Professor Julian Savulescu, National Press Club National Australia Bank Address, Wednesday, 8 June, 2005.

Randall: Ladies and Gentlemen, good afternoon, welcome to today's National Press Club National Australia Bank Address, and a particular welcome to Professor Julian Savulescu, who is our speaker today. Professor Savulescu is Professor of Practical Ethics at the University of Oxford, and he's also head of a not very well known Melbourne-Oxford stem cell collaboration research, ahhh, which has all sorts of implications for the public policy debate in Australia. He's also this year's medallist of the Australian Society of Medical Research. We've collaborated with the Society in the past with previous awards of their medals, we're going to do it again today, and I'd like to invite Professor John Shine, the Chairman of the National Health and Medical Research Council, to actually present that medal to Professor Savulescu.

Shine: Thank you, ahh, thank you Ken. The Australian Society for Medical Research each year selects an individual who has an outstanding reputation both nationally and internationally for his or her contributions to medical research, and they're selected to be the ASMR Medallist. During medical research week, which of course is this week, the ASMR medallist is the guest of honour at functions all throughout Australia, and one of the highlights of course of which is the presentation of the address at the National Press Club. I think it's important as we hear the Medallist's address today, to remember the enormous pace of discovery that's occurring in medical research around the world. And so the particular issue that we'll be discussing today on the ethics is so important for the community, more important now that ever. And the ASMR amongst its membership of course has a diversity of views which is similar to the diversity of views across the whole community, but the ASMR believes it's incredibly important that we have a very frank and extensive discussion of the issues that are raised by modern medical research, and that this discussion is informed by research and by facts. And so I think it's a great opportunity here today. So as Chairman of the NHMRC and as a member of ASMR, it's a great privilege for me to be able to present the ASMR medal for 2005 to Professor Julian Savulescu. Julian.

Savulescu: Thank you

Randall: We won't make him wear it throughout the speech. Julian Savulescu has been involved in many of the great debates of our recent times, about the ethics of the fields in which he's so closely involved. He's going to talk to you today about the implications for people throughout the world and throughout the medical and research communities in particular about those. Please welcome Julian Savulescu.

Savulescu: Thank you very much Ken. I've changed the title of today's talk to "New science, enhancement of human beings, and the future of medicine". I want to share a vision with you and I want to suggest to you that this is a very exciting time to be in Australia and we have a tremendous opportunity both to push our country ahead and make our citizens' lives better. New Science embraces new methodologies which are sometimes ethically contentious, sometimes radical, and sometimes challenge our preconceptions even of our own nature. But they offer enormous potential. The sorts of methodologies in science that I'm talking about are stem cell science, cloning and the new genetics. I think we need to embrace the new science in the 21st century.

I want to also suggest to you that we need to redefine the purpose of science and of medical research. 20th century medicine was marked by a focus on the treatment and prevention of

disease. In addition to these very worthy goals, 21st century medicine, I believe, should develop and use science and medical technology just, not just to prevent and treat disease, but also to enhance peoples' lives. I want to suggest to you that we should make happier, better people.

Let me give you an example of the new science and its potential. On May the 19th, 2005, Woo Suk Hwang and colleagues from Korea reported cloning 31 human embryos. This is the first truly successful cloning of human embryos although they produced a single clone a year ago, and they produced 11 embryonic stem cell lines from that, from those clones. This was incredibly important research, not just for science, but for all of humanity, for two reasons. And understanding these two reasons I think helps us to think about the ethics of this kind of research.
Firstly, it raises the possibility of what's called self-transplantation. These scientists took cells from patients with genetic disease, diabetes, and spinal cord injury, cloned them, and produced embryonic stem cell lines that were compatible with those patients. And this means that in the future, if this research realises its potential, that people who have had stroke, heart attack, Parkinson's Disease, Alzheimer's disease, may be able to have their dead or damaged tissues replaced from cells from their own body through this technology.

But the second reason this is incredibly important research, and I think one that has escaped much public attention, is it raises a whole new possibility for medical research. It raises the possibility of developing cellular models of human disease. What these scientists did was to create tissue with diabetes, with umm genetic disease, and you could use similar research to take a skin cell from a cancer patient, clone it, produce embryonic stem cells, push them into developing into cancerous tissue, and you would have vast amounts of human tissue with that disease, to study the cause of that disease, the genetic contribution to it, the variation between individuals, and more importantly, you'd be able to test drugs on the tissue, without needing to test them on either animals or human persons. Now this is incredibly important, because it opens up a new avenue for performing medical research, and also, I want to suggest to you, avoids many of the ethical objections to embryonic stem cell research.

I was asked to attend a press conference at the Royal Institution on May the 19th when this research was revealed to the public, and they asked me what I thought about the ethics of it. And the first point I made was that the issue that, the main issue that this raises is not whether this research is permissible, but why we aren't doing more of it. The incredible potential, not just for self-transplantation, but for studying common diseases, like cancer and heart disease by developing cellular models, means we have a moral imperative to engage in this research. Why do I say that? Well, in the area of life-threatening disease, time is not only money, time is also life. If you delay the release of a drug that will save a hundred thousand people's lives for one year, and that delay is unnecessary, you're responsible for the deaths of those people. In the same way, if we fail to engage in this research that could save people's lives every day, we're responsible for the people that die because of that unnecessary delay. And we're talking here about diseases that will affect virtually all of us. This kind of research is prevented by law in Australia.

Looking at this research in more detail, I think we can understand which ethical objections are well placed and which are misplaced. One of the major objections to cloning research in Australia is that it involves the destruction of early human embryos. Well, what did these researchers do? They took about a hundred and eighty-five eggs from women who were never going to have children at the time. Women are born with millions of eggs. By the time

they reach - umm - by the time they achieve the ability to reproduce they have got hundreds of thousands of eggs. The vast majority of these eggs perish and die. Only a few - one, two or three produce children, depending on how many children they have. These eggs were never going to produce human beings, they were simply going to perish. Scientists took these what might be termed spare eggs, and used them for very important research.

Human embryos may have a special moral status, when they are a part of a project, by a couple, to have a child. But when they're not part of a project to have a child, they have quite a different status. For that reason, we allow the destruction of embryos from IVF. I believe just as we allow research on spare embryos, we should also allow research on spare eggs.

Secondly, scientists in Australia want to use eggs from non-human animals such as rabbits; to inject human nuclear DNA into these eggs, and produce stem cell lines to study diseases like cancer in the way that I have described. These chimeras, or hybrids, would never develop into a human being. They stop development very early. There is no human embryo involved in that kind of research. So if we're concerned about the destruction of human embryos, we have a way, using what might be a controversial method, of mixing rabbit eggs with human DNA, but a method that would radically improve our power to conduct very important scientific research.

Ethics is about understanding relevant differences and distinctions. And one of the important differences is between cloning for the purposes of developing cells for transplantation and cloning for the purposes of developing cellular models of disease. This second application is immune to the vast majority of objections currently raised to embryonic stem cell research. Firstly, people claim that women will be harmed because large numbers of eggs would be required to develop treatments from embryonic stem cells. Not true for the second application. We'd only need a handful of eggs to develop vast amounts of tissue for diabetic research, Parkinson's disease research, or whatever.
Secondly people claim that this is exotic research, that ignores our responsibility to the world, to benefit people with diseases in the developing world. Not true. The second application allows the study and develop treatments for common diseases such as cardiovascular disease, cancer, that afflict people all through the world.
Thirdly people claim that stem cell research, embryonic stem cell research, is unsafe; that there are risks of transmission of infection. Not true, when we're developing new chemotherapeutic agents, and new drugs, being tested on the tissue derived from cloning.

Lastly people say we don't need embryonic stem cell research because we have adult stem cell research. Not true: adult stem cell research won't enable us to develop these cellular models of human disease. I believe we have a moral imperative to embrace this kind of new science, not just a moral imperative, an economic imperative. California has recognised its potential and devoted 3 billion US dollars to this research. The solution is easy. We shouldn't ban cloning; we should ban reproductive cloning: cloning attempting to produce a live-born child, but allow therapeutic cloning; we should seek a universal global ban on reproductive cloning but facilitate this very important research. We can, I believe, through ethically informed legislation and proper community debate, support this kind of new science ethically.

OK, so much for the new science. Now I want to talk about enhancement, because I think new science is going to offer us huge potential, not just to treat and prevent disease, but to enhance our lives. And there's an enormous popular interest in enhancement; this is not just

a trivial philosophical discussion. Cosmetic surgery is one form of medical technology being used for the improvement of people rather than for the treatment of disease. The whole beauty industry is about enhancing people. The interest in botox or botox. Performance enhancement in sport is obviously in the popular consciousness, steroids, EPO, growth hormone, are all used by athletes to improve their performance. We now have genetic tests to predict whether people will be better at endurance or sprint events. Many of us use cognitive enhancers. Caffeine, modavigil to reduce sleep, nicotine, and many college students use ritalin, and this is administered to children to improve their cognitive performance. We're all embracing already, mood enhancement: many people, many young people use recreational drugs, we all use alcohol. I mean alcohol is a neurotoxin, a hepatotoxin. We use it to improve our mood and to increase our socialisation. Surely today science can do better than ethanol.

Prozac is a drug that has been in use in the US in normal people to improve mood. Well, one of the most striking examples is sexual performance. Every day I receive numerous emails which I assume are not specifically directed to me, for Viagra, although it may be directed towards me because 34% of men aged 40 to 70 have some erectile dysfunction. That's around 20 million men in the US. Twenty million men around the world use Viagra, and this is not for the treatment of disease; this is to ameliorate the normal effects of ageing. Not only do we want to retire, have time with our family, play golf, we want to be sexually active, and often have a second or third family. There is a 12% decline in erectile function every decade after the age of 20, that's normal, but many people don't accept it. Some Americans take Viagra prophylactically to prevent impotence. So if anyone - ahh - questions the importance of enhancement to the ordinary person I think they should look at Viagra.

But much more radical biological enhancement is on the horizon and possible. If we cured all disease - cardiovascular disease, stroke, diabetes etcetera, we would only prolong life on average by 12 years. So we've pretty much reached the ceiling of what we can do by treating and preventing disease. We can make some improvements in that. But when you talk to stem cell scientists like Roger Pederson in the UK and you ask them what's the most important ethical issue that's coming out of stem cell research they say it may radically prolong our lives past the current maximum of 120.

But I don't want to focus on longevity, which I think is going to be one of the issues for this century, but quality of life, how well we live. There's good evidence now that our biology, our genetics in particular, affects how we live. Why do I say that? Well, first of all, just an everyday stroll through the park should reveal to you the power of genetics. All 3 to 4 hundred different breeds of dogs are the result of a 10,000 year genetic experiment involving selective breeding from a small group of wolves and canids 10,000 years ago. Now I think everyone is familiar with the difference between a Labrador, a Chihuahua, a Doberman, and an Alsatian. No matter how much love and attention and diet and environmental manipulation you give a Chihuahua it will never beat a Doberman in a fight. You can certainly cripple a Doberman through neglect and abuse, and you can make it more pretty with a bow around its neck, but you can't fundamentally change its nature, because that's genetically determined.

Recent research from monkeys a year or so ago reported in one of the leading journals nature, reveals that if you take genes from a group of very hard-working industrious monkeys, and insert them into the brains of lazy monkeys, the lazy monkeys become workaholics. In a more provocative experiment, researchers took genetic material from the brains of what are

called “prairie voles”. These are small rats that inhabit the countryside of the US and the prairie vole, the male prairie vole is characteristically monogamous, having one female partner all through its life. When these genes were inserted into a close relative, the meadow vole, which is characteristically polygamous, the polygamous vole became monogamous. Even our sexual behaviour will no doubt have some biological basis.

Neuroscience is making great inroads into understanding and treating disease but this very same research may allow us to radically change our cognitive abilities. In again a very interesting experiment in the last couple of years, scientists created a rat model of the human disease Huntington’s disease, which results in dementia. And they showed, by stimulating these rats with a very rich and interesting environment that they prevented the onset of Huntington’s disease. So by giving them coloured baubles, mazes, and various other stimulation, they actually prevented a disease from occurring. Now people are studying the effect of the environment on young children, and there’s no reason to reject the possibility that radical alterations in our environment may actually improve people who are normal and not just prevent the onset of disease. Even more provocatively, the drug Prozac has been shown to have the same effect as a stimulating environment, and both of them act, not mysteriously, but by increasing the number of neuronal connections in the brain. These results, these experiments suggest that there is the possibility to change our nature and we may be able to change our nature for things such as our sexual predispositions and whether we’re hard-working or not.

Behavioural genetics is a field of genetics that seeks to understand the contribution of genes to our personality, our psychology, our cognitive abilities and our behaviour in general. Now this is a very infantile field. There are no genes for homosexuality or intelligence - at present. But a number of conditions such as aggression, criminal behaviour, alcoholism, personality disorders, homosexuality, maternal behaviour and so on are being studied to understand their genetic and biological basis. And while it is unlikely that we will ever find that a gene causes a certain behaviour, genes and our biology may well predispose us to behave in certain ways, and we may well, in the future, be able to intervene to change that behaviour by effecting our biology. We already do that by mating, where we choose a partner according to their genetic characteristics, and more recently through prenatal genetic diagnosis, and preimplantation genetic diagnosis. We select embryos with a lower chance of disease and a having a greater chance of a longer healthier life. Already, we can use this technology, not just to prevent disease, but to give people what they want. Sex selection, or pre-implantation genetic diagnosis can be used to enable couples to have children of the sex that they desire, very accurately and very safely. In the future, we may well be able to intervene through pharmacology and genetic manipulation to enhance human beings. Well, this raises the question, “Should we do it?” Ethically, should we attempt to enhance people?

I want to give you three arguments that we have a moral imperative to attempt to enhance ourselves and our children. The first one is that choosing not to enhance someone is the same as harming them. All of us, I think, would accept that dietary neglect that caused a child with a stunning intellect to be stunted and have a normal intellect would be wrong, and a form of parental abuse. But failing to institute some diet that would cause a normal child to have a stunning intellect results in exactly the same thing: a child who’s normal, who could have been much brighter, I believe is equally wrong. Now substitute “biological intervention” for “diet”, and you see that if we have a reason to prevent our children from deteriorating we also have a reason to improve them.

Secondly we all are in favour of better education for our children. We accept environmental manipulations through diet and other ways. We train our children to be well behaved, cooperative, intelligent, socially aware, empathetic. But if we allow these environmental manipulations, why shouldn't we also allow direct biological manipulation. Because these environmental manipulations don't work mysteriously, they actually affect our biology. Again in a very interesting experiment, rats who were extensively mothered showed genetic changes compared to rats who were not mothered. Our environment affects our biology, and so too in the future may direct biological interventions. If it's good to be well behaved, if it's good to be more intelligent, then surely we should attempt to use science to achieve those same ends.

The last argument I want to give you is that we are already down the road to human enhancement. We have no logical reason to reject it. If we accept the treatment and prevention of disease, which we do, we should accept enhancement. Why do I say this? Well health is not something that is intrinsically valuable. Health is something that enables us to do what we want to lead a worthwhile life. When we're sick, we can't work, we can't engage with our families, we can't achieve our goals. That's why disease is bad. There is nothing intrinsically bad about disease, apart from its affects on how well our life goes. But if that's the case, what matters, is how good our life is; how far we can achieve our goals, and in so far as our biology in other ways can effect that, we have the same reason to intervene to improve our biology. People of course say, well we know that disease is bad, but we don't know what makes for a good life. Philosophers have debated this issue for several thousand years. But fortunately we don't have to answer the question of what a good life precisely is. We know that it's not just the absence of disease. People trade length of life for non health-related wellbeing all the time, when they smoke, they drink excessive amounts of alcohol, and they engage in risky but pleasurable or exciting activities. Psychology, cognitive ability, and physical ability, may all contribute significantly to our well being, just as disease does. Why do I say that?

Well again, another interesting piece of research, this time from the 1960's showed that when you put 4 year old children in a room with a marshmallow, and you tell them not to eat the marshmallow, and if they don't eat the marshmallow they will get two later on. When you leave the room, some of these children of course can't control their impulses and eat the marshmallow. But those who can control their impulses, when studied a decade later had more friends, were better adjusted, had better academic performance, higher IQs, and better life in general. We're all familiar I think today with the problems associated with poor impulse control, and indeed poor impulse control has been associated not just with running into trouble with the law, but lower socio economic success.

What else might we seek to enhance? Well, philosophers have talked about what are called "all purpose goods" - goods that are good no matter what kind of life you want to lead. Intelligence, memory, self-discipline, foresight, patience, sense of humour, optimism. These may all have a biological contribution. Indeed, we may be able to make people more moral. In so far as empathy, imagination, fairness, and a sense of honesty are biologically determined, we may be able to manipulate these characteristics in humans. There is reason to believe that these characteristics have a biological basis. Again, in another interesting experiment, monkeys were trained to perform a task and were rewarded with either a grape or a cucumber. The monkeys liked the grapes more than the cucumber. In one experiment, a monkey did the task successfully, and when he was rewarded, he was given a piece of cucumber. And next to him was another monkey who hadn't done the task and that monkey

was given a grape. And the first monkey became very angry, obviously indicating that he felt this was unfair, unjust, undeserved. Religiosity, criminality, have all been associated with some degree of genetic contribution. What I've suggested to you is what matters is not absence of disease but human wellbeing. Our biology affects our opportunities in life, the essence of humanity is to choose to be better in so far as in the future we will be able to manipulate our biology, we should manipulate it to make our lives better.

Now I want to close with considering one objection to this, familiar to this sporting nation, that this is un-Australian, unfair and cheating. And the best example of this, people say, is look at performance enhancing drugs in sports, that's cheating, it's against the spirit of sport. Caffeine, beta-blockers, human erythropoietin, growth hormone, anabolic steroids, are all substances which are used to enhance performance in sport. So is it against the spirit of sport to use these substances to make ourselves stronger and faster. Well it depends, it depends on what the spirit of sport is. If sport is a test of natural ability, just a selection of the strongest or fastest man or woman on the planet, then yes it is, because you are altering that natural potential. But that means human sport is just like a dog race or a horse race, where you line up the horses, the jockey flogs them and the fastest one crosses the line. But humans aren't dogs or horses. They have a mind, and they have the capacity to make judgements, about what kind of training to entertain, how to run their race, and I believe, what kind of competitor to be. A truly human sport would allow enhancement because it would allow the exercise of choice over the nature of the competitor. Musicians already use beta-blockers to improve their performance to reduce tremor; nobody suggests this is against the spirit of sport. To be human is to strive to be better and to lead better lives. Far from being against the spirit of sport, allowing biological enhancement, may well be an embodiment of the human spirit.

Now there are a number of objections to this which I'll pass over. One of them is that it is unfair, ok, but lets remember that nature itself is just a lottery. There is no intrinsic fairness in nature. The best example of this is a Finnish skier in 1964, who won three gold medals, because he had naturally a mutation in the gene producing human erythropoietin, producing 40 to 50% more red blood cells. Why is it fair that that individual started with a massive advantage. The only real objection to human enhancement is that it is unsafe or it harms people. For this reason that we should rule out some forms of performance enhancement in sport. But allowing moderate doses of growth hormone or human erythropoietin wouldn't significantly harm athletes. In general we should allow people to use enhancement providing that it's safe and, ahh, free from significant harm. I've suggested to you that the new science, that is, cloning, stem cell science, genetics, offers enormous potential for benefit. We have both a moral and an economic obligation to support new science. My vision for 21st Century medical research is that we not just prevent and treat disease, but we aim to make peoples lives better. In the future, we will have enormous capacity to do this. Genetic engineering through the introduction of artificial chromosomes will be able to introduce large numbers of genes never before present in an individual. Even more radically, nanotechnology and artificial intelligence promise to fundamentally change our lives. Australia has the technological capacity to develop these technologies. Australians must arouse now from their dogmatic slumber and be open to a radically different and possibly much better life. Scientific and medical research, I think, is the way to realise that future - a future that not only will bring Australia great wealth, but also improve the lives of all Australians. Thank you.

[Applause]

Randall: We, we have now our usual period of questions; I'm sure they've all arisen from their dogmatic slumber and we'll test that with Michael Harvey.

Harvey: Michael Harvey from the Melbourne Herald Sun, Prof Savulescu. On the subject of breeding humans that will have better lives and better wellbeing. Can I just put a few examples to you of perhaps how history has shown that some of the most creative geniuses are often linked to the sort of negative behavioural characteristics you talk about; these perceived negative conditions. I think about rock stars who thrive on alcoholism and drug abuse. I think of painters who similarly were linked to such characteristics. I think of actors perhaps linked to aggressive impulsive tendencies. Umm, but I also I think of in Victoria the late public servant John Patterson who often talked about his contribution to society and his achievement was as much a decision he took actively in early life not to be, umm, subdued if you like by his physical condition of dwarfism. He made his contribution as much in reacting to that. Simply I am putting to you that your agenda could have cost us the rock singers, the great public servants and, dare I say it, the Russell Crow's.

Savulescu: Right. God forbid! Umm, There is also an association between manic depression and creativity, and many great artists and people who have achieved a lot have had manic depression. And I think it is a very good point. The response I think to that, is to allow people liberty to make the choices they want. And I don't think that you will see a constriction. I think what was wrong with the Nazi Eugenics Program was that it attempted to force individuals to fit into a State blueprint for what was a master race, force them against their will. Now if we allow people choice there will be a variety of choices. I don't know whether it's better to be more creative and have manic depression. I don't know what I would choose for my children. But I guess the alternative, the current alternative is just to leave it to chance, to throw our hands up and say "Well, let nature decide". I don't think that's the way, I think we should let, in the case of children, parents decide, and in the case of adults, let them decide themselves what they believe their biology should be. I would want to make a decision myself about whether I took drugs to suppress manic depression but that also suppressed my creativity. What we should be about is giving people those choices. And, provided we preserve their freedom to choose, we won't see a constriction in the case of selecting against diseases. Take something like Downs Syndrome. Ninety percent of people who have a screening test that shows they have a foetus with Downs Syndrome, choose to abort that pregnancy, but 10% don't. And some people choose not to have the test. So we will still see a range of characteristics in society. And eventually the experiment of living and allowing people choices, will reveal what makes for a good life. I think it's time to take control of these choices, rather than just leaving it to Nature. If you think you should leave it to Nature, you think Nature has some reason to absolutely pick the right point, but if I said to you, well, would you prefer to be dwarfed or would you prefer to be less intelligent, I don't think many of us would take up that offer. If I said to you, you know, would you prefer to be taller or would you prefer to have higher intelligence, you probably would take it. And that illustrates that you don't believe that Nature has delivered up precisely the right status quo. So I think we are at a point in evolution where we will just continue to allow Nature to select out machines for reproduction. Or we will select out people with greater biological opportunities. Nature is only interested in our reproducing and passing on our genes to the next generation. It is completely indifferent to whether we have disease, whether we suffer, whether we're happy. We only have to survive long enough to reproduce. That's what it is to be a natural human being. But what's so good about that? We want to, not just be free of disease, we want to be happy.

Randall: The next question is from Simon Grose

Grose: Simon Grose, I'm a freelance science journalist, and the science and technology editor for the Canberra Times. Firstly, it is amazing to have such a gung ho genetic warrior in the place. I haven't heard this kind of stuff before, so ahh, so it's a shame that our Minister Mr Abbott is not here to.. be.. to .. we might be able to find some areas of agreement. But I'd like to ask you about the mechanics and the ethics of equity that are involved in what you are talking about. I assume you are talking about, when you talk about enhancing embryos, that you're talking about building on what is now IVF technology, and people would have an embryo conceived in an IVF process, and then the embryo would be manipulated at a very early stage. I just want you to talk about that, how you see the mechanics, and secondly, the ethics of it, that is now and probably in the future will only be available to the richer people in the richer societies. We have a debate here about IVF, umm, the funding of IVF as it is now. And so how do you as a, as a, as a specialist in ethics, ahh, deal with the issue that the kind of thing you are talking about would not be available to all human beings.

Savulescu: Well I think you are quite correct that this may not be available to all human beings. But I think the important point to realise here is this isn't just a question, a problem that applies to enhancement. It applies to private education, private health care, and, and prevention of treatment of disease generally. There are vast inequities in health, and we allow people, well, most of the time, to buy better health, or better education. Now we may decide that we don't want to allow people; we want a more equal society. That's fine, that's a community decision, that's a question about justice. But it's not a question about something specifically about enhancement. The second point that I'd make though, is that you can't predict exactly how expensive or costly these interventions are going to be. Umm, Viagra is not an expensive drug to produce. One of the slides I skipped is performance enhancement. Athletes can push up the human erythropoietin levels by using either altitude training or by what's called a hypoxic air tent, where you reduce the concentration of oxygen. Now a hypoxic air tent costs about $7000 US. It's extremely expensive; US athletes can use it. It's legal, it's permitted. But you can't inject, you can't directly inject EPO. EPO costs around 122 US dollars. So it's not the case that biological improvements will necessarily in the long term, be expensive and increase inequity. It's true that in the short term they may, and we may want to either not allow them, or make them freely available to people, but in the long term I just don't think we know where science will take us. So I think we should be open to the possibility. And it's far better to do the scientific research, and understand what our capacities are, and then regulate application, rather than stopping the research in the first place on the basis of some predicted adverse effect far in the future. I think we need to get on with the science and regulate its application and use, rather than try and closely regulate - I mean we see this in cloning - we should do the research on cloning, and ban its application to produce - I mean if the legislation is going to be effective, it would stop babies being born. But we want to do the research to see where it leads. It may well lead to an understanding of aging, of cancer, of huge numbers of diseases.

Randall: Embryonic enhancement ?
Savulescu: Sorry?
Randall: Embryonic enhancement ? That was his first question.

Savulescu: Well, in the case of manipulating embryos, yes, it's true; I think initially these techniques will have to be on the back of assisted reproductive technology. And they will be

exotic. In the further future, it may well be that pharmacological interventions, drugs, and so on, can affect the kind of children that we have. I mean it may well be that we can develop drugs that are administered during pregnancy. Or here's another example. The, umm, the research which I talked about looking at preventing rats developing Huntington's disease and giving Prozac, changes the number of neuronal connections. It may well be that that research allows us to understand how neurones develop, and these interventions can be given to children after they are born. Prozac again, is not an expensive drug. It may well be in the future that something like Prozac can be given to children, to enhance their cognitive abilities. So it needn't be just at the level of precise genetic manipulation of an embryo. I think the whole area of enhancement is going to be one that has many, many different facets.

Randall: The next question is from Mark Metherall

Metherall: Mark Metherall from the Sydney Morning Herald, Professor. You've spoken about the way, and I think the easiest one to understand is talking about sport enhancement, which rather helps us focus on, don't we follow sport because we are, we admire the spirit and individual achievement of people, yet you're talking about a sort of a process where in a sense, you're talking about the commodification of humanity, so that you're removing the very sorts of qualities that make us watch this in the first place?

Savulescu: Yup, ahh, again, I think this is an important debate. Where do we draw the line on enhancement? At the present point we say no enhancement. I don't believe we should allow any kind of enhancement. So, for example, in swimming, we don't allow people to get into the pool with flippers, and we probably wouldn't allow them to get in the pool with webbed feet, if that was artificially created, but we allow them the skins, because we think that's consistent with the spirit. And there will be enhancements that are consistent with the spirit and with the struggle. I don't think that The Tour de France was any less interesting in 1998 when people were taking it. They're still - no matter how much enhancement I take I'll never be Lance Armstrong. And all that you will see are different levels of performance, and different, and a more creative version of sport. Now it is true that we will want some limits consistent with the activity. We may not want to give people the capacity to read each other's minds, OK, but why wouldn't we give them better memory. So there'll be different kinds of enhancement. I think the debate needs to move on. Rather than having an in-principle objection to something because it's an enhancement, because we want to be natural. We need to consider the possibility there might be some good and worthwhile enhancements, and some perhaps that we don't want.

Randall: Laurie Wilson

Wilson: Laurie Wilson, I'm a Director of the National Press Club. I'm tempted to ask you about marshmallows, I'll never actually look at one again the same. Aahh, I'm also tempted to ask you, given your comments on enhancement of sportsmen, just where your AFL team is sitting on the ladder at the moment, but I won't do that either. Aahh, I am interested in this notion of humanity. We actually look at a well-known singer in the US who has changed his appearance to the extent that he no longer to many of us appears human. He is, presumably, we hope; we await the verdict, I suppose. But he no longer appears that, and it occurs to me, that is, the potential here as we go down this track, as we all perhaps become increasingly the same is to lose that sense of difference which many of us would see as an essential element of humanity. How do you respond to this suggestion that the ultimate outcome of this is in fact to rob ourselves of what is an essential element of humanity?

Savulescu: Well it's true that there are mistakes. But then the whole of Hollywood speaks to the success of most forms of cosmetic enhancement, and I don't think people suggest that somehow most Hollywood actors are less beautiful or attractive in virtue of the fact that a large part of their appearance has been humanly engineered. Umm, what, the value of difference. Look, where the difference serves some social function, I guess we should preserve it, but why is it a good thing that some people have better memories than others? I don't see why we should preserve that difference. Why is it that some people have a higher predisposition to disease than others? I don't think we should preserve that difference. So there may be some things, we maybe, we don't want to maybe have height as one thing we have a variation in. But I think it's again a question of not just of disallowing all forms of enhancement, but saying, "Well, is there a reason to allow this kind of enhancement and not that?" Sport is the hardest case because physical ability in sport is what's called a positional good. It's only good if you're better than somebody else. But there will be lots of things which aren't positional goods, that are just good to have, like memory. Like having the ability to deal with stress or the ability to control your impulses. Now again it may not be clear where you want to sit on the curve, but there will certainly be some ends of the curve, characteristics like impulses, that are clearly bad for people and there's no good reason to preserve a violent uncontrollable temper. We may want our children to be more aggressive; we may want them to be less aggressive. I mean I guess it will depend on the child and also on the parents, and the society that that person lives in, but there will be some areas where we think - the best example I give is the one case of a gene for something; the gene for criminality; a Dutch family where there is a single mutation in the monoamine oxidase inhibitor gene on the X chromosome. So half the males in this family have slight intellectual disability, are severely aggressive, and end up in gaol, for arson, rape, and a number of other violent crimes. Now I don't see what the benefit of preserving that difference is, and I think that genetic technology should be offered to that family to say if you want to have a child that doesn't have this gene, we will help you to do it. So, there will be some differences that might be worth preserving, at the end of the day, I think, the place to leave the choice is with the individual. If somebody wants to remain hideously ugly, fine. But if we've got the option to change their appearance, I don't see why the person that was dealt the short straw at birth should have to remain all through life with a short straw if we can change that.

Randall: Michael Harvey.

Harvey: Michael Harvey again. We talked about the attainment of sporting excellence. The other side of the equation, recovery from injury. It's been a big topic of discussion in Melbourne and Australia-wide about Nathan Brown's injury the other night at football when his leg went out at right-angles, and the discussion about the application of stem cell research technology to speed up recoveries from injury. Just because you're a leading voice in this area, what's your view on that, and how quickly in the future could somebody like Nathan Brown be back on the field after that horribly broken leg that he had last week?

Savulescu: Well, sorry, it's embarrassing to say that I no longer follow the football, so I'm not familiar with this particular issue. But I do know that there was a very, very famous cyclist who after recovering from a very serious illness was allegedly - alleged to have taken some drugs to assist his recovery, that in other circumstances would be seen as performance enhancers. And if that's true, it's entirely appropriate, I think, that we should employ - we should set a performance level, OK, and clearly this man is severely injured; we need to get him up to a reasonable level with whatever technology we have available. Now, we

shouldn't allow him to be pushed beyond that, but I don't see the objection to allowing, allowing the use of whatever technology to restore people to whatever acceptable level of performance we set. I hope he recovers quickly.

Randall: Well, that was the other half of the question. Do you have any prognosis about how quickly that might be possible?

Savulescu: Using stem cell science? Look, I just don't think - one of the, again, one of the slides I omitted was a slide showing the timescale for stem cell research. 1997 Ian Wilmut cloned Dolly the sheep. 1998 Jamie Thompson developed human embryonic stem cell lines. 2004, Huang and colleagues in Korea cloned a human embryo. This year, they perfected the process to be ten times more efficient, it's roughly as efficient as natural reproduction, at least in terms of producing blastocysts, in producing stem cell lines. A single egg has a 6% chance of producing a cloned embryo. I mean that is fantastic progress since 1997, so you can't predict what's going to happen. Moore's law predicts that computing power doubles every 18 months. We just - I think we're going to see radical changes, very soon, but - we may not. And I guess the issue is, if we don't invest the money, we won't see any changes. I mean, the US, the NIH puts, I think, this is roughly, something like 100 times more into medical research than we do in Australia. And one thing's for sure: if we don't spend more, we won't reap the benefits.

Randall: Simon Grose.

Grose: When it comes to being impossible to predict some things, you've talked about Viagra, but you haven't mentioned Thalidomide. So I'd like to come back to ethics and legal liability a bit. I could see how, and also this relates very strongly to our vague understanding now that the genome is a very complex, interactive thing, but we don't know exactly any way how in any way complex it is, and how it works. We could - I could see how you could enhance an embryo to resist cancer, but you could find sometime in its life that it had a different reaction to growth hormones than, say, a normal human being. I could see how you could enhance an embryo to be more intelligent, but maybe you'd find out you might be forcing the growing individual towards autism or other disabilities. So we don't know enough now to in anywhere near go to what you're talking about, so can you give us a bit of a timeline, yeah, and could you talk about legal liabilities and ethics?

Savulescu: OK, look, I'm not a scientist, I'm an ethicist, so - umm - some people have said, that, there's a, well, three people have studied this systematically, that there's a 20 to 50% chance of humanity wiping itself out in the next, in this century, using technology. Those are the three best estimates. So people clearly think the technology, nanotechnology in particular, is going to develop quickly in a way that could threaten, to the extent that it could threaten our existence. So, I don't know - 20, 50 years? The issue, and you raise a very important issue; this is playing God, which raises the idea that this is an incredibly beautiful and complex machine that we don't fully understand and we're meddling with it, trying to play God, but it's really only God that fully understands it and we'll make a mess of it. And I think that's a very good objection, and Thalidomide is a great example of something that was inadequately tested. And I think the response to your argument is that we need more science; we need a bigger gap between scientific research and application, but not that we don't do the scientific research. So, the response here is do more and better testing and science before you use things, not don't consider the possibility. And that answers the question about legal liability. Legal liability will turn on the thoroughness of the science and the investigation and

the confidence that you have that this is reasonably safe. And obviously when it comes to enhancement, rather than the treatment of disease, because the benefits may well be lower than say preventing cancer, we want to make sure that the risks are also much lower, OK, so we want to make sure it's even safer, fine - but just do the science; get the knowledge. I can't see an in-principle objection again, to doing research into this sort of area. So as I said before, it's just not on the agenda. And indeed, when it is - when our technology, like preimplantation genetic diagnosis can be used for non-medical medical purposes, people resist it and say "No, we should only use medical technology for the treatment and prevention of disease". Why? I just want to challenge that. I should say these are my views; I'm putting to provoke you; these aren't the views of the ASMR and I think really the main point is to stimulate you to come to a position on this because I think it's a neglected issue, and I think it's going to be a profoundly important issue in the 21st century.

Randall: Well, let's have a final question today from Mark Metherall.

Metherall: You talked about the dogmatic slumber in Australia; is this something that you feel is particular to Australia, to its current federal government, or is there similar slumber in places like Britain where you live?

Savulescu: Well, I think we have a - I'm all for sport, I think sport's fantastic, and we're a very sport-focussed culture, we're not a science-focussed culture, we're not an intellect-focussed culture. Yet we have enormous potential in those areas. We also, I think, have a resistance to unnatural things; we have a focus on things being natural, we've a lot of natural beauty, we're very fortunate in the way which we can interact and live lives within nature. So I think Australia does have a couple of forces that push it, as well as very strong lobby groups, that resist certain kinds of research. So I think there are some factors that prevent us to going - from really utilising this great medical and scientific potential this country does have - it produced the bionic ear, we discovered the cause of SIDS, and so on. So I think that there are factors to Australia but there's also cause for great optimism. We've got a very good infrastructure, and we could really utilise our talent and resources to become not just a mining or an agricultural country but a real great leader in a century that's going to be, I think, the century of science, and the, the, the application of science to humanity and human life.

[applause]

Randall: Professor Savulescu, thank you very much for joining us today for the National Australia Bank Address. We'd like to give you this membership card for the next year. I don't know whether your schedule allows you to come back, but if you do, keep us in mind. Thank you very much.

Savulescu" Thanks very much.

[applause]

[end of address]