



Das Gottes- handwerk

The subject of *Das Gottes-handwerk* is “playing God” by artificially synthesizing life in the laboratory, and how that is perceived historically and culturally and judged by society. In this small and excellently written book, Joachim Schummer presents the historical, cultural, and theological background for understanding why “the creation of artificial life” and attempts to “play God” are subjects that arouse great public interest and even indignation. Sensation-driven recent reports on advances in synthetic biology (SB), with the help of the popular press and mass media, have fed the public with exciting promises, just as occurred with nanotechnology a decade ago. As in that case, we have learned (again!) that SB will provide solutions to all our problems in the areas of energy, health, environment, food, etc. In this review I will highlight some of the core ideas of the book.

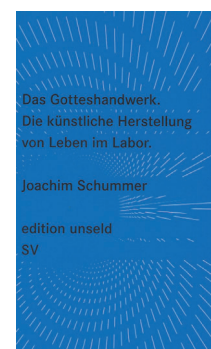
What do the scientists who work on “creating life in the lab” aim to achieve? Statements about their aims are accompanied in the media by emotional phrases such as “interfering with God’s handiwork”. The aims can only be understood by considering the specific cultural context in which SB and other related areas of research (such as nanotechnology) have emerged. Schummer analyzes this cultural context in detail. The sociology of SB and how it is perceived and judged in Western societies is deeply rooted in culture and religion. With this knowledge, it becomes much easier to understand the nature of the cultural reflexes mentioned above. It is no exaggeration to say that Schummer analyzes precisely how these reflexes by the public are intentionally induced, assisted by the immense power of the media. This public awareness is, in fact, skillfully channeled for the promotion of specific commercial or scientific interests of individuals and groups. Unfortunately, such a *modus operandi* is usually at the long-term cost of the scientific reputation of the whole discipline and, even more seriously, of its social acceptance and tolerance. This is very remote from Francis Bacon’s vision of a project by society aimed at creating life-forms designed optimally for human purposes, as envisaged in his utopian novel *New Atlantis* (published in Latin in 1624 and in English in 1627).

Exactly what is meant by “the creation of life”? Unfortunately, there is no general consensus among scientists, philosophers, and theologians about the definition of “life”. Consequently, as the meaning of the word itself is disputed, the idea of creating life can only refer to a vague scientific goal. Thus, “the creation of life” is an ambiguous

expression that triggers different reactions in different interest groups. Consequently, any change in the realm of something so ambiguously (un)defined can always be proclaimed as a “creation”. Seen in this context, it is not difficult to understand why reports about “the creation of artificial life” appeared so frequently in the last century, and probably will continue to do so in the coming decades. In reality, the “artificial creations” being talked about by scientists up to now are only minor modifications, or at most re-syntheses of parts of already existing organisms rather than the “creation” of new ones.

What about the “playing God” label? Historically, the early signs of today’s indignation about “trying to play God” can be seen in the criticisms that some medieval theologians directed at the alchemists. Their efforts to master simple chemical transformations were criticized and damned as an attempt to change the innermost workings of God’s Creation. However, many present-day historians and researchers into cultural trends fail to notice the fact that the old moral-theological world order later underwent a complete reversal, when we compare it with today’s views. In pre-industrial times, the creation of life (even of complicated forms) was regarded as legitimate, and actually as trivial fact, far from being something scandalous or disreputable. The act of creation through either divine power or the power of “The Word” was reserved for “higher life-forms” such as other gods or humans, but was unnecessary for the spontaneous emergence of life from nonliving matter, a process that was thought to occur for simple life-forms such as worms or flies. Even before Christianity, in his *History of Animals* Aristotle wrote: “*Animals and plants come into being in the earth and in liquids because there is water in the earth and air in water, and in all air there is life-giving heat ...*”.

In the past, the objections to the creation of life were not moral or theological, but rather were concerned with hygiene matters and with disgust that might result from the spontaneous creation of pests and molds. However, the theory of evolution changed views dramatically by revealing a fundamental connection between, for example, amoeba and humans. Even the emergence of the radical teaching of Creationism, with its strict denial that life could have been formed spontaneously, would not have been possible without these advances in the natural sciences. In other words, worms and protozoa, which were previously regarded as worthless or as unworthy of study because they were useless or even damaging for mankind, are now seen as important, because in the light of the theory of evolution they represent earlier stages in the development of life towards mammals and human beings. Therefore, those who claim that these creatures are generated spontaneously or



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could even be made in a laboratory could now be accused of “playing God”, because now the question of the creation of humans (exclusively the domain of divine planning and the forces of Creation) is affected.

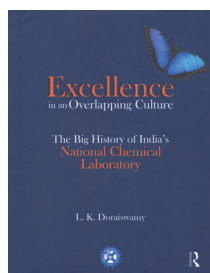
It should also be noted that the first scientific ideas about the creation of new life-forms were born in Germany in the second half of the 19th century, at a time when, as organic chemistry was beginning to develop, attempts were made to disprove, by means of organic syntheses, the idea of a “vital force” (*vis vitalis*). At the beginning of the 20th century, Emil Fischer formulated the program of “chemical synthetic biology”, in the spirit of the ideal of progress from pure imitation of nature to the domination of nature, with the ultimate goal of the chemical synthesis of life. Since then, many reports about the “creation of synthetic life” followed at regular intervals, most of them now forgotten.

Each of the 16 chapters in the book can be read independently, and is a journey through a multitude of facts that, separately, are already familiar to each of us. However, most of us never thought of them from a broader historical and cultural perspective. For example, Chapters 7 and 8 present an excellent analysis of the media coverage of “life creation” during the last hundred years or so. They describe a time-line that extends from the report on the “chemical synthesis of life” by the German-American parthenogenesis researcher Loeb in the 19th century, via Danielli’s experiment of 1970, in which patchwork amoeba were reported as “the first synthesis of a living cell”, up to the recent experiments by Craig Venter on “artificial cells”. Developments such as the revival of the theory of rigid genetic determinism, and the attempts to emancipate SB from molecular biology, biochemistry, and genetics by emphasizing “synthesis of life” as a foremost research goal, are all brilliantly described.

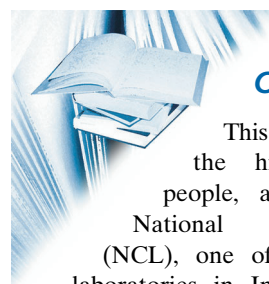
This excellently written book is highly recommended for everyone who wants to understand the main protagonists, driving forces, mechanisms, and the cultural and social background of “high-impact” modern science.

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Excellence in an Overlapping Culture
The Big History of India's National Chemical Laboratory. By L. K. Doraiswamy. Routledge (Taylor & Francis), New Delhi, 2010. 625 pp., hardcover.—ISBN 978-8189643003



Excellence in an Overlapping Culture

This book is largely about the history, the work, the people, and the culture of the National Chemical Laboratory (NCL), one of the over 200 national laboratories in India that operate within the framework of some 15 scientific agencies or departments of the Government of India, most of which were set up after Indian Independence in 1947.

NCL is one of India’s finest research laboratories, and has made significant contributions, both in basic research and applied sciences, and the author, L. K. Doraiswamy, has been one of India’s foremost chemical engineers, but the book does not measure up to these standards.

The first part, of nearly 90 pages, describes mostly the history of Indian science and then the history of the Council of Scientific & Industrial Research (CSIR) of which NCL is a constituent. This part of the book is eminently readable, but it would have been more relevant if the book was about all of Indian science after Independence.

The rest of the book comprises three types of contents: firstly, content of interest to everyone; secondly, content of interest to those directly concerned with NCL, such as the description of projects that failed, in Part IV of the book; and thirdly, content that consists of items too trivial to be of interest except to a very few, if any, readers. The second and third types dominate the book. The attempt to include “everything” often obscures the elements of uniqueness for which the laboratory is justifiably known, such as catalysis, bamboo tissue culture, and Damodaran’s discovery of one of the 20 constituent amino acids of proteins. Part IV of the book, about NCL’s contribution to industry, is perhaps the most valuable, although even this could have been shortened. Chapter XVI, which reviews the culture and the environment that has prevailed in the NCL over the last six decades, makes very interesting reading.

An example of “contamination” of the exceptional with the mundane is the section on chemical biology (pp. 298–301), where about equal space is given to the excellent work on peptide nucleic acids and to the setting up and use of an automated DNA synthesizer and the PCR machine, which should not even have been mentioned. Much of what is in Chapters XIV and XV, such as the description of the guest house, the hostel, the medical centre, recreation facilities, and the shopping centre—facilities that are by no means unique—would be of no interest to a general reader. Then in Chapter XVI there is a repetition of Ratnasami’s work on a