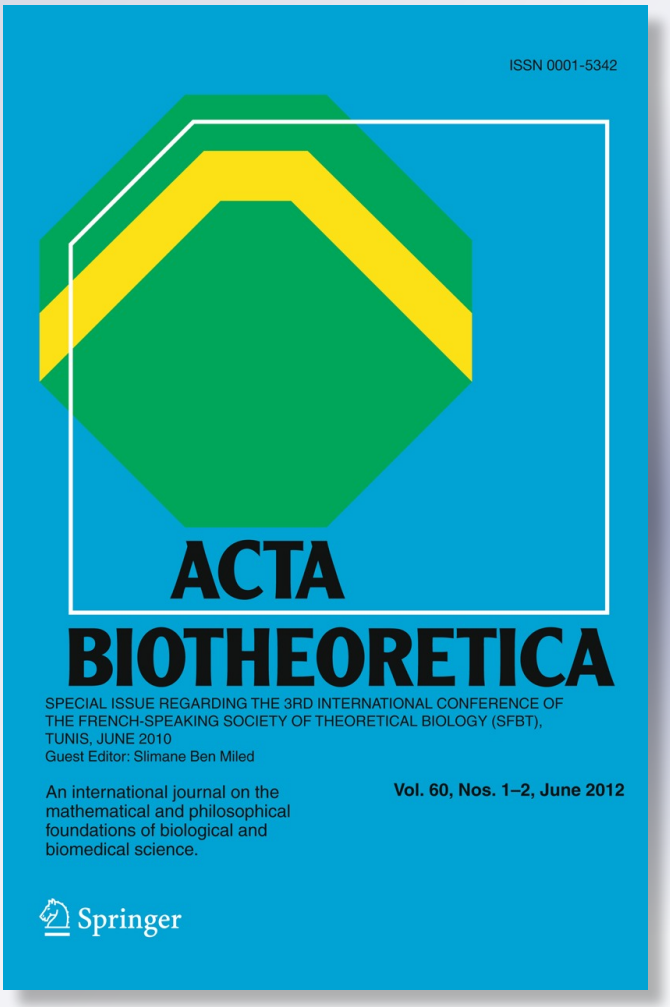
Mark A. Bedau and Emily C. Parke (eds): The Ethics of Protocells: Moral and Social Implications of Creating Life in the Laboratory (Basic Bioethics series)

John P. Sullins

Acta Biotheoretica
An international journal on the mathematical and philosophical foundations of biological and biomedical science

ISSN 0001-5342
Volume 60
Number 3

Acta Biotheor (2012) 60:329-332
DOI 10.1007/s10441-012-9163-3



Springer

Acta Biotheor (2012) 60:329–332
DOI 10.1007/s10441-012-9163-3

BOOK REVIEW

Mark A. Bedau and Emily C. Parke (eds): The Ethics of Protocells: Moral and Social Implications of Creating Life in the Laboratory (Basic Bioethics series)

MIT Press, Cambridge, MA, 2009, 365 pp, ISBN 978-0-262-01262-1, ISBN 978-0-262-51269-5

John P. Sullins

Received: 6 July 2012 / Accepted: 6 July 2012 / Published online: 22 July 2012

In May 2010, scientists at the J. Craig Venter institute were able to synthesize an artificial bacterium, JCVI-syn1.0, gaining brief media notoriety that tended to focus on the potential ethical and social impacts of artificial bacteria (for an example see, Callaway and Coghlan 2010). Craig Venter himself was at the forefront of the public relations campaign trying to steer the conversation away from the hyperbole that the media reserves for these topics. While Venter's achievement is significant, it is not a fundamental breakthrough in synthetic life, since the reproducing cells are not entirely novel, having been constructed out of preexisting DNA which was successfully imported into the cytoplasm of another bacterium (Gibson et al. 2010). But this episode gives us a taste of the excitement that will be generated when viable artificial protocells are finally produced in a lab. Thinking far ahead of this curve are the authors and editors of the MIT Press book, *The Ethics of Protocells: Moral and Social Implications of Creating Life in the Laboratory*. The editors of this volume, Mark A. Bedau and Emily C. Parke, have both been active in tracing the philosophical implications of the development of wet ALife and protocells. In this book they have collected a number of essays that cover the important ethical considerations of this emerging technology. Readers interested in risk analysis, research ethics or the critical evaluation of the potential social impacts of protocells will be pleased with this volume.

The volume begins with a thorough introduction by Bedau and Parke that outlines protocell technology and how it fits into the general project of synthetic biology and biotechnology in general. Protocells are living cells that are created by taking nonliving material and combining it in such a way that basic lifelike qualities are obtained. Life is a notoriously difficult notion to define, but the researchers in this field have a three part working definition that suggests that a cell is alive if it has the ability to (1) localize all of the cells components such that it is individually

J. P. Sullins (✉)
Department of Philosophy, Sonoma State University, Rohnert Park, CA, USA
e-mail: john.sullins@sonoma.edu

identifiable in time and space, (2) gains energy from, and metabolizes portions of, its environment so that it can grow and reproduce, and finally (3) all of this is under the control of information that is inheritable in a Darwinian sense from its predecessors (for more detail see Rasmussen et al. 2008). Besides the obvious purely scientific curiosity for discovering the origins of life, protocells have a number of technological values as well, and it is the hope of capitalizing on these technologies that is spurring investment in this research. Venter seems to be interested in using his synthetic bacteria to help facilitate the creation of biofuels, and vaccines, while the European Union has funded protocell research to assist in the production of information technologies.[1] Basically anything that could benefit from tiny biological "factories" for the synthesis of new substances, medicines, or materials will be impacted by protocell technology. But along with the promise comes potential threats to human health and concerns for the environment.

The first section of the book contains essays on "Risk, Uncertainty, and Precaution with Protocells." Brian Johnson begins the section with his paper, "New Technologies, Public Perceptions, and Ethics." He argues that the acts of discovery and innovation, while intrinsic to human nature, do not necessitate general acceptance and adoption of every new technology. Johnson explores how we might better predict public reaction to new technologies and find out why cultures as similar as Europe and North America can have such widely divergent acceptance of technologies such as genetically modified food and stem cell research. Johnson concludes that many new technologies are derailed by overstatements or misunderstandings of the risks involved in new technologies as opposed to the benefits for the individual in a society. People are quite willing to take risks if they stand to benefit but are uninterested if the benefits seem remote. Johnson suggests we chose to involve the public early on in the discussions of risk and focus on how protocell research will benefit the average citizen.

Mark Bedau and Mark Traint follow with an essay entitled, "Social and Ethical Implications of Creating Artificial Cells." This paper traces some of the actual and potential public reaction to protocell research. They identify two types of moral arguments relating to new technologies, the straightforward extrinsic argument, which is driven by the consequences of the technology, and then there is the intrinsic moral argument that basses its decision on the very nature of the technology in question. The extrinsic argument is the standard cost-benefit style argument and can be dealt with by using strategies similar to those Johnson discussed above. But the intrinsic argument is harder to deal with. When it comes to biotechnology or protocells it is usually expressed in the form of technology "x" is playing God, tampering with uncontrollable forces, crossing a sacred line, or unnatural. After considering all the various intrinsic arguments, Beadau and Traint conclude that they are "…vague, simplistic, or ill-conceived," and thus focus at the end of the paper of the extrinsic arguments. This portion of the paper is an in-depth attack on a too strong adherence to the precautionary principle and a call to the virtue of courage in the research of protocells. This is, of course, the Aristotelian notion of courage, not a headlong and foolhardy rush into the unknown, but a

[1] See PACE Final Report at: http://www.istpace.org/Web_Final_Report/the_pace_report/index.html.

resolute and careful step forward into the possibilities offered by this research. Carl Cranor contributes to this discussion with an essay on "the Acceptability of the Risks of Protocells."

In order to address these issues a number of the essays in this volume discuss the applicability of the precautionary principle to protocell research. The amount of pages devoted to this topic is justified by the fact that the precautionary principle might suggest extreme caution in protocell research. This is due to the threatening scenarios that could develop which might harm human health and cause environmental catastrophe. The fact that protocells are living and evolving makes them somewhat unpredictable, if protocells were to somehow escape confinement and reproduce rapidly, this might result in disastrous consequences. It would seem to follow that precaution is the only moral research choice and consequently, unbridled protocell research is not morally justifiable. Along this line of thinking, the potential risks are just too high and there is no way of knowing with certainty what the likelihood is of a catastrophic event occurring, so prudence would dictate that we use extreme caution when working with these cells in the lab, and perhaps that we abandon the research altogether. Parke and Bedau contribute a strong critique of the precautionary principle to this volume in their essay, "*The Precautionary Principle and Its Critics*" (pp 68–87). In this essay Parke and Bedau raise all the known critiques of the precautionary principle and find that only one critique of the precautionary principle holds in the case of protocells, and that is that since protocells are so new, they defy the normal process of scientific research threat analysis. Normally a commission might weigh the various risks against potential benefits and advise the other researchers on a safe course of action, but in the case of protocells there are too many unknowns, both in the costs and the benefits, to make any sensible recommendations. Perhaps the benefits are so great that not pursuing them would be immoral, as would happen in the case that they might eventually provide effective therapeutic tools for alleviating human suffering. Their suggestion is that the precautionary principle should not suggest total abandonment of this research but it can still be used to advocate for strong oversight and control of the research. The book includes at least five other essays on the precautionary principle and the varying degrees that it should be applied to protocell research.

There are also interesting essays on the potential social impacts protocells will have given that the concept of life plays such an important roll in common moral theory. There is also an important discussion on property and patents and how these concepts might be challenged by protocells. Another set of essays discuss design philosophy as it applies to the creation of novel life forms. An interesting dialogue opened up by a number of essays in the book is the collapsing distinction between technology and the life sciences and the challenges that this rises for the philosophy of technology.

The Ethics of Protocells is a welcome addition to the literature on ethics and emerging biotechnologies. As protocells quickly move from the theoretical to actual, this book will help set the pace for ethical analysis. It is very heartening to see ethicists trying to keep ahead of this technology where they can act as an important proactive voice in steering this technology in positive directions.

References

Callaway E, Coghlan A (2010) Synthetic life: where next? New Sci 206(2762):6–8

Gibson DG, Glass JI, Lartigue C, Noskov VN, Chuang R-Y, Algire MA, Benders GA, Montague MG, Ma L, Moodie MM, Merryman C, Vashee S, Krishnakumar R, Assad-Garcia N, Andrews-Pfannkoch C, Denisova EA, Young L, Qi Z-Q, Segall-Shapiro TH, Calvey CH, Parmar PP, Hutchison CA III, Smith HO, Venter JC (2010) Creation of a bacterial cell controlled by a chemically synthesized genome. Science 329:52–56

Rasmussen S, Bedau MA, Chen L, Deamer D, Krakauer DC, Packard NH, Stadler PF (eds) (2008) Protocells: bridging nonliving and living matter. MIT Press, Cambridge