



Will Synthetic Biology Change How We Value Human Life?

Synthetic biology is, at its most general, the attempt to create new forms of life purely from design. One approach is to create a ‘minimal bacterial genome’ that has the absolute minimal number of genes required for continued existence. On this ‘chassis’ would be attached artificially produced genomic ‘cassettes’ that would create an organism with desired properties, such as producing pharmaceutical components or combining sunlight and water to make hydrogen for use as fuel.

Defining life in terms of DNA?

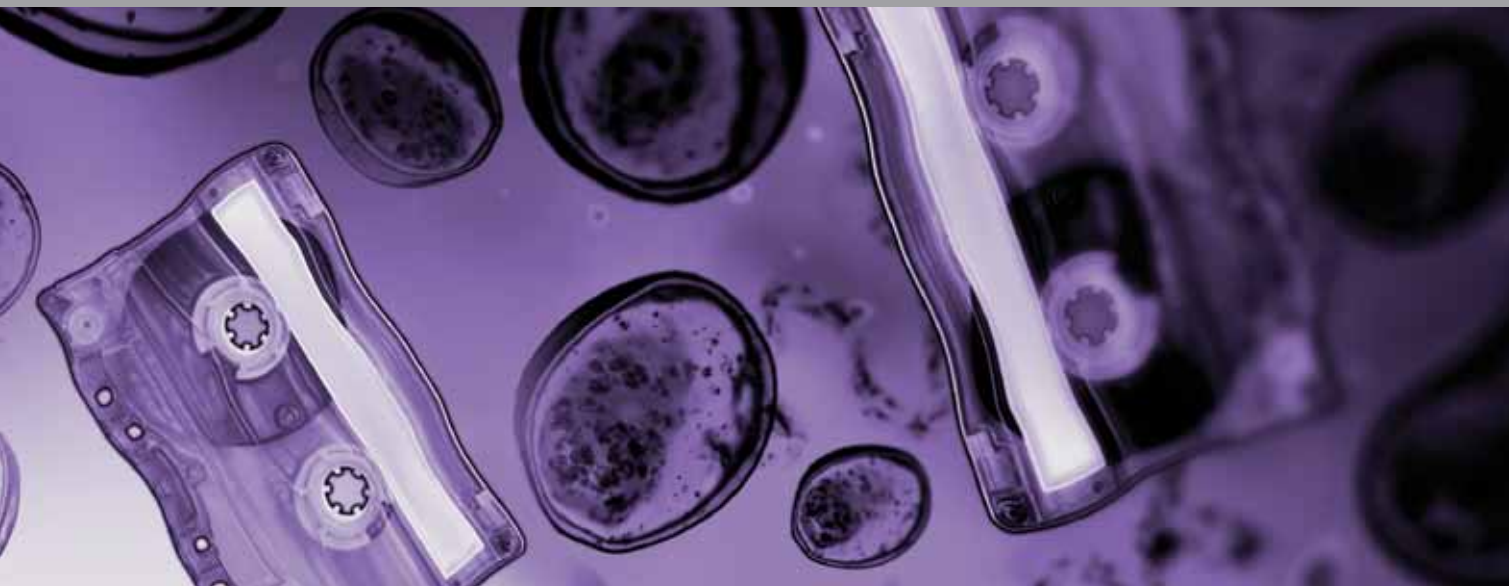
Ethicists have raised serious questions about the moral principles, value and regulation of creating new life forms that could escape, engage in uncontrolled self-replication and damage the environment or fall prey to terrorists or ‘biodesigner-hackers’. Scholars are raising concerns of a more fundamental nature, suggesting that this technological ability will change human self-conception, and lead to us to value human life less. For example, in one of the first ethical reports on synthetic biology a group of bioethicists wondered about the ‘ultimate implications of defining life in terms of DNA?’ They worried that the ‘synthesis of minimal genomes will be . . . perceived by the public as proving that life is reducible to or nothing more than DNA.’ This may ‘threaten the view that life is special’ (*Science* Vol. 286, p.2087-90). Other ethicists worry that the vocabulary of synthetic biology ‘identifies organisms with artifacts, an identification that, given the connection between ‘life’ and ‘value,’ may in the (very) long run lead to a weakening of society’s respect for higher forms of life that are usually regarded as worthy of protection.’ (*Nature Biotechnology* Vol. 26, p. 388). More specifically, the claim here is that synthetic biology teaches us that bacterial ‘life’ is DNA that can be manipulated, and therefore human ‘life’ is DNA that can be manipulated. Conceiving of ourselves in this new way, we would then, ever so slightly, begin to treat each other like we treat bacteria and objects that we manipulate.

These are precisely the sorts of claims that scientists, analytic philosophers and, at least, American bioethicists tend to hate. Inherently vague, difficult to demonstrate, and based on values for which there is no consensus, these concerns are often mentioned in conjunction with technological developments and always ignored. I think, however, they are among the most important questions in the human relationship with technology, and this importance is indicated by the recurrence of this type of claim throughout history. For example, the Copernican revolution purportedly changed how humans viewed themselves in relation to nature, and many social scientists claim that human genetic science more generally teaches us that we are ultimately nothing more than DNA, or a compilation of genes, instead of something more sacred. And, of course, humans have changed our self-perception by making analogies to animals and plants before

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– the eugenics movement took lessons about survival of the fittest originally learned from plants and animals and created a view of humans where some types of people are more valuable than others.

To fight against changing human self-perception, we must then have a clear idea of how this transformation occurs, and it occurs by making analogies across categories. In this case the category analogy would have to be between microbes and humans – that the ‘life’ of microbes is analogous to the ‘life’



of humans. This sort of 'category mistake' spreads through the lazy use of metaphor, when no one stops to proclaim 'but microbes are not humans.' We therefore do not necessarily need to oppose synthetic biology out of fears that this analogy will be made, as long as someone explicitly and repeatedly states that 'just because bacterial life is simply DNA, it does not mean that human life is just DNA.' If science teaches us something about ourselves, an alternative lesson plan can also be developed to counteract the (false) scientific one we do not want people to learn.

Transforming how we think of ourselves

I believe it should not be too difficult to convince humans to reject analogies between bacteria and humans and that people are already primed to do so. Anthropologists have shown that most societies create cognitive distinctions between humans, animals, plants and objects. Evolutionary psychologists have taken this one step further and have claimed that these distinctions are hard-wired into the brain.

We should first ensure that synthetic biology does not cause harm. We should also speak loudly against the simplistic category mistake that will result in a change in human self-conception. While I think that such a campaign will be effective, I would be much more worried if someone creates the "minimal human genome" as a "chassis" on which "cassettes" of desirable human properties are attached. Since this is all within the category of "human," it would be much more difficult to stop a transformation in how we think of ourselves.

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Further information:

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Counterpoint



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Whether or not synthetic biology stands to change how we value human life, it certainly seems to be having a transformative effect on the new generation of researchers being recruited into the discipline. In November 2009, over 1000 undergraduate biologists, engineers and computer scientists from around the world gathered at the Massachusetts Institute of Technology (MIT) for the 5th international Genetically Engineered Machine (iGEM) competition. Armed with colourful team t-shirts, logos, mascots and posters, the 111 interdisciplinary teams presented their summertime efforts to design new biological machines. This year Cambridge took home the Grand BioBrick Trophy for their 'E.chromi' project, engineering the bacterium *E. coli* to produce a range of pigments.

For most iGEM participants, this was their first experience of scientific research. Brought together by their shared enthusiasm, creativity and ambition, the iGEM competition is helping to build a collective identity for synthetic biologists, one that is strikingly different from many established disciplines in the life sciences. To my mind the possible consequences of this could be quite profound.

For more about the 2009 iGEM competition, visit <http://2009.igem.org>