

Should moral objections to synthetic biology affect public policy?

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Moral concerns as to the relationship of synthetic biology with nature do not provide a convincing basis for more stringent regulatory oversight of the field.

There is a growing view that synthetic biology not only promises to engineer organisms that serve purposes ranging from medicine and agriculture to industry and environmental remediation, but also threatens—perhaps more than any other technology—to change the human relationship to the ‘natural’ world in morally undesirable ways^{1–3}. Others dismiss this concern out of hand. Drew Endy, one of the leaders in the field, has asserted that “the questions of playing God or not are so superficial and embarrassingly simple that they’re not going to be useful”⁴.

Certainly, the concern about the human relationship to nature needs to be articulated more clearly. It can, in fact, be spelled out in three different ways, which are based on very different philosophic claims, make different assumptions about what ‘nature’ means, and have different implications for the public regulation of synthetic biology. Some are grounded in large claims about the nature of reality, some only on moral values and some depend crucially on possible consequences. None is superficial or simple. At the same time, once spelled out, none easily generates any special regulatory constraints on synthetic biology.

Metaphysical mistakes

The first possible form of a concern about how synthetic biology might change the human relationship to nature is a metaphysical claim—a claim, that is, about the nature of reality. The claim has two parts, one about the categories of things that exist and another about the moral significance of those categories.

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Much of the language casually thrown around in debates about synthetic biology suggests some version of a metaphysical claim. The term ‘playing God’, for example, insinuates that humans are inappropriately stepping outside their proper role in the cosmos—that is, they are making a mistake about the category to which humans belong in the order of things, and in so doing making a moral mistake. The medical ethicists Joachim Boldt and Oliver Müller¹ come very close to this position, if they do not actually hold it, when they argue that synthetic biology is ethically more problematic than other biotechnologies because it constitutes not merely the manipulation of life but the very creation of life. With the emergence of synthetic biology, they write, the human role in the cosmos changes “from ‘*manipulatio*’ to ‘*creatio ex existendo*,’” which is a “fundamental change in our way of approaching nature”¹.

One kind of metaphysical mistake that might be imputed to synthetic biology, then, is the inappropriate elevation of humans. Another is the inappropriate degradation of life. By ‘creating life’, according to this version of the claim, humans are making a mistake about the category to which living things belong. Often, this claim is merely suggested. Prince Charles touched on it when he lamented that biotech seemed to be leading to “the industrialisation of Life”⁵. In critiques concerned

primarily with the social consequences of synthetic biology, Canadian nongovernmental organization the Action Group on Erosion, Technology and Concentration (ETC Group) conveys it obliquely with such titles and subheads as “Who Owns Nature? Corporate Power and the Final Frontier in the Commodification of Life”⁶ and “Original Syn?”⁷.

To object to synthetic biology along either of these lines, as a failure to recognize the



Watchful oversight of emerging approaches in biological engineering to a large extent should not be based on the various moral concerns that relate to the effects of the technology on the natural world.

appropriate metaphysical category either of humans or of life, is to believe that a very serious moral error is imminent because synthetic biology violates the very structure of reality, perhaps one dictated by a deity (for example, God). But defending either of these forms of the concern also requires defending a larger metaphysical position that makes sense of it. That defense, which will require explication of an overall worldview and perhaps of God's role in creating the world and the proper relationship between God and humans, is not likely, in a modern liberal democratic society, to serve as the basis for public policy that limits or bans the field.

A further problem with both lines of thought is that whether synthetic biology represents a shift from manipulating to creating is at best debatable. Several existing biotechnologies converge in synthetic biology, and the heart of the field is arguably just the ongoing refinement and extension of research on genetic engineering⁸. Furthermore, even the work that is most dramatically 'synthetic'—the creation of a protocell and a minimal genome to put into it—still starts with existing materials. By contrast, the kind of creating with which God is credited is creation *ex nihilo*.

Intrinsic wrongs

A concern about how synthetic biology changes the human relationship to nature can also be understood as a merely moral claim. In this form of the concern, the moral standards at stake are a product of human culture or reason rather than of the structure of reality.

One way to articulate a purely moral concern about synthetic biology would be to show that synthetic biology undermines morally significant concepts. For example, Mildred Cho and coauthors³ wrote that synthetic biology might threaten the perceived specialness of life. Alternatively, Boldt and Müller¹ argue that synthetic biology might, by making humans "creators" of nature, unjustifiably inflate humans' understanding of themselves.

These contrasting claims are obviously speculative and may prove unfounded. One reason for skepticism is that synthetic biology in its current form is concerned almost exclusively with the engineering of single-celled organisms, which is likely less troubling than the engineering of more complex organisms⁹. If the work is also restricted to the laboratory and the factory, and the release of organisms into the wild forbidden or restricted, then it might not be seen as broadly changing humans' views of other

living things. Finally, one might wonder why the work's possible conceptual implications generate a moral objection. It would not be the first time that science has challenged humans' views about life and their place in the cosmos. A very cogent argument must be given to explain why the conceptual implications are so problematic that they generate special regulatory constraints.

Another way to articulate a purely moral concern about synthetic biology would be to argue that 'nature' refers, not to metaphysical categories, but just to the natural environment, more or less independent of human intervention, and that some human interventions into nature are morally undesirable in themselves—intrinsically undesirable, that

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is. To understand the concern this way is to see synthetic biology as analogous, for example, to the extirpation of naturally occurring species or the destruction of wildernesses—other environmental interventions that many consider intrinsically undesirable.

The environmental philosopher Christopher Preston² objects to synthetic biology along these lines. He argues that synthetic biology intervenes in nature in a way that "traditional molecular biotechnology" does not. "The relevant difference," he explains, "is that traditional biotechnology has always started with the genome of an existing organism and modified it by deleting or adding genes"². By contrast, because synthetic biology would "create an entirely new organism," it crosses a cherished line: it "departs from the fundamental principle of Darwinian evolution, namely, descent through modification."

Defense of the view that synthetic biology is intrinsically morally undesirable rests on two key stipulations, having to do with the meaning of nature and the bounds of morality. First, the term 'nature' must be understood as distinguishing what does not result from human intervention from what does. A bright line is surely not possible, given the extent of human influence in the modern world, but a bright-line definition may not be necessary, just as it is not for the

morally significant concepts of 'personhood' and 'lying.' Perhaps the distinction can be rendered usable by drawing on an assortment of widely accepted examples—wolves and the Alaskan backcountry on one side, Chihuahuas and Midwestern American farms on the other—while admitting that many examples fall into a gray area in between. Furthermore, we might be able to regard the distinction as a matter of convention rather than a timeless fact; we might be able to hold, that is, that something is natural when the degree of human intervention in it does not cross socially established bounds. 'Natural' is used this way in the labeling of produce: anything available in the supermarket is to some degree a product of human intervention, but most people allow that organic orange juice can be labeled natural but not the fizzy beverage Tango. Similarly, although a restored creek or prairie is achieved only through human interference, most people would consider it 'natural'.

Second, moral opinions about human interventions into nature must be possible. It must be possible, for example, that driving a species into extinction, logging a forest or perhaps even just altering a geological feature can be considered intrinsically morally undesirable. The theories of morality dominant in Western philosophy—utilitarianism and Kantian theories, in particular—do not easily accommodate this kind of valuation. Even so, contemporary attitudes concerning the environment and public policy (for example, the US Endangered Species and Wilderness acts) suggest that many people have a wider view of moral value.

Although far from unassailable, these stipulations are now reasonably widely accepted. Accepting them, however, does not mean agreeing that synthetic biology is intrinsically morally undesirable. They are only necessary conditions for that view, and they are consistent with thinking that synthetic biology is acceptable, or that at least it should not be publicly restrained.

Indeed, there are several reasons to think that synthetic biology should be tolerated, at least at the level of public policy. First, even among those who have intrinsic objections to synthetic biology, many would still be willing to weigh them against the possible benefits. The value at stake in any human intervention into nature might be overridden by other moral considerations; we might still log an old-growth forest.

Second, the strength of the objection must be assessed; even if we agree that synthetic biology is undesirable, it might not be deeply undesirable. The human–nature issues that

have most alarmed the public, and that have led to public policy, have concerned damage to the natural world, and perhaps permanent and universal damage: when the passenger pigeon was killed off, for example, its place in nature was probably gone forever, and its absence could be observed and felt by anybody. In contrast, the creation of a new kind of organism is a creative act. Arguably, the natural world would remain unchanged, at least if the organism remained confined to the laboratory or manufacturing setting.

Environmental concerns are therefore the wrong analogy for showing that synthetic biology is intrinsically undesirable. Bearing in mind that synthetic biology is arguably only a refinement and extension of gene transfer, one should look instead to the debates over genetically modified (GM) crops and livestock. That debate, however, also does not support a restrictive view of synthetic biology, as there is no consensus that GM foods and animals should be banned. Even some commentators who take seriously concerns about how GM foods affect the human relationship to nature recommend merely that the relevant food products be labeled^{10,11}.

Preston's² objection to synthetic biology echoes the explanation offered by the science writer Michael Pollan¹² of why he found GM potatoes troubling: when new varieties are created through conventional breeding, he argued, they can be seen both as products of human creativity and as an example of adaptation to fill a special ecological niche; with genetic modification, only the story of human creativity makes sense. The evolutionary story is suppressed¹². But Pollan did not draw the conclusion that the potatoes should be banned, or even that they were clearly wrong. He just didn't eat the potatoes.

Environmental harms

One final way of understanding the concern synthetic biology raises about the human

relationship to nature collapses it, in effect, into concerns about the field's possible consequences. One frequently mentioned fear is

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that synthesized organisms might leak out of the laboratory or factory, perhaps mutate and become established in the wild¹³.

Another fear is bioterrorism: particularly if terrorists targeted agriculture, a synthesized pathogen might be suitable, or evolve to become suitable, for other hosts in the environment. These possibilities are worth taking seriously for the same reasons we take seriously the environmental threats posed by other kinds of industry or agriculture; among these reasons is the intrinsic value widely given to nature.

Unlike other forms of the concern about how synthetic biology might change our relationship to nature, understanding it as a straightforward concern about how synthetic biology might damage actual living things in the world around us seems to be a very plausible candidate for grounding public policy. It requires no special defense beyond that already offered for policies to protect rare species and undeveloped lands. For the same reason, however, no special policy

implications seem to follow from it beyond already familiar concerns about environmental impact.

Conclusions

The upshot, then, is that the different forms of the moral concern about synthetic biology's effect on nature have very different implications. Of the three forms considered here, all may be worth taking seriously as personal moral positions, but the two that have radical implications for public policy are also implausible bases for policy, whereas the one that is a plausible basis for policy would support a policy position that is identical to our present approach. This third position merely gives reason to ensure that the cost-benefit assessment of synthetic biology includes the possible consequences for environmental destruction or amelioration in addition to those for human well-being.

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