robots). Those refusing to cyborg-up will become the techno-rubes of the near future.

-----A. Garrison (2016) Mind, Machine, and the Empathic Revolution: Manifesto for a New World. Create Space Independent Publishing. The author claims that a lack of empathy for others is a major problem in the world today. He contends that technologies can be used to augment our emotional intelligence and reduce the amount of suffering in the world.

----H. Wiseman (2016) The Myth of the Moral Brain: The Limits of Moral Enhancement. MIT Press. Moral enhancement is a hot topic for some cyborg and transhumanism advocates. On their view, implants might be able to alter the brain and increase the likelihood of moral behaviour. This book says, “not so fast.” The author points out the sheer complexity of morality with its myriad cultural, religious, group and individual influences. The author favours biomedical contributions along with attention to religious community approaches.

----A. Maynard (2016) “Considering ethics now before radically new brain technologies get away from us.” The Conversation, Sept 14. <https://theconversation.com/considering-ethics-now-before-radically-new-brain-technologies-get-away-from-us> While the author acknowledges the potential benefits of wireless implants in our brains for treating various neurological conditions, he is concerned about their possible misuse – such as altering our thoughts, feelings and perceptions without our consent. A useful update on emerging technologies is well presented in the second part of the article. See also Warwick (2010).

# -----S. Vallor (2016) Technology and the Virtues: A Philosophical Guide to a Future Worth Wanting. Oxford University Press. A virtue ethics (character ethics) approach to many problems in technology, including human enhancement (see Chapter 8).

----S. Clarke, J. Savulescu, C. A. J. Coady, A. Giubilini, & S. Sanyal (eds.) (2016) The Ethics of Human Enhancement: Understanding the Debate. Oxford University Press. Talk about cyborgs is tied into the large area of human enhancement, and this book gives an overview for academics of the debates between those who support human enhancement and those who are more cautious and skeptical of what it promises to deliver and what we might lose. The purpose of the book is to inform readers of the arguments on both sides and try and move the debate forward.

-----M. Hall (2016) The bioethics of enhancement: transhumanism, disability, and biopolitics. Lexington Books. A very thoughtful Feminist-inspired overview of the political aspects of transhumanist views on human enhancement and their tie-in to what is considered ‘best’ for human beings, and who is left out. Provides a good summary of the blueprints of enhancement strategies in the 20th century and their tie-ins with recent 21st transhumanist utopian ideals. The book will be of special interest to those in special education with concerns regarding our Western views of disabilities. Hall contends there are no moral obligations to enhance ourselves through genetics or technologies, as some proponents contend. See also, the chapter by Linda Barclay on enhancement and disability in Clarke, *et al* (2016).

-----S.K Nagel & P.B. Reiner (2016) “Embedded beings: how we blend our minds with our devices.” Aeon Magazine, Oct. <https://aeon.co/ideas/embedded-beings-how-we-blended-our-minds-with-our-devices> The authors believe that the extensive blending of modern technologies with our minds threatens our autonomy and privacy.

-----A. Paliwal (2016) “Beyond sexual orientation.” Nautilus, Oct. <http://nautil.us/issue/41/selection/beyond-sexual-orientation>

This interesting article does not directly address cyborg issues but provides important background for thinking about the topic and gender. Argues for the fluidity of gender identity for many people. A number of people experience changes in attraction and variability in sexual identity over time. I’ve added this article to counteract the over-simplistic representation of sex and gender predominant in discussions of sexuality, gender and cyborgs (especially in movies and other media).

----A. Adams (2016) “Can a monkey type Shakespeare?” Stanford Engineering, <https://engineering.stanford.edu/news/can-monkey-type-shakespeare> A report on a brain implant that allows monkeys to move a computer mouse. The researchers (at Stanford University) are working on several methods of interfacing with the brain. These brain interfaces will likely be components in near future cyborgs.

---- H. Ellis-Peterse. (2016) “Racial identity is biological nonsense, says Reith lecturer.” The Guardian, Oct 18. A good reminder that our notions of nationalism, religion, race, and sexual orientation are cultural inventions of local identity. One hopes, consistent with the views of many feminists, that in the near future, the development of cyborgian-related technologies will undercut many of our simplistic binary distinctions. At the same time, we can’t rule out the possibility that our **human** cyborg component will find new ways to dehumanize others.

---- M. Brownstein & J. Saul (Ed) (2016) Implicit Bias and Philosophy (vol.1 & 2). Oxford University Press. Given the biological component of cyborgs and potential problems arising from this, further thought must be given to the naturally arising biases associated with our nature. These two volumes are aimed at academics and describe recent empirical literature on implicit biases and their role in underlying structural and institutional inequalities in society. Several ways of removing or limiting implicit biases are explored.

----Q. Moore & Richards-Kortum (2016) “Digital health devices are great, but their prices are widening the health gap.” The Conversation, Oct 17. <http://theconversation.com/digital-health-devices-are-great-but-their-prices-are-widening-the-health-gap-63380>. Many poor people cannot afford devices that would improve their health, creating a gap in health care. Would this gap widen in a cyborg age? (Also, Harari, 2015 & 2016).

----F. Van Scoy (2016) “Moving toward light at the speed of thought.” The Conversation, Oct. https://theconversation.com/moving-toward-computing-at-the-speed-of-thought-

An article that those in education will find relevant. The author says that human beings will soon be able to communicate directly with computers, creating the possibility of new virtual experiences in history classes, video games and other subjects. See also, Adams (2016).

---- “Artificial intelligence and life in 2030.” (2016). Can be downloaded (for free) at <https://ai100.stanford.edu/sites/default/files/ai100report10032016fnl_singles.pdf>

A report generated by a group of leading academic and industrial thinkers. A useful read for teachers and academics on what life *may* look like in a typical North American city 25 years from now. Sections cover transportation, robots, health care, education, entertainment, security, and the job market. An excellent non-technical overview of the field of artificial intelligence and its possibilities. A good source of topics for discussion in the classroom. The report does not discuss many of the issues brought up in this paper, and assumes human beings won’t be cyborgs any time soon. It provides great background information for any such discussions.

----J. Booton (2016) “How I became a cyborg and joined an underground medical movement.” MarketWatch, Dec 26. <http://www.marketwatch.com/story/i-joined-an-underground-medical-movement-but-had-to-become-a-cyborg-to-do-it-2016-11-15> An up-to-date description of an underground (so far) American “bio-hacker” trans-human movement where people obtain implants. This “cyborg culture” (the author’s expression) is largely (so far) focused on implanted devices that monitor health.

----F. Klotz (2016) “What it takes to be a cyborg.” Motherboard, Mar 8. http://motherboard.vice.com/read/biohacking-implants-cyborg-fair

Cyborg subcultures are arising in China, Malaysia, Germany, Sweden, the US and the UK. A description of the popular devices people around the world are implanting in their bodies.

----E. Schwitzgebel (2016) “My daughter’s rented eyes.” The Splintered Mind (Blog), Oct 11. <http://schwitzsplinters.blogspot.ca/2016/10/my-daughters-rented-eyes.html>

Schwitzgebel is one of the most creative philosophers around and is always worth reading. In this short science-fiction piece about how companies might encode software into their Cyborgian products: a daughter is provided with rented-eyes that make the wearer turn toward particular products in grocery stores. A cautionary tale. What Schwitgebel is suggesting is not out of line with what we might expect from advertisers. Read T. Garvey (2016) The persuaders: the hidden industry that wants to change your mind. Icon Books, led.

----M. O’Connell (2017) To Be a Machine: Adventures Among Cyborgs, Utopians, Hackers, and the Futurists Solving the Modest Problem of Death, Granta, A fascinating set of interviews with various types of transhumanists. All exhibit a strong faith in what technology can deliver in the near future. A diverse set of interests are involved for the individuals interviewed. The topics cover extending lifespans, curing disease, ending death, uploading minds to computers, being frozen after death, etc. One individual is saving himself for sex-robots because they are less likely to cheat on him and give him STD’s. If sex-bots develop high AI, could one cheat on a sex-bot? This might be tied into the issue of obligations/rights for robots. [see E. Schwitzgebel (2016) ‘We have greater moral obligations to robots than to humans’ Aeon magazine, <https://aeon.co/ideas/we-have-greater-moral-obligations-to-robots-than-to-humans> ]

-----K. Warwick (2017) “A cyborg’s take on utopia.” IAI News, Feb 2. <https://iainews.iai.tv/articles/a-cyborgs-take-on-utopia-auid-765>

Ken Warwick was likely the first person to incorporate cyborg technology into his body. A very short essay tying in cyborgization with the human enhancement movement. Focuses on potential enhancements that will provide us with extended abilities. His concern is that a gap or split may occur between those who desire these enhancements and those who reject the technologies, for whatever reasons. He asks,

“For those with the implanted technology, with the ability to communicate by thought, will they really still want to communicate with ordinary humans who do not have the same abilities? Or will they merely ignore them and get on with their technologically enhanced lives? For you as an individual, would you want extra mental abilities or would you prefer to be left behind in some form of sub-culture?”

  See also <https://iai.tv/video/cyborg-future> and Warwick (2010).

----T. O’Reilly (2017) ‘What will our lives be like as cyborgs’. The Atlantic (online). https://www.theatlantic.com/technology/archive/2017/10/cyborg-future-artificial-intelligence/543882/ An optimistic, wide-ranging overview of the influence of technologies on our lives and future possibilities. Our technologies have always augmented us both physically and mentally by providing an increase in knowledge and control over ourselves and nature. The author does not share the doom and gloom scenarios of a number of observers of the AI field. He contends that advances in AI and related technologies have great potential to simplify, make more interesting, or make more available many of the activities we presently engage in along with newer tools that enhance the quality of our lives.

----D. Robitzski (2017) ‘Researchers anticipate problems as cyborgs become a reality’ Inverse, May 31st, <https://www.inverse.com/article/32271-cyborg-research-issues-looking-forward>

We tend to envy those who are richer and stronger than we are. Would we feel the same way about cyborg individuals, as they enter society, who are stronger, or have more sensive sense organs etc?

----W. Barfield & A. Williams (2017) “Cyborgs and enhancement technology.” Philosophies, 2/1. <http://www.mdpi.com/2409-9287/2/1/4/htm> After reading Warwick (2010, 2017), a useful and thoughtful follow-up would be this excellent article. A very in-depth overview of body implantation technologies. The authors adopt a non-continuum view of cyborgs (“A person with a heart pacer is a cyborg as is a person with an artiﬁcial arm controlled by thought” (p.2)). The authors describe the wide range of medical and non-medical technologies that are or will soon be available. They further introduce the likely effects cyborg technologies will have on our self-identity and notions of human nature. A worthwhile article to discuss in classes in both high school and colleges.

-----A. Porter (2017) “Bioethics and Transhumanism.” Journal of Medicine and Philosophy, 42: 237–260. Porter introduces an entire issue of JMP devoted to transhumanism – a social, political, and intellectual movement that encourages the use of technologies to improve human beings with the ultimate goal of becoming “post-human.” Porter says concerns of “personhood” and “moral status” will be central features of debates with the emergence of post-humans and robots along with possible contact with extraterrestrial aliens.

-----M. Hudson (2017) ‘Beyond the five senses’ The Atlantic, July/August. <https://www.theatlantic.com/magazine/archive/2017/07/beyond-the-five-senses/528699/>

This article focuses on how our perceptions (literally) of the world might change if we “had new and different senses.’ For example, what if we could hear pictures, acquire echolocation, see ultraviolet, detect earthquakes anywhere on earth, and directly sense other people’s moods?

-----A. Martin (2017) ‘Transhumanism: the final chapter in humanity’s perpetual quest to be kitted out in comforting accessories’ Independent (UK), Aug 24. <http://www.independent.co.uk/news/long_reads/transhumanism-third-thumb-add-ons-naked-ape-contact-lenses-a7909791.html> . A short piece pointing out that we human ‘bags of water’ have never been ‘naked apes’ but have always used accessories to cover ourselves and do things, and becoming more cyborgy is just a continuation of this. Those who don’t ‘cyborg-up’ will end up being the equivalent of the village idiot. Some fascinating tidbits along the way, did you know Jules Verne ‘predicted newspapers made out of chocolate that you could eat after reading them, or that Jules was not a big fan of bicycles? Neither did I.

-----A. Sagan & P. Singer (2017) ‘Do you want to be a cyborg?’ Project Syndicate, May 16. <https://www.project-syndicate.org/commentary/elon-musk-cyborg-ambition-by-peter-singer-and-agata-sagan-2017-05> The authors are sympathetic to Elon Musk’s view that we must either become neurologically tied-in with computer in the near future or become eliminated by super-smart AI in the future. This will, according to the authors, require experimenting on healthy human beings and other animals and will also require relaxing the strict present-day regulations on human participants in research. Reading this in conjunction with Ferrando (2014) and Maynard (2016) will contribute to lively class debates for undergraduate students in philosophy, the social sciences and technology.

----M. Coeckelbergh (2017) New Romantic Cyborgs: Romanticism, Information Technology, and the End of the Machine, MIT Press.A different take onour fascination with cyborgs and other aspects of modern communication technologies. Much of our fascination with cyborgs and robots is partly due to roots in re-enchanting the world that has been taken away by much of modern science and technology. On the author’s view, Romantic philosophies of the last few centuries and technology are more complexly tied together than we have typically thought.

----R. Blackford (2017) Science Fiction and the Moral Imagination: Visions, Minds, Ethics. Springer. A useful overview of the recent history of science fiction by a philosopher concerning how sci-fi has addressed a number of moral concerns over the last century. Chapter 7 is a most interesting chapter for those interested in how science fiction has dealt with moral issues concerning cyborgs, post-humans, human enhancement, and those who are ‘just different’. What surprised me was that a good number of the concerns about enhancement technologies and our interactions with ‘the other’ expressed today have been a central feature of science fiction writers for a long time.

----B. Davies (2017) “Enhancement and the Conservative Bias.” Philosophy and Technology, 3, 339-356 A reflective consideration of the effects radical enhancement modifications we might undergo could have on significant others in our lives who do not have, or do not wish to have, similar enhancements.

---- F. Foer (2017) The World Without Mind: The Existential Threat of Big Tech. Penguin press

A strong critique of Silicon Valley and the increasing control tech companies are considered as having on our lives: from collecting detailed on-line data about our private lives to subtly influencing our beliefs and available choices by the selection of what information is presented to us on-line. Foer contends that Tech companies are undermining democracy and individual choice. In regards to cyborgs, what enhancements would be available and what secret information gathering programs would be embedded in those technologies would be a concern for Foer. Interesting book and a good source for the technophobe.

----S. A. Midson (2017) Cyborg Theology: Humans, Technology and God. Bloomsbury.

This book is different from the majority of other books and articles on the topic of cyborgs and provides a theological interpretation of Haraway’s writings on cyborgs. Midson advocates a ‘theological cyborgology’ tied to relationships rather than focusing on cyborg components and separateness from others and nature. See also, Gocke, 2018.

-----S. Perkowitz & E. von Mueller (2018) Frankenstein: How a Monster Became an Icon: The Science and Enduring Legacy of Mary Shelley’s Creation. Pegasus Books. This book is worthwhile reading alongside Coeckelbergh (2017). This book provides an overview of the worldwide influence Shelley’s early nineteenth century novel Frankenstein had on both popular culture and the ethical concerns it raised about the direction modern technologies are taking us. The views of a variety of scientists, academics and artists are surveyed. Our notions of the cyborg may be a contemporary Frankenstein figure.

----- Harari (2018) ‘Will the Future Be Human?’ WEF Annual Meeting Presentation. https://www.youtube.com/watch?v=npfShBTNp3Q&feature=youtu.be

Harari says No. Harari contends the most important influence on our future will be data (especially bio-metric data). In the near future, Harari believes, humanity will split into different species. While hacking today involves computers, in the near future it will involve hacking human biology.

-----D. Berlinski (2018) ‘Godzooks’ Inference: International Review of Science. 3, 4. <http://inference-review.com/article/godzooks#When:00:35:00Z>

A sustained critique of the assumptions underlying Harari’s two books Sapiens (2014) and Homo Deus (2016). Berlinski contends Harari’s views are guilty of Scientism along with the advocation of very problematic guesses under the guise of serious speculation. He disagrees with Harari’s notions that organisms and their consciousness and emotions are just biological algorithms, that contemporary human beings are less violent than in the past, that free will is an illusion, that the human mind is reducible to the brain alone, that in the near future we will lose our social usefulness to artificial intelligence, that Dataism will be the unifying theory of the future, and alleges that talk of Deep Learning isn’t very deep at all. Worth reading and pondering.

----L. Cabrera & J. Carter-Johnson (2018) ‘It’s not my fault, my brain implant made me do it.’ The Conversation, April 3. <https://theconversation.com/its-not-my-fault-my-brain-implant-made-me-do-it> This short article brings up the important point that brain implants can “influence an individual’s perception of the world and behavior in undesirable ways.” Where do legal and moral responsibilities lie in such cases?

---- G. Bhattacharjee (2018) The Age of Man-Machine Hybrids. Dream 2047, November, 21/2.

<http://vigyanprasar.gov.in/wp-content/uploads/dream-nov-2018-eng.pdf>

A very understandable overview of the revolutionary changes technological changes are making across the entire landscape. Contends future advances will make ‘pure’ human intelligence redundant since we will all meld with AI, making talk of ‘us’ versus ‘them’ moot. A very good overview of present day cyborg technology and future possibilities. A useful introduction for discussion with high school or undergraduate college students.

# ----L. MacFarquhar (2018) The Mind-Expanding Ideas of Andy Clark. The New Yorker, April 2.

<https://www.newyorker.com/magazine/2018/04/02/the-mind-expanding-ideas-of-andy-clark>

A wide-ranging interview that covers many of the influences on Clark’s views on a variety of topics. Clark is an advocate of the ‘extended mind thesis’ that we cannot separate our mind and self from the tools we use. This view has implications across a variety of disciplines. For example, with the advent of widespread cyborgian technology our notions of privacy and independence may change extensively, and perhaps for the better!

----B. P. Gocke (2018) Christian cyborgs: a plea for a moderate transhumanism.

Faith and Philosophy, 34/3, 347-364. The majority of articles discussing cyborgs come from a secular perspective. While this reflective paper incorporates secular concerns about cyborgs, the author contends that there is nothing in the transhumanist agenda that is necessarily at variance with Christian beliefs. (see also, Midson, 2017).

----Popular Science (2018) Your New Brain: When Humans and Computers Merge. Popular Science: Special Issue. pp. 70-81. The issue is devoted to ways we are upgrading the human brain. The first section of the issue describes common myths we have about the brain, the lack of interchangeability between the terms IQ and intelligence, problems with the accuracy of our ‘first’ memories, the teenage brain, ways to improve your memory, and ethics and epistemological issue concerning lab grown brains. The second section on medicine oncerns recent brain mapping, new migraine drugs, using electro-shock therapy for PTSD, the state of our knowledge about Alzheimer’s, the present state of using wireless implants, and some problems with the idea of head implants. The third section entitled ‘Enhancement’ includes influences of recreational drugs on brain chemistry, medical drugs and brain function, artificial neurons, implanting new (false) memories into our brains using CRISPR or nano-particles, injectable mesh, longevity, intelligence and hormones. The final section, ‘Tech’ describes some of the uses of brain implants for disabilities, communicating with patients with locked-in syndrome, ad open-source brain-computer interfaces. An interesting short piece describes the possible uses of brain implants to modify the brains of criminals, the possibility of mind-transfer and mind-uploading and brain simulation. A nice introduction to the present state of human-computer interactions for the curious.

----‘Cyborgs’ (2018) Encyclopedia of Science Fiction. [www.sf.encyclopedia.com/entry/cyborgs](http://www.sf.encyclopedia.com/entry/cyborgs)

Science fiction fans will enjoy this overview. The entry distinguishes among different types of cyborgs and includes reference to both Sci-fi novels and short stories involving cyborgs.

----J. Gray (2019)The new tech totalitarianism: when companies know more about us than we do. New Statesman, February 6. <https://www.newstatesman.com/culture/books/2019/02/new-tech-totalitarianism> . Gray describes concerns about the increasing capitalist surveillance that is gathering more and more data on each of us. He contends that while more effective democratic government might rein in big data companies to some extent, criminal and totalitarian regimes will remain threats for the foreseeable future. Reading this article in conjunction with Clark’s New Yorker interview (MacFarquar, 2018) may be enlightening here. If we all become part of a human-AI connected world, the future might be very different from what can be imagined and present-day concerns about individual data collection no longer an issue since we might all have access to all of it.

----B. Anderson (2019) Researchers create ‘rat cyborgs’ that people can control with their minds. Discover (online). <http://blogs.discovermagazine.com/d-brief/2019/02/14/researchers-control-rat-cyborgs-with-their-minds/#.XG2TLrh7nIU> This article describes the recent use of brain-brain interface where human beings can directly control the behavior of rats with their minds. The article states that these technologies are still in their early stages and direct brain-to-brain communication between human beings is still futuristic.

----F. Dyson (2019) ‘Biological and cultural evolution’ Edge, Feb 19. <https://www.edge.org/conversation/freeman_dyson-biological-and-cultural-evolution>

Dyson expresses a concern that our new genetic engineering technologies, if “careless or commercially driven …could make the concept of species meaningless, mixing up populations and mating systems so that much of the individuality of species is lost”. In particular, a concern is that the progress over the last few centuries toward a brotherhood of man could be disrupted. While Dyson’s concerns focus on genetic engineering, the same concerns arise with the technologies encouraging AI-brain interfaces and cyborg implant technologies that could conceivably result in isolated communities of posthumans.

----M. Milford & P. Stratton (2019) A robot that can touch, eat and sleep? The reality of cyborgs like Alita: Battle Angel. The Conversation, Feb 13, <https://theconversation.com/a-robot-that-can-touch-eat-and-sleep-the-reality-of-cyborgs-like-alita-battle-angel-110430> This article reflects on the 2019 film ‘Alita: Battle Angel’ and its central star, a futuristic evil-trashing female cyborg. The article enjoyably describes several of Alita’s abilities and characteristics (such as a location -sensitive sense of touch and an antimatter heart) and their feasibility along with answers to questions you have always wanted to ask such as ‘Will cyborgs need to eat/sleep?’ and could they have a very long lifespan? (keep in mind cyborgs are part human).

----D.W. Pasuka (2019) There are no aliens….at least officially. OUP blog, Feb 25. <https://blog.oup.com/2019/02/technopreneurs-technology-aliens/?utm_source=feedblitz&utm_medium=FeedBlitzRss&utm_campaign=oupblog>

This article describes the commonly-held view among many technopeneurs that we are already cyborg-like and will become more so in the near future. This strongly suggests that an intelligent extraterrestrial aliens will be full-blown cyborgs. Suggests that a reason we haven’t found them so far may be that we are either looking in the wrong places or haven’t developed the right tools to detect them. This is fascinating stuff and a more wide-ranging and detailed account of these views can be found in her (2019) book American Cosmic: UFO’s, Religion, Technology. OUP.

-----A.M. Habib, A.L. Okorokov, M.N. Hill, J.T. Bras, M. Lee, S. Li, S. Gossage, M. DRimelen, M. Morena, H. Houlden, J. D. Ramirez, D.L. H Bennett, D. Srivastava, & J.L. Cox (2019) ‘Microdeletion in a FAAM pseudogene identified in a patient with high anandamide concentrations and pain insensitivity’ British Journal of Anaesthesia, (available online March 28) <https://reader.elsevier.com/reader/sd/pii/S0007091219301382?token=A2242F5F45A8DC3CF79234D36A2C22608B87EC5C2D1AB9BE00458FE7FAF1B1CA5712AF63F17C3B87FEFEEFA205BD119E> This article is interesting because of its identification of gene mutations responsible for several qualities that would likely be desirable in future soldiers. The woman described in this article has an insensitivity to pain and little anxiety and never panics. A disadvantage, of course, is not being aware of problems in one’s body that pain is a symptom of. Either CRISPR or implants could modify or control such gene expressions for those desiring such changes. What I found of interest is how other, perhaps unanticipated behaviors were also associated with the gene mutations, e.g a sunny disposition.

----T.K. Browne & S. Clarke (2019) Bioconservatism, bioenhancement and backfiring. Journal of Moral Education, (online April 1). A critical examination of the global ‘backfiring’ objection to future human enhancements---the view that such possibilities are likely to lead to problematic outcomes. The authors contend a better approach to the consideration of particular human enhancements should utilize a pragmatic cost-benefit analyses.

----S. Bullimore (2019) Cyborg technology draws FDA attention. Manufacturing Chemist, Mar. <https://www.manufacturingchemist.com/news/article_page/Cyborg_technology_draws_FDA_attention/152388> With cyborgs becoming a reality, the American FDA is publishing a preliminary regulatory set of guidelines on the technology: “The new guidelines consider not just non-clinical testing and clinical studies, but also technical advice for the devices themselves, study designs, and compatibility with blood and other bodily functions.”

----A. L. Reskies (2019) Neuroethics Fifteen years On. The Philosophers Magazine,

(Available online) <https://www.philosophersmag.com/essays/196-neuroethics-fifteen-years-on>

This article will be of interest to teachers in both high school and university. The issues raised around brain stimulation and implants and their likely affects on our conceptions of privacy, personal and self-identity, possible side-effects of such technologies and notions of moral responsibility are those an educated citizenry need be both be informed about and have the tools for intelligently entering debates on the topics. A great discussion piece for classrooms.

----J. Brockman (2019) (Ed.) Possible minds: 25 ways of looking at AI. Penguin Press.

The central focus of 25 leading scholars is on artificial intelligence (AI), and the topic is approached from a variety of perspectives (the authors are from various disciplines including psychology, philosophy, engineering, computer science, physics, etc). Given these differing backgrounds, and that AI is in its relatively early stages, it is not surprising that the views expressed are often at variance. While AI systems are presently superior to human beings at specific tasks, the concerns focus on when AI will be developed with all around superior abilities to human beings and whether this will end up a good thing or not. It will be interesting to find out what experts say in the year 2050 about the same issues. The topic is relevant to those thinking about cyborgs because cyborgs will be interacting with AI systems and many of the components of cyborgs may be designed by AI and incorporated into cyborg bodies.

----A. P. Vaccari (2019) ‘Why should we become posthuman? The beneficence argument questioned’ The Journal of Medicine and Philosophy, 44/2, 192-219.

Vaccari criticizes the belief of transhumanists that we should become posthuman (a wide meaning term that encompasses cyborgs) because it will lead to a better overall state for humanity. The problem, the author says, is that transhumanist reasons lack specifics. “We need to be convinced that [a posthuman future] will be either good or bad; and transhumanists have yet to persuade ‘us’ of either conclusion”.

----J. Lovelock (2019) Novacene: The Coming Age Of Hyperintelligence, Allen Lane.

Whether we like it or not, a cyborg future will be here soon. Contends that future cyborgs will leave human beings in the dust. However, they will likely view us as we do plants and not destroy us.

----K.W. Miller (2020) The brain implants that could change humanity. The New York Times, Aug 30. https://www.nytimes.com/2020/08/28/opinion/sunday/brain-machine-artificial-intelligence.html?action=click&module=Opinion&pgtype=Homepage. An overview of some of the brain implants already in use and on the horizon.

---J. Horgan (2020) Who wants to be a cyborg? (Interview with Susan Schneider). Scientific American, July 21, https://www.scientificamerican.com/article/who-wants-to-be-a-cyborg/ A wide ranging, informative discussion of the potentials and possible downsides of cognitive enhancement technologies. [see also, S. Schneider (2019) Artificial You: AI and the Future of Your Mind. Princeton University Press].

-----M. Maier & R. Harr (2020) Dark design patterns: an end-user perspective. Human Technology, 16/2, 170-199. There are many ways that information can be designed to influence our choices and views (many of these ways are called ‘dark design patterns’). This article is a good overview of such patterns and how they motivate us. There is little reason to think cyborgs would be immune to such devices.

1. With special thanks to my long-term colleague, philosopher Karl Pfeifer (Monash University, Australia) for his useful comments and suggestions on several drafts of this paper. The initial draft was placed on Research Gate, January, 2017. [↑](#footnote-ref-1)
2. The background to the word ‘cyborg’ can be found in Madrigal (2010). [↑](#footnote-ref-2)
3. Of course, the two (genetic modifications and electronic implants) are not mutually exclusive. They could be combined in various ways: the implants might incorporate some biological/organic components, including genetically engineered elements. Some developers are already working on such chips. See https//newatlas.com/cyborg-biological-powered-chip/40815/. Thanks again to Karl Pfeifer for this reference. One can imagine ways in which genetic engineering and implants might interact, for example, implants might be used to turn on, or turn off, or modify particular biological processes for differing periods of time.

 [↑](#footnote-ref-3)
4. Thanks to Karl Pfeifer for this point. [↑](#footnote-ref-4)
5. Clark (2000) calls an electronic virgin someone with “no silicon chips, no retinal or cochlear implants, no pacemaker” and no smartphone, computer, and perhaps no glasses! [↑](#footnote-ref-5)
6. Perhaps one very special implant might incline us to consider someone a cyborg in some cases? Consider the short-lived American TV series ‘Intelligence’ (2014) where the protagonist has a special chip implanted in his brain which enables him, among other things, to stroll through a global virtual internet reality to seek and analyze data and basically hack into all sorts of computerized systems. <http://www.imdb.com/title/tt2693776/> Thanks again to Karl Pfeifer for this pointer. [↑](#footnote-ref-6)
7. The main guides to what we tend to think cyborgs might be like is largely influenced by their portrayal in the movies and films. Leane (2014) ‘Movie cyborgs, sci-fi, and what’s really Going on’ Den of Geek, <http://www.denofgeek.com/movies/cyborgs/29674/movie-cyborgs-sci-fi-and-whats-really-going-on> Leane points out that in the movies cyborg characters tend to be at the extremes of good (RoboCop, Del Spooner in I Robot, Max in Elysium, Macus from Terminator Salvation) or evil (Darth Vader from Star Wars, the Borg from Star Trek, the Cybermen from Doctor Who). Of course, this shouldn’t be surprising, many characters in fiction tend to also be at the extremes along the morality spectrum. One might consider the way apprentices of sorcerer’s have been portrayed in fantasy novels. See J. Zipes (2017) The Sorcerers Apprentice: An Anthology of Magical Tales. Princeton University Press. Talk of "The Sorcerer's Apprentice" might conjure up images of Mickey Mouse from the Disney film *Fantasia (1940)*, or of Harry Potter (books 1997 onwards). As this anthology reveals, however, "sorcerer's apprentice" tales—in which a young person rebels against, or complies with, an authority who holds the keys to magical powers—have been told through the centuries, in many languages and cultures, from classical times to today. In these stories, readers enter worlds where household objects are brought to life and shape-shifting occurs from human to animal and back again. We meet two types of apprentice: "The Humiliated Apprentice," a foolish bumbler who wields magic ineffectively and promotes obedience to authority; and "The Rebellious Apprentice" who, through ambition and transformative skills, promotes empowerment and self-awareness. [↑](#footnote-ref-7)
8. The externalist approach to mind was first conceived by [Andy Clark](https://en.wikipedia.org/wiki/Andy_Clark) and [David Chalmers](https://en.wikipedia.org/wiki/David_Chalmers), in their philosophical article (1999), "The Extended Mind." Analysis, 10-23. A very readable interview by MacFarquhar (2018, see my references) with Andy Clark provides a useful outline of the externalist theory of mind. [↑](#footnote-ref-8)
9. A large number of philosophical issues arise when we think of cyborgs. For example, how would increasing cyborgization affect our notions of free will? While questions of free will usually center on human beings, what if more and more of our bodily parts are composed of mechanical parts? Similarly, if more and more of our mental structure is tied in with computer parts, how would this affect our views of human nature and issues such as the mind-body problem? [↑](#footnote-ref-9)
10. I’ve just considered two ways of thinking about what a cyborg is----namely categorical and dimensional. There are a number of other ways. For example, do the specific **purposes or functions** of the electronic implants may a role in the definition of cyborg? Would implants emphasizing particular intellectual abilities be more important than those that enhance perceptual abilities? One might best think of the term ‘cyborg’ as a family resemblance concept where a variety of overlapping uses of the same word are connected rather than with any strict necessary or sufficient conditions. An accessible discussion and critique of the family resemblance approach can be found in C. McGinn (2011) Truth by analysis: games, names, and philosophy. OUP. Chapter 2 ‘Definition and family resemblance’. [↑](#footnote-ref-10)
11. Talk of augmenting our emotions brings up the notion of teledildonics (or cyberdildonics) where remote sexual textual sexual sensations can be transmitted over remote links between people. Trout in the following article describes present day live cam sex with ‘two-way sex-toy integration’ and future possibilities: C. Trout (2018) ‘Teledildonics gave me he gift of long-distance sex with a stranger’ engadget, Feb 7. <https://www.engadget.com/2018/07/02/flirt4free-teledildonics-long-distance-sex/>

Serious legalities will arise when a teledidonic act is hacked. Depending on the state of the technology, issues around consent and rape will come to the foreground. [↑](#footnote-ref-11)
12. Empathy involves being able to experience the emotions of others. While this seems to be an all-around positive human ability, it is controversial. The neurologist Burton considers it a myth that we can experience the minds of other people [R.A. Burton (2018) ‘The theory of mind myth’ Aeon magazine, July 23, <https://aeon.co/essays/think-you-can-tell-what-others-are-thinking-think-again>]. Bloom, on the other hand, does not consider empathy a myth but denies that it necessarily has a strong connection with moral reasoning and behavior. [P. Bloom (2016) Against empathy: the case for rational compassion. Ecco]. [↑](#footnote-ref-12)
13. #  Making ourselves more moral opens up a minefield. Exactly what actions would we encourage and who would decide? And how would we justify to others our chosen enhancements? How one answers this question may relate to one’s notion of human nature and how morality is related to evolutionary theory. Much may depend on commitment to certain ‘facts’ which may not be decidable. Some consider morality as a necessary overlay on our basic nature. Others do not. Al-Rodham contends enhancement issues need to take into account human nature and especially our neurological predispositions. N. Al-Rodham (2019) ‘Neurophilosophy and transhumanism’ Blog of the American Philosophical Association, Feb 19. <https://blog.apaonline.org/2019/02/19/neurophilosophy-and-transhumanism/> Also, the same authors blog “A Neuro-Philosophy of Human Nature: Emotional Amoral Egoism and the Five Motivators of Humankind” American Philosophical Association Blog, April 4, 2019. <https://blog.apaonline.org/2019/04/04/a-neuro-philosophy-of-human-nature-emotional-amoral-egoism-and-the-five-motivators-of-humankind/> Young considers debates over moral enhancement problematic because moral norms change over time and who knows what future norms will be held? And present-day debates are conducted from very different premises (moral realist or non-realist or pragmatist) making agreement on standards for moral enhancement more unlikely. G. Young (2018) ‘How would we know if moral enhancement had occurred?’ The Journal of Speculative Philosophy, 32/4, 587-606.

 [↑](#footnote-ref-13)
14. See D. Nelkin (2015) “Psychopaths, incorrigible racists, and the faces of responsibility,” Ethics, vol 125/ issue 2, 357-390. [↑](#footnote-ref-14)
15. Not everyone would agree with our present human-centered notions of personhood. Mark Rowlands (2016) Are animals persons? Animal Sentience, 10/1. <http://animalstudiesrepository.org/animsent/vol1/iss10/1/> Rowland contends the kind of self-awareness present in some animals qualifies them to be considered persons. This would be directly relevant to any personhood considerations regarding cyborgs. Those in the Humanities will find Lake’s book of special interest. It is also noteworthy that different cultures can have different notions of personhood than those in the West [see S. Jackson (2019) ‘A rock, a human, a tree: all were persons to the Classic Maya’ Aeon magazine, April 22. <https://aeon.co/ideas/a-rock-a-human-a-tree-all-were-persons-to-the-classic-maya>] C. B. Lake (2013) Prophets of the Posthuman: American fiction, Biotechnology and the Ethics of Personhood. University of Notre Dame. Lake argues that stories play an unrecognized role in ethical reflection confronting enhancement of cognitive abilities in animals (including human beings) and machines. [↑](#footnote-ref-15)
16. While most pet owners would attribute particular **personalities** to their pets, most would balk at considering them **persons**. The latter is (so far) largely restricted to human beings. [↑](#footnote-ref-16)
17. At the same time, we might also want specific-purpose dumbed-down cyborgs such as field hands, some soldiers, or toilet attendants. [↑](#footnote-ref-17)
18. It would seem notions of attractiveness are associated with biological beings. It is difficult to conceive of robots

having their own notions of attractiveness. Since cyborgs are at least part biological, they might have their own notions of attractiveness, even if pure robots can’t. It is useful to point out that for non-cyborgs biological beings robots can be sexually attractive (think of ‘sexbots’). Indeed, a British magazine featured a physically attractive ‘female’ robot on its cover in 2018. See

N. Byrd (2018) “Robot model on fashion magazine cover leaves some readers ‘freaked out’ “ Inquisitr, Jan 28. https://www.inquisitr.com/4759542/robot-model-on-fashion-magazine-cover-leaves-some-readers-freaked-out/ [↑](#footnote-ref-18)
19. Saxton contends that some part of what we find attractive (with specific other people) depends to some extent on the “physical similarity between one’s parent and one’s partner”. T. Saxon (2017) ‘Keeping it in the family: why we pick the partner’s we do’. Aeon Magazine, August. <https://aeon.co/ideas/keeping-it-in-the-family-why-we-pick-the-partners-we-do> . **If** this idea has merit, it could be modified or made redundant in a world of genetic engineering or where technological implants may change or modify or our desires and interests. At the same time, Saxton’s contention about *physical* characteristics strikes me as small town xenophobic parochialism of a by-gone era. Many people have hooked up with partners physically (often racially) unlike their parents. Further, there are all sorts of individuals who haunt comic book stores who find aliens and androids attractive; there’re even categories of porn for that. [↑](#footnote-ref-19)
20. Our answer might depend on the role human beings have in the activity. The more active a role human beings have may diminish the concern here. After all, there are those Korean gaming olympiads or tournaments; also programming competitions are common nowadays where human imagination and cognition still have a sizeable role. [↑](#footnote-ref-20)
21. There are already proto-animal cyborgs, but these tend to be designed to promote human interests, and not those of the organisms themselves. For example, consider cockroaches with electronic backpacks that can pick-up subtle human sounds under rubble in disasters or have their flight patterns controlled so they can be directed to fly through narrow passages in human rescue operations. <https://www.popsci.com/tags/cyborgs>. An interesting ethical question that arises concerns the possibility that insects feel pain and are conscious. See B. Keim (2019) ‘I, cockroach’ Aeon magazine (online). https://aeon.co/essays/do-cyborg-cockroaches-dream-of-electric-trash [↑](#footnote-ref-21)
22. While bio-mechanical implantations could be involved in **animal** **enhancement**, genetic modifications are more likely to be involved. We are still in the initial stages of such experimentation at present. Those genetic enhancements most visible in the media seem largely limited to reports of glow-in-the dark rabbits, and cows that fart less than typical cows. Of course, genetic modifications and bio-physical implants are not mutually exclusive; both could be utilized at the same time. A central issue is how should we approach the topic of non-human animal enhancement? Chan contends that if we regard the enhancement of human beings a **mora**l obligation, so should we also regard non-human animal enhancement. S. Chan (2009) ‘Should we enhance animals?’ Journal of Medical Ethics, 35/11, pp. 678-683. See also books discussing animal enhancement in the reference section. [↑](#footnote-ref-22)
23. Consider those who already have their dead pets memorialized via taxidermy. Some might consider revitalizing their deceased pets by turning them into interactive cyber-zombies. A lot of different ethical issues would arise on this topic. [↑](#footnote-ref-23)
24. Science fiction readers may be remined of Olaf Stapledon’s novel Sirius (1944) about an intelligently enhanced dog which is rejected by human society. It raises the question about how we human beings would react to enhanced creatures that are non-human or implant modified. Another issue is, would enhanced animals be used for military purposes? Consider the genetically enhanced ape-like killer (the ‘Outsider’) in Koontz sci-fi novel Watchers (1987). Enhanced animals seem a more plausible approach to military use than inbreeding suggested by Stalin in World War Two. Stalin suggested making super-warriors by inbreeding human beings and apes [E.M. Johnson (2011) ‘Scientific ethics and Stalin’s ape-man super-warriors’ Scientific American Blog. <https://blogs.scientificamerican.com/primate-diaries/stalins-ape-man-superwarriors/> ] It is of further interest to note that talk of cross-breeding humans and animals to produce new species was considered in the speculations of some enlightenment thinkers [A.S. Curren (2019) Diderot: And the art of thinking Freely, Other Press, NY, pp. 255-2580] [↑](#footnote-ref-24)
25. Pets occupy a unique place in our lives. Should they be given special consideration over other animals in **enhancement**? Yeates and Savulescu point out pets both share our homes and are dependent on us and can be harmed or benefited by our actions, emotionally as well as physically. Given this, the authors contend pets should have special ethical considerations beyond those given to other animals. While the authors do not directly consider enhancement (genetic or technological), this would be an outcome consistent with their position. J. Yeates & J. Savulescu (2017) ‘Companion animal ethics: a special area of moral theory and practice?‘ Ethical Theory and Moral Practice, 20, 347-359. [↑](#footnote-ref-25)
26. The field of robotics is itself worth exploring. A continually updated site on robotic development can be found at IEEE Spectrum, Robotics. <https://spectrum.ieee.org/robotics> [↑](#footnote-ref-26)
27. See Ferrando (2014) for concerns along this path. [↑](#footnote-ref-27)
28. See E. Knowles & L. Tropp (2016) “Donald Trump and the rise of white identity politics,” The Conversation, Oct 20. Chaplin (2017) points out, “The progress [we have made in the West on LGBTQ rights] ... doesn’t exist in most of the world: 74 countries still criminalise homosexuality, including Russia and much of Africa and the Near East. Even where it’s legal, to be identified as LGBTQ often leads to stigmatisation, harassment, assault. And all of these might yet increase. Gender conventions are stubborn. So is racism. The Black Lives Matter movement states a goal – to make US law enforcement recognise blacks as the equals of whites – that should not in 2017 be utopian, but is. The ‘Black Lives Matter’ slogan is….a comparison of some human lives against others. And because the incidents of police violence that elicited the movement occurred after the financial crisis of 2007-8, Black Lives Matter is [important] in identifying the persecution that comes with constrained economic circumstances. Attacks on historically racialised individuals elsewhere have shown that the problem is global.” J. E. Chaplin, “Is greatness finite?” Aeon Magazine, (online). https://aeon.co/essays/how-more-and-malthus-light-the-way-towards-humanitys-future [↑](#footnote-ref-28)
29. See E. Schwitzgebel (2017) ‘In 25 years, your employer will directly control your moods’ Oct 26. The Splintered Mind Oct 26, <http://schwitzsplinters.blogspot.ca/2017/10/in-25-years-your-employer-will-directly.html> S contends that employers will be able to control the moods and emotions of their employees (by drugs or direct brain stimulation) within a few decades and will likely find ways of using that ability: “McDonald's might ask its cashiers to tweak their dials toward perky friendliness. Data entry centers might ask their temp workers to tweak their dials toward undistractable focus. Brothels might ask their strippers to tweak their dials toward sexual arousal”. We might also consider how other groups might manipulate emotions or moods such as political organizations, large companies, criminal cartels (See Gray, 2019). Or might we be able to also modify our own minds: could particular implants allow us to modify our own values, desires, tendencies? A discussion on this can be found at H. Shevlin (guest post) (2017) ‘What would (or should) you do with administrator access to your mind’. The Splintered Mind blog, Aug 16. <http://schwitzsplinters.blogspot.ca/> This also brings up a lot of interesting issues around personal identity. One might also consider the possibility that some changes might be so large that personal identity might continually change or may no longer be considered a topic of relevance. A related issue is the possibility of cybog implants being hacked---a not remote possibility. One might keep in mind in this regard, that results from MRI and CT scanners can potentially be hacked, putting false positives or false negatives in readings. See K. Zetter (2019) ‘Hospital viruses: fake cancerous nodes in CT scans created by malware, trick radiologists’. The Washington Post, April 3, <https://www.washingtonpost.com/technology/2019/04/03/hospital-viruses-fake-cancerous-nodes-ct-scans-created-by-malware-trick-radiologists/?utm_term=.b37bd7bf8099> and N. Wetsman (2019) ‘Health care’s huge cybersecurity problem.’ The Verge, April 4, https://www.theverge.com/2019/4/4/18293817/cybersecurity-hospitals-health-care-scan-simulation. [↑](#footnote-ref-29)
30. A concern that Forer (2017) shares. [↑](#footnote-ref-30)
31. Gibb (2016) contends that military applications will be a large part of future research in human-computer interfaces. [↑](#footnote-ref-31)
32. A useful background on this ethical issue can be found in C. Wareham (2017) ‘How can life-extending treatments be available for all?’ Aeon magazine online, August. <https://aeon.co/ideas/how-can-life-extending-treatments-be-available-for-all>. The topic under discussion considers the high likelihood that life-extending technologies would be initially available to financially richer members of society with a further increase in inequality. We can substitute talk of ‘technological implants’ for the article’s life-prolonging drugs. The concern is that the very rich will therefore **always** be one step ahead of the rest of us, as only they will have access to the very newest technologies. Perhaps. [↑](#footnote-ref-32)
33. An excellent introduction to the differing ways terrestrial animals experience the world can be found in H. C. Hughes (1999) Sensory Exotica. MIT Press. This book describes the senses that animals possess that we do not and the physiological and structural biological organs that underlie such senses. [↑](#footnote-ref-33)
34. E.Reas (2014) ‘Small animals live in a slow-motion world’ Scientific American/Mind. <https://www.scientificamerican.com/article/small-animals-live-in-a-slow-motion-world/> [↑](#footnote-ref-34)
35. Changes to human psychological makeup may be initially subtle but far reaching. As far as I know human beings are the only species that collects things that have little direct survival value such as antiques, coins, stamps, etc. Could changes in cognitive structure inadvertently eliminate or modify such interests. Taken further, its difficult to imagine a cyborg hoarder. [↑](#footnote-ref-35)
36. **A. Buchanan & R. Powell (2018)** The Evolution of Moral Progress: A Biocultural Theory**. Oxford University Press.**  [↑](#footnote-ref-36)
37. Especially when we also have to consider interactions between cyborgization along with the rapid changes in the virtual realities in which we are immersing our lives. An excellent book on how virtual reality increasingly affects all aspects of our lives can be found in J. Gackenbach & J. Bown (Ed.) (2017) Boundaries of self and reality online. Academic Press. In chapter 6 de Gortari and Griffiths describe the effects of virtual video game worlds on frequent players. The authors point out that the in-game experiences have carry-over effects into everyday life. As such worlds become more sophisticated and immersive and interact with technological bodily implants that may enhance or produce totally new experiences, the effects on notions of self and identity, interpersonal relationships and world-views will be likely unimaginable. [↑](#footnote-ref-37)
38. P. J. Bowler (2017) A History of the Future: Prophets of Progress from H G Wells to Isaac Asimov. OUP. Bowler provides an enjoyable survey of popular science, science fiction, films, and news media pieces about what life might be like in the later 20th and 21st centuries. The book is of interest because it reflects many 19th and 20th century public perceptions of science and technology and how they were thought might unfold in the near future. [↑](#footnote-ref-38)
39. Unforeseen consequences often come with new scientific advances. Some consequences end up more serious than others. In this regard, one might keep in mind the drug thalidomide which was prescribed treatment for morning sickness with its severe malformation effects on developing embryos. The drug seems to have had few, if any, negative effects when given to non-pregnant adults. [see N. Vargesson (2015) Thalidomide-induced teratogenesis: history and mechanisms. Birth Defects Research C Embryo Today, 105, 140-156). Another example, might be the famous case of Dolly the Sheep, the first mammal to be successfully cloned from an adult body cell. One unexpected effect associated with Dolly was that she aged faster than normal sheep. [see K. Murray (2017) 20 years after Dolly the Sheep, potential of cloning remains unclear. CNN Health, <https://www.cnn.com/2017/02/24/health/dolly-the-sheep-cloning-anniversary/index.html> ]. Even if effects are not negative, they can be unanticipated and far ranging. Consider the Russian fox domestication study done in the early 1950’s where pups exhibiting the most human-friendly behaviors were interbred. While one would expect docility to be a resulting trait (and it was), other unexpected features also resulted after a number of interbreedings such as a smaller face and snout and less seasonally related periods of fertility. [ see J. G. Goldman (2010) ‘Man’s new best friend? A forgotten Russian experiment in fox domestication’. Scientific American. Online at <https://blogs.scientificamerican.com/guest-blog/mans-new-best-friend-a-forgotten-russian-experiment-in-fox-domestication/> ].

 [↑](#footnote-ref-39)
40. For the legal and moral concerns here see Cabrera and Carter-Johnson (2018). [↑](#footnote-ref-40)