

Welcome and Opening Addresses

Towards a Web of culture and science

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First of all let me convey the greetings of our President, Peter Gruss, who unfortunately cannot be here and has asked me to report to you about the perspectives and the activities of the Max Planck Society with regard to what many of us see as the emergence of a new paradigm of science, fostered by the information revolution.

For a scientific institution comprising more than 80 institutes active at the forefronts of basic research, the issues of access to information and of optimal conditions for disseminating information, including reliable mechanisms of quality control, are a key topic.

Its budget of roughly 1.3 billion Euros is comparable to that of a large university, but according to its research and publication output it is no doubt a global player.

It is therefore obvious that, with regard to the rapid development in information technology and its profound impact on the system of scientific information, the Max Planck Society cannot take just a standby position.

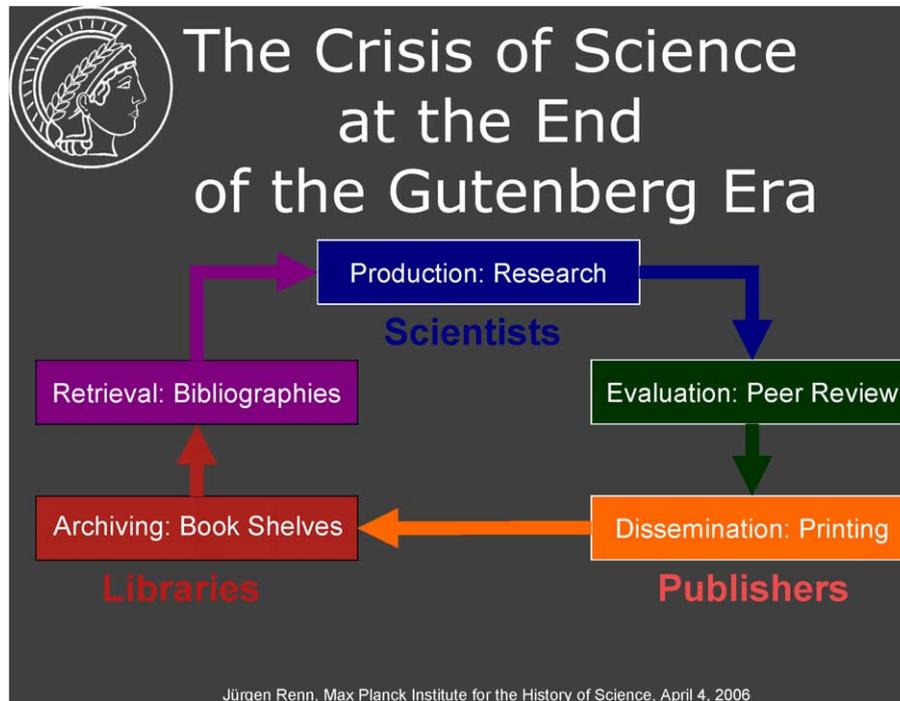
First of all, we have to make sure that the society's scientists have the best possible access to scientific information, in whatever form that information is available. Traditionally, the institutes' libraries are responsible for this information provision.

The growing role of scientific information in the electronic format has made it necessary to add new components to this traditional system.

As most institutes work in interdisciplinary fields and as we have decided to treat information not as a scarce resource but as a necessary raw material that should be abundantly available across all disciplinary boundaries, the society has already decided in 1998 to use the new potential of the electronic medium and provide its scientists with a basic provision of electronic information, comprising by now 18 000 journals and 100 databases – a generic resource worth 9 million Euros that is available to all institutes.

The basic provision with electronic information is part of a Max Planck double strategy. The other prong of this double strategy is dedicated to developing the new opportunities for information dissemination offered by the electronic media, exploiting the greater speed and the lesser requirements on infrastructure associated with them. Hence, next to the prominent role of the society's scientists in leading scientific journals, a widespread electronic preprint culture has developed, which in some fields, like high-energy physics, has long replaced commercial journals as the main carrier of scientific information.

Based on this tradition, the society has engaged itself at an early stage in creating an infrastructure suitable to support new forms of electronic publication such as the e-Doc (<http://edoc.mpg.de>) platform, also in order to address some of the novel problems emerging within the electronic information system such as that of the archiving and longevity of electronic information.



I have said that the information revolution has, as mentioned before, made it necessary to complement the traditional information cycle, involving researchers, publishers, and libraries, with new components.

Actually, this is quite an understatement. If one takes a closer look at the changes in the information cycle implied by this revolution, it seems likely that this information will engender a true paradigm shift in the way we do science.

For one the dissemination of scientific information has become much more rapid and effective and the infrastructure it requires is practically identical to that for generating research. Consequently, dissemination costs have become research costs. On the other hand, new problems emerge, as already mentioned, such as the archiving problem.

A new vision of information emerges just at the time when the traditional information system is confronted with serious challenges.

Costs for scientific journals have risen to an extent that budget limitations seriously limit access to scientific information even in rich institutions and hence diminish the potential impact of scientific authors.

Quality assurance is becoming an ever more serious problem, also due to the lack of direct access to primary data in traditional publications. Fraud is just the tip of the iceberg; the major problem is the irreproducibility of many results.

Mapping the traditional journal system into the electronic medium creates artificial barriers as long as the lack of universal open access limits the connectivity of scientific information on the Web. In the humanities, for instance, we are often hindered in bringing texts together with helpful language technologies by password or other artificially imposed barriers.

In short, the potential of the new media for new ways of scientific collaboration and communication is not adequately used as long we limit ourselves to transferring the structures of the Gutenberg galaxy to the Internet-World.

In order to address these challenges in a more adequate way, one has to grasp the full dimension of the transformation process we are experiencing and hopefully shape it to the best of science and society. This kind of sharper global perspective will also help to bring the discussion about open-access versus toll access out of a narrow-minded economic perspective and steer it away from unfortunate confrontations between publishers and scientists.

Indeed, the open-access movement is just part of a larger openness movement, transforming the way we deal with knowledge.

Where are we now in this transformation process?

The Internet has established a worldwide connectivity of computers.

The Web has established a worldwide connectivity of texts. As a matter of fact, the web is a global hypertext.

The next step, many of us believe, will be the result of the open-access revolution bringing us to a global connectivity of knowledge.

From this perspective the presently still dominating practice of mapping existing structures of publication into the new medium are at best a first step. More promising are the emerging new forms of publication that make use of the innovative potential of the electronic medium, such as the open-access review journals of the *Living Review* (<http://www.livingreviews.org>) family coming from the Max Planck Society. New forms of peer review and quality control are also being very successfully explored, in particular in connection with the new possibilities to integrate publications with the accessibility of primary data. The true challenge of the immediate future will be the creation of sustainable, overarching infrastructures optimized to the integrated needs of research and publication, as are already emerging in some fields. Examples for developments in this direction are the virtual observatory of astronomy, Google Scholar, and the ECHO infrastructure for European cultural heritage (<http://echo2.mpiwg-berlin.mpg.de/home>).

This point I would like to briefly elaborate. As shown in the upper figure on page 76, the *Virtual Observatory in Astronomy* brings together information that is usually produced and gathered by different communities, such as for instance observations of the Milky Way in different spectral ranges. As new discoveries often take place at the boundaries between fields, the Virtual Observatory has considerable innovative potential.

The same is true for ECHO, the *European Cultural Heritage Online* initiative, started by the Max Planck Society. This infrastructure may be considered as a kind of virtual observatory for culture. An example is the *Cuneiform Digital Library Initiative* CDLI (<http://cdli.ucla.edu/>), which was also launched by the Max Planck Society and is now integrated into the ECHO platform, and which features over 70,000 cuneiform tablets. Although the information actually pertains to the same object, in this case the ancient Babylonian culture, it is usually gathered by different communities, say by archaeologists and philologists, but can now be integrated into a virtual environment.

When investing in e-science, it is important not to forget that it is not enough just to tinker with some elements of the present information system, but that we develop a comprehensive vision to guide our actions.

First of all it is clear that global challenges such as climate change, epidemics, energy provision, and famine, require a problem-oriented scientific approach to study its objects, not in isolation, but in context.

It therefore makes sense to think of scientific knowledge on the Internet, not in terms of rigid disciplinary structures, but in terms of self-organizing thematic structures, which live on the Web and reflect the interaction of the users. In this sense, the way that Google uses the interaction of the users in order to rank websites is just the first step of a furthergoing development.

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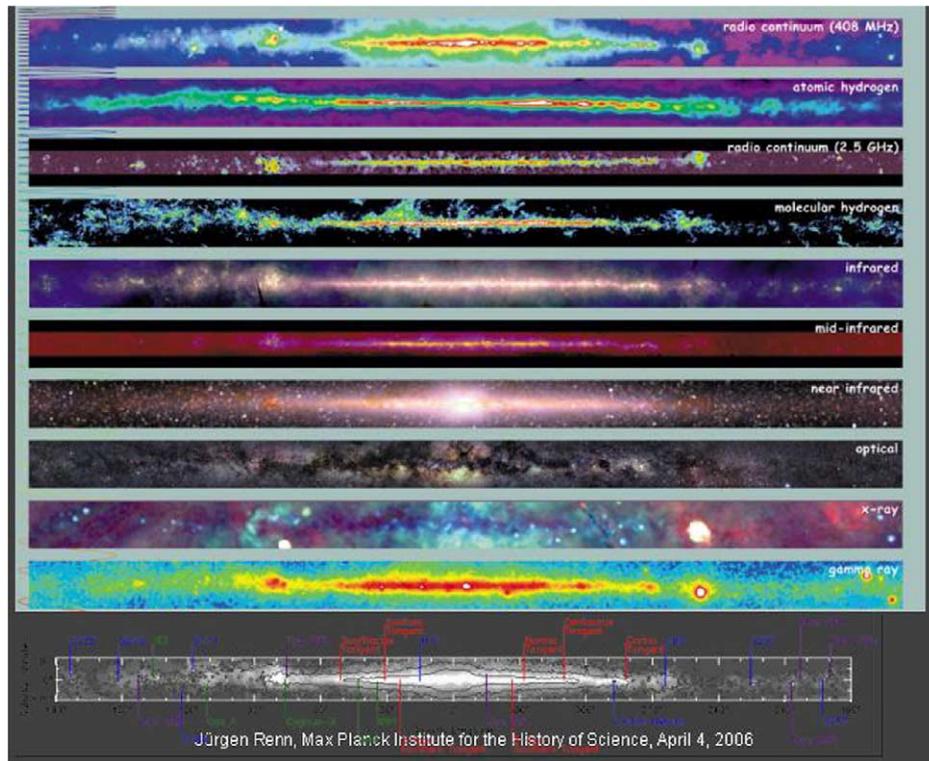
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Jürgen Renn, Max Planck Institute for the History of Science, April 4, 2006



The way in which we represent the world to be analyzed and described by science will change too. It no longer makes sense to represent the world by fragments of texts, images, and data connected *ex post* by databases or search engines. In a future web, it will rather be represented by virtual objects, studied in virtual co-laboratories, such as the virtual observatory in astronomy or the ECHO environment.

Let me illustrate this point with another challenge requiring interdisciplinary cooperation.

How is the earth changing and what are the consequences for life on earth? Addressing this question requires systems that support research, combine different models, and couple different strategies.

The seamless integration of knowledge required to approach this vision, can, however, only be realized under certain conditions:

- The most important one is open access to scientific knowledge and cultural heritage.
- But then we also need stable and dynamic infrastructures built according to the needs of science, culture, and the public interest.
- We need new mechanisms for disseminating results in flux.
- We have to ensure the long-term preservation of data.
- And we have to develop new forms of quality control.

As I mentioned earlier, the Max Planck Society cannot take a stand-by position in this major upheaval in the conditions of scientific work. It has therefore decided early on to play an active role in shaping the future infrastructure of science in a way that optimally serves the needs of research. One important step was the foundation of the Heinz Nixdorf Center for Information Management in 2001. Another important step was to create national and international alliances in order to agree on a joint perspective and in order to coordinate the necessary practical steps.

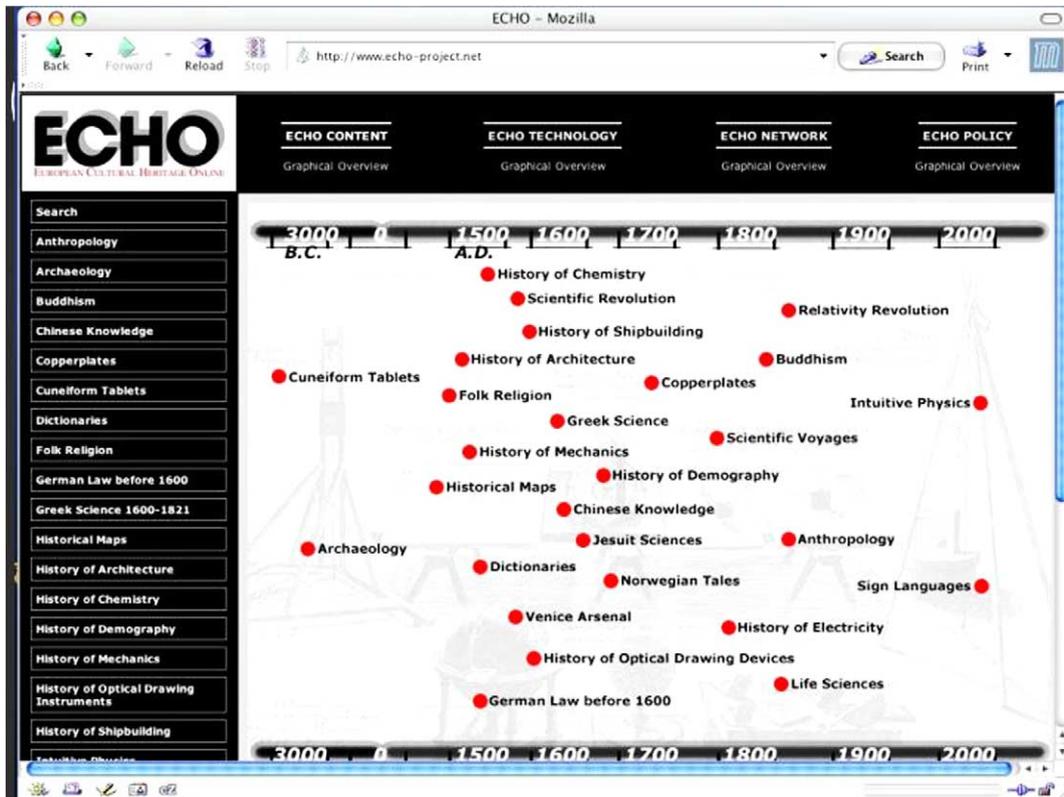
The formulation of the Berlin declaration on open access to scientific information AND cultural heritage in 2003 was a milestone: to date there are around 150 institutional signatories from all over Europe, Asia and the Americas. It was also due to the Berlin declaration that the Geneva world summit on the information society included open access in its final declaration.

The Berlin declaration triggered a number of concrete steps, among them the organization of four international open-access conferences, following up on a joint road map of the signatories towards open-access.

At present, there are major developments both in the US, in Europe, as well as on the German national level to build up a cyber infrastructure in the sense I have indicated above.

The Max Planck Society participates in these developments by a joint project with the Fachinformationszentrum Karlsruhe, funded by the German Ministry of Science, aiming at the development of a publication management system for research results, as well as at a working and publication environment for the humanities. The creation of a new permanent institution, the Max Planck Digital Library, was recently approved by the Senate of the society.

As it may be appropriate for this occasion, let me conclude with a word on publishers and scientists. If I am right that open-access is a paradigm shift of science, then it is definitely wrong to consider it at its core a matter of confrontation between publishers and scientists, even if there are sometimes good reasons for disagreement. The transformation process towards open access will, however, only then lead us to a better infrastructure for science and culture, and ultimately for society at large, if we are ready to give up long-familiar habits, privileges, and roles, and if we prepare ourselves to explore new answers to the questions arising. As yet no one really knows what the future system of publication will look like. But there can be no doubt that publishers can make, will make, and are already making important



contributions to its adaptation to the changing needs of scientists, for instance, by creating open-access journals themselves, by proposing new business models, or by using their truly entrepreneurial talent to come up with new offers for added value. In this sense, I am optimistic very much looking forward to your suggestions and ideas on how to address jointly the challenges that lie before us in a constructive collaboration between scientists and publishers.