TECHNOLOGY

How Engineering the Human Body Could Combat Climate Change

From drugs to help you avoid eating meat to genetically engineered cat-like eyes to reduce the need for lighting, a wild interview about changes humans could make to themselves to battle climate change.

ROSS ANDERSEN MARCH 12, 2012

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The threat of global climate change has prompted us to redesign many of our technologies to be more energy-efficient. From lightweight hybrid cars to long-lasting LED's, engineers have made well-known products smaller and less wasteful. But tinkering with our tools will only get us so far, because however smart our technologies become, the human body has its own ecological footprint, and there are more of them than ever before. So, some scholars are asking, what if we could engineer *human beings* to be more energy efficient? A new paper to be published in Ethics, Policy & Environment proposes a series of biomedical modifications that could help humans, themselves, consume less.

Some of the proposed modifications are simple and noninvasive. For instance, many people wish to give up meat for ecological reasons, but lack the willpower to do so on their own. The paper suggests that such individuals could take a pill that would trigger mild nausea upon the ingestion of meat, which would then lead to a lasting aversion to meat-eating. Other techniques are bound to be more controversial. For instance, the paper suggests that parents could make use of genetic engineering or hormone therapy in order to birth smaller, less resource-intensive children.

The lead author of the paper, S. Matthew Liao, is a professor of philosophy and bioethics at New York University. Liao is keen to point out that the paper is not meant to advocate for any particular human modifications, or even human engineering generally; rather, it is only meant to introduce human engineering as one possible, partial solution to climate change. He also emphasized the voluntary nature of the proposed modifications. Neither Liao or his co-authors, Anders Sandberg and Rebecca Roache of Oxford, approve of any coercive human engineering; they favor modifications borne of individual choices, not technocratic mandates. What follows is my conversation with Liao about why he thinks human engineering could be the most ethical and effective solution to global climate change.

Judging from your paper, you seem skeptical about current efforts to mitigate climate change, including market based solutions like carbon pricing or even more radical solutions like geoengineering. Why is that?

Liao: It's not that I don't think that some of those solutions could succeed under the right conditions; it's more that I think that they might turn out to be inadequate, or in some cases too risky. Take market solutions---so far it seems like it's pretty difficult to orchestrate workable international agreements to affect international emissions trading. The Kyoto Protocol, for instance, has not produced demonstrable reductions in global emissions, and in any event demand for petrol and for electricity seems to be pretty inelastic. And so it's questionable whether carbon taxation alone can deliver the kind of reduction that we need to really take on climate change.

With respect to geoengineering, the worry is that it's just too risky---many of the technologies involved have never been attempted on such a large scale, and so you have to worry that by implementing these techniques we could endanger ourselves or future generations. For example it's been suggested that we could alter the reflectivity of the atmosphere using sulfate aerosol so as to turn away a portion of the sun's heat, but it could be that doing so would destroy the ozone layer, which would obviously be problematic. Others have argued that we ought to fertilize the ocean with iron, because doing so might encourage a massive bloom of carbon-sucking plankton. But doing so could potentially render the ocean inhospitable to fish, which would obviously also be quite problematic.

One human engineering strategy you mention is a kind of pharmacologically induced meat intolerance. You suggest that humans could be given meat alongside a medication that triggers extreme nausea, which would then cause a long-lasting aversion to meat eating. Why is it that you expect this could have such a dramatic impact on climate change?

Liao: There is a widely cited U.N. Food and Agricultural Organization report that estimates that 18% of the world's greenhouse gas emissions and CO_2 equivalents come from livestock farming, which is actually a much higher share than from transportation. More recently it's been suggested that livestock farming accounts for as much as 51% of the world's greenhouse gas emissions. And then there are estimates that as much as 9% of human emissions occur as a result of deforestation for the expansion of pastures for livestock. And that doesn't even to take into account the emissions that arise from manure, or from the livestock directly. Since a large portion of these cows and other grazing animals are raised for consumption, it seems obvious that reducing the consumption of these meats could have considerable environmental benefits.

Even a minor 21% to 24% reduction in the consumption of these kinds of meats could result in the same reduction in emissions as the total localization of food production, which would mean reducing "food miles" to zero. And, I think it's important to note that it wouldn't necessarily need to be a pill. We have also toyed around with the idea of a patch that might stimulate the immune system to reject common bovine proteins, which could lead to a similar kind of lasting aversion to meat products.

Your paper also discusses the use of human engineering to make humans smaller. Why would this be a powerful technique in the fight against climate change?

Liao: Well one of the things that we noticed is that human ecological footprints are partly correlated with size. Each kilogram of body mass requires a certain amount of food and nutrients and so, other things being equal, the larger person is the more food and energy they are going to soak up over the course of a lifetime. There are also other, less obvious ways in which larger people consume more energy than smaller people---for example a car uses more fuel per mile to carry a heavier person, more fabric is needed to clothe larger people, and heavier people wear out shoes, carpets and furniture at a quicker rate than lighter people, and so on.

And so size reduction could be one way to reduce a person's ecological footprint. For instance if you reduce the average U.S. height by just 15cm, you could reduce body mass by 21% for men and 25% for women, with a corresponding reduction in metabolic rates by some 15% to 18%, because less tissue means lower energy and nutrient needs.

matthewliao2.jpg

S. Matthew Liao is a professor of philosophy and bioethics at N.Y.U.

What are the various ways humans could be engineered to be smaller?

Liao: There are a couple of ways, actually. You might try to do it through a technique called preimplantation genetic diagnosis, which is already used in IVF settings in fertility clinics today. In this scenario you'd be looking to select which embryos to implant based on height.

Another way to affect height is to use a hormone treatment to trigger the closing of the epiphyseal plate earlier than normal---this sometimes happens by accident in vitamin overdose cases. In fact hormone treatments are already used for height reduction in overly tall children. A final way you could do this is by way of gene imprinting, by influencing the competition between maternal and paternal genes, where there is a height disparity between the mother and father. You could have drugs that reduce or increase the expression of paternal or maternal genes in order to affect birth height.

Isn't it ethically problematic to allow parents to make these kinds of irreversible choices for their children?

Liao: That's a really good question. First, I think it's useful to distinguish between selection and modification. With selection you don't really have the issue of irreversible choices because the embryo selected can't complain that she could have been otherwise---if the parents had selected a different embryo, she wouldn't have existed at all. In the case of modification, that issue could certainly arise, but even then I think it's important to step back and ask why we are looking at these solutions in the first place. The reason we are even considering these solutions is to prevent climate change, which is a really serious problem, and which might affect the well being of millions of people including the child. And so in that context, if on balance human engineering is going to promote the well being of that particular child, then you might be able to justify the solution to the child.

In the paper you also discuss the pharmacological enhancement of empathy and altruism, because empathy and altruism tend to be highly correlated with positive attitudes toward the environment. To me this one seems like it might be the most troubling. Isn't it more problematic to do biological tinkering to produce a belief, rather than simply engineering humans so that they are better equipped to implement their beliefs?

Liao: Yes. It's certainly ethically problematic to insert beliefs into people, and so we want to be clear that's not something we're proposing. What we have in mind has more to do with weakness of will. For example, I might know that I ought to send a check to Oxfam, but because of a weakness of will I might never write that check. But if we increase my empathetic capacities with drugs, then maybe I might overcome my weakness of will and write that check.

Let me push you a little on that. The Oxfam example is a clean fit for your argument, but might it be the case that drugs of this sort---empathy increasing drugs---would cause people to generate entirely new beliefs, rather than simply mitigating issues having to do with weakness of will.

Liao: It's conceivable, yes, and to be clear, if that's the case that wouldn't be something that we would advocate. We are interested only in voluntary modifications, and we certainly don't want to implant beliefs into anyone. But even then, those beliefs might still be considered yours if they arise from a kind of ramping up of your existing capacities, and so perhaps that could obviate that problem.

I suppose there are already drugs that might be belief-inducing. You might think that antidepressants induce new beliefs about self worth, or about the personalities of other people.

Liao: That's right. That's a great analogy. If you're very pessimistic about the world, and you take a drug that will cause you to develop a more positive outlook, then in some sense those are beliefs that you already desired. In a case like that the ethical issues might fall away on account of the fact that you previously desired those beliefs, and that you're aware of the consequences of taking the drug. We would want as much transparency as possible with these technologies so that people are aware of the consequences of using them, and that includes empathy-increasing drugs, which, if they had the kind of effects you're suggesting, would require warning labels at a minimum.

In your paper you suggest that some human engineering solutions may actually be liberty enhancing. How so?

Liao: That's right. It's been suggested that, given the seriousness of climate change, we ought to adopt something like China's one child policy. There was a group of doctors in Britain who recently advocated a two-child maximum. But at the end of the day those are crude prescriptions---what we really care about is some kind of fixed allocation of greenhouse gas emissions per family. If that's the case, given certain fixed allocations of greenhouse gas emissions, human engineering could give families the choice between two medium sized children, or three small sized children. From our perspective that would be more liberty enhancing than a policy that says "you can only have one or two children." A family might want a really good basketball player, and so they could use human engineering to have one really large child.

catseye.jpg

"We figured that if everyone had cat eyes, you wouldn't need so much lighting"

I have to push back a little on that point. It seems like those human engineering techniques would be liberty enhancing only in a context in which there were some severe liberty constraint that doesn't exist now. Is there another way these techniques might be liberty enhancing?

Liao: Well, again, I would return to the weakness of will consideration. If you crave steak, and that craving prevents you from making a decision you otherwise want to make, in some sense your inability to control yourself is a limit on the will, or a limit on your liberty. A meat patch would allow you to truly decide whether you want to have that steak or not, and that could be quite liberty enhancing.

Your paper focuses on human engineering techniques that are relatively safe. Did your research lead you to any interesting techniques that were unsafe?

Liao: Actually, yes, although unfortunately the science is not there yet---we looked into cat eyes, the technique of giving humans cat eyes or of making their eyes more catlike. The reason is, cat eyes see nearly as well as human eyes during the day, but much better at night. We figured that if everyone had cat eyes, you wouldn't need so much lighting, and so you could reduce global energy usage considerably. Maybe even by a shocking percentage.

But, again, this isn't something we know how to do yet, although it's possible there might be some way to do it with genetics---there are some primates with eyes that are very similar to cat eyes, and so possibly we could study those primates and figure out which genes are responsible for that trait, and then hopefully activate those genes in humans. But that's very speculative and requires a lot of research.

Some critics are likely to see these techniques as inappropriately interfering with human nature. What do you say to them?

Liao: Well, first, I would say that the view that you shouldn't interfere with human nature at all is too strong. For instance, giving women epidurals when they're giving birth is in some sense interfering with human nature, but it's generally welcomed. Also, when people worry about interfering with human nature, they generally worry about interfering for the wrong reasons. But because we believe that mitigating climate change can help a great many people, we see human engineering in this context as an ethical endeavor, and so that objection may not apply.

In your paper you argue that some of the initial opposition to these solutions is rooted in a particular kind of status quo bias. Can you explain what you mean by that?

Liao: Sure. Take having smaller children for example. People might resist this idea because they might think that there is some sort of optimal---the average height in a given society, say. But, I think it's worth remembering how fluid human traits like height are. A hundred years ago people were much shorter on average, and there was nothing wrong with them medically. And so, if people are resistant to the idea of engineering humans to be smaller because of some notion of an optimal height, they might be operating from a status quo bias.

Taking a look at this from the perspective of deep ecology---is there something to be said for the idea that because climate change is human caused, that humans ought to be the ones that change to mitigate it---that somehow we ought to bear the cost to fix this?

Liao: That was actually one of the ideas that motivated us to write this paper, the idea that we caused anthropogenic climate change, and so perhaps we ought to bear some of the costs required to address it. But having said that, we also want to make this attractive to people---we don't want this to be a zero sum game where it's just a cost that we have to bear. Many of the solutions we propose might actually be quite desirable to people, particularly the meat patch. I recently gave a talk about this paper at Yale and there was a man in the audience who worked for a pharmaceuticals company; he seemed to think there might be a huge market for modifications like this.

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