

## Synthetic Biology, Analytic Ethics

BY GREGORY E. KAEBNICK

The news in May that researchers at the J. Craig Venter Institute had created a synthetic life form brought a fresh round of delight, concern, and puzzlement about the march of biotechnology. And all of these reactions were appropriate. It was surprisingly hard to understand just what JCVI had done.

First off, the technical achievement was less than some thought. JCVI had not actually created a synthetic life form; it had borrowed a naturally occurring cell and inserted into it a synthetic version of a naturally occurring genome. The work was also not obviously a big step forward in the creation of useful synthetic microbes, since that work does not depend on the kinds of organisms used in this research and may not require the synthesis of entire genomes anyway. The work was still a terrific feat, but probably not a game-changer. Craig Venter described it best when he told Congress, in a hearing following the announcement, that it was a “proof of concept” that genomes could be assembled in the lab and inserted into cells.

Philosophically, too, the news was less than billed. Some claimed that science had finally shown, once and for all, that life is just a well-organized puddle of chemicals. Living things have no greater being. But if a Greater Being gives microbes their own little greater being, then it would presumably be well within the Being’s powers to endow a synthetic organism with whatever vital essence living organisms typically have. In general, just as a person created through cloning would be as likely as anybody else to have a soul, a microbe created through genome synthesis could have whatever life force characterizes other microbes.

It was also more than a little difficult to say what was at stake morally in the announcement. The initial question in many minds was whether synthesizing a life form was a kind of moral Rubicon in the human relationship to nature—a morally troubling new level of human mastery over nature. Remembering that the achievement was just a synthetic genome, not a life form, may allay that worry. Recognizing that the research does not prove living things

have no vital essence might also help. It could also help to recognize that synthetic biology—the field to which the JCVI research contributed—is so far only about microbes, and could be only about microbes with contained, industrial applications. Engineering algae to produce gasoline, partially replacing the petroleum industry, might not constitute a grave threat to the human relationship to nature. Indeed, the classic concerns about the human relationship to nature are about environmental destruction—the demolition of species and wildernesses, for example—and fuel-emitting algae might end up helping with that. This is not to belittle concerns about the human relationship to nature. Indeed, those concerns could still generate forceful objec-

tions to some applications. But a rich understanding of those concerns need not translate into generic opposition to every use of every biotechnology. (So I argued at the hearing.)

Right now, the most significant moral problems associated with synthetic biology have to do with its potential outcomes. But there really are problems here, mainly because it’s hard to say just what the outcomes will be.

Synthetic biologists envision all sorts of applications, but whether the long-term outcomes will be beneficial is less clear. The organisms require investments of land, water, and nutrients that would have their own costs, and industrial accidents and deliberate misuse also pose undeniable risks. Further, these risks are hard to assess. Many of them are low probability but high impact, which tends to be baffling. We both blow such risks out of proportion, as air travelers sometimes do, and weigh them too lightly, as oil company engineers recently have. Nor is it clear how much we can learn about the risks from our experience with older biotechnologies. Because synthetic biology is on a continuum with older work, it can be seen both as resembling and as departing from it, and testimony at the congressional hearing cast it both ways—emphasizing the novelty when discussing benefits and the familiarity when discussing risks.

I think a general moratorium on the science is not needed, but surely we need to think more carefully about the potential outcomes. And even if some applications genuinely look promising, a refusal to stop the field in its tracks need not translate into support for every imaginable use.

■  
*Small steps, but where  
are we going?*  
■

---

*Gregory E. Kaebnick is a research scholar at The Hastings Center and editor of the Hastings Center Report.*