

Synthetic Biology in Ethical Perspective  
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The Hastings Center, one of several bioethics think tanks, recently announced that it is doing a study on ethical issues in synthetic biology, noting that “this rapidly advancing technology raises ethical questions about benefits and harms that have not been thoroughly addressed.” But because synthetic biology is a part of the continuum of research in the broad field of biotechnology, most of the ethical and policy issues it might raise are at least somewhat familiar. The challenge is to identify those issues, if any, that are quantitatively or qualitatively different for this field.

Synthetic biology is not limited to engineering specific changes in existing naturally occurring cells and organisms. Rather, it is predicted to be capable of constructing powerful and problematic organisms from scratch. When researchers announced that they had synthesized the deadly and virulent polio virus – for the purpose, they said, of showing how easy it would be to construct new bioweapons from off the shelf materials – scientists and ethicists were alarmed and the National Academies initiated a study on ways to prevent the destructive use of biotechnology. The familiar safety issues raised by biotechnology were now qualitatively altered to include bioterrorism, leading to extended discussions about scientific freedom versus the asserted need to prohibit some forms of research or to censor some forms of scientific communication.

Another long-running debate concerns intellectual property and the status of elements of living systems, such as gene sequences or altered organisms. For decades, U.S. law has granted patent rights for these products of biotechnology research and innovation, but whether this has achieved the goals of the patent system – incentivizing investment, inducing open disclosure, and speeding technological advances – has been debated unrelentingly since the first patent was granted for an altered bacterium. Certainly the prospect of modular elements allowing a wider range of people to participate in the construction of new organisms may change the way the patent system’s incentives actually function, and may lead to rethinking the use of patents in this area.

More dramatic, however, is the fact that synthetic biology represents the ability to construct artificial life forms. The sheer ability to construct a living organism is a fundamental break with history of the human species, one that may lead to profound questioning of deeply held religious and cultural beliefs about the origins and meaning of life. As one observer noted wryly, “God has competition.” If life is not a mystery but rather a predictable consequence of combining elements of the material world, it bespeaks a mastery over creation that has led to deep distress in public debates surrounding IVF in the 1980s and cloning in the 1990s. It taps into fundamental divisions among major world religions in their views on the proper domain of human activity, and it even affects notions of human exceptionalism, whether in the context of debates on evolution or speculation about life on other planets. But the extent to which these debates are changed as one moves from cloning to synthetic biology is not yet understood.