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## SPOTLIGHT ON SWITZERLAND : 11 JULY 2002

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**Research in Switzerland: Build on the existing strengths**  
Regional Promotion with editorial assistance from Martin Fischer Information Officer

Education, research and technology: these interlinked policy areas are of significant priority for Switzerland, the small country with a population of 7 millions in the heart of Europe. That's why Switzerland devotes about 5,5 % of its GNP to education and reaches with about 2,7% of its GNP to research and development one of the highest percentages in the world.

Switzerland is one of the countries with the highest research expenditure in terms of GNP (2000: 2,7 %). Over two-thirds of Swiss research is financed by private industry, the remainder is publicly funded. Trust in research site Switzerland is demonstrated by the fact that even in the acute recession in the early 1990's Swiss industry did not reduce its volume of inland R&D investments.

The priority given by Switzerland to its system of education and research has resulted in a number of successes. Swiss research results top the worldwide list, measured by the Citation Index.

### High quality of Swiss research

Based on the databank of the Institute for Scientific Information (ISI) in Philadelphia (USA), the Swiss Science & Technology Council has investigated the intermediate number of citations per publication of the OECD countries in 22 scientific fields in 1994-1998. It found Switzerland among the top four countries no less than 15 times:

1st place in botany and zoology, chemistry, immunology, engineering sciences, materials research, molecular biology and genetics, ecology and environmental sciences, pharmacology, physics, and multidisciplinary journals; 2nd place in biology and biochemistry, information and communication technologies, and neuroscience; 3rd place in microbiology; 4th place in astrophysics.

In the natural sciences, no less than 15 Nobel Prizes have gone to researchers in Switzerland. The number of publications in relation to population puts Switzerland at the top of the list of OECD countries. The Swiss figure is two times higher than in Germany or France and is nearly double that of the United States.

The magazine 'Science' in 1998 listed Europe's most research-intensive regions, measured by the number of English-language scientific publications per head of population. The result is - with all caution due to such statistics - flattering for the internationality of Swiss research:

Cambridge	81*
Oxford, Reading	41
Geneva, Lausanne (Switzerland)	29
Basel, Mulhouse (Switzerland, France)	20
Bristol, Cardiff 10,633	15
Zurich (Switzerland)	13
Stockholm, Uppsala 20,195	12
Helsinki 10,287	12

\* = publications per head

### Centers for research: the Swiss universities and the Swiss international enterprises

Apart from private industry, research in Switzerland is based around the two Federal Institutes of Technology in Zurich and Lausanne, the four Federal Research Institutes (PSI, WSL, EMPA, EAWAG), the ten cantonal universities and the seven Universities of Applied Sciences (UAS). Additionally, the Federal Office of Agriculture carries out research at six Federal Agricultural Research Stations.

There are also numerous research-intensive large international enterprises - of which the lion's share comes from the chemical, pharmaceutical, machine and electrical engineering industries - with headquarters or laboratories in Switzerland.

The international character of Switzerland's scientific community is exemplified by the substantial proportion of foreign students and teaching staff in the field of higher education (every fifth student and every third professor at Swiss universities is from abroad) and also by the substantial proportion of foreign scientists working in Switzerland's industrial research laboratories.

#### Planning the future: the goals of the Swiss science policy for the new century

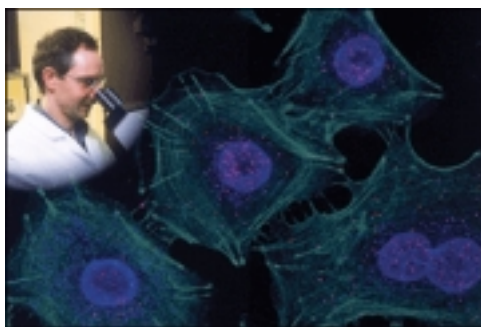
Switzerland may be poor in natural resources, but it has a wealth of skills and know-how, by which it has gained international renown in flourishing economic sectors such as microtechnology, information technology and biotechnology. But the world - and its economies - have changed and priorities have changed in turn. To mark the new century, which has been highlighted by an unprecedented explosion of knowledge, Switzerland has put forward a vision in its science policy: reform and invest! The goals of the Swiss science policy are to:

- promote excellence in its universities and research centers and to strengthen vocational training;
- develop basic and applied research and to support innovation and its industrial application;
- intensify collaboration between science and the private sector of the economy, between science and the state and to encourage dialogue between science and society;
- encourage scientific and technological cooperation at the European and international level;
- demonstrate the quality and performance of Switzerland as a site for scientific and technological activities;
- promote the attractive framework conditions in Switzerland for free and applied research and for companies;
- identify new countries with which Switzerland could collaborate more closely;
- increase the attractiveness of Switzerland as an educational destination for students and professors abroad.

The Swiss Government adopted an ambitious research policy. Its keynote is the unity of the tertiary levels. The goal is to create networks in which the cantonal universities, the Federal Institutes of Technology and the UAS work closely together. It is imperative to build up the recognized strong points - and to strive less for completeness in all fields but much more for excellence in sectors crucial to the future. In targeted research, says the Swiss Government, priority should be given to:

- The life sciences
- The humanities and social sciences
- Sustainable development and environment
- The information and communication technologies.

A central role is also played by further technical core disciplines such as nanotechnology, the materials sciences or medical technology, and support for the current needs of industry.

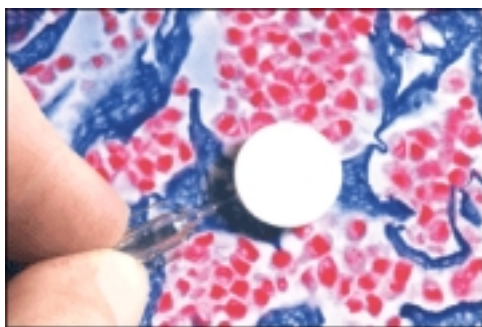


Cells are well protected against invaders, but viruses manage to fool them. Now for the first time we can see how a virus slips under the protective guard cell. With the financial support of the Swiss National Foundation, Urs Gerber and his team at the Zoological Institute of Zurich University characterized in detail the path into a nucleus adenoviruses take.

#### Two pillars of the national advancement of research in Switzerland

The most important instrument for promoting public research is the

Swiss National Science Foundation (SNSF), mostly financed by the Confederation. Its two main activities are supporting projects in basic research and encouraging the coming generation of scientists. In addition, the SNSF is in charge of various research programs: National Research Programs (NRP), Swiss Priority Programs (SPP), and National Centers of Competence in Research (NCCR).



**Patients suffering from severe anemia may soon be able to do without injection of EPO, a hormone that stimulates the production of erythrocytes, the red blood corpuscles. In the framework of the Swiss National Research Programme implants and Transplants' a research team in Lausanne developed a new therapeutic approach. They implant a small capsule containing EPO-secreting living cells.**

The second main pillar of the national advancement of research is the Commission for Technology and Innovation (CTI). The Commission provides support to the building up of skills in applied research and development at the Universities of Applied Sciences, carries out the technology-oriented programs and fosters industry related R&D projects, especially those favoring small and medium-sized businesses. Moreover, the CTI provides assistance in development of start-up enterprises and is helping to establish National Networks of Excellence, e. g. in biotechnology, telecommunication technologies, microelectronics and wood processing.

#### **Active in research collaboration worldwide**

Switzerland is neither a member of the European Union (EU) nor of the European Economic Area, but has participated successfully over many years in the EU's Framework Program projects. Nevertheless, in May 2000 the Swiss voters approved a series of bilateral agreements with the EU. As soon as the ratification process within the EU has been completed, Swiss scientists will be able to take part as fully-empowered partners in the EU's Framework Programs for Research. At the same time, it is a priority for Switzerland to deepen its scientific ties with East Asia and North America. In fall 2000, the first scientific consulate in the world - the Swiss House for Advanced Research and Education (SHARE) opened its doors near Boston (Massachusetts, USA). Switzerland's openness in international research cooperation is also to be seen in its participation in numerous international programs and organizations, such as the:

- European 'Eureka' Initiative for the promotion of marketable technologies
- European cooperation in scientific and technical research COST
- Global research program Intelligent Manufacturing Systems IMS
- International Human Frontier Science Program HFSP in neurobiology
- the European Organization of Nuclear Research CERN (Switzerland / France)
- The European Space Agency ESA and the European Southern Observatory ESO
- The fusion program of Euratom, the European Atomic Energy Community
- European Synchrotron Radiation Facility ESRF and the Institute Laue-Langevin ILL for neutron science and technology, both in Grenoble (France)
- European Molecular Biology Laboratory (EMBL) in Heidelberg (Germany)

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