

Executive Summary

Genetic Technology - Shaping the Future

Brainstorming, 18 May 1998, Center for Applied Policy Research, Munich, Germany

The look into the future began with a glimpse at the past. At the very start of his presentation Dr. Bernd Kirschbaum pointed out that in the seventeenth century the dissection of human corpses was forbidden as blasphemous, whereas nowadays we simply take it for granted and consider it a necessary part of medical study. Will genetic engineering undergo a comparable change of public acceptance? Will future generations have a hard time seeing how we could get so worked up about the implementation of a new technology?

Kirschbaum's rhetorical step into the past efficiently opened up a lucid introduction to the range of possibilities that a deep understanding of the genes will bring about: At present we are just starting to know a lot about data in the genes, because we have learned how to read them. However, we know far less about the processes that use this data to make cells or organs, to provoke defects or diseases. For the time being, this means that people are faced with the dilemma of not knowing what to do with genetic knowledge: People can, for example, know that they face an increased risk of cancer thanks to a faulty gene - yet our chances of providing curative treatment are still very low.

But this seems to be just a temporary problem, as Kirschbaum explained. With better tools for DNA analysis and much more knowledge about which genes do what, our picture will get sharper and sharper. There is reason enough to think that in the coming decades we will trace the causes of more diseases, develop more life-giving medicines and find innovative therapies when because discoveries keep leading to new techniques, with which yet more discoveries can be made. The biomedical advances that we have experienced over the last ten years have already blurred into rising productivity. As Kirschbaum estimated, the market share of genetically engineered pharmaceuticals will have already risen to 17 percent by the year 2000.

„Nonetheless, hope must not make us blind,“ he concluded. This means that we have to look at what biotechnological breakthroughs will cost us, and in which research fields we will concentrate our resources. It also means that scientists and society as a whole should not turn a blind eye to bioethics but enter the next stage with considerable foresight and responsibility.

Dr. Boris Steipe joined in the argument that biotechnology may be a key technology with a potential to transform societies. Its capacity for technological advances in a large segment of today's medical, chemical and agricultural markets is quite obvious and can be readily extrapolated from today's developments. We have copied nature's techniques for genetic variation and added a few of our own, we are now beginning to read the genetic record on a large scale and today's markets are readily taking up our developments. "Green" genetic engineering, for example, is already on its way to increase crop yields and safeguard harvests.

Among its goals are plants that are more resistant to diseases and pests (reducing requirements for agrochemical intervention), may contain less allergens, more nutrients or withstand unfavourable environmental conditions. Bio-based nanotechnology is another direction in which the field may evolve. Steipe defined goals such as novel materials (from textiles to plastics to construction engineering), novel technologies (biosensors and catalysts) and visions how nature's bottom-up engineering paradigms might be applied to attain these goals: evolutionary optimization, small-scale structuring through self-organization and self-replicating entities.

Undoubtedly, the most profound medium-term impact is felt to occur in medicine. Steipe emphasized that for the first time in history we are launching a large scale, coordinated attack to cure diseases at their root, not just treat their symptoms. It appears to be a logical consequence, that ultimately we will be able to prolong life significantly by considering - and treating - aging as a genetically influenced disorder.

But there are less obvious aspects which deserve further attention. One of these is the technology's simplicity, allowing a large and diverse number of small and medium-scale enterprises to be competitive in their respective fields on a global level. A continuous influx of academic creative potential and increased efforts to shorten the time until innovation reaches the market will drive the creation of many new future market opportunities. The successes of biotechnology will shape society's perception of the problems it would like to see solved. This scenario of wide-spread, localized, small-scale development raises the question of whether any control by society is conceivable. Indeed, Steipe related that the past history of genetic engineering has been accompanied by ethical considerations, but that any influence on the topics of the field and its dynamics was far from obvious.

Steipe's remarks emphasized the ambiguity that is perceived today in biotechnological progress. The discussion which followed the presentations evolved around the major social impacts which healing diseases and stretching the life-span would impose upon societies. The necessary transformation of our health care and pension systems, the consequences of a further increase in population growth, the spectre of discrimination against those who may wish to grow naturally old - these are currently open questions. We have to proactively address these developments and we have to formulate guidelines of how we are going to deal with them, before the reality of change is imposed upon us. Individuals in modern, pluralistic societies will hardly let themselves be restricted in their choices, even if these choices may appear unethical by the standards of a majority. There will be no obvious consequences from asking whether and how much of these developments we actually want. It is all the more important to take the debate on ethics and responsibility beyond its current role of commenting the present, to formulate practical guidelines and clear-cut goals for the future. "For example, human dignity is a concept everyone will readily subscribe to, but how many would agree on what this concept precisely means or how we would apply it to concrete cases?" he asked.

In the light of all the social impacts involved, Dr. Reiner Anselm agreed that the ethical dimension of the biotech revolution would confront us with essential questions. But the guiding line that humanity needs already exists. Kant's

categorical imperative ('Do only those things that you would wish to see become universal practice') and the respect for the dignity and autonomy of the individual can serve as the pivotal points of all debates on technology and ethics. Thus, they can also provide the necessary orientation in all fields of biotechnological applications. The production of genetically engineered insulin, for example, would not cause ethical problems. Even the different forms of genetic therapy could not entirely be rejected, since they might help to vanquish severe genetic disorders which jeopardize the individual's life. But at the same time he conceded that we are already trapped in a number of situations which would pose the *slippery slope* problem. At present we are neither close to overseeing nor to mastering all the risks which genetic therapy might imply. For example, introducing new genes into an adult might have many more side effects than we presently anticipate; or, genetic treatment may increase vulnerabilities to other disorders. It is this kind of complexity, embodied in various specific questions, which makes the ethical approach so difficult. According to Anselm, people tend to refrain from things that they are not able to fully understand in a situation like that. „When you're in doubt, play safe, vote no,“ would be a common reaction which governs the initial public response to almost every technological advance. (*at least in Germany and/or Europe but perhaps less in the U.S. and China*). The only way out? Only a more vivid and vigorous public debate will enable us to start making choices about how we want to shape the world.

Summary of the Discussion

The presentations were followed by a discussion which made it clear that future societies will have to put up with major social implications as biotechnology moves forward. The scientific progress and its various applications seem to produce developments at such a dynamic pace that society fails to keep up with the possibilities. As a result, policy measures continuously tend to lag or fall behind. Questions which we now consider urgent (for example the reform of the pension system, as Professor Werner Weidenfeld remarked) might prove obsolete sooner than we expect. All discussants consented that the promise to prolong life (be it by tailored viruses, cellular grafting, smarter medical drugs or genotype choice) comprises a fundamental challenge to come to terms with. A longer life span would offer us more benefits and choices but also force us to decide what we want, individually and collectively. Substantial and sensitive issues such as the future of our social systems, the consequences of a further population growth, our attitudes towards health, disease and age as well as the access to healing (one must consider that therapy might remain expensive and exclusive) will be questioned.

The view of Chinese culture provided a clear counterpoint to European wrangling over ethical fine points. „How might China react to the biotechnological revolution?“ Werner Weidenfeld asked Professor Paul Ulrich Unschuld who is a noted expert on the history of Chinese medicine and who travels to China regularly. Unschuld clearly expressed the Chinese would not share the German/European worries and ethical concerns. The Chinese would make use of every biotechnological facet accessible in order to overcome deeply rooted and historically ingrained fears of hunger and death. Their conception of knowledge also varies considerably from our notion of advance and progress. (He described the Chinese approach as "cognitive dynamics;" knowledge which derives from past generations and eras is not regarded as outdated and can therefore easily

coexist with today's knowledge) Thus, Unschuld's remarks sharply illustrated that the Western concept of morality and ethics - the underlying principle of many of the questions discussed during the evening - will definitely not apply as a universal values system.

In short, European biotechnology has its work cut out for it in the social and political realms: the public is alarmed, but not informed. The scientists would welcome guidance on goals and priorities, but they hear mainly worries and fears. Moreover, these worries are often based on irrational concepts of what biotechnology is about, and what its possibilities are. Thus participants in the public dialogue are often talking past each other. In contrast, worries in Asia and America are not nearly as strong, and what little public dialogue exists on biotechnology tends to focus on possible applications, or possible economic opportunities.

Program

**Brainstorming
„Genetic technology - shaping the future“**

May 18, 1998

Center for Applied Policy Research, Munich, Germany

7.25 p.m. Introduction

Prof. Dr. Werner Weidenfeld
Director, Center for Applied Policy Research,
Ludwig-Maximilian University of Munich

**Facets of genetic engineering and their implications
for the future of society**

7.35 p.m. Dr. Bernd Kirschbaum
Head of the Center of Applied Genomics (CAG),
Hoechst Marion Roussel Deutschland GmbH,
Martinsried

7.50 p.m. Dr. Boris Steipe
Senior Research Fellow, Genetic Research Center,
Ludwig-Maximilian University of Munich

**Ethics of genetic engineering: What kind of strictures
do we need?**

8.10 p.m. Dr. Reiner Anselm
Senior Research Fellow, Institute of Systematic Theology,
Ludwig-Maximilian University of Munich

8.30 p.m. Discussion

10.00 p.m. End of the Brainstorming

Participants

Dr. Reiner Anselm
Senior Research Fellow, Institute of Systematic Theology,
Ludwig-Maximilian University of Munich, Germany

Dr. Warnfried Dettling
Book author and essayist for the weekly paper DIE ZEIT,
Munich, Germany

Dr. Thomas R. Henschel
Director, Research Group on Youth and Europe,
Center for Applied Policy Research,
Ludwig-Maximilian University of Munich, Germany

Dr. Bernd Kirschbaum
Director of the Center of Applied Genomics (CAG),
Hoechst Marion Roussel Deutschland GmbH,
Martinsried, Germany

Prof. Gabriele Kokott-Weidenfeld
Professor of Law,
University of Applied Sciences of Koblenz and Ludwig-Maximilian University of
Munich, Germany

Mr. Douglas Merrill
Senior Research Fellow, Research Group on the Global Future,
Center for Applied Policy Research,
Ludwig-Maximilian University of Munich, Germany

Dr. Thomas Paulsen
Senior Research Fellow, Research Group on European Affairs,
Center for Applied Policy Research,
Ludwig-Maximilian University of Munich

Ms. Christine Scholz
Editor of the magazine Medical Genetics,
Manager, Professional Association of Medical Genetics & German Society for
Human Genetics,
Munich, Germany

Dr. Boris Steipe
Senior Research Fellow, Genetic Research Center,
Ludwig-Maximilian University of Munich, Germany

Mr. Jürgen Turek
Director, Research Group on the Global Future,
Center for Applied Policy Research,

Ludwig-Maximilian University of Munich, Germany

Prof. Dr. Paul Ulrich Unschuld
Director of the Institute for the History of Medicine,
Ludwig-Maximilian University of Munich, Germany

Mr. Markus Vorbeck
Senior Research Fellow, Research Group on the Global Future,
Center for Applied Policy Research,
Ludwig-Maximilian University of Munich, Germany

Mr. Arnd Wagner
Managing Director, Hoechst Foundation,
Frankfurt am Main, Germany

Prof. Dr. Werner Weidenfeld
Director, Center for Applied Policy Research,
Ludwig-Maximilian University of Munich, Germany

Short biographies:

Presenters:

Dr. Reiner Anselm is a theologian and a senior research fellow at the Institute for Systematic Theology at the Ludwig-Maximilian University of Munich. He is about to finish a book on Lutheran church doctrine which will qualify him as a university lecturer (Habilitationsschrift). His previous works include several publications on bioethics and medical ethics.

Dr. Bernd Kirschbaum is Director of the Center of Applied Genomics (TCAG) at Hoechst Marion Roussel Deutschland GmbH, Martinsried. He earned a Ph.D. in biochemistry at the University of Konstanz and joined Hoechst in 1994 after serving as a research associate at the Institut Pasteur in Paris and Rockefeller University, New York. He is currently leading a collaborative project between Hoechst Marion Roussel and the Genetic Research Center of the Ludwig-Maximilian University of Munich.

Dr. Boris Steipe is a senior research fellow at the Genetic Research Center of the Ludwig-Maximilian University of Munich. After studying medicine, he was a researcher at the Max Planck Institute for Biochemistry. He has worked for the Genetic Research Center since 1995 and has carried out a number of projects, for example on protein engineering.

Participants:

Dr. Warnfried Dettling is an essayist and author of several books on politics, society and democracy. His work includes a variety of topics, from the transformation of the welfare state to the analysis of the Chancellor Kohl's political legacy (Das Erbe Kohls. Bilanz einer Ära).

Dr. Thomas R. Henschel is head of the research group on Youth and Europe at the Center for Applied Policy Research. He has published several books on the attitudes of youngsters towards Europe.

Prof. Gabriele Kokott-Weidenfeld teaches law at the Ludwig-Maximilian University of Munich. She was previously a state legislator in the Rhineland-Palatinate.

Dr. Thomas Paulsen is a senior research fellow with the research group on European Affairs at the Center for Applied Policy Research. Research and development policy and the future of transatlantic relations are two of his major fields of work.

Ms. Christine Scholz is a sociologist who has done both theoretical and empirical research on pregnant women's attitudes towards prenatal diagnosis. She edits the magazine Medical Genetics and works for the Professional Association of Medical Genetics as well as the German Society for Human Genetics.

Prof. Dr. Paul Ulrich Unschuld heads the Institute for the History of Medicine at the Ludwig-Maximilian University of Munich. He holds a master of public health and also earned a doctorate in sinology. For several years he taught at the School of Hygiene and Public Health at the John Hopkins University, Baltimore. His areas of expertise include the history of medicine in Europe and China, medical ethics and public health.

See also the Members of the Project Team and the Homepage of Prof. Dr. Werner Weidenfeld (Director of the Center for Applied Policy Research):

<http://www.hoechst-forum.uni-muenchen.de>.