

## Enhancement and Obsolescence: Avoiding an “Enhanced Rat Race”

**ABSTRACT.** A claim about continuing technological progress plays an essential, if unacknowledged, role in the philosophical literature on “human enhancement.” I argue that—should it eventuate—continuous improvement in enhancement technologies may prove more bane than benefit. A rapid increase in the power of available enhancements would mean that each cohort of enhanced individuals will find itself in danger of being outcompeted by the next in competition for important social goods—a situation I characterize as an “enhanced rat race.” Rather than risk the chance of being rendered technologically and socially obsolete by the time one is in one’s early 20s, it may be rational to prefer that a wide range of enhancements that would generate positional disadvantages that outweigh their absolute advantages be prohibited altogether. The danger of an enhanced rat race therefore constitutes a novel argument in favor of abandoning the pursuit of certain sorts of enhancements.

### INTRODUCTION

A claim about continuing technological progress plays an essential, if unacknowledged, role in the philosophical literature on “human enhancement.” Advocates for enhancement typically point to the rapid progress being made in biotechnology, information technology, and nanotechnology as evidence that we will soon be able to achieve significant improvements on normal human capacities using these technologies (Lin and Allhoff 2008; Savulescu and Bostrom 2009; Roco and Bainbridge 2002).

In this paper, I will argue that—should it eventuate—continuous improvement in enhancement technologies may prove more bane than benefit. The phenomenon that inspires the argument that follows will already be familiar to those of my readers who have ever bought a mobile

phone, digital camera, or computer. The very pace of the evolution of these technologies creates a novel dilemma: what should I purchase, and when should I purchase it, given that I know that a better product, with more—and more powerful—features, will be coming out in just a few months? Indeed, in all likelihood by the time I have taken a product home, set it up, and worked out how to use it, it will already be out of date: in just a few years it will be obsolete.

The thought I want to explore here, then, is what does this familiar experience imply for a future in which human enhancement is possible? What if it is not our cameras and computers, but our bodies and our brains, that quickly become out of date and then effectively obsolete? What if we knew that, while enhancement would allow us to improve our own capacities, people born just a few years after us would have powers that put ours to shame? I will argue that in order to avoid creating what I shall call an “enhanced rat race” it might be rational to prefer that some enhancements not be available at all.

Let me state at the outset that I do not think that this argument will work for all enhancements or in all periods. Whether or not concerns about an enhanced rat race give us good reason to reject particular types of enhancement depends upon the truth of a number of premises about the pace of progress in enhancement technology, the capacity of individuals to “update” their enhancements, the extent to which particular enhancements constitute absolute and/or positional goods, and the structure of the society in which enhancements become available. Nevertheless, as I will argue below, these premises are likely to be true for some of what at first, at least, appear to be the most exciting forms of human enhancement.

#### THE PROSPECTS FOR ENHANCEMENT

There is currently a vigorous debate in applied ethics about human enhancement using various technologies, including:

- Gene therapies to improve athletic performance (Miah 2004) and extend life expectancy (de Grey and Rae 2007).
- Genetic selection of embryos with “above species-typical” traits using preimplantation genetic diagnosis (PGD) (Savulescu 2005; Silver 1999).
- Genetic modification of human beings (Bostrom 2003; Harris 2007; Stock 2003; Green 2007).
- Neural implants to enhance cognition, increase memory, and to allow individuals to control electronic devices by thought alone (Lin and Allhoff 2008; Jotterand 2008; Roco and Bainbridge 2002; Warwick 2002).

- Stem cell therapies to extend life expectancy beyond the species-typical range (de Grey and Rae 2007).
- Transcranial magnetic stimulation to enhance creativity and insight and reveal hidden savant-like skills (Carter 1999; Chi and Snyder 2011; Phillips 2004; Snyder et al. 2003).
- Enhanced prosthetics and artificial organs, which improve upon the function of the body parts they replace (Karpin and Mykitiuk 2008).
- Nanotechnological devices to extend life expectancy and to integrate humans and machines (Jotterand 2008; Lin and Allhoff 2008; Roco and Bainbridge 2002).
- Drugs to extend life expectancy (de Grey and Rae 2007), improve athletic performance (Savulescu, Foddy, and Clayton 2004), reduce the need for sleep, improve memory, enhance cognition (Bostrom and Sandberg 2009; Cakic 2009), manage traumatic experiences (Henry, Fishman, and Youngner 2007), and even to make individuals “more moral” (Douglas 2008; Persson and Savulescu 2008; Persson and Savulescu 2012).

Given the enormous gap between existing technologies and those required to produce the enhancements they discuss, enthusiasts for enhancement must rely on the claim that further—and presumably continuing—progress of these technologies will occur in order to make enhancement possible. For the remainder of the discussion, then, I will assume that in the not-too-distant future two things will become true:

1. It will be possible to achieve significant enhancement of human capacities using some or all of the technologies listed above.
2. Technologies of human enhancement will undergo rapid and continuous improvement.

The interpretation of premise two—and in particular the claim that technological improvement will be “rapid”—is of great importance in the argument that follows. I am going to assume that technologies of human enhancement might improve at roughly the pace of contemporary consumer electronics: within five years, what was once state-of-the-art enhancement will have started to look decidedly clunky; within 10 years it will be embarrassingly out of date and may have ceased to function entirely due to the decline of the social, economic, and technological infrastructure required to maintain it.

Mention of consumer electronics inevitably raises the topic of “Moore’s Law” and the specter of the “Singularity.”<sup>1</sup> Notoriously, a number of writers move from the perceived success of Moore’s Law in predicting improvements in integrated circuits, to the larger claim that technological

progress is exponential, and then to the conclusion that at some point in the future the rate of technological change will be effectively infinite (Broderick 2001; Kurzweil 2005; Moravec 1998). At this point—the Singularity—the normal laws of history will cease to apply, as our technology will make it possible to do things we can as yet barely imagine.<sup>2</sup>

It is hard to know what to make of this argument, which presumes to make dramatic social and technological predictions on the basis of algebra. There would seem to be an obvious danger in reasoning from induction here: one imagines philosophers born in the midst of the nearly 300 years of peace during the Ming Dynasty in China rhapsodizing about a future without war. Moreover, the focus on progress in the manufacture of computer hardware in this argument risks glossing over the fact that other, equally plausible, technological indicators (the speed of software, cancer survival rates, discovery of new antibiotics, the production of fusion power) do not reveal exponential growth. Finally, while the ranks of writers about the Singularity include many engineers, computer scientists, entrepreneurs, and “futurists,” there are far fewer professional historians, sociologists, or economists predicting such a technological rapture. These are all reasons for skepticism about the Singularity.

In any case, for current purposes, the problem with discussions of the Singularity is the way in which claims about our amazing future technological powers license resort to untrammelled speculation when it comes to concerns about possible negative impacts of technological progress. For this reason, I am going to proceed on the assumption that while the technology is necessary to produce human enhancement will indeed continue to improve, this will not lead to a singularity.

Note that the argument of this paper will also be called into question if the rate of progress of enhancement technologies is too slow. If progress in enhancement technologies is more like recent progress in psychiatry than in electronics—so that significant improvements are a matter of decades rather than years—then any obsolescence will occur at a genteel pace that we may well be willing to embrace. There already exists a social and economic trajectory wherein each generation is gradually eclipsed by the next as the result of the difficulties involved in maintaining cultural and technological literacy and as a result of the typical increase and then decline of human powers as we age. If individuals got to enjoy the benefits of being enhanced for three or four decades before they were no longer able to compete effectively with younger citizens then this might well be

sufficiently close to what we now experience as to be a price that we were willing to pay for enhancement.

Thus, concerns about the possibility of our enhancements becoming obsolete are serious only on the assumption that improvement in enhancement technologies is likely to be rapid and continuing, rather than slow or finite, and without accelerating to produce a singularity. However, as I have argued here, this is the most plausible scenario if enhancement is to arrive at all.

#### ENHANCEMENTS AND UPDATES

There has been—to the best of my awareness—very little attention paid, in the academic literature, to the implications of particular enhancements becoming obsolete as technology improves.<sup>3</sup> I suspect that this is because writers in this literature unconsciously assume that individuals will be able to update their enhancements as required. This is, after all, the solution we have adopted in response to the problem of our consumer electronics becoming out of date: every few months we update our software and every few years we update our hardware. Importantly, the need to update technological systems is effectively forced upon us by the central social (and economic) role they now play and by relations *between* technologies. Again, most readers will be familiar with the phenomenon wherein the latest generation of computers no longer includes a port for the storage devices we purchased some years ago or wherein the new operating system (which we need to run the latest version of Word, which we need to open documents sent to us by our colleagues . . .) requires a more powerful processor than the computer we currently own.

For some enhancements, the solution to the problem of obsolescence will be the same: we will simply “update” our enhancements. Thus, if one’s “super strength” results from an exoskeleton (an enhanced prosthesis) and someone designs a better exoskeleton, one might purchase a new exoskeleton. Similarly, if one is taking a particular drug in order to reduce the need for sleep and a better class of drugs become available, then perhaps one could simply swap the new drug for the old.

However, there are a number of classes of enhancements, including some that contain some of the most promising and powerful types of enhancement, where updating is unlikely to be an option.

Most obviously, any enhancements that must be achieved by the manipulation of embryos will offer individuals—or, rather, their parents—only one chance at achieving some particular level of enhancement. Thus,

for instance, if preimplantation genetic diagnosis (PGD) starts to be used for enhancement by selecting for above-species-typical traits, parents will be able to select only from amongst the number of embryos the available technology makes it possible to create and on the basis of the available knowledge of the genetics of desirable traits. Once the embryo is selected, the “enhanced” individual can receive no more (direct) benefit from future improvements in the technology.<sup>4</sup> Similarly, if recombinant-DNA technology were to be used to enhance human beings, this would almost certainly require manipulating embryos. Individuals modified in this way will have capacities fixed by the level of recombinant-DNA technology available at the time.

Other methods of enhancement that require procedures to be performed on children in order to intervene in the development of the human organism, or to benefit from superior powers of the growing organism in responding to changes in its environment, will also resist updating. Importantly, this may include neural implants and other devices that integrate electronics with the human nervous system. Establishing an effective electronic interface with the nervous system may require implanting devices while the brain still evidences a large amount of “neural plasticity.” The process of learning to use a cochlear implant, for instance, involves training the brain to interpret the signals from the implant as much as it does modifying the implant to produce suitable signals. For this reason, audiologists typically recommend that pre-linguistically deaf children are implanted as soon as is possible, with the result that children are undergoing implantation as young as six months (Sharma et al. 2004; Valencia et al. 2008; Vlastarakos et al. 2010). If neural implants also require “training the brain” they too may be effective only if implanted in young children—and will therefore not be capable of being updated.

However, some enhancements that individuals might undergo as adults are also likely to be very difficult—and perhaps impossible—to update. For instance, any enhancement that requires an adult to undergo surgery—as do enhanced prostheses, neural implants, artificial organs, and (perhaps) stem cell transplants—risks jeopardizing future options by removing relevant tissues, altering organic structures, or through the formation of scar tissue. Thus, for instance, individuals who have a USB port installed in the back of their necks may damage the nerves that they need to use in order to be able to upgrade to FireWire when it becomes available. It is even possible that some pharmaceutical enhancements will resist updating. This may be the case where the drug that provides the enhancement also

produces a chemical dependency such that stopping taking the drug is strongly contraindicated and where it is not safe to take both the “old” drug and the new improved pharmaceutical together. In other cases, the body may respond to one class of drugs in ways that makes the next class of drugs less effective. Notice also that there are likely to be significant questions about the safety of taking a number of different drugs, for extended periods, in succession that may not arise concerning any of the individual drugs.

None of this is to suggest that individuals who have been enhanced in the various ways discussed here will not be capable of further improving on their capacities using different technologies. However, the level of enhancement available to them through their original modification will be fixed by the power of the relevant technology at the time it was used.

Finally, a more prosaic reason why updating particular enhancements may be impossible is that achieving cutting-edge enhancements may be so expensive that many people cannot afford to attempt it more than once. Those who have spent all their savings in order to benefit from state-of-the-art enhancement technology may then find themselves condemned to obsolescence when their enhancements go out of date and they cannot afford to replace them.

It is true that, if progress in the technology of enhancement is indeed rapid and continuing, one might expect that the price of achieving some particular type or level of enhancement will inevitably come down so that such enhancement will become more widely available. However, the cost of *state-of-the-art* enhancement may well remain too high for many people to achieve it more than momentarily. We can observe this phenomenon, too, in consumer electronics: while the price of a given feature, or set of features, usually declines, the price of cutting-edge technology remains more or less constant. Thus, even if those who have impoverished themselves to achieve a momentary superiority in capacities to those around them can later afford to upgrade their all-too-soon obsolete enhancements, they may never again be able to afford to have the same powers as younger or wealthier citizens.

It might be thought that this particular obstacle to updating is amenable to a relatively straightforward socio-economic “fix”: we could simply provide publicly-funded guaranteed access to enhancements for all citizens. However, this thought radically underestimates the enormous cost involved in doing so. Providing all citizens with any given enhancement or set of enhancements will not avoid the problems caused by rapid and

continuous technological progress in enhancement technology as these enhancements would themselves quickly become obsolete.<sup>5</sup> Instead, the state would need to guarantee access to “state-of-the-art”—or at least not too far behind state-of-the-art—enhancement for all citizens, which would require the willingness to update the enhancements of the entire population every few years (presuming, of course, that cost was the only barrier to updating the enhancements concerned). For this reason, it seems likely that financial considerations may well stand as a significant barrier to updating enhancements for many people.

If it proves possible to simply update enhancements whenever they go out of date, then we need have no fear about our enhancements becoming obsolete. However, as we have seen, for many enhancements the risk of obsolescence remains.

#### AN ENHANCED RAT RACE?

The thought that in the future one’s brain and body might become effectively obsolete in the course of just a few years is a challenging one to say the least! The prospect of our enhancements going out of date is especially disturbing once we realize that while enhancement may provide us with an initial few years during which we will have superior capacities relative to those around us, we will spend many more years being obsolescent than we will being ahead of the pack.

I want to suggest that the sort of social order that will result from pursuit of enhancement where there is a risk of obsolescence is best described as an “enhanced rat race” in which many of the worst features of contemporary capitalist societies—which cause (some) people to refer to life in them as a “rat race”—are greatly exacerbated. Life in such a society, even for enhanced individuals, may actually be worse than the lives we live today. If this is true, then, as I will argue further below, we would have reasons to try to restrict access to enhancement in order to avoid creating an “enhanced rat race.”

The idea that the pursuit of enhancement may generate a rat race is not a new one. Other authors have pointed out that if enhancement is sought for the positional advantages it provides then the project of enhancement may be self-defeating (Kavka 1994). If everyone is enhanced, then nobody gains any advantage relative to anyone else. Indeed, if there are costs involved in securing the enhancements, everyone may be worse off! Yet my concerns about bringing about an enhanced race differ in six important respects from those previously canvassed. First, the implications of obsolescence for the

social order and for the opportunities available to individuals in a society in which enhancements are improving rapidly are previously unacknowledged costs of the pursuit of enhancement. Second, I will highlight subjective costs associated with possessing obsolete enhancements, which may greatly reduce the welfare even of those who benefit most from enhancement. Third, I will argue that the evils associated with an enhanced rat race need not be the product of the futile pursuit of positional advantage but may also result from the pursuit of enhancements for the absolute benefits they provide. Fourth, I will suggest that the prospect of enhanced longevity greatly exacerbates the costs of obsolescence. Fifth, I will point out that concerns about the implications of obsolescence will be especially pressing when we are considering enhancing our children. Finally, together these arguments suggest that an enhanced rat race might be something to be avoided even if the enhancements that generate it initially appear to offer significant absolute benefits.

#### THE OBJECTIVE COSTS OF OBSOLESCENCE

Obsolescence is likely to involve significant costs, both subjective and objective, that to date have been almost entirely neglected in the literature on human enhancement.<sup>6</sup> The “objective costs” of obsolescence are the impacts of obsolescence on our social and economic relations with others—regardless of our own feelings about them.

If our enhancements will become obsolete, then even with the benefit of enhancement, people will spend most of their lives with substantially inferior capacities to an ever-growing proportion of the population. Once our enhancements are more than a few years old, younger people will have greatly superior powers to our own. Eventually, we may even struggle to communicate with and understand those much younger than us, who will effectively move in a very different world as a result of their superior enhancements. Admittedly, a similar phenomenon already occurs, to some extent at least, as a result of the impact of the aging process on individuals’ capacities across the natural course of the life cycle and of age-associated differences in cultural and technological literacy.<sup>7</sup> As I observed above, if the pace of progress of enhancement technologies is slow, the differences between age cohorts may be tolerable. However, rapid progress in enhancement technologies might produce very large differences in the capacities of individuals who differ in age by only a few years. Moreover, whereas differences between age cohorts relevant to social, economic, and political participation today are, for the most

part, matters of degree and are amenable to redress through education, differences arising from different generations of enhancement may, at least in some cases, be qualitative as well as quantitative; that is, those with a given generation of enhancement may possess capacities that those with older enhancements lack entirely and can never attain.

Of course, as we become obsolete, those who secured their enhancements earlier than us will be becoming more so. Thus, it will not be the case that we fall suddenly to the bottom of the social order. Rather, it will be as though the period in which we are at the peak of our powers relative to others, which is currently perhaps 20 to 30 years, was compressed into just two or three years in our early 20s, and the speed and extent of our relative decline after this peak was greatly increased. In this period of life, we would be well advised to work furiously in order to take advantage of our brief moment of relative superiority and in order to prepare ourselves for the years of obsolescence ahead. This in turn means that life in an enhanced rat race is likely to be more competitive.<sup>8</sup>

Once our enhancements have become out of date we will never be as well suited for positions of power and responsibility as a younger generation, even though we may well retain superior powers to those older than us. From a relatively young age, then, individuals may begin to be excluded from the forefront of social, economic, and political life by virtue of the fact that they lack capacities that the most modern enhancements provide. While a certain degree of intergenerational inequality is a feature of many contemporary societies, if the pace of improvement in enhancement technologies is rapid enough—and enhancements cannot be updated—then we might see large inequalities between people born just a few years apart. Thus, “generation of enhancement” is likely to become another axis of social and economic stratification, alongside class, sex, race, age, religion, et cetera, and society will consequently become more unequal. There is now a substantial body of research that suggests that inequality is bad for everyone and not just for those at the bottom of the social heap (Wilkinson and Pickett 2010). Large differences in the distribution of goods in a society place everyone, both those with much and those with little, under greater stress than more egalitarian societies. Those with little suffer from the effects of deprivation, while those with a lot suffer from the anxiety that they may lose what they have.

In short, an enhanced rat race is likely to exacerbate many of the worst features of contemporary capitalist societies. Daily life for individuals struggling with the consequences of obsolescence is likely to be lived within

a social structure that encourages competition, produces inequality, and engenders anxiety.

Independently of these social consequences, there are also some circumstances where having an obsolete enhancement may leave one objectively worse off than if one had no enhancement at all.<sup>9</sup> This may occur when an enhancement replaces or displaces the mechanisms that a normal individual would use for some set of tasks and then ceases to function by virtue of a lack of social and technological support for obsolete technologies. Consider the fate that may befall an individual who never learns to read because their neural implant allows them direct access to the Internet. If their implant becomes obsolete and ceases to function because the manufacturer has gone out of business and it is no longer possible to secure batteries for it, they may be significantly worse off than someone who never received the enhancement at all.

#### THE SUBJECTIVE COSTS OF OBSOLESCENCE

The social changes wrought by the phenomenon of the rapid and continuous improvement in enhancement technologies—resulting in a social formation that I have characterized as an “enhanced rat race”—along with the possibility that individuals may be worse off with obsolete enhancements than if they had none at all, constitute the main reasons to be (extremely) cautious about this prospect. However, when we are thinking about the prospect of a world in which enhancements are available, we would be well advised to consider not only what our objective circumstances in such a world are likely to be, but also how we are likely to feel about them. That is, we should consider the “subjective costs” of enhancement.<sup>10</sup> These costs are associated with two different comparisons that it will be difficult to avoid when living in an enhanced rat race: our comparison of our situation with what might have been had we enhanced ourselves at a later date; and, a comparison of our situation with the situation of others.

#### OPPORTUNITY COSTS AND OPTION REGRET

I began this paper by referring to the dilemma facing consumers today when purchasing cameras or computers: what should we buy and when, given that a better product is always just about to be released? Similarly, choosing an enhancement, knowing that one will be stuck with it for the rest of one’s life, is likely to be a stressful and difficult business. Whatever one chooses, a better enhancement will become available in just a few

years. Having chosen some particular enhancement, one risks spending the rest of one's life ruing the fact that one did not wait just a few years more or that one was not born a few years later. That is to say, there will be a real danger of "option regret," wherein our awareness of the things we missed out on in making the decision that we made detracts from the enjoyment of the goods we secured through that decision (Schwartz 2004).

Of course, one may comfort oneself with the thought that one might have been still worse off if enhancements were not available. Yet there are two reasons why regret about the benefits that we had to forego is likely to be more often present to our minds than satisfaction with the goods we possess.

First, as many of us have experienced with our cameras and computers, the frustrations of grappling with an obsolescent technology can be profound. With certain sorts of enhancements, at least, such as neural implants, artificial organs, enhanced prostheses, or (perhaps) pharmaceuticals, one will be constantly reminded that one is obsolete by the inconveniences involved in maintaining the functioning of our enhancements when the social, economic, and technological supports they require have ceased to be easily available.

Second, and more importantly, the enhancement debate encourages an individual psychology and a public culture that is likely to greatly exacerbate option regret. It is a fundamental assumption of the argument for enhancement that we should not be satisfied with our capacities as they are now. Rather, we should seek to transcend our current limitations—whatever they should be. In terms that Erik Parens (2005) has recently popularized, then, advocates of enhancement emphasize the importance of "creativity" in what it means to be human. Parens contrasts this to an emphasis on "gratitude" or "acceptance," which is the idea that it is a necessary condition of a good human life that we acknowledge and cherish the fact that some things are beyond our powers. Whether one valorizes the overcoming of limits ("creativity") or adopts an attitude of "acceptance" will make a significant difference to the experience of spending most of our lives with obsolescent enhancements. However, a society in which enhancement technologies are being continuously improved is likely to be a difficult environment in which to cultivate an attitude of "acceptance" that might allow us to remain happy with our obsolescent capacities.<sup>11</sup>

## STATUS ANXIETY

Another reason why it will be hard to avoid destructive regrets about how our lives might have been better if only we had had access to better enhancements is that we will be constantly surrounded by other people who *have* benefited from the superior enhancements that became available after we chose our own enhancements. This comparison with other people is likely to be extremely destructive of our well-being.

Human beings are essentially social creatures. Another, less flattering, way of putting this is that we are intensely status conscious. The markers of status—and what is required to achieve them—differ from society to society but in every society the vast majority of people care how they appear in the eyes of others. In capitalist societies, the primary measure of status is arguably wealth, although the nature of what one has done to achieve this wealth is also important. Consumption of goods is a marker of status in so far as it is a proxy for wealth, which is often difficult to perceive or display directly.<sup>12</sup>

It seems likely that enhancements will be an important source of status in any society in which they are available. Wealthy people will tend to have better enhancements and so the quality of one's enhancement will serve as a marker of one's wealth. Moreover, the rhetoric of human enhancement encourages the thought that people with better enhancements are better people—not necessarily morally better, but with more of the things worth having in human life—and are therefore to be envied for their enhancements.<sup>13</sup>

When we first secure our enhancements, which ideally will be the best (then) available, we will be a source of envy for those around us. We may even gain satisfaction from the knowledge that we have superior capacities to individuals with no—or inferior—enhancements. Moreover, our own sense of self-worth is likely to be bolstered by the subtle social signals of third-party assessments of our status on the basis of our enhancements.<sup>14</sup> However, in just a few years this comparison will begin to be less flattering. While we will continue to shine relative to those older (and, perhaps, poorer) than us, we will look distinctly shabby next to people who are just a few years younger than us and who were able to benefit from the superior enhancements that became available after ours. As those younger than us come to have more and more spectacular and desirable enhancements, it may be increasingly difficult to avoid being envious of them and ashamed of our own (comparatively) meager talents.<sup>15</sup>

Again, while we might hope to comfort ourselves with the thought that we are still better off than those older than us or those with no enhancements, in a society that valorizes enhancement it will be extremely hard to avoid envying the superior enhancements of others. Over the course of a human life, then, the experience of living with—at first cutting-edge and then obsolete—enhancements may turn out to be an overwhelmingly negative one. Importantly, this will prove true for every generation.

#### POSITIONAL AND ABSOLUTE GOODS

Advocates of enhancement have acknowledged that the pursuit of positional advantage through enhancement may have negative social consequences and have typically conceded that regulation to restrict access to enhancements may sometimes be justified by the need to prevent such rat races (also called “Red Queen’s races”) (Agar 2004; Glover 2006; Harris 2007). However, they have also pointed out that many enhancements are not just valuable for the advantages they provide vis-à-vis others but are also valuable simply in themselves. That is to say, they are also “absolute goods.” Of course, in practice many enhancements are likely to offer both absolute and positional benefits simultaneously; moreover, the distinction between positional and absolute goods often depends on the desires of the person enjoying the good. The pursuit of absolute goods does not in itself lead to rat races: pursuit of positional goods that are also absolute goods is likely to leave people better off even if the positional goods do not eventuate.

The positional goods associated with enhancement *are* likely to play a role in generating an enhanced rat race. At any given moment, those who choose to enhance themselves will accrue advantages in relation to those who do not choose to enhance themselves, which establishes a significant incentive for individuals to choose enhancement (Wolbring 2010, 72). Positional goods—or, rather, positional harms—also play a central role in explaining why an enhanced rat race is so destructive. Even if one “wins” the rat race with one’s contemporaries by securing positional advantage through enhancement, one will still eventually suffer a tremendous positional disadvantage relative to younger people with better enhancements.

Yet, the dangers of an enhanced rat race are not solely associated with the *pursuit* of positional advantage. It is a good thing in itself to live longer in good health, to be more intelligent, to have a better memory, and to be more capable of achieving one’s goals, et cetera. It is likely that many

people will be attracted to enhancement by a desire to secure these absolute benefits and with little regard to whether they are thereby better or worse off than others. However, if the enhancements that produce these goods will become obsolete then—whether they care about this or not—they will eventually be worse off than others born after them and will suffer the consequences of positional disadvantage in competition with others with superior enhancements.

The objective costs of obsolescence, then, are incurred as much by the pursuit of absolute goods as positional goods. It is also likely to be hard to avoid the subjective costs of obsolescence even if one values enhancements for the absolute benefits they bring. Because option regret involves a comparison with what *we* might have had rather than what others do have, it is not necessarily any less intense when the good involved is an absolute rather than a positional good. Of course, status goods are by their very nature positional, so someone who genuinely doesn't care about the positional goods associated with their enhancements will not suffer status anxiety. However, for the reasons argued above, in a society that develops and promotes enhancement, it is likely to be very difficult indeed not to care how one's enhancements compare to those of other citizens.<sup>16</sup> The fact that the pursuit of absolute goods may generate these negative outcomes sharply distinguishes my concerns about an enhanced rat race from previously expressed concerns about how enhancement might lead to a rat race.

#### LONGEVITY AND OBSOLESCENCE

Interestingly, the costs of finding oneself with an obsolete set of capacities are likely to be greatly increased by one of the enhancements that is currently being advocated and pursued most vigorously—enhanced longevity (de Grey and Rae 2007). If scientists succeed in extending “normal” human life expectancy it will mean that individuals will spend more years with greatly inferior capacities to those younger than them.

Enhancement of longevity that cannot be updated may also be expected to generate especially severe subjective costs. At least up to some indefinite—but very large—figure, living longer in good health appears as though it would be straightforwardly a good thing. Thus, increases in longevity are an absolute good.<sup>17</sup> For just this reason, however, option regret in relation to the choices that determined one's life expectancy may be expected to be especially severe. The thought that one is likely to die 10 years earlier than one would have if one had waited just a year more

to embrace some particular life-extending enhancement may be a cause for lifetime regret! Moreover, in a world where enhancement is possible, there is also likely to be a significant status component to the benefits of longer life expectancy—or more precisely, to the harm of having a shorter life expectancy. It is possible that people who know that, as a result of having invested in particular enhancements, they may expect to live to 150 will feel superior to those whom they know may expect to live only to be 110. It is almost certain that those who know that, as a result of not having access to particular enhancements, they will have a life expectancy of 110 will resent those who they know can expect to live to be 150. Thus even though we may live longer in the future as a result of enhancement, our extended lives may be blighted by an extended period of obsolescence accompanied by regret and resentment.

#### CHILDREN, ENHANCEMENT, AND OBSOLESCENCE

To this point, I have discussed the implications of the possibility of post-enhancement obsolescence as though we would always be confronting the implications of the availability of enhancements for ourselves. However, some of the most powerful enhancements—those involving genetic selection and/or manipulation and (perhaps) early surgery—will be possible only if parents make decisions about enhancement for their children. Rapid improvement in technologies of enhancement will place us in an invidious position when it comes to preparing our children for life in a world in which enhancement is available. The longer we delay enhancing our children, the better off they will be. Yet if we delay enhancement too long, our children will miss out altogether. Regardless of the choice we make, children born after our own will have superior enhancements. Indeed, by the time our children get to enjoy their enhancements they will already be obsolete. Imagining what it will be like for our children to be born into a world of continuous technological progress resulting in obsolescence makes the dilemma I have outlined more psychologically compelling even if it does not change its fundamental nature.

#### AVOIDING OBSOLESCENCE

The prospect of an “enhanced rat race” is therefore a daunting one. I want to suggest that it might be reasonable to prefer that enhancements that cannot be updated not be available at all rather than to have to confront the prospect of spending most of our lives with obsolete enhancements. That is, while, if such enhancements are available, it is rational to adopt them because of the positional advantages they provide, it may also be rational

to prefer to live in a world in which the choice of doing so is not available to anyone.<sup>18</sup> The circumstances that (might) generate an enhanced rat race therefore have a structure of a “collective action problem,” wherein the aggregate consequences of the rational choice for individuals generate an outcome that those individuals would themselves prefer to avoid (Kavka 1994). As I will discuss further below, the solution to collective action problems is for those who confront them to act collectively to restructure the character of the choice that individuals confront. In order to avoid an enhanced rat race, then, we might collectively decide to prohibit the development and/or use of enhancements that cannot be updated.

#### FURTHER CONSIDERATIONS: INDIRECT BENEFITS OF ENHANCEMENT?

In suggesting that there is a real risk that enhancement will exacerbate the rat race, I am assuming that social relations will remain essentially competitive. It might be argued that this is unduly pessimistic. Perhaps those born after us and who will have who have superior powers to us will take care to avoid treating us as their inferiors and will support us financially when we become unable to support ourselves. Alternatively, perhaps the wealth that each new cohort of enhanced individuals will generate will “trickle down” to those whose enhancements have become obsolete. To the extent that either of these things is true, then while we may not be able to benefit directly from superior enhancements developed after we were enhanced, we might nevertheless benefit indirectly from continuing progress in enhancement technology.

This claim that widespread access to enhancement might reduce social competition might be true of post-Singularity society, which—by all accounts—we may expect also to be “post-scarcity” (Crandall 1996; Kurzweil 1999). It is obviously impossible to rule out its being true for some societies short of the Singularity. However, the recent history of technological progress suggests that it is unlikely to be true of most of the societies in which enhancements are being developed. There is little doubt that scientific and technological progress has generated large increases of welfare for most of the world’s population. However, its impact has been extremely uneven. Wealthy citizens of California already have approximately twice the life expectancy of poor residents of sub-Saharan Africa, yet there is insufficient concern in California about this fact to motivate meaningful action to address it. Even within nations, recent technological advances have been accompanied by a decline in social solidarity, with the result that social programs that were once considered

to be an essential part of the welfare safety net are now being wound back around the globe. Competition for social and economic goods, including status, remains endemic to contemporary capitalist societies despite the enormous technological progress they have experienced in the last decades.

It is possible—although, I suspect, very unlikely—that the development and widespread adoption of technologies of “moral enhancement” might remedy this sad state of affairs and thus ensure that the benefits of state-of-the-art enhancements are redistributed to the majority of the population whose enhancements have become obsolete. A number of philosophers and bioethicists have recently begun to speculate about the possibility of altering the moral behavior and dispositions of human beings using various advanced biotechnologies (Douglas 2008; Persson and Savulescu 2008; Persson and Savulescu 2012; Walker 2009).

It is difficult to know how to respond to this literature, let alone assess the prospects for the technology about which it speculates, given the complexity of both the intended target of enhancement (“moral behavior and dispositions”) and the science (psychology, neuroscience, economics, pharmacology, genetics, et cetera) that might explain it (de Melo-Martin and Salles 2014; Jotterand 2011; Sparrow 2014c). Indeed, even the most enthusiastic advocates of “moral bioenhancement” admit that

moral bioenhancement worthy of the name is practically impossible at present and might remain for so long that we will not master it, nor succeed applying it on a sufficient scale . . . [to address the consequences of humanity’s new found technological powers—RS ]. (Persson and Savulescu 2012, 123)

However, even if it *were* possible, there are at least two reasons to be cynical about the likelihood that moral bioenhancement will bring about the existence of a society where those with obsolete enhancements did not suffer from the fact.

First, in order for moral enhancement to eliminate competition for scarce social goods, it would need to occur universally (or at least very nearly so). Yet it is hard to imagine a politically plausible mechanism by which this might come about, especially because the fact that—in the absence of universal moral enhancement—those who were morally enhanced might themselves suffer significant disadvantages in social competition establishes a significant disincentive for individuals to “opt in” to moral enhancement (Sparrow 2014a).

Second, moral enhancements might themselves generate benefits that were not available to those with inferior (moral) enhancements and also

be subject to the same dynamic of obsolescence due to technological progress with the result that even with the best will in the world the morally enhanced may not be able to ensure that those with obsolete enhancements (moral and otherwise) are not disadvantaged. As Allen Buchanan (2011, 209–41) has noted in the context of the discussion of the impact of cognitive enhancements, there is a relation between the capacities of agents and the benefits that may be generated in various forms of social cooperation. Sometimes this means that individuals have a legitimate interest in excluding others with inadequate capacities from particular cooperative activities. For instance, there is a certain pleasure to be had in playing bridge—a game which requires a certain level of cognitive capacities. Admitting a young child or a person with a significant cognitive impairment to a bridge game immediately makes it impossible for the adult players to enjoy the game. A similar phenomenon might occur with moral enhancements. The benefits available through social cooperation are strongly determined by what we can expect of other participants by way of their *moral* behavior. For this reason, the “morally enhanced” may have a legitimate interest in excluding the participation of those who are less “moral” from certain important cooperative activities (Sparrow 2014b).<sup>19</sup> Should this turn out to be the case then, even if the morally enhanced are more concerned with social justice than are people today, they will still have a strong—indeed (in so far as their own interests legitimately carry a certain moral weight) a moral—reason to tolerate social arrangements that place those with obsolete enhancements at a significant disadvantage.

These remarks about moral enhancement are necessarily extremely speculative given how far the philosophical literature on the topic is ahead of the science. It is, I suppose, possible that progress in moral enhancement will mitigate some of the negative consequences of obsolescence I have surveyed here. Equally well, however, it is clear that it would be unwise to simply assume that moral enhancement will prevent an enhanced rat race.

Whether the benefits of enhancement will “trickle down” to those with obsolete enhancements in the future is also hard to evaluate. It is arguable, for instance, that enhancements will massively increase the productive capacity and thus the total wealth of societies in which they are available. If some percentage of this total wealth is distributed to the worst off (à la Rawls) through a system of redistributive taxation, then even those who suffer most from the consequences of obsolescence *might* still be better off (whether they are or not will depend upon whether the absolute benefits the recipients of this distribution receive from it are outweighed

by any positional disadvantages associated with the new distribution). Moreover, Allen Buchanan (2011) has recently drawn attention to the fact that “network effects,” whereby the benefits of each individual’s enhancements increase and are increased by the enhancements of others, may result in enhancements being public as much as private goods. To the extent that this is true, those who suffer positional disadvantage as a result of obsolescence *may* still benefit from the availability of enhancement, even in the absence of redistributive taxation. However, the fact that (some) enhancements will become obsolete interacts in complex ways with the phenomenon of network effects. Obsolescence may greatly reduce the extent of such network effects by preventing those with different generations of enhancement from benefiting from the enhancements in earlier or later generations. Indeed, to the extent that technologies become obsolete precisely because other people stop adopting them, other people’s adoption of superior enhancements may make us significantly worse off. On the other hand, network effects can sometimes effectively coerce the continued use of a technology that should properly be obsolete because early adopters of technically superior technologies are disadvantaged by the lack of a critical mass of other users of the technology that might produce the network effects that users of the inferior technology currently benefit from.<sup>20</sup> Finally, presumably sometimes we *will* benefit from the fact that other people have superior—or even obsolete—enhancements.

The ultimate impact of network effects on the benefits of enhancement is therefore complex and difficult to resolve. It is certainly possible that, despite the objective costs of obsolescence, even enhancements that become obsolete may leave people “objectively” better off than if they had no enhancement at all. What is far less clear is whether this improvement would outweigh the subjective costs of obsolescence. That is, even if people were—according to some set of material indicators—actually better off, they may actually feel worse off. Given that how we feel is an important component of our welfare, this feeling may indeed make us worse off. Again, the recent history of technological progress suggests that this is, in fact, quite likely. Increases in the average real income in wealthy industrialized societies have not lead to corresponding increases in welfare, precisely because it appears that—once our basic material needs have been met—we care as much or more about our position relative to others as we do about our absolute wealth.<sup>21</sup>

Whether the indirect benefits of the availability of enhancement are likely to outweigh the cost of obsolescence will need to be evaluated on a

case-by-case basis. Nevertheless, where a particular enhancement may be expected to be strongly associated with status and where network effects seem more likely to exacerbate the costs of obsolescence than to increase the benefits of enhancement, it may still be rational to prefer to avoid an enhanced rat race.

#### AVOIDING AN ENHANCED RAT RACE

The value of individual liberty establishes a *prima facie* case that decisions about enhancement should be left up to individuals. However, this freedom is not absolute and may properly be restricted if enhancement would lead to harm to others—including if, as I have argued here, having the freedom to enhance oneself generates a destructive collective action problem. Where collective action problems exist, we cannot simply assume that leaving individuals free to choose between goods will result in them being able to get what they want. When presented with different choices (Would you adopt enhancements that could not be updated if they were available? Would you prefer that they not be available?) the very same individuals may express different preferences (Sen 1977). It is therefore not enough simply to say that individuals should be “free to choose.” Rather, we must decide which choice is more important for people to have, in full consciousness that the attitudes of different individuals towards these choices may conflict. If a majority of citizens would prefer to avoid an enhanced rat race then they may be justified in restricting everyone’s access to enhancement in order to preserve the freedom to avoid having to adopt them. Note, moreover, that where collective action problems exist, it will often be possible to elicit a supermajority in favor of regulation, as it is genuinely in individuals’ best interests to avoid the costs associated with the aggregate consequences of individual decisions in the absence of regulation.

At this point I must confront an objection that often arises whenever a discussion of the ethics of a new or proposed technology reaches the conclusion it would be better if a new technology was not adopted or developed, which insists that regulation of new technologies or technological development is essentially impossible because of the powerful dynamics driving technology development and uptake. Once a given or potential technology offers a competitive advantage, so this account goes, individuals and corporations will develop and adopt it regardless of what the government or community would prefer.<sup>22</sup> Such technological determinism flies in the face of a well-documented history of societies

failing to develop or use technologies that existing science was sufficient to invent and produce; both technology development and uptake depend upon the prevailing network of public attitudes, economic arrangements, and laws and regulations, which may either facilitate or frustrate both processes.<sup>23</sup> Indeed, as I have discussed elsewhere, the claim that the arrival of some new technology is inevitable often occurs in close proximity to a demand for higher levels of government funding or changes in public attitudes or regulatory regime in order to enable its development (Sparrow 2007; Sparrow 2008).

This last observation should alert us to the existence of a powerful mechanism for making choices about the development of enhancement (and other) technologies by means of conscious decisions about the regulation and funding of research to develop new technologies. Governments already shape technological trajectories by allocating research funds to projects according to the extent to which they address certain national priorities and also by prohibiting certain forms of research (for instance, in most jurisdictions, experimentation on human embryos is prohibited after 14 days from conception). Indeed, many of the technologies that we now think of as the inevitable product of scientific progress came into existence as the direct result of concerted programs of government-funded research. By refusing to fund research to develop or continuously improve particular enhancement technologies and/or by prohibiting research into such technologies, governments could prevent the collective action problem that might generate an enhanced rat race from arising.

Even if enhancement technologies *are* developed and continuously improved, the fact that many enhancement technologies will have to be installed and/or maintained by skilled professionals suggests that regulation of these professions is an obvious way to secure regulation of enhancements. Neural implants will need to be installed and serviced by surgeons, enhanced prosthetics by surgeons and engineers, pharmaceuticals by physicians and pharmacists, et cetera. These are professions that are already heavily regulated and indeed that rely upon a regulatory context that licenses them and determines their responsibilities and liabilities; without this regulation they could not exist. It is plausible, then, to think that the regulation of these professions might include restrictions on their making available certain classes of enhancements in order to avoid establishing an enhanced rat race.

I have not attempted here to argue that any particular enhancements or class of enhancements should be restricted. As I noted at the outset,

whether concerns about the danger of an enhanced rat race are sufficient to justify regulation of particular enhancements will depend upon the various considerations I have surveyed here. However, let me suggest in closing that the dangers of an enhanced rat race represent a novel and important argument as to why we should be wary about human genetic enhancement and a powerful consideration to be taken into account in the design of neural implants and other enhancements involving surgery. Genetic enhancements pose a particular danger of an enhanced rat race because it seems highly unlikely that they will be capable of being updated and because they seem especially likely to be closely associated with social status. The high costs of obsolescence are an important design consideration for neural implants and other surgical enhancements in so far as whether these enhancements can be updated or not—and also the extent to which they will generate positive network effects—will be highly dependent upon the extent to which they are designed so as to be “future proof.” Indeed, unless implants can be safely removed and replaced as superior models become available, it is hard to believe that people would be willing to undergo implantation, especially as many of the functions of implantable devices could presumably be replicated, albeit less efficiently, by portable external devices.

Enthusiasts for human enhancement assume that continuing technological progress will make an ever larger and more powerful range of enhancements available to us. I have argued that where enhancements cannot be updated such progress may generate an enhanced rat race that it would be rational to prefer to avoid by rejecting the enhancements altogether. In some eyes, this conclusion may appear perverse: surely the fact that we expect a technology to improve cannot itself be reason to reject it? Yet the appearance of perversity is just that and is caused by a failure to fully acknowledge the paradoxical nature of collective action problems. It is characteristic of a collective action problem that the aggregate consequences of individually rational decisions produce an outcome that these same individuals can recognize as being worse than if they had been denied the opportunity to make the individually rational choice. The collective decision to reject an enhanced rat race would reflect the recognition that, while the technology will continue to improve, the benefits it offers each of us will not—indeed our circumstances will get comparatively worse and worse. Continuing progress in enhancement technology may be something to be regretted rather than to be welcomed if it means that we will all soon be left behind.

## ACKNOWLEDGMENTS

The research for this paper was supported under the Australian Research Council's Future Fellowships funding scheme (project FT100100481) and Centres of Excellence funding scheme (project CE140100012). The views expressed herein are those of the author and are not necessarily those of the Australian Research Council. I would also like to thank Catherine Mills, Nicholas Agar, Toby Handfield, Bob Simpson, Russell Blackford, David Neil, David Braddon-Mitchell, and Victor Cole for comments and discussion over the course of this paper's inception.

## NOTES

1. The precise formulation of Moore's Law is a matter of some controversy. However, as it has entered popular culture, Moore's Law states that the number of transistors that it is possible to fit on a silicon chip of a given size will double every two years.
2. Although, because many of those writing about the Singularity are published science-fiction authors, an enormous amount of effort has, in fact, been put into imagining them.
3. Wolbring (2010) is an admirable exception to this rule, which I became aware of only after submitting the current manuscript for consideration for publication.
4. However, as I will consider further below, they *may* enjoy "indirect benefits" from future improvements in the technology.
5. State subsidy of enhancement is also properly controversial, at least among liberals, insofar as it would arguably require the state to make judgments about the relative importance of the life projects of different citizens, which could not be determined without reference to a substantive conception of the good, in order to decide which enhancements should be funded. For a discussion of this issue in the context of debates about genetic human enhancement, see Sparrow (2010).
6. The only other discussion of these costs to date, of which I am aware, is Wolbring (2010), which mostly emphasizes the subjective costs of obsolescence and says little about the objective costs I discuss below.
7. For a striking description of this dynamic and its consequences, see Scheiber 2014.
8. While compressing the period in which individuals are at—or near—the peak of their capacities seems very likely to intensify competition between individuals during this period, the ultimate impact of enhancement followed by rapid obsolescence across the full human life cycle will also depend upon

the extent to which individuals with obsolete enhancements receive indirect benefits from the enhancements of others. I discuss this matter below.

9. I owe this point to David Braddon-Mitchell.
10. While different theories of the nature of human welfare may value them differently, the difference between the “subjective” and “objective” costs of enhancement, as I use this distinction here, is a matter of the mechanism that generates them (roughly speaking, psychology versus economics) and this choice of terminology is not itself intended to imply any difference in their import or force. For current purposes, I will assume that both our actual circumstances and our feelings about them are relevant to assessments of well-being.
11. Again, we can see an echo of this in contemporary attitudes towards consumer electronics: given the amount of energy put into developing and advertising new features for these systems, once a “better” device becomes available it is actually quite difficult to remain happy with what just a few years ago was a wonderful new technology.
12. For an extended and sophisticated discussion of the importance of status goods for social and economic analysis, see McAdams (1992).
13. Should “moral enhancement” become possible, the enhanced may be morally better people as well! For discussion of the implications of this claim, see Sparrow (2014b).
14. Because status is an interpersonal relationship, the effects of status on human well-being are not merely a function of the subjective experience of individuals. Social status is implicated in a whole range of social relations with the result that low-status individuals may suffer persistent marginalization and discrimination, regardless of whether they are themselves conscious of their status. These effects, which, according to Wilkinson and Pickett (2010), are the primary mechanism whereby inequality generates high costs for all citizens, therefore partially undercut the distinction between “subjective” and “objective” harms that I rely upon for expository purposes here.
15. While younger people today may already have (slightly) superior talents and capacities to those significantly older them, continuous progress in enhancement technology would greatly exaggerate this phenomenon. Moreover, because, in the future, the superior talents of those younger than us will not merely be a function of their position in the natural human life cycle but instead mostly of their access to superior enhancement technologies, it is likely to be much harder to avoid comparing ourselves to them: had we waited a bit longer to enhance ourselves (or our parents waited to enhance us), we could have had the very same capacities!

16. Moreover, other people may care about an individual's status vis-à-vis third parties and alter the way they treat them as a result. Thus, even those who do not care about status may be affected by it.
17. There is also a significant positional component to the benefits of increased longevity. Living longer (in good health) than others allows us to attempt and achieve projects that they cannot. As our longevity-enhancements become obsolete we will therefore suffer positional disadvantage.
18. The fact that many enhancements will offer both positional and absolute benefits renders the assessment of whether one is ultimately likely to be better or worse off in circumstances in which particular forms of enhancement rapidly become obsolete a complex and difficult matter. Nevertheless, given that the price of achieving the absolute benefits of enhancement in the context of rapid obsolescence is ultimately likely to be severe positional disadvantage, it seems likely that this assessment will speak against societies embracing certain forms of enhancement.
19. It is not entirely clear whether we should think of individuals' capacities for acting morally as admitting of the possibility of continuous enhancement. If we believe that it might be possible for people to become "perfectly" moral then presumably any enhancement that achieved this would never become obsolete. However, it seems at least equally plausible to think of moral and cognitive enhancement as intertwined so as to allow for the (theoretical!) possibility of continuing improvements to our capacities for moral reasoning and to the extent of our moral concern.
20. I owe this point to David Neil.
21. The fact that increases in average income do not lead to corresponding increases in happiness was first noticed by Richard Easterlin (1974). It must be acknowledged that the precise relationship between income and happiness remains the topic of ongoing research and controversy. For recent contributions to this debate from opposing perspectives see Stevenson and Wolfers (2013) and Clark, Frijters, and Shields (2008).
22. It is striking just how many (and which) people are opposed to any regulation of technology without being libertarians on other social and policy questions: very few people, for instance, are willing to draw the conclusion that the deliberate killing of unconsenting human beings should not be illegal from the fact that no society has ever succeeded in entirely preventing murder. Note also that if it is not possible to make conscious social choices about technological trajectories, then discussions of the ethics of human enhancement—indeed, of any technology—both "pro" and "con" are entirely pointless.
23. See, for instance, the essays collected in MacKenzie and Wajcman (1999).

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