

## ETHICS

## Do We Need “Synthetic Bioethics”?

Erik Parens,\* Josephine Johnston, Jacob Moses

With the explosion of public interest in human genetics that surrounded the launch of the Human Genome Project, a new field of bioethics was born, and named “gen-ethics.” Shortly after the end of the Decade of the Brain in the early 2000s, neuroethics was born. Soon after came nano-ethics. Now, synthetic biology is the hot new star, and calls for examination of its ethical implications are growing louder.

In the wake of the announcement earlier this year of synthesis of a bacterial genome, two German scholars suggested that synthetic biology has ethical implications distinct from those raised by genetic engineering (1). A British group has just published a White Paper on synthetic biology’s social and ethical challenges (2). Researchers funded by the European Commission recently hosted an electronic conference devoted to safety, security, and ethical concerns associated with synthetic biology (3). The 2006 and 2007 International Meetings on Synthetic Biology featured presentations on ethical issues, and the 2008 conference is scheduled to include sessions on security, societal issues, and policy. The Hastings Center has recently received two grants to map the ethical issues in synthetic biology (4), including one from the Alfred P. Sloan Foundation, which is considering a larger initiative in this area.

Is it time for the birth of yet another bioethical subfield, perhaps “synthetic bio-ethics”? Although creating such a subfield might be in the short-term self-interest of bioethicists, in the long run, further balkanization of bioethics would be a mistake.

Asking bioethical questions in the context of emerging science and technology is hugely important for our health, environment, and, ultimately, our democracy. But anyone who engages with those questions must acknowledge the extent to which they are similar from one scientific arena to another. After all, if synthetic biologists are able to create biofactories that make gene products, they are engaging in a form of genetic engineering that, presumably, could be considered in gen-ethics. Insofar as synthetic biologists work at the nanoscale, their work seems to fall within the purview of nanoethics, and so on. Given the convergence of sci-

entific investigations, it is not logical to separate the associated ethical inquiries.

Particular ethical questions are certainly more pressing in some arenas than in others. For example, concerns about privacy might be more pressing in genetics than in synthetic biology and concerns about civil liberties might be more pressing in neuroscience than in genetics. But the questions themselves are virtually identical to the ethical questions that have arisen in the past. Failing to recognize that fact can lead to reinventing the bioethical wheel for each new technology and, thus, squandering scarce resources. Instead of lovingly listing the ethical questions that arise over and over, we need to dig deeper. We need to test intuitions, arguments, and responses developed in previous contexts against new fact patterns.

When bioethicists think they have found a new set of ethical questions, they are prone to think they can provide a new set of answers. We are not here wagging our fingers at others; one of the authors of this piece has himself, in once promising new guidelines for prenatal genetic testing, fallen prey to such irrational exuberance (5). If we better recognized that the questions are, at core, familiar, we might make more realistic promises, better appreciating salient differences among the kinds of responses we can offer.

Some of the ethical questions raised by synthetic biology are of a kind that we have addressed with some success. Whether safety should be left to self-regulation (6–9) or conducted by a public body is a familiar ethical question. And the good news is that we have experience to draw on. For example, we have learned from tobacco, asbestos, and pharmaceutical products that information about risk is not always shared voluntarily. Our concern to protect people from harm and preserve informed consumer choice can legitimately outweigh our commitment to minimal regulation and free markets, which is why we sometimes compel sharing of risk information. In genetics, we have learned that individuals can react to the same risk information in fundamentally different ways. With nanotechnology, we are learning that there is a public expectation and a private-sector desire for international standards and rigorous risk assessment. Focus groups have shown public demand for independent, third-party risk assessment of emerging technologies, which calls into question

As we address ethical issues in emerging fields, ethicists, funders, and policy-makers should resist balkanization.

claims that self-regulation will suffice to reassure consumers (10). Some familiar questions raised by synthetic biology are not about safety, such as concerns about fair distribution of economic benefits and monopoly controls on inventions. The context is new, but we can build on earlier conceptual and practical work.

Other questions are thornier. Some scholars, journalists, and public interest groups are asking whether synthetic biology amounts to an overweening ambition to shape ourselves and other life forms (1, 11). We continue to see this question in the debates over assisted reproduction, genetic engineering, and surgical and pharmacological enhancement. It is at core a question about what it means to be human. It reemerges, it does not admit of crisp yes/no or good/bad answers, and we have not yet figured out how to best bring the concerns underlying this question into discussions of policy or the conduct of research—though we believe it is too soon to stop trying.

Bioethics does not need a new subfield to justify support for research on synthetic biology. Instead, we need to get better at appreciating and explaining that digging into familiar questions in new scientific contexts is the smartest way to inch forward.

## References and Notes

1. J. Boldt, O. Muller, *Nat. Biotechnol.* **26**, 387 (2008).
2. A. Balmer, P. Martin, *Synthetic Biology: Social and Ethical Challenges* (Biotechnology and Biological Sciences Research Council, Swindon, Wiltshire, UK, 2008); [www.bbsrc.ac.uk/organisation/policies/reviews/scientific\\_areas/0806\\_synthetic\\_biology.pdf](http://www.bbsrc.ac.uk/organisation/policies/reviews/scientific_areas/0806_synthetic_biology.pdf).
3. Synbiosafe E-conference, [www.synbiosafe.eu/forum/](http://www.synbiosafe.eu/forum/).
4. E. Parens, J. Johnston, J. Moses, *Ethical Issues in Synthetic Biology: An Overview of the Debates* (Foresight and Governance Project at the Woodrow Wilson International Center for Scholars, Washington, DC, in press).
5. E. Parens, A. Asch, *Hastings Center Rep.* 29(4), S1 (1999).
6. M. S. Garfinkel, D. Endy, G. L. Epstein, R. M. Friedman, *Synthetic Genomics: Options for Governance* (J. Craig Venter Institute, with Center for Strategic and International Studies and Massachusetts Institute of Technology, Rockville, MD, 2007); [www.csis.org/hs](http://www.csis.org/hs).
7. H. Bugl *et al.*, *Nat. Biotechnol.* **25**, 627 (2007).
8. S. M. Maurer, L. Zoloth, *Bull. At. Sci.* **63**(6), 16 (2007).
9. G. Church, *Nature* **438**, 423 (2005).
10. J. Macoubrie, *Informed Public Perceptions of Nanotechnology and Trust in Government* (Woodrow Wilson International Center for Scholars, Washington, DC, 2005).
11. ETC Group, *Extreme Genetic Engineering: An Introduction to Synthetic Biology* (ETC Group, Ottawa, Canada, 2007); [www.etcgroup.org/upload/publication/pdf\\_file/602](http://www.etcgroup.org/upload/publication/pdf_file/602).

The Hastings Center, Garrison, NY 10524, USA.

\*Author for correspondence: [parens@thehastingscenter.org](mailto:parens@thehastingscenter.org)

10.1126/science.1163821