

The dangers of self-improvement

Reviewers savaged Remaking Eden, Lee Silver's warning of where genetic engineering may be leading. But **Tim Radford** finds the Princeton professor is unrepentant, and a number of scientific heavyweights are beginning to think along the same lines

WATCH OUT for *Homo proteus*, the species that changes its own shape.

Last month, Cambridge physicist Stephen Hawking told President Clinton — at a millennium lecture at the White House — that humans were likely to redesign themselves completely over the next 1,000 years. Also last month, *Visions* (Oxford £18.99), by the New York physicist Michio Kaku, proposed that humans would get up to all sorts of tricks, including replacing their own organs as they wear out

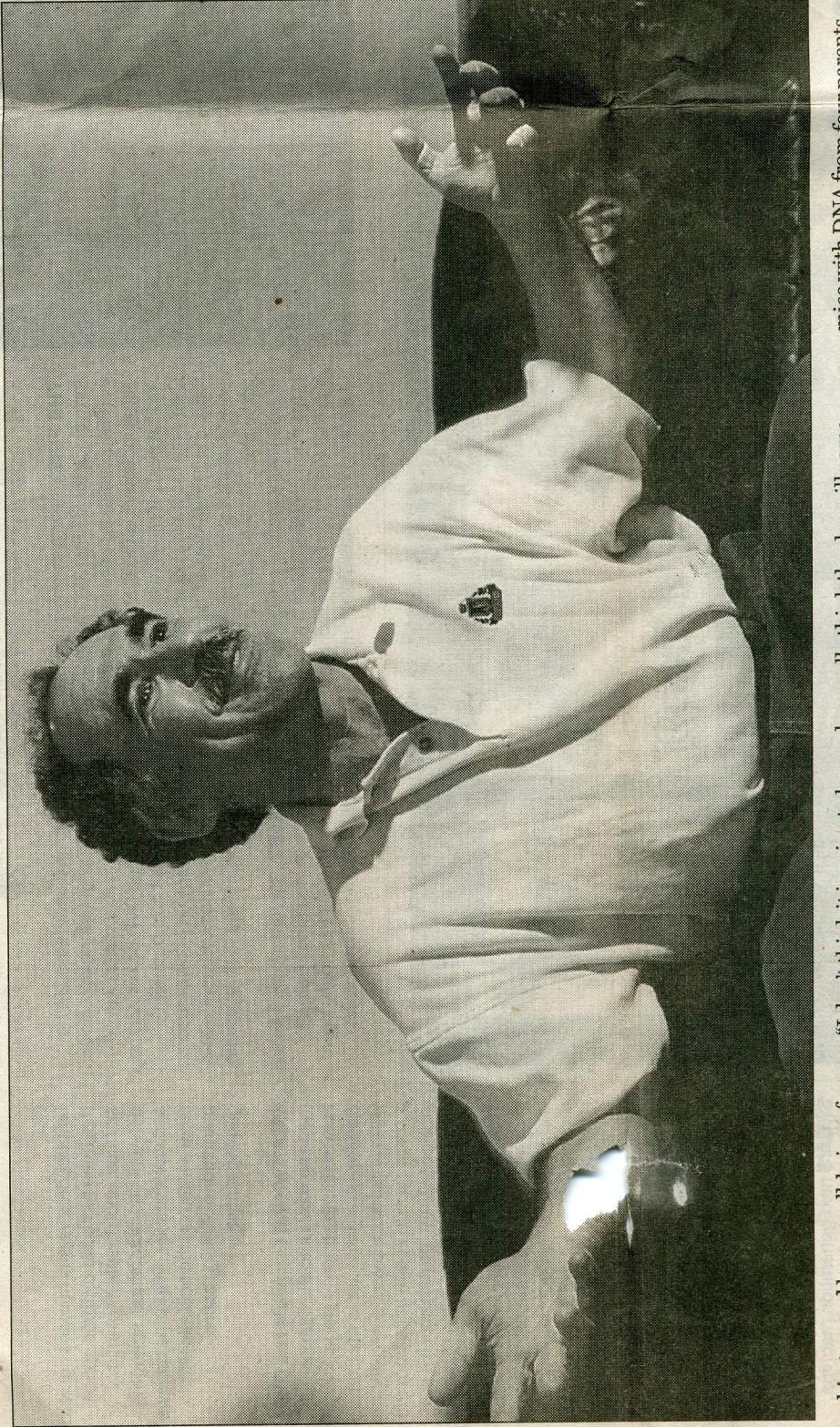
and (if they try hard enough) maybe even engineering wings.

Later this year, in a new book called *Consilience* (published by Little, Brown, no price yet), Edward O Wilson, the great evolutionary theorist of Harvard University, will argue the same thing: that *Homo sapiens* is about to decommission natural selection, that from now on human evolution will be a matter for science and technology, tempered by ethics and political choice.

Actually, Lee Silver of Princeton University said it all in January in a

book called *Remaking Eden* (Weidenfeld, £20) and got into terrible trouble. The irony is that unlike the others, Silver is a molecular biologist and really does go around altering life as we know it, although not human life. Another irony is that he got it in the neck, in the *Guardian*, from Lord Winston, one of the giants of reproductive biology. Winston has himself dramatically altered life for many families, simply by making children possible for them. "We scientists should understand that support for our

Science and technology



Brave new world: Silver fears that experiments like Dolly the sheep could lead to a human super race

MAIN PHOTO: TOM JENKINS

"I don't think it is going to be used terribly. I think it is going to be used to prevent disease. The problem is — in the US — that it is going to be controlled by the marketplace. And I am very cynical about the marketplace. That's my fear about genetic engineering: it is so powerful, it is so good, it will only be available to those who have money."

His critics, he says, see the technology as limited. He doesn't. If we can tamper with one gene, why not five, why not 20? It will begin in simple ways at first: the provision of resistance to disease, the elimination of certain diseases. Then there will be a whole range of things.

"I really think the day will come, whether in 100 years, or 1,000 years, when we really will have a better understanding of how our brain works, and be able to go far beyond. We are all human beings, and basically very similar to each other. But if we stepped out of that, that's dangerous. I look at the US, I look at what the marketplace has

mice with DNA from four parents instead of two. But genetics is now harnessed to robotics and computing, and the exponential acceleration of the technology astounds him. And he, remember, is one of the practitioners. One criticism of his book was that humans could look only at two or three genes not the whole lot, as cops and doctors do in the movie *Gattaca*.

"I would have thought that was true, two or three years ago. But all of a sudden, they invent the DNA chip." The DNA chip gives the potential to look at 100,000 genes, and although scientists don't yet

and then you take blood, or cells and put them on this chip, and the chip will tell you exactly what form of every gene you have got. This is really, really remarkable. It blows open the whole game."

He is not the only one to be alarmed. Wilson's forthcoming book amounts to a warning. Hawking told the White House gathering: "I'm not advocating human genetic engineering as a good thing. I'm just saying that it is likely to happen in the next millennium whether we like it or not." Kaku, too, warned against a new genetic aristocracy. In one way, just the act of writing the

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"Dr Silver is simply likely to bring an important subject into disrepute," Winston wrote. "One of Silver's offences was to take the tentative and clumsy knowledge of human genes, which now exists, and propose a future *Homo supergeneticus*. Silver is entirely unrepentant: he doesn't propose a super race because he likes the idea, he says. He is being deliberately outrageous. He

subject — and hence well-being of our society — depends on proper public understanding of science and accurate appraisal of the risks and benefits it provides," Winston wrote.

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now exists, and propose a future *Homo supergeneticus*. Silver is

entirely unrepentant: he doesn't propose a super race because he likes the idea, he says. He is being deliberately outrageous. He proposes it as a warning.

"My fear of genetic engineering is not so much that it will be used to hurt people, because most people want not to hurt their children; most people want to give their children advantages in life.

My fear with genetic engineering very simply is one of the things I try to bring out in my book: that it won't be available to everybody. It will cause greater social injustice. That's my real fear," he says.

"I don't think it is going to be used terribly: I think it is going to be used to prevent disease. The problem is — in the US — that it is going to be controlled by the marketplace. And I am very cynical about the marketplace. That's my fear about genetic engineering: it is so powerful, it is so good, it will only be available to those who have money."

His critics, he says, see the technology as limited. He doesn't. If we can tamper with one gene, why not five, why not 20? It will begin in simple ways at first: the provision of resistance to disease, the elimination of faulty heart genes. Then there will be the additions. One per cent of the people in the world have natural resistance to the HIV virus. Wouldn't it be handy to hand on an immunity to AIDS? "That's the beginning, what other people have. So what's so terrible about you giving something to your child that other people can naturally give to their child?" he asks.

"But then, in the future, the

question is: how far can we remove

ourselves from human beings? I

really think the day will come, whether in 100 years, or 1,000 years, when we really will have a better understanding of how our brain works, and be able to go far beyond. We are all human beings, and basically very similar to each other. But if we stepped out of that, that's dangerous. I look at the US, I look at what the marketplace has

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"I would have thought that was true, two or three years ago. But all of a sudden, they invent the DNA chip." The DNA chip gives the potential to look at 100,000 genes, and although scientists don't yet know what most of them do, they will soon. "It is very simple. It is a little chip, just like a computer chip, but you can put a million different little drops of DNA detectors on it. What these little drops do is detect the presence of a gene. We only have 100,000 genes, or fewer, perhaps 70,000. On this little chip you put down the 10 most common forms of each of our genes, and you put them all down on this little chip

done to Americans, and I think it is awful, this huge gap between the haves and the have-nots, and genetic engineering just widens that gap."

He doesn't have a problem with altering soya beans, or spraying frost-resistant bacteria on Californian strawberries. He does disconcerting things to mice embryos, like create chimeras — laboratory