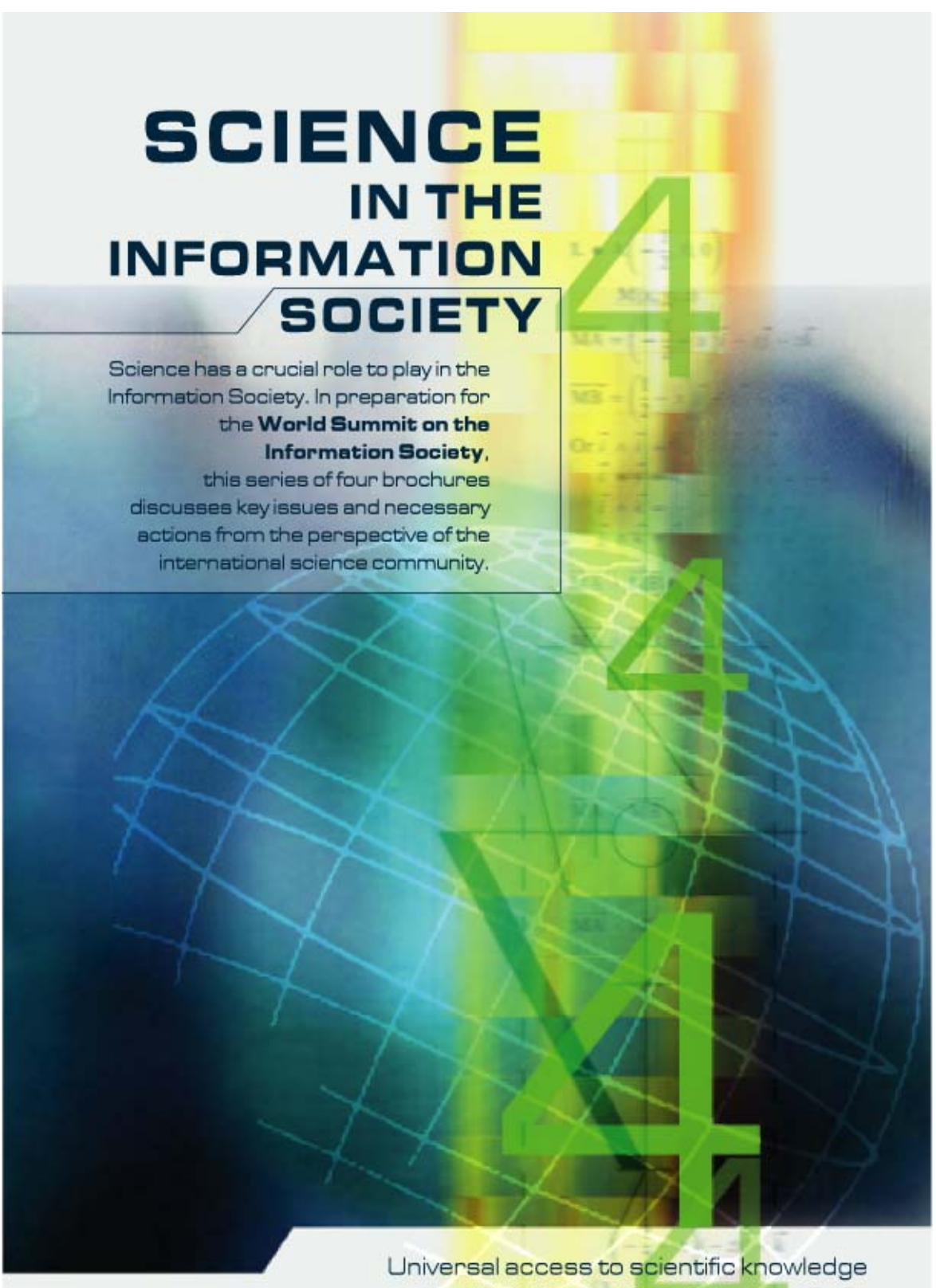
SCIENCE IN THE INFORMATION SOCIETY

Science has a crucial role to play in the Information Society. In preparation for the **World Summit on the Information Society**, this series of four brochures discusses key issues and necessary actions from the perspective of the international science community.



Universal access to scientific knowledge
Decision making and governance
Policy issues for scientific information
>> Improving education and training

ICSU
International Council for Science

Information and communication technologies (ICTs) are already having a tremendous impact on scientific education and training in many countries. Yet there is a risk that poorer countries, in particular, will be excluded from this development.

ICTs offer unprecedented opportunities to support scientific education and training programmes that exploit and enhance global knowledge, yet can be tailored to local needs. However, it is important to note that not all education and training programmes require high-speed, two-way communication. In some cases, lower-level technologies may be most appropriate.

>> IMPROVING EDUCATION AND TRAINING

An ever-increasing amount of science and technology information is freely available. Yet, without education and training on how to access and utilize it efficiently and effectively, the potential benefits for society as a whole will not be realized.

The dialogue between researchers and the potential end-users of scientific information—be they government ministers or local farmers—must be improved. When producing scientific information, researchers need to consider the dissemination and benefit to the end-users.

KEY PRINCIPLES:

- **Scientific knowledge derived from data and information is vitally important for all levels of education and training.**
- **Learning to infer the implications of data is vital to the public understanding of science.**
- **Education should include an appreciation of the importance of data quality.**
- **ICT educational tools should take into account the world's linguistic and cultural diversity.**

CHALLENGES

There are a number of opportunities and threats to the use of scientific information and tools for training and education.

- ICT tools can decrease the costs of disseminating knowledge, but they require that people have a higher level of information literacy.
- New frameworks for quality assurance of ICT education need to be established.
- The use of ICT tools could lead to the excessive commercialization of education.
- In some countries and institutions, there is a lack of foresight and willingness to invest in ICT-based education.

Bringing data into the classroom

School children in Europe and Africa are using real-time data in their classrooms to follow migration patterns of black storks between their respective continents.

An international programme, launched in 1998, brings together scientists, naturalists, and schools in a joint effort to study the habits and behaviours of these protected birds. The storks are tagged with radio markers and their signals are picked up by the ARGOS satellite-based data location and collection system—a system dedicated to monitoring and protecting the environment.

Children can use the recorded data, accessed via Internet, to calculate flight speeds and compare performances of individual birds. This information is also integrated into a wider ranging study of the environmental factors influencing the storks' migration patterns. www.explorado.org/solon-new/

ACTIONS REQUIRED

>> **Support further research into ITC-supported learning.** Science educators must understand how the use of ICTs relates to the learning capabilities of children. They should also recognize the importance of imparting how scientific knowledge is produced and how it differs from other types of information. Both students and the general public should be taught how to discriminate between scientific information of variable quality, particularly with regard to information available on the Internet.

>> **Encourage service-learning—or community service as a mode of learning—in science classes to promote public understanding of science and knowledge transfer.** Use of the scientific method and 'hands-on' data collection should be an integral part of science lessons in schools whenever possible. ICTs should support such activities to give children the opportunity to integrate the use of digital data in their early learning experiences.

>> **Use ICTs to share educational resources through open courseware that is freely available online to researchers, teachers, and students.** Open distance learning, as well as global virtual libraries and laboratories, can be used to support scientific research and education worldwide. Educational ICT materials must be archived to ensure that best practices are safeguarded and that resources are available over long periods of time.

>> **Promote mechanisms for integrating traditional knowledge into modern information societies.** Creating a bilateral flow of education and learning between local communities and scientific researchers is vitally important. ICTs can provide new opportunities for information and knowledge exchange between communities, but they must be supported by appropriate capacity building and skills training.

>> **Recognize the value of research published in electronic format and of service-learning efforts in higher education and research institutions.** Researchers need to see that their efforts to share data and knowledge with the widest possible public will be positively encouraged and recognized by their peers.

Opening up education

A growing number of ICT-based initiatives provide opportunities for individuals and higher education institutions to access valuable educational material.

The Massachusetts Institute of Technology's OpenCourseWare initiative plans to make approximately 2000 MIT courses and related teaching material freely available for use by faculties and students around the world. http://ocw.mit.edu

CERN, the European Laboratory for Particle Physics, is piloting a web-based project to archive a selection of its lectures. It aims to implement an electronic archival system for slide-based presentations as a tool for collaborative communication and learning.

UNESCO is leading the Avicenna Virtual Campus project, which promotes best use of ICT-assisted Open Distance Learning (ODL) through a network of 11 e-learning centres around the Mediterranean basin. In collaboration with some of the EU's leading Open Universities and ODL providers, the project will establish local infrastructure and transfer best practices between participating universities.
http://avicenna.unesco.org/

Safeguarding indigenous knowledge

A project in the Philippines is combining ICT-based data and indigenous knowledge to create 'community maps' of forests and other areas that are environmentally at risk due to economic development.

Scientists from the Environmental Science for Social Change Centre, based at the Manila Observatory, are working closely with members of the local community to create a detailed map of the area. The project combines indigenous knowledge, which provides information about the current ecosystem, and data from satellite-based Geographic Information Systems (GIS), to ensure that the map is spatially accurate. The resulting community map shows how land is currently being used and models various plans for the future. These maps help the community and government resource management professionals develop a sustainable approach for future land use—one that respects both local needs and cultural values.

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In March 2003, more than 60 invited experts—leading scientists and representatives of international organizations—gathered at UNESCO in Paris to consider the role of science in the information society.[1] Participants developed an overall **Agenda for Action** for consideration by all parties interested in using information and communication technologies (ICTs) for a better society.

AGENDA FOR ACTION

>> Ensure that all universities and research institutions have affordable and reliable high-speed Internet connections to support their critical role in information and knowledge production, education and training.

>> Promote sustainable capacity building and education initiatives to ensure that all countries can benefit from the new opportunities offered by information and communication technologies (ICTs) for the production and sharing of scientific information and data.

>> Ensure that any legislation on database protection guarantees full and open access to data created with public funding. In addition, restrictions on proprietary data should be designed to maximize availability for academic research and teaching purposes.

>> Promote interoperability principles and metadata standards to facilitate cooperation and effective use of collected information and data.

>> Provide long-term support for the systematic collection, preservation, and provision of essential digital data in all countries.

>> Promote electronic publishing, differential pricing schemes, and appropriate open source initiatives to make scientific information accessible on an equitable basis.

>> Encourage initiatives to increase scientific literacy and awareness of how to interpret web-based scientific information.

>> Support urgently needed research on the use of information technologies in key areas, such as geographical information systems and telemedicine, and on the socio-economic value of public domain information and open access systems.

>> Recognize the important role for science in developing and implementing the new governance mechanisms that are necessary in the information society.

1. Further information on the workshop can be found at www.icsu.org and www.codata.org. See also www.unesco.org/wsis.

INTERNATIONAL COUNCIL FOR SCIENCE (ICSU)
51 Bd de Montmorency, 75016 Paris, France
tel: (33 1) 45 25 03 29
fax: (33 1) 42 88 94 31
e-mail: secretariat@icsu.org
http://www.icsu.org

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