CHANGING THE WORLD TOGETHER: EMERGING PATTERNS IN THE CO-PRODUCTION OF SCIENTIFIC KNOWLEDGE AND SOCIAL ORDER

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The time I spent as a Fellow at the Wissenschaftskolleg during the fall of 2005 represented a key juncture in the development of my research project on the social and political uptake of biotechnology in the light of recent developments in epigenetic research. My aim is to understand how our emerging knowledge of genetic and epigenetic regulation challenges or reinforces current settlements about the body, the self and the role of the individual ver-

sus the collectivity. Clones, stem cells, and predictive genetic tests do not just enter the public arena as pre-packaged technological objects. They are invested with existing moral codes; they are accommodated within existing legal or political categories that they often contribute to reshape; they become objects of the polity through a process of negotiation in which the scientific representation constitutes only one component. I am after the components of this process with the aim of understanding how scientific findings of the molecular age manage to become socially functioning technologies.

My work proceeded in two stages: 1. a comparative analysis of cloning and stem cell policies in different countries and political systems to bring into focus the ways in which the epistemological and political dimensions of scientific-technological novelties are co-produced; and 2. the application of the analytical methods validated in 1. to a broader project that I am carrying out with Helga Nowotny on the mutual redefinition of the individual that is taking place in the life sciences and in the contemporary polity.

A comparative analysis of cloning and stem cell policies

I applied the analytical tools of Science and Technology Studies (STS) scholarship to a comparative analysis of cloning research and policy in the US, the UK, Germany and Italy in the course of an ongoing collaboration with Sheila Jasanoff at the JFK School of Government of Harvard University. I was invited to present the result of this part of my research at the Wissenschaftskolleg at the conference of the European Association for the Study of Science and Technology (EASSS Lausanne 2006), in the session on "Global governance of stem cell therapies: policies, practices and moral systems".

My work showed that the development and/or uptake of somatic cell nuclear transfer (cloning) technology proceeded very differently in the countries examined. An empirical analysis of several sources (court rulings, reports of advisory commissions, scientific publications and several sites of public discourse) revealed that in each country the same set of epistemological material about what a clone is (on the basis of the concept of genetic program, the emerging field of reprogramming, the molecular model of early development and so forth) was fitted onto pre-existing moral and legal settlements about the status of developing human life and the boundaries of the self. The epistemological questions about the clone as a novel technological artifact and a novel way of making life became tightly linked with normative questions about what we should do about it. But, and this was the most interesting finding, this process was actually bidirectional. If scientific advances were

interpreted and translated into the legal language of political ontology, the converse was also true and became particularly evident in the American context, in which a variety of novel technologies were developed explicitly in order to find "morally unproblematic" ways of using cloning and stem cells. As in the case of "Altered Nuclear Transfer", a proposal put forth at the US President's Council on Bioethics and currently at the centre of the scientific and political debate, existing commitments about the moral value of nascent human life were translated, quite physically, into new life forms designed with the latest tools of genetic engineering so as to be morally indifferent. I identified in this development a particularly salient example of co-production (as defined in S. Jasanoff. *States of Knowledge: The Co-Production of Science and Social Order.* Routledge, 2004*)* whereby moral and religious commitments about the beginning of human life and the source of its dignity, political commitments about the necessity of consensus and a social understanding of science as a public enterprise (that therefore requires consensus) conflate with the molecular explanation of life and the most sophisticated tools for its genetic engineering. This opens new analytical options to think about the place of science in the current polity. If biotechnology, with its exquisite power to redesign life, can be used to translate political agendas into "living things" that conform to those agendas, this poses a set of completely new challenges, but also opportunities, to re-think the democratic governance of science in the global age.

I have begun to explore some of these issues in the chapter I wrote, while at the Wissenschaftskolleg, for the book *Cells and Citizens* (Cellule e Cittadini), edited by Massimiano Bucchi. The book was just published and is the first in Italy to address the issues of biotechnological governance. In my chapter, I traced the scientific and sociological differences between the so-called "red" and "green" biotechnologies. I drew on the transnational comparison of embryonic stem cell policies to analyze the main elements of the discourse on science governance. This analysis highlighted that one of the most salient differences in the public reception of "green" versus "red" biotechnologies has to do with the different degree to which they mobilize the conflict between individual and collective agendas.

In June 2006, I further expanded on this topic in the paper I presented at the Wissenschaftskolleg Seminar "Cultures of Democracy", organized by Charles Taylor and Patrizia Nanz.

Finally, I analyzed the implications of these development from a historical perspective in the paper I contributed to the proceedings of the Workshop of the Max Planck Institute for the History of Science on the History and Epistemology of Molecular Biology and Be-

yond: Problems and Perspectives (G. Testa. *Nuclear Transfer: an Example of Responsive Epistemologies.* Preprint 310, 2006, pp. 205–214).

For the book project I am pursuing with Helga Nowotny, the stay at the Wissenschaftskolleg was a very fruitful period of study. The amazing quality of the library services allowed me to expand the horizon of my reflections and to build a solid foundation for the main argument of our book, drawing on a diverse array of sources. In particular, I focused on the following themes:

The scientific and philosophical aspects of genetic determinism. I explored both the latest scientific findings on genetic causation and the historical and social context in which this powerful set of ideas developed. I integrated an analysis of the latest experiments of molecular systems biology with the epistemological critique of the concepts of emergence and causation in biology.

The historical and sociological analysis of technological determinism. I did extensive research on the evolution and spreading of technologies, especially biotechnologies, and on the main problems encountered in widespread accounts of technological determinism.

The emergence of new political institutions that try to deal with biotechnological change and its political consequences. I explored particularly the Human Fertilization and Embryology Authority of the UK, carrying out a case study analysis of its main decisions as a revealing example of the new tensions and accommodations between science and polity.

Several rounds of discussions and also of exchanges with other Wissenschaftskolleg Fellows led Helga and me to develop the backbone of our inquiry. Our aim is to investigate the place of the life sciences in today's society, tracing the most conspicuous patterns of their interaction and pointing to their imminent developments.

To put it simply, both the life sciences and society at large are redefining their fundamental units, the units around which their theories and practices are constructed: the gene and the individual. The most thought-provoking scholars have long drawn attention to the parallel development in science and polity (R. Lewontin. *Biology as Ideology.* 1992): The rise of the bourgeois state that projects the individual at the centre of economic and political life; and the advances in biology that situate the individual and its individual genes at the forefront of evolutionary history. So when the life sciences and society engage simultaneously in a profound redefinition of their respective units of understanding and operation, this occurrence represents a window of opportunity to address, and hopefully redirect, the most burning issues at the interface of the life sciences and society.

The life sciences are witnessing a great expansion, so much so that the very existence of molecular biology as a discipline is questioned. Its powerful tools and analytical framework have pervaded all neighbouring disciplines to the extent that the paradigm of molecular biology is de facto the paradigm of life. This success is linked to a gene's eye view of life, in fact it depends on it: the ability to manipulate DNA at the level of the single gene goes hand in hand with an explanatory framework that grants genes pre-eminence in the making of life. And yet, at the very pinnacle of its success, the molecular biological approach is also acting as an "intellectual Trojan horse" within the citadel of the gene's eye view. For it is the very power of molecular biology, the very ability to test the meaning of gene action within the context of organisms and ecosystems that is uncovering the limits of the gene-cantered paradigm. The rise of epigenetic inheritance and system biology, and the increasing difficulty to pinpoint the physical and epistemological boundaries of the gene, characterize this phase of redefinition. But these epistemological challenges are not only academic preoccupations: questioning genetic causation amounts to a thorough rethinking of genetic knowledge and of what it is really possible to do with it. So on the side of biology, the contemporary individual finds himself at a crossroad: carrier of a unique genetic baggage, increasingly known, knowable and soon modifiable, but whose link of causation to a variety of conditions and future outcomes is increasingly difficult to predict. The greater the freedom and the push to act upon one's own genome, the greater the uncertainty of what that freedom actually entails.

And yet the discourse on the gene diffuses through the public sphere seemingly unaffected by these shifts and redefinitions. The promise of genetic medicine, the view of DNA as the master template of personal development and behavioural attitudes have de facto turned the genome into the "secular equivalent of the soul", in Alex Mauron's formulation. And just as with the soul of the good old days, so too the genome is an essentially individual "business": individual genes making up an individual genome making up the individual citizen of modern nation states.

If we now turn to the individual in the political realm, we observe several strands of redefinition. The rise of the consumer citizen; the emergence of modes of representation alternative to elections; the recognition of a private sphere shielded from state intervention but exquisitely open to the logic of capital; the possibility to build identities and communities beyond geographical boundaries and increasingly around common individual aspirations; these are just salient examples of new ways of being an individual, usually subsumed under the common heading of globalization and dispersed political agency in the knowl-

edge-based society. And globalization is in fact also the most evident, but slightly superficial rubric under which to frame the dynamics of the life sciences and society. The most evident, because from DNA testing to assisted reproduction, from life enhancing treatments to psychotropic and lifestyle drugs, a number of modern individuals are increasingly unconstrained by nation states or local communities and are called upon to manage this unprecedented freedom in a state of uncertainty matched only by the degree of expectation, be it hopeful or fearful.

But the "flatness of the world" is also a superficial account, because the very genetic knowledge that should guide this immense freedom does not come to the individual's fruition in abstract ways (the example of the breast cancer gene testing is a particularly strong one). The discourse on globalization in knowledge-based societies treats knowledge as any other good and posits the transfer of this good in almost purely abstract terms. But an empirical look renders an altogether different picture, as my analysis of cloning policy shows. Once a discovery is made or a new technology becomes available, it is not as if results flew smoothly and homogeneously to the public of individuals who are the presumed target audience. The way this flow occurs is highly contingent and depends on a variety of previous settlements (legal, historical, institutional, etc.). Indeed, despite globalization, the ways of knowing – and of applying knowledge – around the world remain remarkably different, even among apparently similar democracies.

So the challenge of our times is indeed a lack of knowledge, a lack that becomes all the more serious the more the choices we have to make deal with the fundamentals of the human condition: what kind of people we want to be, what kind of children we want to have, what kind of death we want to die, etc. But we argue that this lack of knowledge is a lack of thick knowledge. At one extreme, today's individual could be conceived as a consumer of biotech dreams that indeed travel easily through the globalized market as eminently thin, and hence portable, knowledge. At the other extreme, this individual can be thought of as facing much deeper challenges, because the choice of which gene test to take, where to get it interpreted, and what form of life-enhancing treatment to choose as a consequence do not reflect thin and abstract knowledge, but rather a thick "imbroglio" of epistemological assumptions, technological specificities and political commitments. We are after the emerging modes and institutions that should render this thick knowledge available.

The period I spent at the Wissenschaftskolleg has been instrumental in providing me with the conceptual tools to carry this project forward. It has been an enriching and remarkable experience, reflecting the unique atmosphere of the institution. I found particu-

larly inspiring the combination of expertise across disciplines, and the breadth of interests of the Fellows: regular and extensive discussions with scientists and scholars from other disciplines (history of science, epidemiology, political sciences, economics, political sciences) provided me with new angles to look at my own research. Within this atmosphere, the library acted as a highly effective catalyst, enabling me to carry forth my research with a depth and speed that would have been otherwise much more difficult to achieve. Thus, I wish to take the opportunity of this report to express in writing my gratefulness to this amazing institution and to its incredibly qualified and friendly staff, looking forward to coming back for a whole year.