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Governing in the Context of Uncertainty

A commentary on Kaebnick, G.E, Gusmano, M.K, and Murray, T.H. 'The ethical issues of synthetic biology: next steps and prior questions'

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Kaebnick, Gusmano, and Murray tackle some important issues raised by the emerging field of synthetic biology. Many of these issues arise precisely because synthetic biology is emerging, making it hard, if not impossible, to predict how the technology will pan out. In the context of this uncertainty, Kaebnick, Gusmano, and Murray imply, we may have to change our familiar patterns of thinking and governing. It is this point I elaborate on here.

I argue that if we embrace the distinctive characteristics of emerging biotechnologies this can lead us away from attempts to analyze the risks and benefits of technological developments, and toward discussions of the motivations and purposes that drive them in the first place. This perspective gives us a solid rationale for public and stakeholder engagement (or "democratic deliberation," as Kaebnick et al. call it), and helps us address some of the concerns Kaebnick and colleagues raise about how this engagement should be organized.

The Nature of Emerging Biotechnologies

The Nuffield Council on Bioethics' report on emerging biotechnologies (including synthetic biology) identifies three characteristics that make them particularly difficult to govern: uncertainty, ambiguity, and transformative potential (Nuffield Council on Bioethics 2012). Uncertainty is the difficulty of predicting the consequences and applications of emerging biotechnologies. Lacking those predictions, quantitative risk analysis is extremely difficult, since outcomes cannot be confidently characterized and probabilities cannot be assigned. Ambiguity is the lack of agreement about the value or implications of an emerging biotechnology. Even deciding what constitutes a "cost" or a "benefit" is problematic, since what is perceived as a benefit for one group (life extension, for example) may be interpreted as a cost by another (overpopulation). Finally, transformative potential is the capacity of emerging biotechnologies to transform or displace existing practices in ways we cannot predict in advance.

The key point I want to draw out here is that we have to think about governance differently when we are thinking about it in the context of uncertainty. Kaebnick et al. recognize this: "What makes this work difficult is that, precisely because the technology is emerging and is thought to be transformational, both the final products and the impact they might have on society are as yet unknown" (p.10).

The challenge that such uncertainty places on governance is known as the "Collingridge dilemma" (Collingridge 1980): In the early stages of the development of a technology, predicting what its future holds is extremely difficult, although our power to control its development is relatively high. But once we know the consequences of the technology, our power to control its development will be limited, because it will have gained momentum and taken a path of its own. Rather than drawing the defeatist conclusion that any intervention into the path of a technology will be either too early or too late, Collingridge argued instead that we need to incorporate flexibility, resilience, and diversity into technological developments. A similar point is made by Kaebnick et al., who maintain that "given the likelihood, perhaps even inevitability, that the technology and applications will change over time, both the investigation of outcomes and the regulatory mechanisms put in place to control them will need to be flexible" (p.10).

However, Kaebnick et al. do not take the next step, which is one that opens up a whole new area of investigation. In demonstrating that prediction and control will not be possible, the Collingridge dilemma allows us instead to analyze the aims, intentions, and purposes that guide scientific and technological developments. This is because aims, intentions, and purposes are always in the present, even if their future consequences are not.

This focus on purposes draws attention to the inadequacy of existing risk analysis tools for dealing with emerging biotechnologies. If we merely focus on measurable risks, we cannot ask bigger questions like, "Is this research field one in which we want to invest society's limited resources?" This question demonstrates that technology choice is an ethical issue. It is completely different from the question of whether or not synthetic biology poses potential harms to human health or the environment. As Wilsdon and Willis (2004) argue, in discussions of science and technology, "Possible risks are endlessly debated, while deeper questions about the values, visions and vested interests that motivate scientific endeavour often remain unasked or unanswered" (p.18).

This next step, away from analysis of the risks and harms of an already-existing technology, toward a focus on "what kind of future do we want innovation to bring into the world?" (Owen et al. 2012, p.758), is challenging but, I think, potentially liberating. It is very different from the attempt to "to monitor the technology and try to respond to it as it unfolds and as potential applications come into view" (Kaebnick p.27). Such monitoring seems to come from the detached perspective of an observer watching a technology pursue its autonomous path, rather than a participant who has a stake in the technology and the social goals it aspires to achieve. Instead, a focus on motivations and purposes invites us to imagine the future in different ways.

This is some of the thinking that is behind the notion of "Responsible Research and Innovation," (RRI) an approach to innovation governance that is gaining momentum in Europe. The aim of RRI is to ask "how the targets for innovation can be identified in an ethical, inclusive, democratic and equitable manner" (Owen et al. 2012, p.754). Although the notion of RRI has yet to solidify, its key proponents argue that it has four features: anticipation, reflection, inclusivity, and responsiveness (see Stilgoe et al. 2013).

Public Engagement

I do not have space to discuss all these features here, but I will address one of them – inclusivity – because it resonates with the aspiration for democratic deliberation in Kaebnick et al.'s paper. Inclusivity is central to RRI because if purposes and motivations replace risks as the focus of governance, then the pertinent questions concern the broader social and economic goals that emerging technologies like synthetic biology should serve. Unlike the technical details of the research, these broader goals can (and arguably should) be opened up to wider public discussion. This can allow for a "constructive negotiation of possible alternatives, multiple trajectories, and different technologies, including of different social ends" (Wynne 2006, p.218).

This leads to questions about when public engagement should take place. The discussion of social goals clearly comes at the early stages of technology development, and may even occur at the stage of science policy-making. Such "upstream" engagement provides an opportunity for broader goals to be "consciously incorporated into technological development before particular trajectories and attitudes become set" (Delgado et al. 2011, p.835). This can allow new types of conversation to happen. For example, rather than assessing whether or not we "accept" synthetic biology, we can talk about the best way of ensuring global food security and the extent to which biotechnologies might help further this end. Engagement can also occur "midstream," at the level of the research lab (Fisher et al. 2006). Finally, and most familiarly, engagement can take place "downstream," at the

level of applications and products. But since synthetic biology has produced very few applications so far, such engagement may be premature. Furthermore, "by the time a technology becomes an appropriate subject for a possible policy decision – the point at which broader engagement usually takes place – it has already emerged to a significant degree and the issues are already invested with values and expectations" (Nuffield Council on Bioethics 2012, p.89).

There are not only different stages at which public engagement can take place, but different reasons for doing it in the first place (see Stirling 2008). Kaebnick et al. acknowledge this in passing, but some elaboration is useful. The first rationale is instrumental: public engagement is conducted in the services of a predefined end such as the restoration of legitimacy or trust. The second is normative. Here, public engagement is undertaken because it is considered to be "the right thing to do." This might, for example, be based on a commitment to the idea of democracy. The third rationale is substantive, and it is grounded in the idea that public engagement will lead to better decision-making and more socially robust science.

Kaebnick et al. express concerns about representativeness, but if we start differentiating public engagement activities according to the stages at which they take place and the rationales that motivate them, we see that different forms of public engagement are suited for different purposes, and that representativeness will not necessarily be a relevant concern. For example, if "the purpose is not (instrumentally) to justify a single settled verdict but, instead, to inform wider (substantive) policy debates" (Nuffield Council on Bioethics 2012, p.87), then the aim is to "open up" these debates to broader social values. Such (substantive) public engagement does not need to represent "the constellation of groups that represent the range of perspectives in the general public" (Kaebnick et al, p.23), but it does require bringing in voices that might otherwise not be heard. Also, the issue of how the information is "framed" does not arise in the way that Kaebnick et al. discuss, if the point is not to choose between discrete alternatives but to generate new ways forward.

The United Kingdom's Synthetic Biology Public Dialogue, which took place in 2010, elucidates some of these issues. This dialogue involved 160 members of the public, all of whom participated in three day-long workshops, held in four different locations across the U.K. The participants were "invited," in that they were recruited by a market research agency. This necessarily neglected a large range of "uninvited" publics, such as civil society organisations and DIY biologists – arguably one of the most important "publics" in synthetic biology.

Five central questions about synthetic biology emerged from the dialogue: "What is the purpose? Why do you want to do it? What are you going to gain from it? What else is it going to do? How do you know you are right?" (BBSRC/EPSRC 2010, p.7). What is interesting about these questions is that they challenge us to broaden the scope of our discussions. The first three cannot be answered with more scientific knowledge or more accurate risk assessment, and none of them expressly address the intrinsic value of doing synthetic biology. They resonate most with Kaebnick et al.'s concern about justice, and especially with the idea that "Questions about justice can, and we believe should, be asked not just about the applications but also about the very research and development of the technology" (p.17). These are perhaps the most challenging questions. We are liberated to step back and address them if we take seriously the idea of governance in the context of uncertainty and shift our focus from risks and toward purposes.

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