



Institute for Alternative Futures  
100 North Pitt Street, Suite 235  
Alexandria, Virginia 22314 USA  
(703) 684-5880 • Fax (703) 684-0640  
[cbezold@altfutures.com](mailto:cbezold@altfutures.com)  
[www.altfutures.com](http://www.altfutures.com)



Centre for Research on Innovation  
and Competition  
University of Manchester/ Oxford Road  
Manchester M13 9PL UK  
(0161) 275 5922 Fax (0161) 275 7361  
[Ian.Miles@man.ac.uk](mailto:Ian.Miles@man.ac.uk)  
<http://les1.man.ac.uk/cric>

# ESRC Genomics Scenario Project

## 1. Executive Summary of the Genomics Scenario Project

A Project for the  
Economic & Social Research Council



# 1. Executive Summary of the Genomics Scenario Project

## On the Genomic Scenarios Project

The Project on *Scenarios on Genomics and Society: Priorities for Social Science Research* for the ESRC is one aspect of ESRC's exploration of genomics (other aspects include a major national survey of public attitudes and the establishment of a Centre on genomics and society). ESRC commissioned a team led by the Institute for Alternative Futures (IAF) and the Centre for Research on Innovation and Competition (CRIC) to use the futures methodologies of forecasting and scenarios to explore the future of genomics and society. The aim was to provide a view of emerging social research issues and the requirements for social sciences to contribute effectively to the evolution of genomics and associated social processes.

*Consistent with ESRC's broad use of the term genomics, for this Genomics Scenario Project, genomics includes the knowledge of genes, gene sequencing and gene functioning, and the application of that knowledge.*

## Project Materials

Four reports were used for this Project:

- 1) **Key Drivers of Genomics: Forecasts to 2015** – Ten drivers affecting the development of genomics and its applications are identified and a range of forecasts provided;
- 2) **Genomics and Social Science** – Using the ESRC Thematic Priorities, CRIC developed a series of questions and forecasts related to genomics, highlighting the issues raised for social science;
- 3) **Genomics and Society: Four Scenarios for 2015** – Based on various material prepared for the project, four scenarios were developed which explored the interaction of the various drivers along four different pathways to 2015.
- 4) A fourth report, **Overview and Forecasts of the Applications of Genomics**, provided background for the project, particularly for those less familiar with genomics, as well as forecasts for genomic applications in agriculture, human health, the environment and other sectors. (See the full Project Archive for these reports).

These reports are based on interviews with a variety of experts in genomics, social scientists and other stakeholders, a December 4 design workshop with a core group of participants, input from IAF and CRIC futurists, and additional research.

On January 16 and 17, 2002, twenty-four participants took part in some or all of the Scenario Workshop. Though the short time available to organise the meeting meant that several of those contacted were willing but unable to attend the Workshop (due to prior commitments), a good range of participants was achieved. They were well qualified to represent social science, basic science, health policy and delivery, and insurance. State-of-the-art groupware, COUNCIL, was used to accelerate the deliberations.

Together with the background material prepared by the study team, the results of the Workshop present a significant exploration of genomics and the opportunities for social science contributions over the next 15 years. Given the speed of the process, time constraints at the workshop, and the magnitude of the social, economic, environmental, and genomic forces considered, the results reported here from the Workshop should be seen as suggestive rather than definitive. However, if this process were repeated, it is likely, in spite of some shortcomings, that the results of this workshop would be largely supported by future explorations.

### Key Drivers Shaping Genomics

A critical task of the Project was to determine and develop forecasts for the key drivers shaping genomics over the next 15 years. The project began with 10 key drivers and developed a range of forecasts for each (a “best guess extrapolation” of current trends; a forecast reflecting challenges or hard times; and a forecast exploring “success” or visionary outcomes). The Workshop considered these drivers, added two others and ranked their relative importance to be roughly in this order:

- 1) **Functionality of Genomics** (how well do the applications of genomics work),
- 2) **Regulation of Genomics** (health, agriculture, other uses, including military),
- 3) **Business Forces and Beyond** (industrial structure, operations, innovation);
- 4) **Genomics Itself** (the internal or endogenous aspects to the science of genomics and the institutions that will develop it);
- 5) **Politics and Geopolitics** (global developments of states, MNCs and other players and global implications of national and local politics);
- 6) **Demand** (for the range of genomic related products in food, health, environment, manufacturing, etc.);
- 7) **Social Attitudes** (towards or opposed to genomics, including how social learning takes place and attitudes change);
- 8) **Social Mobilization** (group and organization structures as they support or oppose genomic developments);

- 9) **Governance of Knowledge** (Intellectual Property Rights IPR, distribution of knowledge);
- 10) **Events** (within genomics and beyond that could be more disruptive in accelerating or retarding genomic applications);
- 11) **Risk** (the nature of genomic related risks, perception of the risks, liability for them);
- 12) **Environment** (the state of the environment and genomics impact).

The 12 drivers of genomics thus identified provided the first lens through which the participants could identify opportunities for social science contributions related to genomics.

### **Thematic Priorities, Genomics, Forecasts and Social Science Opportunities**

The ESRC has established seven “thematic priorities” (TPs) for social science research. Using these as the starting place a CRIC paper raised questions related to genomics and developed a rich series of forecasts. Participants considered the opportunities for social science research contributions and identified 36 different areas related to the TPs. Grouping similar items led to these areas of high opportunity for social science research:

- **Specificities of genomics** (e.g. understand the nature of scientific activity and if genomics is really different in its impacts; define “paradigm busters” in terms of the environment, attitudes to the self);
- **Science and technology knowledge** (e.g. relation between public and private science; how the public learns);
- **Regulatory Issues** (e.g. privacy and data protection, right to know, duty to reveal, professionals and genomics);
- **Social and Health Policy Challenges** (e.g. insurability, handling NHS and other health care costs affected by genomics);
- **Interfaces Between Disciplines** (e.g. innovation, market and industry structures, consumption ((future product development and interest groups, impact on industrial and health care organization));
- **Cultural Implications and Institutional Resources** (e.g. social science in relation to natural sciences, new meanings for ‘exclusion from opportunity’).

Thus the TPs proved a second, useful lens through which to identify challenges to and opportunities for social science contributions related to genomics. The Workshop elicited views from participants as to key contributions that social science could make to understanding and informing the evolution of genomics in relation to each of these areas.

## Scenarios of Genomics and Society 2015: Social Research Priorities

The four scenarios consider genomics applications though with very different patterns of success. In **Genomics, Inc.** the benefits are primarily for the developed countries, the affluent, and corporations while **Genomics for All** sees genomics developed to increase equity and sustainability. In the **Broken Promises** scenario, genomics works poorly. While in **Out of Our Control** genomics works well (for good and ill) but is a destabilizing force internationally and environmentally. (The scenarios descriptions in the full project material and the title of the “Out of Our Control” scenario reflect suggested revisions by participants). During the Workshop small groups were assigned specific scenarios, and asked to consider the key contributions for social science, assuming the assigned future was occurring. This too yielded a large number of opportunities. The group work with the scenarios did not address their relative plausibility, but instead asked participants in small groups to take each scenario as given, explore the social science implications of each scenario, and develop possible signpost events that could indicate movement towards each scenario.

In **Genomics, Inc.** social science would consider impacts of genomics on various sectors of society, concepts of well-being, ethics and NHS use of genomics, the new industrial structure and property rights, as well as the growing divide genomics would contribute to. Signposts that this scenario is coming would include continuing mergers, increasing divide between public and private sectors, and inequalities among individuals.

In **Broken Promises**, as genomics fails repeatedly, social science research contributions come through re-evaluation of the notion of progress; reflexive social science would research alternative lifestyles and product use; better understanding of political change; the reconceptualisation of risk including the inevitability of “normal” disasters and the need to prepare for them. Signposts on the road to this future include Greens winning in Tunbridge Wells, Monsanto going bust, and Golden Rice burned in India because of unforeseen side effects.

In **Out of Our Control**, China takes the lead in genomic research and applications in the face of more stringent regulation in developed countries. Social science would consider the comparative advantage and disadvantage of states and their relations to MNCs, the nature of international organization. Signposts supporting this scenario include China buying Monsanto, and European protestors attacking Greenpeace for obstructing their access to GM products.

In the **Genomics for All** scenario social science research supports the development of international institutions that can regulate bio weapons; identifying genomic products and applications that will support equity and sustainability; comparative analysis of scientific and political change, using ICTs as an example, historical research on international institutions, understanding how “cultural creatives” unite politically and affect corporations,

developing value impact assessment for new technologies. Signposts indicating this emerging future include international agreements on genomics treaties and standards, intellectual property concessions for developing countries, and new potentials for orphaned drugs due to genomics.

When participants “thought across the scenarios” for items that appeared in more than one scenario or for other patterns in more than one scenario, they were able to identify, as important, various topics for social research (see below). They also stressed the need for social science research stances and styles that are critical, visionary and historically informed; research probing critical political and moral constructs, e.g. the meaning of development and well-being; innovation studies on global issues; global actors and changing industrial structures; the ecosystem impacts of genomics and public processing of ecological knowledge.

Finally participants, individually, in small groups, and in full group sessions considered the potential contribution of social science research through the lenses of forecasts for key drivers of genomics, the therapeutic priorities for social science research, and scenarios of genomics and society 2015. While most of the discussion focused on what social science should focus on, they also considered how it should be done. Given this input a concluding set of priorities was developed and synthesized into sixteen -- five focused on research organization and process and eleven focused on the content of research.

### **Social Science Research Priorities Related to Genomics and Society: How? And What?**

#### **How? -- Priorities Related to Research Organization and Process**

There was strong agreement that the challenges presented by genomics to social understanding go well beyond simply specifying a number of issues that social research needs to address. Many of the contributions that were identified as most important were those involving the approach to be adopted by social research. The argument could be summarised as follows:

- It is necessary for social researchers to be able to grasp technical issues, and issues that extend beyond topics that can be readily contained within traditional disciplinary compartments.
- It is necessary for social researchers to be able to interact with researchers and practitioners from a wide range of disciplines, to understand the points that they are raising, and to communicate the (actual or potential) contributions of social research to them.
- More broadly, the social implications of the genomics revolution are so wide, and affecting so many stakeholders, that social researchers have an important role to play in facilitating better communication between experts, practitioners, and social groups of all kinds.
- Beyond this, there may be significant roles for social researchers in helping to articulate not only information about social and economic

change, but also in helping to envision alternative paths of development for the relationships between genomics and social affairs. Social research will need to seriously and critically examine received concepts used by institutions for describing and handling issues raised by genomics. This will include confronting the ways in which social conflicts and inequalities are involved in – and changed by – the developments addressed here.

Below, we classify the issues raised by the workshop concerning the organisation and process of social research in terms of a few broad categories.

**1. Interdisciplinarity** – Social science research must make a contribution to genomics and its interaction with society. Success in this field will require interdisciplinary approaches to research including working with natural scientists regarding both genomics and related ecosystem impacts, and with medical scientists.

**2. Engaged Research** – Social research should be actively oriented to informing social innovation and attempts to envision and create futures. It should be prepared to draw lessons from history, and recognise the rooting of assumptions and practices in historical contexts, be able to move beyond roadblocks posed by academic and other institutions, and determine the training needs that will ensure that social scientists can make their appropriate contribution to genomics.

**3. International Research** – The genomics revolution is inherently global and requires analysis by international teams; the necessary focus on global divisions (see also the next point) demands research in and from the point of view of the third world.

**4. Research Confronting Conflict and Inequality** – Social research cannot afford to shy away from the conflicts, social divisions, and other disparities and their relationship to genomics', though it should examine presuppositions of "genomics divides" carefully.

**5. Communication of Results** – Social research should play a significant role in enhancing social dialogues about genomics and related social issues by working in new ways to enhance dialogue, informing and preparing the public to deal with genomic accidents and their consequences, and monitoring change.

### **What? – Research Issues Related to Genomics Requiring Social Science Attention**

The issues identified by the workshops spanned the disciplines of economics, sociology, political science, etc., and identified needs for macro and micro, qualitative and quantitative modes of research. Research issues included

both those centered on attitudes and discourse, in the public at large and in social movements and within institutional frameworks; and action including those actions conventionally recognised as political, and those that are more likely to be seen as a matter of narrow business and financial decisions. In many ways the grouping below is arbitrary, in that many of the workshop participants stressed *interactions* among these broad classes of research issue, and many of the specifications concerned the dynamics that they share.

The notes below group the research issues into a number of main categories, and order them in terms of the number of votes that were achieved in aggregate by the issues grouped into each heading. (Here-- especially for the first few categories, which received the most votes-- we could have allocated the issues in different ways across topics.) Rather than take the groups below as a definitive specification of areas of concern, we suggest that these categories are used more loosely to inform thinking about the sorts of topics that form priorities for research – where there are liable to be major contributions from social science directed at these issues.

**1. Social Perceptions and Ethical Structures Concerning Genomics and Related Institutions** – The current nature, sources and formation of social attitudes and perceptions about genomics, and its impacts particularly on the ecology. The role of media representation, religious and corporate views of genomics, conflicts when scientists and major social players lose their authority to government regulation. And moral agency. (This category is the most highly rated of all the combined topics. It reflects the bundling together of several elements: not only attitudes but also aspirations and expectations, and not only on the part of the broad public but also among particular stakeholders; not only the views themselves, but also how they are generated, sustained and challenged, and what social institutions articulate them and how. The issues raised clearly overlap with those touched on elsewhere, particularly in categories 2, 4, 5,6 and 8 below.)

**2. Critical Analysis of Key Social Constructs and Their Use** – Critical examining of major social assumptions and constructs that are deployed in debates and practical decision-making around genomics, including ethical debates, concepts of well-being, conceptions and nature of research on risk, moral entrepreneurs, accountability of different stakeholders, and notions of progress.

**3. Business and Economics – Shaping and Being Shaped By Genomics** – In addition to analysis of the dynamics of investment, innovation, market formation, and industrial structures, these items include the exploration of challenges to conventional economic analyses that may be raised by the wide-reaching emergence of genomics. (This topic contains issues overlapping with those in other groups, especially 10 and 11 below.)

**4. International Politics and Institutions** -- The specifically international dimensions of the political issues associated with genomics ranging from

security regimes to regulatory ones, as well as the global patterns of local and national politics. (Relates particularly to groups 6, 8 and 11 below.)

**5. Cultural Reception and Consumption Practices** -- Genomics role in our understandings of human behaviour and responsibilities, including leisure and performance enhancement. Social practices associated with use of genomics applications in everyday life, and the broader implications that this may have for patterns of demand and consumption, new lifestyle groupings, recreational drugs, and understanding what is displaced by genomics. (Rather a heterogeneous category, relating to 8 and 9 below, among others.)

**6. Co-Evolution of Laws and Legal Structures and Genomics** – Legal institutions and practices will respond to the availability of new knowledge, the issues it raises about the ownership of such knowledge and the liabilities and rights of owners and users, as well as the attribution of responsibility to individuals with distinct genetic propensities that may be related to psychological or behavioural attributes and dispositions.

**7. Food and Agricultural Applications of Genomics** – Social science research is needed to understand the impacts of genomics on the food chain, on the food consumption and medicine, and on the rural urban debate.

**8. Mobilization of Groups to Pursue Interests Through Or Concerns About, Genomics** – The formation and organization of action around genomics by stakeholders other than the original innovators or industries concerned, and the ways in which such processes may impact the development of the field.

**9. Interrelations Between Technologies** – Genomics studied in relation to related, enabling and competing technologies, e.g. ICT.

**10. Corporations, Innovation and Technology Transfer** – Several items above touch on innovation processes, but the focus here is on large firms, and their role in international diffusion of technologies and their relations with countries.

**11. Genomics Innovation and the State** – These items, related to those in geopolitics and industrial structures, call for analysis of the role of states in the global development of genomics, in relation to both other states and to multinational corporations.

Several points should be borne in mind in considering these results. First, the particular groupings here employed are somewhat arbitrary; different categories might have been used, and some items could fall into more than one category. Related to this, it should be remembered that all of the items covered appear because a workshop member did consider it important, and almost half of the items are ones that a scenario group had nominated among the most important contributions that social research could be making. A third point is that the process of voting was accomplished under some time pressure, and had the workshop members had a little more time to reflect on

the grouping of topics, they might have awarded somewhat different distributions of votes. However given the opportunity to review these results, while some suggested slight edits, none objected to the 16 items or their ranking in relative importance.

But while the precise votes should not be taken too seriously, the general pattern of the results is quite telling. The workshop members were themselves struck, for example, by the stress placed upon rendering social research a more active party in helping to create visions for the use of genomics, in being socially engaged and addressing international inequalities, and the like.

### **Postscript: Reflections on the Workshop**

Participants were asked to reflect on the insights, lessons, things to change and things liked about the workshop. Insights gained included the divergence of attitudes and views among social scientists themselves and the divergence from other scientists; the nature and utility of the futures process; and the transformative nature of genomics and its implications. For some participants there were no new insights. Lessons for ESRC echoed the ones raised throughout the workshop: the need for interdisciplinarity and dialogue, for new settings and infrastructure to support these, and the importance of future-oriented perspectives. Suggestions for future meetings of this kind included the need to involve more natural scientists in this sort of dialogue and the need to allow for more lengthy dialogue. A larger number of positive responses to the workshop were recorded, including those centred on the general idea of the workshop (important to have such opportunities to meet, exchange views, provide input at the early stage of a research effort) and those dealing with the specifics the workshop (its process, pace, use of groupware, rapid summaries/synthesis, and futures techniques).