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Both the date and the place are symbolic: on August 1st 1952 in the Council of States chamber of the Swiss Parliament in Berne the Swiss National Science Foundation was founded with the mandate to promote scientific research. The connection between the Foundation and Swiss politics is as close today as it was then. The Swiss government has entrusted the Foundation with the administration of funds allocated to research, and the Foundation is accountable to the state's political representatives for its activities.

During the Swiss parliamentary debates on the federal allocation for the Swiss National Science Foundation someone inevitably asks whether the research being funded is also "useful". This is a difficult question. In accordance with its mandate, the Foundation supports mainly basic research, the outcome of which is, by definition uncertain, but which often enough does eventually prove to be "useful". But not always.

Therefore, science has to trust that society and politicians will understand the need for some latitude for creativity in research, and that these endeavours do not always lead to scientific success or useful applications. Research that is "not useful" is not a priori useless research.

To ensure access to the unknown, our new Federal Constitution expressly protects the freedom of research. Jurisprudence has not yet been asked to define this right in practice, but it is already obvious that there are limitations on the freedom of research. Any state that accepts the rule of law cannot allow other freedoms and rights to infringe on legally protected fundamental rights such as human dignity.

A lot has changed in 50 years of research, but some things have not – including the law of innovation that combines creativity with risk-taking: nothing ventured, nothing gained.

Professor Heidi Diggelmann **President of the National Research Council**

Nothing ventured, nothing gained. This might have been the personal motto of Alexander von Muralt, who 50 years ago was the driving force behind the creation of the Swiss National Science Foundation, which put Swiss research on a solid basis.

Over the past 50 years Swiss scientists have – not least with the support of the Swiss National Science Foundation – gained international recognition and been a source of innovation and renewal in our society. This anniversary publication is an acknowledgement of their achievement. It looks back over these five decades, highlighting milestones in Swiss research and scientific support – without, however, being able to single out every significant contribution.

The latter is something in which it has a lot experience. For 50 years the Swiss National Science Foundation has been spoilt for choice. Its limited financial means were never enough for all research proposals. This was and is a cause of concern for the Research Council, particularly when it has been unable to grant excellent ideas the support they deserve.

When money is scarce, security is at a premium. The Swiss National Science Foundation is all too aware of this. Hence, besides demanding better funding, the Fund must do all in its power to ensure that Swiss science and research focuses increasingly on the cutting-edge: by giving even greater support to new fields of research, for instance, or by flattening stultified academic hierarchies, or helping scientists to move sideways into university careers. Without such progress, scientists, and in particular women scientists, will never be able to realize their full potential.

To ensure that 50 years from now the Swiss National Science Foundation will be able to look back with satisfaction on a century of achievement in the service of Swiss research, all of us – researchers, universities, politicians, and the Foundation, too, of course – need to show greater courage in taking risks and greater openness towards the unconventional.

50 years in the service of scientific research

A bouquet in the Swiss colours, presented to Alexander von Muralt by Federal Councillor Philip Etter on the day of the inaugural session of the SNSF, August 1st 1952.

A light summer breeze blows over Berne, ruffling the flags of the Federal Parliament building. A few people are walking towards the square to celebrate the 661st anniversary of the Swiss Confederation, while inside a solemn atmosphere prevails. The date is August 1st 1952, and Switzerland is inaugurating a national institution to promote science, the Swiss National Science Foundation.

Already seated in the chamber of the Council of States are representatives of the administration and of cultural and scientific associations, several Nobel Prize winners, two Federal Councillors (Philipp Etter and Markus Feldmann), the members of the Foundation Council and those of the Swiss National Research Council presided over by Alexander von Muralt. For this ardent defender of the cause of science, a doctor specializing in physiology, it is one of the most important days of his life: the inaugural session of the Swiss National Science Foundation, for which he has been campaigning for a number of years.

Alexander von Muralt was well acquainted with the Swiss "system" of promoting research – if the term is appropriate to describe so fragmented an approach. Universities and institutes were entirely the responsibility of their home cantons; their research budgets were very limited. The Confederation had no political competence when it came to supporting science. In short, the Swiss scientific establishment had no backbone. This was to be the role of the Swiss National Science Foundation (SNSF).

The first public exhibition, in 1953. The SNSF was taking part in the Comptoir de Lausanne fair, presenting the issues at stake in nuclear research. The SNSF has always sought to communicate with the general public.

A man of many contacts, holding doctorates in medicine and physics, Alexander von Muralt harnessed the interests of science and politics to create the SNSF, a national institution with the task of promoting scientific research. He adopted the US model for dealing with applications, which is still in use today. He was President of the National Research Council from 1952 to 1968.

A commitment to rebuilding Europe

In Switzerland, the idea of founding an institution of this kind was not born of a desire to structure scientific activity, but as a way of creating jobs and combating unemployment. A prototype organization, the CERS (Committee for encouraging scientific research), had been set up in 1944, but was criticized by scientists because it did not support all fields of scientific endeavour.

In 1948, Alexander von Muralt, then President of the Swiss Society of Natural Sciences (now the Swiss Academy of Natural Sciences, ASSN), set up a committee tasked with submitting a plan for a Swiss National Science Foundation to the Federal Council. The plan, presented in 1950, defined the Foundation's mission as that of supporting basic research projects in all scientific disciplines. It was to be run by two bodies consisting of scientists: a National Research Council of 15 members (two to be appointed by the Federal Council), and a Foundation Council, with a maximum of 50 members. Funding was to come from the Confederation, to the tune of 4 million Swiss francs per annum. A number of scientific institutions made contributions to its capital of 330 000 Swiss francs. In 1952, Parliament unanimously approved the Message of the Federal Council.

This fine town-house, at 20 Wildhainweg, Berne, became the headquarters of the SNSF in 1958.

"Atoms for Peace", using nuclear energy for peaceful purposes, was on everyone's mind in the 1950s. Prof. Paul Scherrer was President of the Committee for Nuclear Research, which was incorporated into the SNSF in 1958.

The Genevan man of letters Olivier Reverdin became President of the National Research Council in 1968. He took over from Alexander von Muralt, at a time when the SNSF was entering a period of political and financial turbulence.

The new institution enabled the Confederation to take its first steps in the field of research policy. It also fulfilled a moral need by enabling Switzerland to take a full part in the reconstruction of Europe: "Switzerland, which was spared in the recent conflict, has an obligation to the world, and particularly to Europe, to make efforts in scientific research at least equivalent to those of other countries, in particular small nations afflicted by the war."

Initial efforts in the atomic energy field

The first years of the SNSF were devoted to consolidating its procedures and regulations. The members of the National Research Council were not yet organized in divisions representing different scientific fields. The problem of overspending soon raised its head.

The young SNSF was introduced to its European neighbours, its American counterpart and the Swiss public at the Comptoir de Lausanne fair in 1953. The theme chosen, "Atom and radiation", was an issue of burning relevance. In the recent war, the great powers had concentrated on using the atom for military purposes. Peaceful use of the atom held out great promise, particularly in the fields of energy (if fission could be mastered), the natural and engineering sciences, and medicine.

The present headquarters of the SNSF, still in Wildhainweg. The former town-house has been replaced by two buildings, where over 100 people are employed in managing research projects.

Sundays with no cars were symbolic of the oil crisis of the 1970s. The authorities looked to scientists to find answers to society's problems. The SNSF was given the task of managing national research programmes.

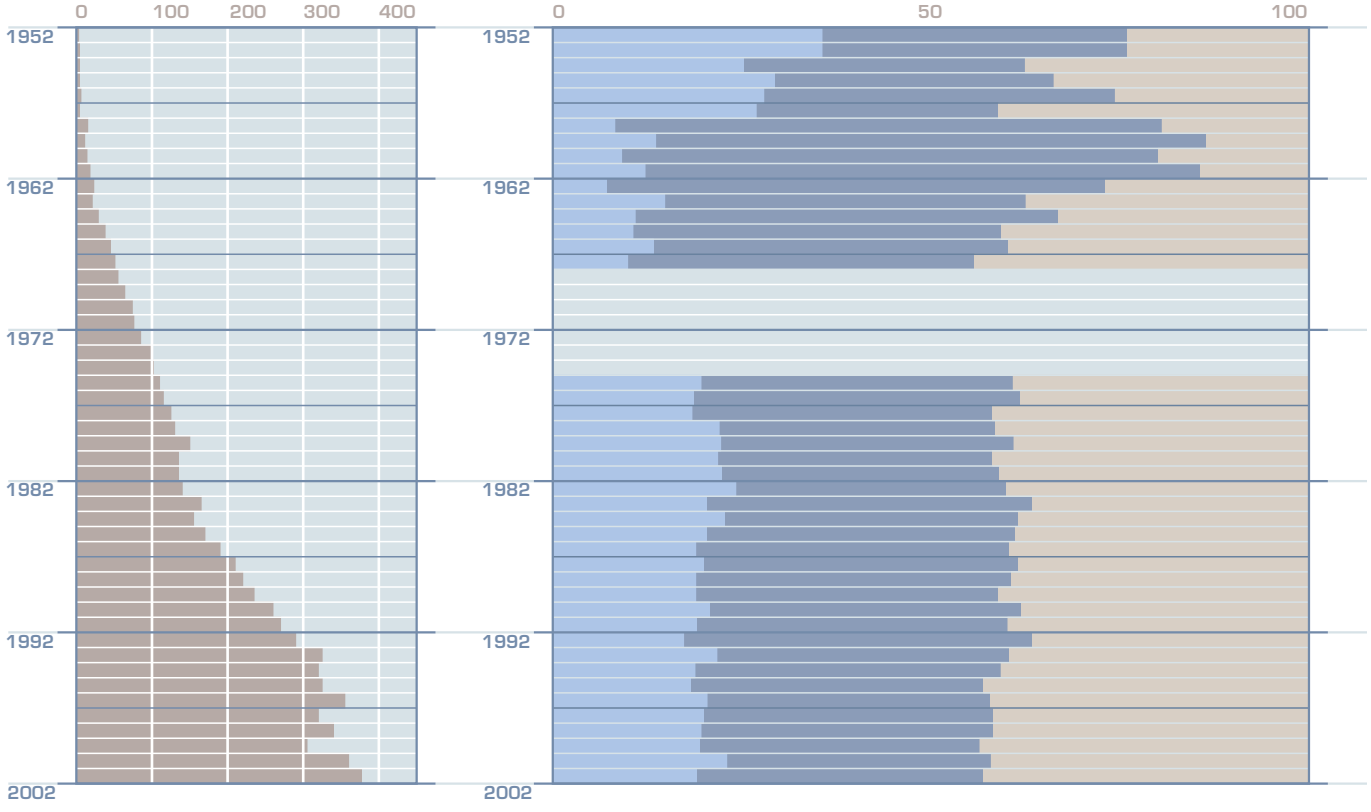
Diagram 1

Amount of research grants applied by year, in million CHF

Diagram 2

Distribution (percentage) of grants by research fields from 1952–2002

- Humanities and Social sciences
- Mathematics, Natural and Engineering Sciences
- Biology and Medicine
- Missing data for the period 1968–1974



Clinical medicine became part of the SNSF's remit in 1976, when Division III absorbed the Research Commission on Health.

In 1988, the SNSF launched the Swiss scientific research magazine "Horizons". Available free of charge, it disseminates the results of scientific research four times a year, in two languages, in a form that most people can understand.

But Switzerland had a lot of ground to make up in this area. In 1958, the Federal Council set up the Federal Atomic Energy Committee.

Within the SNSF, the need to manage atomic research led to the constitution of a Commission for Atomic Science (CSA), a new body with a budget of 10.5 million Swiss francs. In 1962, the CSA was integrated with the National Research Council, which then divided for the first time: Group 1 was responsible for the humanities and social sciences, Group 2 the natural sciences. At this time, the SNSF was receiving an overall grant of 23 million Swiss francs.

Switzerland establishes further institutions

The 1960s saw a further institutionalization of science and research. The Swiss Science Council was established in 1965. In 1968, the Confederation adopted a law providing for grants to universities. The Upper and Lower Chambers and the Swiss Federation of Industry and Commerce("Vorort") set up their own scientific committees. The SNSF followed the same trend, organizing its own Research Council, then a Secretariat, on a divisional basis: hu-

Information technology is the main subject of one of the four Swiss Priority Programmes (SPP) managed by the SNSF. These new programmes, launched in 1991, further strengthened the targeted research, and were intended to ensure that every scientific field had its place in the national research structure. The other three priority programmes were concerned with the environment biotechnology and the social sciences. Since 2001, the SPPs have been replaced by National Centres of Competence in Research.

manities and social science projects to be evaluated by Division I, natural and exact science projects by Division II, and projects in the fields of biology and medicine by Division III. The SNSF also decided to run its own research centres. In Lausanne, a start was made on building a research laboratory for plasma physics but, with the first signs of economic recession, the SNSF gave up the idea of funding such centres and devoted its efforts to supporting individual projects.

The SNSF was in evidence at the festivities organised to celebrate the 700th anniversary of the Confederation. With the Swiss universities, it took part in the great Heurêka exhibition devoted to Swiss science.

Birth of National Research Programmes (NRP)

The early 1970s were marked by the oil crisis and economic recession. The watchword was rationalization, planning for greater efficiency. Research was also affected. In 1974, the SNSF was entrusted by the Federal Council with managing a series of research programmes, the aim of which was to find solutions to problems of national importance. Between 10 and 12 % of the federal grant was allocated to these programmes, which were managed by a new division of the Research Council, Division IV.

When the recession ended, the SNSF entered a phase of maturity and, to some extent, expansion. An increase in the federal grant made it possible to launch new national research programmes. The 1984 Federal Law on research confirmed its status as the body responsible, with others, for science policy. Internationally, the SNSF played an important part in the creation of representative scientific bodies, such as the European Science Foundation (ESF) and the International Science Foundation (ISF). It managed the participation of Swiss scientists in major European projects – an activity which became even more important after 1992, when Switzerland's membership of the European Economic Area (EEA) was rejected by the electorate. The SNSF continues to work to prevent the isolation of Swiss researchers and defend the position of Swiss research internationally.

In parallel with these developments, in the early 1990s the SNSF was entrusted with a new mission: the management of problem-oriented research through the Swiss Priority Programmes (SPP) in the fields of information technology, biotechnology, the environment and social sciences. The issue of ensuring the future of academic institutions had also become important, with half the professors currently in office having to be replaced by the year 2000.

In 1992, the Swiss "no" to the EU came as a shock to the scientific community. The SNSF redoubled its efforts to ensure that Swiss scientists had a place in European research programmes.

The end of the millennium saw moves to give special attention to women. The SNSF took several initiatives to encourage them to take up academic careers.

Looking to the future

The last decade has been characterized by a determination to gear the primary tasks of the SNSF – the promotion of basic research and the fostering of young scientific talent – to the requirements of science policy. In-house, informal strategic reflection groups (GRIPS) have been set up to review SNSF procedures and put forward proposals on how to improve knowledge transfer, project evaluation, and access to academic careers for women and young people. The SNSF has also taken two new initiatives: establishing National Centres of Competence in Research to replace the existing Priority Programmes (SPPs); and instituting a programme of SNSF Professorships, which aims to encourage the return to Switzerland of promising young scientists by introducing a new academic grade to Swiss universities and Federal Institutes of Technology.

Fifty years after it was inaugurated, the SNSF is looking to the future. The intention – as Alexander von Muralt wrote in 1968, when he retired from the SNSF – is that Switzerland should continue to hold "the respected, high-profile position it currently occupies in the great orchestra of scientific research".

Division I

Humanities and Social Sciences

After World War II, and particularly from the 1960s on, the humanities and social sciences in Switzerland underwent an expansion that, as new institutes and organizations testified, could not be contained by the existing structures. But even at that time, and more obviously from the 1970s, the balance was shifting to the natural sciences. Despite this, support for the humanities and the social sciences has remained pretty constant at about one-fifth of total funding by the Swiss National Science Foundation.

An extremely broad spectrum of projects has received backing in the past 50 years. Whereas the Foundation initially focused on projects in the classic humanities, such as the (still incomplete) French etymological dictionary and the complete edition of the works of Jean Jacques Rousseau, in the 1960s and 1970s it sustained a body of outstanding research that ranged from archaeological excavations to models of Swiss economic development. This trend towards scientific specialization was reinforced by the rediscovery of the social sciences in the 1980s and the emergence of new university disciplines – film, theatre, media and gender studies – in the 1990s.

At the same time, in the past 40 years the social sciences and the humanities have broken out of their tradition of predominantly backward-looking analysis, as evidenced, for instance, by the success of educational research in replacing traditional pedagogy. University enrolment in these disciplines has risen steadily. As the pressure of teaching increases, the humanities and social sciences face two challenges: to maintain quality of research and to successfully compete with the natural sciences in popularizing their achievements among the general public.

Developmental psychology

Psychology was one of the few disciplines in either the humanities or the social sciences that managed to establish a reputation as an "empirical" discipline at a very early date. A substantial factor in this perception in Switzerland was the internationally acclaimed research of outstanding scientists such as Jean Piaget and Bärbel Inhelder.

Pioneering work on children's intelligence

The fresh insights into the intelligence of children and adolescents provided by the pioneering psychological work of Jean Piaget and his partner in research, Bärbel Inhelder, are still studied and applied today, above all in educational science.

Piaget and Inhelder's field of research became known as genetic epistemiology, a branch of learning initiated by Jean Piaget (1896–1980). Genetic epistemiology studies the development of people's cognitive abilities by comparing the development of individual children at different ages.

The "International Centre for Genetic Epistemiology" in Geneva, founded by the Neuchâtel-born developmental psychologist in 1955, attracts scientists interested in interdisciplinary collaboration from around the world – developmental psychologists, science historians, logicians, mathematicians and science theorists.

Jean Piaget and Bärbel Inhelder at the award of an honorary doctorate at Temple University, Pennsylvania, 1971.

How does cognition come about?

In the course of his investigations, Piaget constructed a schema to describe the stages of children's cognitive development. According to this, the development of children's cognitive abilities begins in the "sensorimotor" phase (from birth up to two years), in which children display pre-speech intelligence, continues in the "pre-operations" phase (two to seven) in which children develop concepts and acquire language skills, followed by the "concrete operations" phase (seven to 11) of logical and abstract thought, before entering the "formal operations" phase (11 onwards), in which the child begins to connect hypotheses with his actions. At the end of this development, at about the age of 15, people have become "epistemic subjects" capable, in principle, of pursuing science. Piaget demonstrated that cognition means dividing a "subject" into structures typical of the subject, and that the individuals develop this ability to structure in a series of stages.

Eleven honorary doctorates

Through her research on the development of operational and spatial thought, on children and adolescents' development of logic and on cognitive strategies, Bärbel Inhelder (1913–1997) helped to spread the theory of stages of development. The St. Gallen-born psychologist was not only Piaget's co-worker, but also an outstanding researcher in her own right who received 11 honorary doctorates for her contributions to child and adolescent psy-

Perceptions of children and young people, in this case in a Swiss school in 1952 – an interesting area of research.

Toothbrushing test in a Zurich school, 1961. Interviews, testing and observation of children were the tools of Jean Piaget's and Bärbel Inhelder's trade.

chology, among other work. In 1971, three years after she had declined the offer of a chair at Radcliff College, Harvard University, preferring to remain with Piaget in Geneva, Jean Piaget retired as professor for genetic and experimental psychology at the University of Geneva and Bärbel Inhelder was chosen as his successor. In 1975 she became the first woman to be appointed to the Research Council of the Swiss National Science Foundation, of which she remained a member until 1981.

How a new language takes root

No fewer than five written languages, not to mention numerous dialects, are used in the small Romansch-speaking region of Switzerland. To facilitate public communication in this linguistic diversity – and, in the final analysis, to contribute to the survival of Romansch – since 1982 the Swiss National Science Foundation has supported essential primary work on developing "Rumantsch Grischun", a project initiated by "Lia Rumantscha", an organization for the advancement of the Romansch language. This written language has a uniform vocabulary and grammar that is based on words and forms common to all, or most, of the five existing written languages. This primary work on Rumantsch Grischun has already had a practical effect: the fourth official language is now used for official publications of the federal authorities. However, the proportion of Romansch-speakers in Switzerland has continued to decline, from 0.8 % in 1980 to 0.6 % in 1990 and (according to the provisional figures of the latest census) to 0.5 %, or 34 000 people, in 2000.

Surselvisch, Sutselvisch, Surmeirisch, Vallader and Puter are the names of the five Romansh written dialects of the Swiss canton of Graubünden, which are standardised as Rumantsch Grischun.

When two specialists in literature deciphered the entire text of Robert Walser's "Micrograms" in the early 1980s, it was a sensation in the world of literary studies. Suddenly, the pages strewn with tiny characters were no longer illegible secret texts, but a source of insights into Walser's oeuvre and his life as an outsider.

From the world of the pencil

Robert Walser (1878–1956) is one of the masters of modern Swiss literature. Born in Biel/Bienne, the author of works such as "The Tanner Sisters" and "Jakob von Gunten" is, despite his fame, shrouded in mystery. The latter reputation rests primarily on a collection of manuscripts in minuscule handwriting that were long regarded as secret texts written in indecipherable code, and even now constitute a unique literary achievement.

After the early parts of these "Micrograms" had been elucidated in 1976, it was generally accepted that the remainder, by far the greater part of the 526 pages of pencilled characters just one to two millimetres high, would never be transcribed, especially as Walser's writing grew smaller and smaller over the years. Eventually, however, with powerful magnifying glasses and patient comparison Werner Morland and Bernhard Echte accomplished this feat. The many unknown texts – as well as the novel "Robbers" and the scenes from "Felix" – were published in four volumes in 1982 and 1990, and the poetic diversity of the contents ranges from everyday observations of a passionate walker to love stories and reflections on language.

In 1924 Walser moved from the "realm of the pen" to the "world of the pencil". "In a time of disintegration" – he was committed to the Waldau mental institution in 1929 – his "pencillings" helped him recover from an existential crisis in his writing. He wrote that, like a boy, he had learnt to write again in miniature. Then, in 1933, he stopped, and never wrote another word.

Outstanding scholarly editions

Scholarly editions constitute a large part of the literary projects funded by the Swiss National Science Foundation, and the deciphering and reconstruction of source texts play an important role in other disciplines as well. Such SNSF projects range from late medieval German prayer books to the works of Johann Caspar Lavatar and the correspondence between Hannah Arendt and Karl Jaspers, edited by Jeanne Hersch.

Sociology and political science

Human coexistence, attitudes and behaviour can, like natural scientific phenomena, also be measured and described in exact terms, as sociologists, political scientists and other researchers have demonstrated in a wide range of empirical investigations in the past five decades.

Modern society in facts and figures

The social sciences are concerned with social aspects of human behaviour and coexistence, on the one hand, and mechanisms of socialization, on the other. Depending on one's point of view, the body of social scientific research grouped around the classic core disciplines of sociology and political science can range from ethnology to media studies.

In the first three decades of the Swiss National Science Foundation, sociologists and political scientists generally had a hard time of it persuading the SNSF's Research Council to support their projects. This is an accurate reflection of the state of the social sciences in Switzerland as a whole at that time. Until well into the 1970s, social science was able to hold its own only in French-speaking Switzerland. Compared to abroad, German-speaking Switzerland was laging behind.

A start was made in the 1960s, when the SNSF started funding research projects on political decisions and the party system in Switzerland, for instance Roland Ruffieux's study on "Swiss Direct Democracy in the 20th Century", which studied the formation of opinion in the run-up to different referendums. Ruffieux's range of re-

Much ado about job sharing

By the beginning of the 1980s, job sharing was already a fashionable topic, but had attracted little empirical research. Rüdiger Klimecki, a management expert at the University of St. Gallen, conducted the first major Swiss study on job sharing between 1984 and 1986. The results showed that job sharing is "a work-group-related management concept that can be applied in various ways to shape working conditions and job content". Job sharing offers a "means of adjusting work to the demands of business" on the one hand and "of shaping work to take better account of individual needs" on the other. At the time of publication, his study and its subject drew some criticism from the research community. The impossibility of dividing up the job of government minister, for instance, was one of the many objections raised. Today, job sharing finds greater acceptance. However, Klimecki's conclusion that job sharing is "still an exception" in Switzerland is as true today as it was then.

search interests is exceptionally wide, but even allowing for this, his work reflects the blurring of the distinctions between the different disciplines in the social sciences that was common in the early years.

In 1982, Ruffieux, a trained historian, published the results of a sociological study undertaken on behalf of the Swiss National Foundation in conjunction with the Swiss Army and the Arts Council of Switzerland, Pro Helvetia, that presented new insights on the consumption of culture and the cultural values of Swiss recruits. Among the mass of information, the statements of the young men showed that 86% of them listened to music on a daily basis, that their favourite recreational pastime was talking with their friends and that honesty (66%) was most widely regarded as the "typical Swiss" value, while respect for the law (23%) and discipline (17%) ranked at the bottom of the list.

In the 1980s the social sciences flourished, a trend that grew even more pronounced in the 1990s. In the field of non-problem-oriented research as promoted in the SNSF's Division I, a number of highly regarded research works were published, for instance Wolf Linder (University of Berne), Hanspeter Kriesi (University of Geneva) and Ulrich Klöti's

The pattern of annual growth rings in trees reveals the age of wooden archaeological finds and provides an insight into climatic conditions of past times.

Reading the wood: tree ring dating

Traditionally, classical archaeologists have paid scant regard to the ancillary science of dendrochronology, the study of the annual growth rings of trees. Yet, the work of Swiss archaeologists in this field is internationally recognized as a pioneering achievement. Comparative studies of the annual ring patterns of wooden objects found in excavations have led to completely new insights into prehistory. Progress was most rapid in the 1980s, when comparisons of annual ring calendars across Europe facilitated absolute dating of past events for the first time, sometimes to the exact year. In that period, laboratories in Zurich, Neuchâtel and Birmensdorf applying the methods of the natural sciences to archaeology achieved a breakthrough with innovative measuring techniques that enabled them to produce evidence on climatic developments – for instance on the growth and retreat of glaciers in recent millennia. Today dendrochronology is regarded as the most accurate and cheapest method of dating wood.

(University of Zurich) political study of the Swiss federal elections of 1995. This work, the largest social scientific survey ever supported by the SNSF, provided empirical evidence of, among other things, the growing irrelevance of political parties. >|

What were the factors which shaped the result of 1995's National Council and Upper House elections? This was the central issue addressed by the Swiss Electoral Studies ("Select") which were based on a survey comprising some 7500 interviews with voters. This highly regarded joint project between the Universities of Geneva, Berne and Zurich has been continued since the 1999 elections.

Division II

Mathematics, Natural and Engineering Sciences

Division II has passed through various incarnations over the last 50 years, being known as the "Exact and Natural Sciences Division" until 1985, when it was renamed the "Mathematics, Natural and Engineering Sciences Division" to place greater emphasis on engineering. Since 1987, the engineering and environmental sciences have also experienced an upturn. Within the engineering sciences, information technology has also experienced considerable growth since the early 1990s.

Atomic physics played a major role in the first decades, as the Commission for atomic science was incorporated into the SNSF in 1963, bringing considerable capital funding with it. Then solid state physics became more significant and is still moving ever further into the nanometre and femtosecond range. 1987 saw the launch of the CHF 6 million "Supra 2" (and subsequently "Supra 2+") programme to promote research into superconductivity, which laid the foundations for the National Research Programme "High-temperature superconductivity".

Research promotion spending in chemistry has almost doubled since the end of the 1960s. Because of its chemicals industry, Switzerland has particular strengths in organic chemistry research. In 1993, Division II also launched the CHiral2 research initiative with a total budget of CHF 9.8 million in order to foster research into chirality.

Another major trend has been the development of ever larger and more complex equipment, which has resulted in greater international cooperation and scientific specialization. However, the Division noted that investment in research equipment had been falling since the mid-1990s and has since been offsetting this trend with the R'EQUIP initiative.

Physics

The first moon landing was a major event for physicists at the University of Berne as they were able to have their solar wind sail erected and so collect valuable information about the sun and the origins of the universe. Since then, they have remained at the cutting edge of solar wind research.

The mysterious solar wind

On their first moonwalk in 1969, even before the Stars and Stripes had been planted, the Apollo 11 astronauts had erected the Swiss "solar sail" or "Swiss Flag". This "Swiss Flag" was the solar wind experiment of the physicist Johannes Geiss from the University of Berne which was intended to capture particles from the solar wind.

The solar wind sail from Berne was used on five Apollo missions and gathered important data about the isotopic composition of the noble gases. The data are still of use today in solar physics and, for example, in studies of planetary formation. The University of Berne's moon experiment has thus

Steam from the primordial soup

The solar wind is the name for the charged particles emitted into space by the sun. It provides researchers with solar material, or "steam" from the primordial soup, from which the solar system was formed billions of years ago. It is possible to measure the solar wind on the moon because the moon, unlike the earth, has virtually no atmosphere and no magnetic field.

During the first moon landing in 1969, Apollo 11 astronauts erected the University of Berne's solar wind sail, an aluminium film designed to capture particles from the solar wind. The results of the experiment confirmed, inter alia, the big bang theory. An experiment was conducted on the solar probe Ulysses (small picture) which enabled the inert gas helium to be measured and thus the proportion of dark, exotic matter in the universe to be estimated.

Gluons can be investigated with the aid of collisions between lead nuclei. The result is a gluon-quark soup whose traces can be visualized.

Glueballs – pure energy

"We expected to find them and we have," says experimental physicist Claude Amsler, expressing his satisfaction. He's talking about "glueballs", a state of pure energy. Glueballs are formed from gluons, the "glue" which binds together quarks, the smallest known constituents of matter. These gluons are capable of exchanging energy and so assume a form which does not consist of matter but just its intrinsic energy, namely glueballs. The theory of strong interaction in the atomic nucleus had predicted their existence.

Experimental proof has now been obtained from the Crystal Barrel project, which ran from 1990 to 1997 and occupied some 80 scientists. The glueballs left traces behind on the 1380 radially arranged crystals. Glueballs are formed naturally in the upper atmosphere, for example. For the experiment, they were produced artificially in CERN's particle accelerator from collisions between protons and antiprotons.

contributed to confirming the big bang theory, which predicts the nature and abundance of the elements and isotopes which must have been formed in the big bang. The solar wind sail for the first time provided reliable values for isotope ratios from space.

Planet hunters

In 1995, Michel Mayor and his doctoral student Didier Queloz from the Geneva Observatory discovered the first planet outside our solar system. The planet orbits the star 51 Pegasi (number 51 in the Pegasus constellation). This discovery was made indirectly by Mayor and Queloz proving that 51 Pegasi does not orbit at a uniform velocity and that these variations are caused by a planet orbiting the star. The precise measurements were possible thanks to Mayor's observation techniques, which he had developed over more than two decades of research and for which he was awarded the CHF 500 000 Balzan Prize in 2000.

Participation in the Ulysses solar probe

Researchers from the University of Berne have been at the cutting edge of solar wind research since the first moon landing. They were also represented on the Ulysses solar probe, launched in 1990, with the space mass spectrometer SWICS. Measurements by Ulysses have revealed that the interstellar medium, a mixture of gas and dust surrounding our solar system, penetrates the solar system (the gases of the interstellar medium can be differentiated from those originating from the sun by their electrical charge, velocity, temperature and distribution in space).

Exotic matter abundant in the universe

Thanks to SWICS, Geiss and his colleague George Gloeckler from the University of Maryland, were able to carry out the first measurement of interstellar helium-3, the light isotope of helium. As a result, they were able to calculate the increase in the quantity of helium-3 since the formation of our solar system. Surprisingly, the increase was smaller than expected. The researchers concluded from this that the proportion of dark, exotic matter in the universe, which is invisible and can be detected only by its gravitational effect, is greater than had been assumed, accounting for some 95% of the matter formed in the big bang. This means in turn that expansion of the universe will be infinite.

Many Swiss researchers participated in international expeditions with the deep-ocean drilling vessel "Glomar Challenger". Their analyses contributed to explaining how the Atlantic Ocean had formed and to solving the puzzle of the massive retreat of the Mediterranean Sea five million years ago – it quite simply dried out.

Successor to the deep-ocean drilling vessel "Glomar Challenger": Swiss geologists are again taking part in the research expeditions of the "Joides Resolution" drill ship.

When the Mediterranean Sea was a desert

Where Switzerland is located was once ocean. Swiss geologists had long been certain of this, evidence having been provided by rocks in the Swiss mountains which originated from a former seabed. The Alps had accordingly been formed by folding of the earth's crust as Africa and Europe collided. Africa drifted northwards and new seabed must thus have formed elsewhere. The theory was that Africa had become detached from the American continent.

Success with Pascal

The well-known programming language Pascal was developed between 1969 and 1970 by Niklaus Wirth, professor of computer science at the ETH Zurich. Wirth wanted to create a language which made it possible to develop properly structured and organized programs, was suitable for teaching important programming concepts and ran efficiently and reliably on the computers of that time. Pascal was also the first computer language to have a clear data type concept and is a structured language, which thus forces programmers to write methodically and carefully.

The programming language Pascal owes its name and origins to them: French philosopher and mathematician Blaise Pascal and ETH professor Niklaus Wirth (below).

Pascal was named after the French philosopher and mathematician Blaise Pascal, who invented the first digital calculating machine in 1642. Pascal is of great importance in teaching programming skills and is widely used. It has been used as the basis for further programming languages, such as Ada, Modula and Oberon and is still used today for industrial, scientific and private applications.

This theory was confirmed with the assistance of the "Glomar Challenger" research vessel, which was capable of drilling in water depths of up to 6 000 metres and going down to a depth of up to 750 metres below the sea floor and was in service from 1968 to 1983. Twenty seven geologists from Zurich, Berne, Basel and Geneva also participated in the international deep-ocean drilling project. By determining the age and type of oceanic sediments, the geologists were able to help to provide a conclusive explanation of the formation of the Atlantic Ocean. Analysis of the deep-ocean core samples did in fact reveal that Africa had been driven slowly away from South America towards Europe.

Understanding Alpine geology thanks to deep-ocean core samples

The knowledge gained by the Swiss geologists from their study of modern oceanic sediments also helped them to obtain a better understanding of Alpine geology. In total, more than 100 research projects in Switzerland have made use of the deep-ocean core samples.

The Mediterranean Sea dried out about 5.5 million years ago because the Strait of Gibraltar had closed up.

All in all, the ocean project has revolutionized the Earth sciences because findings about the origins, earlier chemical composition or circulation history of the oceans helped to solve some long-standing geological puzzles. Swiss scientists, including the ETH geologist Kenneth Hsü, made a substantial contribution here too.

Why did the Mediterranean Sea retreat?

One of these puzzles was the massive retreat of the Mediterranean Sea 5.5 million years ago, which had been proven by geological investigations on dry land. Rivers then cut deep ravines in the Earth's surface. The resultant valleys were resubmerged 5 million years ago. Some of them, for example the valleys of the Ticino, were filled in with sediments, while in others, dams formed at the valley mouth, resulting in the formation of the Southern Alps lakes.

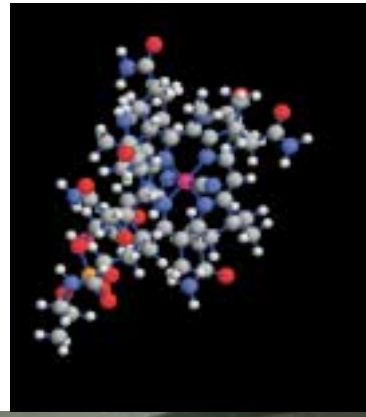
The sudden retreat and return of the sea was a major puzzle for many Swiss geologists. Drilling into the bed of the Mediterranean Sea provided the answer: thick salt beds and concentric patterns of evaporites were evidence that the Mediterranean had dried out some 5.5 million years ago. The desiccation was caused by the Strait of Gibraltar which had closed as Africa edged closer to Europe, so shutting off the inflow of seawater from the Atlantic. As a result, the Mediterranean Sea dried out within approximately 1000 years (water being lost by evaporation approximately ten times faster than it was replenished).

After the desiccation, the entire Mediterranean region was a barren, desert-like basin for 100 000 years. When water from the Atlantic Ocean found a new way back through the Strait of Gibraltar, these valleys were resubmerged.

The Alps were formed by folding of the earth's crust when Africa broke away from the American continent and collided with Europe. Deep-ocean drilling carried out between 1968 and 1983 confirmed this theory conclusively. Analysis of the sediments also helped Swiss scientists to arrive at a better understanding of Alpine geology.

Chemistry

For a decade, two research teams in Switzerland and the USA had worked on synthesizing vitamin B12 until they achieved success in the early 1970s. This complicated biomolecule is easy to obtain using natural methods, so why all the effort?



Vitamin B12: The journey is the destination

At the beginning of the 1960s two research groups almost simultaneously began their attempts to synthesize vitamin B12: Albert Eschenmoser's team from the organic chemistry laboratory at the ETH Zurich and Robert Woodward's team from Harvard University in the USA. The work was completed in 1972. Using more than 60 chemical reactions, over 100 researchers had managed to replicate the complicated biomolecule. This synthesis was considered a milestone in organic chemistry and Eschenmoser and Woodward received many awards for their work.

Originality, imagination and synthesis skills

However, vitamin B12, which humans need to form blood, is easily produced using microorganisms, so why the enormous effort? "The many years of effort made a large number of new synthesis methods available to organic

chemistry, for which Eschenmoser's originality, constructive imagination and subtle synthesis skills were to a great extent responsible", ran the citation from the Marcel Benoist Foundation for its award to Eschenmoser in 1972. It was also important to optimize the methods so as to obtain higher yields, a vital factor in the success of such a multistage synthesis.

However, just synthesizing vitamin B12 was not enough for Eschenmoser. He wanted to know how such fascinating, complicated molecules "with an almost perfect correspondence between structure and function" came to be. It was found that nature, like a composer, creates variations on a given structural theme, so obtaining quite different effects from a basic structure.

Eschenmoser has remained faithful to his search for the chemical origin of life even after retirement: at the renowned Scripps Research Institute in California, he is now seeking out possible candidates as precursor substances for the genetic system. And he has adopted Einstein's motto: "We don't only want to know how nature is, but why nature is what it is and not something else."

It took more than 60 chemical reactions to synthesize vitamin B12 in the laboratory. But all the tinkering paid off because it made many new synthesis methods available to organic chemistry.

Albert Eschenmoser (left) received the Marcel Benoist Prize in 1972 for his contribution. Together with his team, he succeeded, inter alia, in replicating the basic structure of the complex biomolecule.

Molecules in the cross hairs

One of organic chemistry's most important present-day analytical methods is nuclear magnetic resonance (NMR) spectroscopy, which is used primarily for the structural analysis of molecules. Richard Ernst, a chemist from the ETH, made a major contribution to improving the sensitivity and resolution of the technique for which he was awarded the 1991 Nobel Prize.

Kurt Wüthrich, a biophysicist from the ETH, also made a substantial contribution to the development of NMR spectroscopy. His team used the technique to investigate the natural structure of the prion protein deposited in the brain in spongiform encephalopathies, such as BSE or Creutzfeldt-Jakob disease, finally discovering that the prions in humans and cattle are virtually identically folded.

Division III

Biology and Medicine

"It is not so long since a certain Friedrich Miescher isolated 'nuclein' – a substance that now forms the focus of scientific attention as a carrier of genetic information – from pus-soaked dressings at Tübingen University Hospital (a heroic effort given the assault to his sense of smell!)": Research Council President Alexander von Muralt in 1967.

Fifty years after the founding of the Swiss National Science Foundation, genetic information is still a focus of biomedical research. Since the 1950s, when the structure of DNA was discovered, genetics has made spectacular advances. Now that the sequencing of the human genome has been completed (and officially published at the start of 2001), further work is going on at the protein level.

Research is entering territory that would have been inaccessible just a few decades ago, leading to concerns among the public. One such reaction was the 1998 people's initiative on gene protection, which was subsequently rejected by the electorate, to the great relief of many researchers. Another is the debate surrounding stem cell research. In autumn 2001, the decision of the SNSF to authorize a Geneva-based research group to import human embryonic stem cells prompted the drafting of a specific law to regulate the use of surplus embryos.

The close link between biomedical research and social issues is demonstrated in a slightly different way by Aids research. Since it began reviewing Aids research projects in 1991, the SNSF has been careful to include the social sciences. These alone provide the key to discovering how Aids spreads in society and to identifying where preventive measures should be implemented.

Discussion

Biology is now as important as physics was fifty years ago. But biology had to change a lot for this shift to take place. The Geneva-based science historian Bruno Strasser and his Basle colleague Niklaus Stettler discuss the rise of the biology that is concerned with molecules and the fall of the biology that focuses on whole organisms.

The evolution of biology

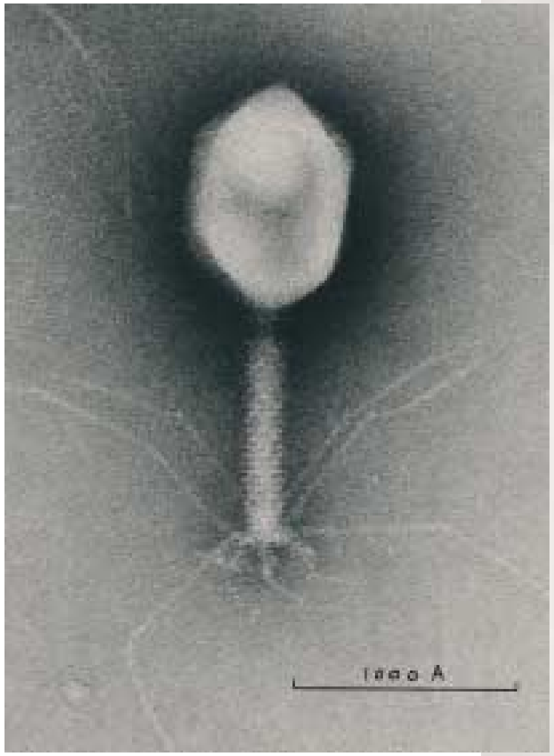
Bruno Strasser, Geneva is the birthplace of Swiss molecular biology. How did that come about?

Bruno Strasser The first Institute of Molecular Biology was established in Geneva in 1963 on the initiative of the scientist Eduard Kellenberger. But molecular biology itself came into being a generation earlier. Kellenberger was a pupil of the Geneva-based physicist Jean Weigle, who was involved in the development of the electron microscope in the early forties. Using this microscope, Weigle started to investigate viruses and bacteria.

In discussion

Niklaus Stettler (right) is a historian working in Basle. After receiving initial funding from the Man-Society-Environment Foundation (MGU) at the University of Basle, he wrote a dissertation on the cultural history of the biosciences at Swiss universities between 1945 and 1975 as part of an SNSF project. This is now available in book form ("Natur erforschen", Chronos Verlag 2002).

Bruno J. Strasser (left) is a biologist and science historian. In the context of an SNSF project he has published a dissertation on the history of molecular biology in Switzerland. He is currently working at the Institute for the History of Medicine at Geneva University and at the University of Paris 7.



The electron microscope led to the birth of molecular biology in Switzerland, providing fascinating new pictures of bacteria and images (above).

Eduard Kellenberger, initiator of the first Swiss institute of molecular biology (in Geneva), at work on the electron microscope. The founders of molecular biology in Geneva were all physicists originally: Kellenberger, his teacher Jean Weigle, and Werner Arber.

So the physicist discovered biology.

Bruno Strasser The founders of molecular biology in Geneva – Jean Weigle and his pupils Eduard Kellenberger and Werner Arber – were all physicists originally. They exploited the prestige then accorded to physics to open up a new field of biology. Moreover, in 1949 Weigle emigrated to the United States, to the California Institute of Technology, where he began a new career as a molecular genetician. But he returned regularly to Geneva to train his microscopy students in the experimental genetics techniques being developed in the United States.

Botanist at the microscope: the contemplative observation of nature has given way in recent decades to competitive biology characterized by projects with a specific duration and defined research goals.

The electron microscope doubtless played a crucial role in this development.

Bruno Strasser Yes, particularly in Switzerland. Whereas electron microscopy was viewed as just another technique in other countries, here it led to the birth of molecular biology. The fascinating new images of viruses and bacteria produced by the electron microscope attracted not only biologists and doctors, but also the funding universities and, not least, the Swiss National Science Foundation in 1952.

So the electron microscope gave birth to molecular biology in Switzerland. Niklaus Stettler, is that also how you see it?

Niklaus Stettler Molecular biology actually originated in the USA. Weigle, Kellenberger, Arber – all Swiss pioneers in this field – spent time in the USA and brought their new knowledge back to Switzerland. The important role played by the electron microscope in this development does not surprise me. Swiss biologists were traditionally empiricists rather than theoreticians. To embark on a new field, they needed a new method rather than a new theory.

... and obviously researchers to bring back the experience acquired in the USA.

Niklaus Stettler That's why Geneva was so important in the development of Swiss molecular biology: because of this very link with the USA.

Bruno Strasser And this was a really new development at the time. Whereas, prior to World War II, Swiss scientists used to go to Germany to conduct their post-doc research, after the war they started going to

the USA instead. This also prompted a change in the scientific culture.

Niklaus Stettler Exactly. The approach to scientific work in Germany was quite different. In the attempt to explain the complex nature of the world, researchers would place one piece of the mosaic next to the other. A university chair could be acquired with just a few publications. And then at the age of 70 one would write one's seminal work on life and nature. This is how organismic biology worked in Switzerland as well.

And with the influence of the American scientific culture ...

Werner Arber, pioneer of molecular biology and genetic engineering

In 1978, together with two Americans, Werner Arber was awarded the Nobel Prize for physiology/medicine. In the early sixties, Arber had discovered "restriction enzymes", one of the main tools used in genetic engineering.

Originating from Aargau, Werner Arber studied chemistry and physics at the ETH in Zurich before moving in 1953 to the Biophysics Laboratory at Geneva University, from where he made a number of trips to the USA. In 1965, he was awarded an SNSF-funded "ad personam" professorship in Geneva, in the hope of persuading him to stay in Switzerland. In 1971 he moved to the Biozentrum in Basle.

Niklaus Stettler ... began the pressure to produce research results and publications. People worked in small steps. One experiment, one publication. Research became more international and was increasingly characterized by competition rather than contemplation.

What role did the Swiss National Science Foundation play in this scientific "cultural revolution"?

Bruno Strasser The SNSF was a crucial contributor in importing the scientific culture of the USA to Switzerland. The founder of the SNSF, Alexander von Muralt, had previously seen for himself how things were in the USA. The Swiss approach to managing research proposals was greatly influenced by the American system. Projects of a specific duration, precisely defined research goals, publication as proof of success: all these factors of SNSF policy favoured biologists in the mould of Eduard Kellenberger who, instead of writing a thick tome in one of the national languages, would publish in international English-language journals.

And traditional organismic biology had problems with this way of working.

Niklaus Stettler Not just problems, but an apparent aversion to addressing nature in the same way as molecular biologists did. This was demonstrated by an example from the late sixties, before the Biozentrum was founded in Basle. The representatives of organismic biology initiated a huge debate about whether the Biozentrum, with its focus on molecular biology, was entitled to the prefix 'Bio'. The actual points at issue were the question whether the new research

still had anything to do with life, and protests against the shift away from the kind of biologists who sit by the banks of the Rhine, observe nature and give themselves over to contemplation. Probably the most brilliant mind amongst them was the Basle-based scientist Adolf Portmann. But his kind of biology – with its very high ethical claims – was increasingly being sidelined.

And yet organismic biologists are still around today.

Niklaus Stettler But no longer in the mould of the contemplative philosopher Portmann. Although organismic biology made a comeback after the 1992 Earth Summit in Rio, its weaknesses were highlighted at the same time. It was simply overwhelmed by the diversity of subjects to be investigated. Nor could it provide any answers to important environmental questions.

Bruno Strasser Nowadays, it's much more difficult to make a clear distinction between molecular and organismic biology. What kind of biology is involved when the behaviour of a transgenic mouse is under observation? The boundaries are becoming increasingly blurred.

Niklaus Stettler As recent discussions of the Swiss Commission for Biology also show. Biologists themselves no longer see any clear categorization of their discipline. Although the ideologies of demarcation invariably flare up when it's a question of allocating research funding.

Modern management of bone fractures owes a great deal to the Association for the Study of Internal Fixation (AO) in Davos.

Inventive bonesetters

Medical historians agree: one of the most important medical developments of the last fifty years in Switzerland was the founding of the Association for the Study of Internal Fixation (AO) in Davos in 1958. In forming the AO, a group of general and orthopaedic surgeons laid the foundation for a new era of bone fracture management in which screws, nails and plates were used to fix broken bones. Since the AO was founded, two companies have developed the necessary implants under licence, and the sale of patented products is the AO's main source of income.

The AO is now the largest network of doctors in the world. Since 1960, over 300 000 surgeons from all over the world have attended further training courses to learn about the AO standards. The organization owns a research and development centre in Davos.

From the sidelines the Swiss National Science Foundation has also taken part in the development of the AO, primarily in funding basic research projects relating to osteosynthesis, for example in the field of bone metabolism.

The research activities of Alexander von Muralt, SNSF founder and for many years President of its Research Council, focused on the investigation of signal transmission in the nervous system.

In the field of brain research, many Swiss scientists have made a name for themselves beyond Switzerland's borders. Not least among them, important representatives of the Swiss National Science Foundation have devoted themselves to research on nerve cells and the brain.

Fascinated by the cells that mediate communication

It all began – long before the Swiss National Science Foundation appeared on the scene – with Philippus Aureolus Theoprastus Bombastus von Hohenheim, also known as Paracelsus. A 16th-century town physician in Basle and the first representative of scientific medicine, Paracelsus also wrote on nervous diseases, believing that they were caused not by sorcery, the devil or witches, but by organic and cosmic influences.

What started with Paracelsus was to be pursued over the centuries, culminating in the widespread expansion of – in particular – multidisciplinary brain research in the 20th century. The Swiss National Science Foundation and its representatives were closely involved in this work.

Experiments on the olfactory nerve of the pike

Working at the University of Berne, Alexander von Muralt – SNSF founder and for many years President of its Research Council – had a significant impact on Swiss neurophysiology, thanks to his own research work and his personal contacts with leading scientists in Europe and the USA. Von Muralt's main interest lay in signal transmission in the nervous system, a subject on which he also wrote textbooks. He studied the nature of nerve impulses in, for instance, the olfactory nerve of the pike.

The physician and chemist Alfred Pletscher, President of the SNSF Research Council from 1981 to 1987, also devoted himself to the study of nerve cells. In 1960, he was appointed Professor of Pharmacology at the University of Basle and, in 1967, Head of Research at Hoffmann-La Roche. He was subsequently a co-founder of the Biozentrum and the first Director of the Research Centre at Basle's University Hospital. He was known particularly for his pioneering work on catecholamine and serotonin neurotransmitters.

The regeneration of nerve fibres is a particularly challenging task. A number of Swiss teams are working at the international cutting edge of research in this field.

The Swiss National Science Foundation was closely involved in the development of multidisciplinary brain research.

Hopes of Superman actor

Several prominent exponents of brain research have been, or are now, members of the SNSF's Research Council. They include Swiss government minister Ruth Dreifuss's brother Jean-Jacques Dreifuss, of the University of Geneva, who is a specialist on hormones of the hypothalamus, a central control region in the brain. And Martin Schwab, a Zurich-based neurobiologist who is currently investigating the regeneration of nerve fibres. The former Superman actor Christopher Reeve, who has been paralysed from the neck down following a riding accident, is hoping for great things from Schwab's research work; this publicity makes it one of the more high-profile projects in the recent annals of Swiss science.

Research in hospitals

It is not easy for Swiss clinicians to conduct practical scientific research on patients. Federalist hospital structures make it difficult to set national research priorities. The number of patients per study is usually small, and so the results are not very meaningful. And for those working in clinical research, the prospects of a scientific career are anything but good.

With its TANDEM programme, the Swiss National Science Foundation has sought since 1997 to improve the quality of clinical research in Switzerland. The aim of TANDEM is to bring together clinical and experimental research groups for periods of six years.

In the TANDEM project at Lausanne University Hospital, for example, chemists, haematologists and surgeons are working together to find new forms of treatment for myocardial infarction. In another project in Zurich, radiobiologists are working with gastroenterologists and gene researchers to develop a genetic map for bowel cancer with the aim of improving early detection.

The TANDEM programme aims to foster exchanges between experimental and clinical research groups.

Division IV

Research programmes

Division IV was set up in 1976 with the aim of increasingly directing the scientific potential of universities and equivalent institutions towards applied research for the benefit of society as a whole. Since then, the National Research Programmes (NRP) have been conducting interdisciplinary, practically-oriented research which is helping to resolve problems of national significance. To date, 54 National Research Programmes have been launched (NRPs 1–52 and the two supplementary programmes NRP 44 and 55). These programmes usually extend over five years and, on average, receive funding of CHF 11 million.

Of the changes that have taken place in recent years, the most significant has been the reform of the process by which research topics are selected, with greater emphasis being given to ensuring practical relevance. While the earlier series of NRPs were launched at four-year intervals, the practice now is to approve smaller batches of programmes at shorter intervals to ensure greater responsiveness to current problems.

The Swiss Priority Programmes (SPP) were introduced a decade ago to complement existing research promotion schemes by focusing resources on priority areas such as man, the environment and technology and so strengthening or developing Switzerland's research potential. 1992 saw the launch of SPP "Biotechnology", SPP "Information and Communication Structures" and SPP "Environment" under the guidance of the SNSF, while SPP "Switzerland – the Future" began in 1996. Since 1992, the Federal Government has invested a good CHF 290 million in SPPs.

In 1998, the Swiss Priority Programmes were replaced by a new instrument designed to achieve more sustainable structural effects: the National Centres of Competence in Research (NCCR). A first series of 14 NCCRs began in 2001, and approximately 20 NCCRs are planned for the medium term.

Today, it is primarily working people with children who are hardest hit by poverty. This and other important findings about Swiss society have been generated by programmed research. So far, the social sciences and humanities have accounted for almost half the spending on NCCRs. SPP "Switzerland – the Future" also yielded significant findings about Swiss society.

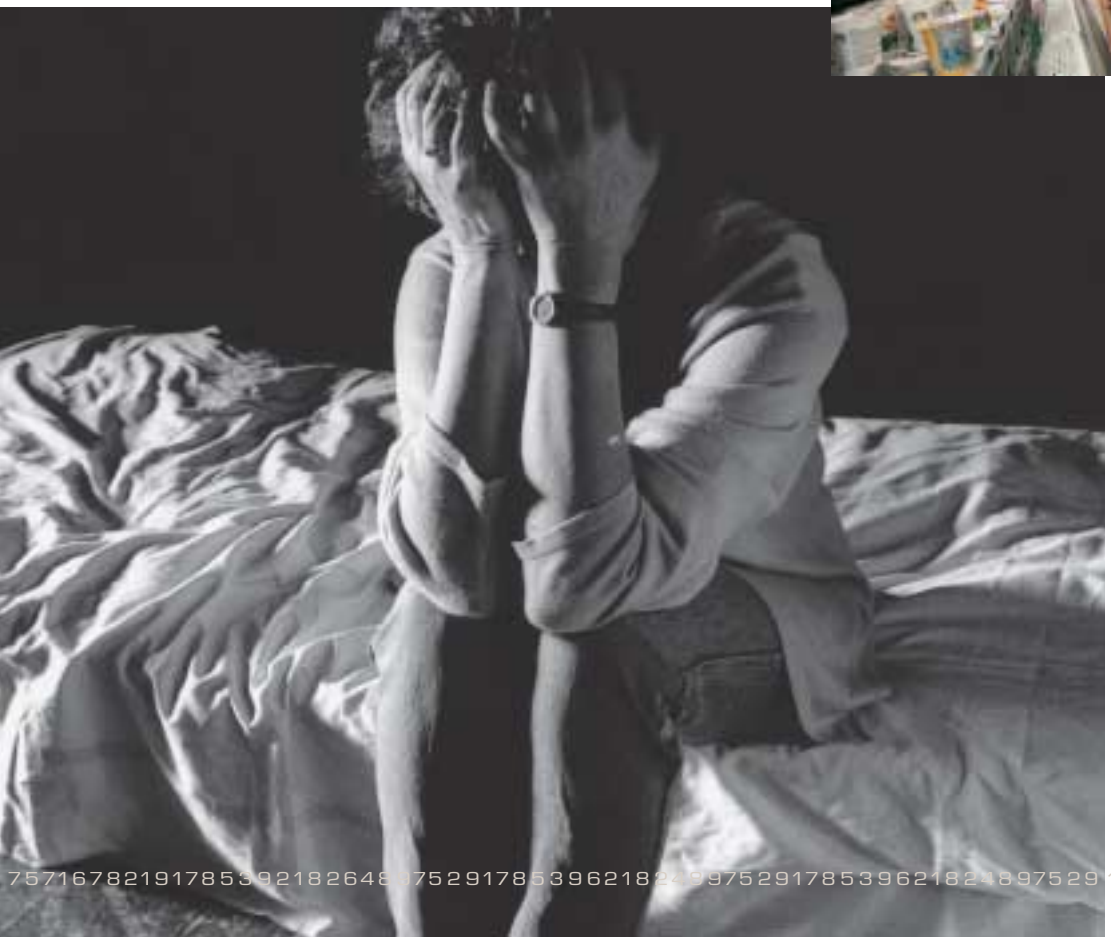
Swiss society in the throes of change

It is no longer the elderly who are poor, but working people, especially those with children. Some 60% of the poor are under 40. Single parents and single men are particularly hard hit by poverty. These are just some of the findings obtained in the first study of poverty covering the whole of Switzerland, which was directed by the economist Robert Leu from the University of Berne. Funded by the two National Research Programmes "Changing ways of life and social security" (NRP 29) and "Ageing" (NRP 32), the study focused on poverty and on quality of life in 1992. The national poverty study created awareness of the "working poor" and has become a key document in defining social and family policy.

The situation of elderly people, in contrast, has substantially improved since 1979, as has been shown by a study led by Christian Lalive d'Epinay from the University of Geneva. As long ago as 1979, this sociologist had surveyed the health and living conditions of elderly people drawing a state pension in central Valais and in Geneva as part of NRP 3 "Problems of social integration in Switzerland" and had repeated the survey in 1994 as part of NRP 32 "Ageing". The results of the survey demonstrated that the elderly, especially those under 80, have made considerable progress in terms of

health and mobility. While one third of those over 65 live alone, they are not isolated. They keep in closest contact with their children and grandchildren. Such contact has tended to increase and the elderly also have a more extensive network of friendships than before.

It's no longer the elderly who are poor – some 60% of those below the poverty line are under 40. This is one of the findings of a study of poverty that covered the whole of Switzerland.



Inadequate social reporting

Despite such studies, in 1993 the Swiss Science and Technology Council identified shortcomings in the Swiss social sciences and made recommendations for remedying the situation, including the creation of a Swiss Priority Programme (SPP) for the social sciences. The Swiss Federal Statistical Office also noted in 1994 that Swiss social reporting had a lot of catching up to do to match other European countries. As a result, SPP "Switzerland – the Future" was launched in 1996.

SPP "Switzerland – the Future" addresses a wider range of subjects than comparable National Research Programmes. One outcome of this SPP is the "Social Report 2000", which provides an overall view of the social changes that have occurred in Swiss society over the last 30 years. In particular, it reflects the rise of individualism since the late 1950s and the rapid changes in economic structu-

Drilled polar ice cores demonstrate that atmospheric CO_2 levels have increased by more than 30% as a result of the consumption of fossil fuels.

Climate change scenarios

Climate research is one of Switzerland's strengths. As long ago as 1979, the environmental physicist Hans Oeschger from Berne proved by means of air bubbles in drilled ice cores that carbon dioxide levels had risen by more than 30% over the past 250 years. SNSF research programmes have also made a major contribution to Swiss climate research, notably NRP "Climate change and natural disasters" (NRP 31) from 1992–1998 and the CLEAR module of the SPP "Environment" from 1992–1999. The research shows that, in both ecological and economic terms, the gradual shifts brought about by climate change have a more serious impact than extreme disasters. Swiss climate research also continues to be vigorously promoted in the National Centre of Competence in Research, "Climate", at the University of Berne, which came on stream in 2001.

res which took place in the 1990s. This transformation has resulted, on the one hand, in increased personal freedom for the individual and, on the other, in increased problems of integration.

Focus on households

Long-term observation is of particular significance in social reporting because its allows analysis of individual changes and interactions. This is why the household panel was set up in 1999 as part of SPP "Switzerland – the Future". In this programme, the members of some 5000 randomly selected households are surveyed once a year about their personal living conditions and satisfaction in relation to work, leisure, education, health and politics. Initial evaluations have revealed, among other things, that the traditional division of men's and women's roles is still very widespread. It will, however, be particularly interesting in ten or twenty years to correlate family type with the children's future prospects. However, this presupposes that the household panel will be continued after conclusion of SPP "Switzerland – the Future" in 2003.

Research programmes are intended to provide proposals for solutions to current problems. But what can be done to ensure that the results are genuinely relevant to the real world? The magic word is interdisciplinarity, which means involving a range of specialists and stakeholders from the very outset of the project. The research programmes are doing ground-breaking work in this connection.

Dialogue required

Researching as a team, especially with people from a different educational background and with different interests, is stressful, time-consuming and earns no scientific laurels. Nevertheless, it is the only way of devising workable practical solutions capable of meeting the demands placed upon them by society. Those working in programmed research, whether the National Research Programmes (NRP) or the Swiss Priority Programmes (SPP), are doing ground-breaking work in this connection. One successful result is, for example, the Grindelwald development model which was devised in the 1980s in collaboration with researchers from NRP "Man and the Biosphere" (MAB). The model has since been found to have had a decisive impact on sustainable local development. One particularly important factor was that the model had been widely debated at the preparative stage. As follow-up surveys have revealed, this made a fundamental difference to the attitudes of decision makers and the population.

Applied successfully in practice: The Grindelwald development model devised in collaboration with researchers from NRP "Man and the Biosphere". They had engaged in intensive discussions with decision-makers and the general public, which did much to ensure acceptance of the principles.

The "Stop Violence" project in NRP 40 "Violence in daily life and organized crime" has also been implemented successfully. This project has developed a model for combating domestic violence in the Canton of Basel-Stadt. Legal and sociological studies had revealed that insufficient use was being made of existing legal options, that the victims were not being adequately supported and that the offenders were hardly ever prosecuted. As a result of collaboration between the authorities, the Frauenhaus (women's refuge) and other institutions directly involved, a round-table forum for exchanging experience was created, professional development courses for the police, the public prosecutor's office and the criminal and civil courts were established, a social training programme for offenders was developed and public awareness was raised. The project is now being continued by the Canton of Basel-Stadt with both public and private funding.

An intervention model aimed at combating domestic violence was developed as part of NRP 40. It is now being further developed by the Canton of Basel-Stadt.

Incentive for healthy living

The very first NRP took its research results to the people. In a project entitled "Prevention of cardiovascular disease", the researchers attempted to win whole sections of society over to healthy living. Between 1978 and 1980, the research findings were put into practice in a prevention campaign involving courses, self-help groups and popular festivals in Nyon and Aarau. The campaign was a huge success, with the economic benefit being estimated at twice the costs. Its effects are still being felt: every year, well over 10 000 people attend some 60 events organized by the "Aarau eusi gsund Stadt" (Aarau, Our Healthy City) Foundation, which evolved from NRP 1.

Interdisciplinary research requires high-level project management skills and its success is still judged on the basis of traditional criteria of quality such as publication activity and frequency of citation – criteria which are not appropriate for an interdisciplinary approach to research. Researchers working on SPP "Environment" have addressed these issues and developed recommendations: for example, projects should not simply outline their subject matter, but should instead address specific issues and define clear targets. Moreover, the results should be subjected to evaluation in the light of the targets, requirements and context of the research.

Materials for the future

With their invention of the scanning tunnelling microscope, Nobel Prize winners Gerd Binnig and Heinrich Rohrer have given us an insight into the world of atoms and molecules. This has inspired researchers to investigate and structure surfaces and other materials on an ultra-small scale or to build tubes or wires only a few millionths of a millimetre thick which could be useful in new kinds of displays or miniaturized electronics. Internationally, Switzerland is among the leading nations in nanosciences, a discipline which is exciting chemists and biologists as well as physicists. This achievement is due at least in part to the National Research Programme "Nanosciences" (NRP 36), which came to an end in 2000. Basle researchers working on NRP 36, for example, have developed a special scanning force microscope which for the first time makes it possible to directly measure the forces between two atoms. Since 2001, the SNSF has also been promoting the nanosciences with a corresponding National Centre of Competence in Research at the University of Basle.

The ultrahigh vacuum, low-temperature, atomic force microscope developed by Hans Hug and his team not only provides brilliantly clear images of atoms on surfaces but can also move them individually.

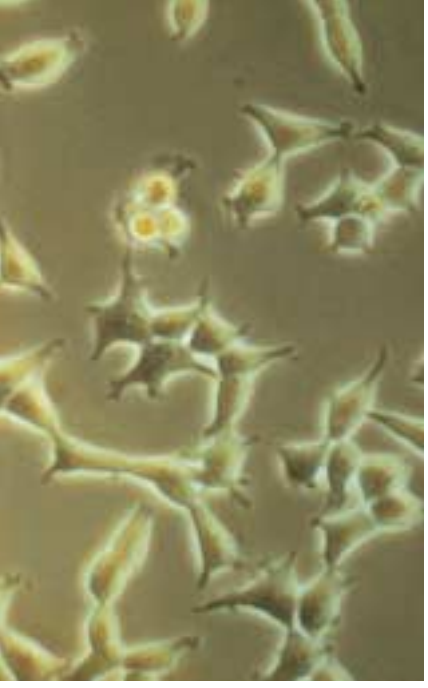
Technology transfer

Publication is not in itself enough to ensure that research results will benefit society. Another step has to be taken: technology transfer. Fostering technology transfer was one of the aims of the Swiss Priority Programmes. SPP "Biotechnology" has done pioneering work in the life sciences.

Tangible research success

While cooperative research projects between universities and industry in the life sciences were still few and far between ten years ago, the situation is now quite different thanks to the Swiss Priority Programme "Biotechnology" (SPP Biotech).

For example, Florian Wurm's team at the EPF Lausanne has developed an antibody which prevents rhesus negative mothers from mounting an immune response against their rhesus positive babies and which can be produced on an industrial scale. The present antibody preparation is obtained from blood, but the number of donors is falling as ever fewer women suffer such an immune response. The Lausanne-based researchers have solved this problem by using genetically modified hamster cells which produce these antibodies. The product, which was named MonoRho by the industrial partner ZLB-Bioplasma in Berne, is currently undergoing clinical trials and is expected to be commercially available in 2005.



A genetically engineered antibody has been developed which can prevent rhesus-negative mothers mounting an immune response against their rhesus-positive babies.

A vital success factor in this example of technology transfer was SPP Biotech's own Unitectra organization (formerly Biotectra), which was set up for this purpose. Unitectra supported researchers in finding the best implementation strategy, negotiating contracts, protecting intellectual property, forming spin-off companies and in other issues relating to technology transfer.

In the eight years since the programme began, more than 100 companies have, as transfer partners, made investments worth some CHF 10 million (in addition to about CHF 100 million of federal funding). SPP Biotech has borne further fruit in the form of 18 new start-up companies, over 70 patents and licences and an efficient technology transfer network with universities, federal institutions and economic development bodies.

Unitectra was converted into a not-for-profit public company. It has been owned by the Universities of Berne and Zurich since 1999, and advises researchers there on technology transfer issues.

Rapid BSE test

Prionics, which supplies the world's leading rapid test for mad cow disease (BSE), is a casebook example of successful technology transfer. Bruno Oesch and his team developed the prototype test in 1996 with support from the Swiss Priority Programme "Biotechnology". In 1997, the researchers founded the company Prionics with the assistance of the research programme's technology transfer organization. The start of the EU-wide BSE monitoring programme in early 2001 brought about the vital breakthrough, and the Prionics test is now sold worldwide under an agreement with Hoffmann-La Roche.

Future potential

"We have to foster our young academics, in particular talented young scientists! Formerly, a well-to-do social stratum with a solid tradition of education used to perform this function as a matter of course. Two world wars destroyed the economic foundations of this social stratum, and the people who have subsequently acquired wealth do not share this tradition. At the same time, the urge of young people for independence from their parents has grown enormously. Above all, we want to open the door to a successful academic and scientific career for talented young people from a less prosperous background!" These words were written on the occasion of the Swiss National Science Foundation's tenth anniversary.

From the very beginning the research commissions of the Swiss universities have played an important role in encouraging young research scientists – even if they were initially created as a concession to allay the suspicions of the cantons (as the 1953 Annual Report put it: "[The cantons] jealously watch out for any centralist tendencies that might creep into the federalist structure of cultural life").

Today, on the 50th anniversary of the SNSF, the figures speak volumes: half of all scientists working on research projects supported by the SNSF are under 30 years of age and three quarters under 35. Through a wide range of grants, fellowships and exchange programmes the SNSF has done, and is doing, all in its power to retain "talented young scientists" for research in Switzerland.

At the beginning of the 1990s, the realization that more than one third of all Swiss professors would be retiring by the end of the decade prompted the Federal Government, the cantons and the SNSF to take action. It was also a time of growing awareness of the position of women, and therefore efforts were initiated to create equal opportunities for them.

Promoting equal opportunities for women

The discussion about raising the proportion of women researchers began in earnest only in the 1990s. It is a topic that will continue to command the attention of the Swiss National Science Foundation well after its 50th anniversary. There is still a lot to be done in this field.

The long road to equal opportunities

There is, of course, already a long tradition of women research scientists. Some of the very first research proposals received by the SNSF in 1953 were submitted by women. But how long did it take for a woman to be appointed to the National Research Council? Until 1975, when Bärbel Inhelder, professor of psychology at the University of Geneva, was appointed as the first female member of the Research Council. In 2002, the National Research Council is composed of 66 men and 13 women, one of whom, Heidi Diggelmann, has been President since 1997 – the first woman to hold that post.

Since 1991, Marie Heim-Vögtlin grants have been helping women scientists resume their careers in research.

Returning to the lab after a career break: a challenge still fraught with difficulties and as topical as ever.

Although the proportion of women in the Research Council has risen to just 16%, it is still twice as high as in the Swiss universities, which provide the Research Council with most of its members. In 2000, the proportion of female professors in Switzerland was only eight percent.

Particularly the realization in the early 1990s that a wave of retirements among Swiss professors was pending generated a call to foster young scientific talent in general and talent among women in particular. In 1991, the SNSF initiated a special programme to advance the careers of women scientists. The Marie Heim-Vögtlin Programme, named after the first Swiss woman doctor (1845–1916), was established to help well qualified female research scientists in medicine and the natural sciences to resume their careers – in most cases after taking time off to start a family.

GRIPS recommendations

One advancement programme is not enough to achieve a sustainable improvement in the proportion of women in research. For this reason, in 1999 the SNSF created the "GRIPS Gender" reflection group, which presented its "Recommendations on Equal Opportunities for Women in Science and on the Furtherance of Gender Studies" in February 2001. One recommendation was implemented unusually quickly: the appointment of an SNSF equal opportunities delegate and the formation of an internal SNSF equal opportunities commission. Since the second half of 2001, delegate and commission have ensured that the other "GRIPS Gender" recommendations are not swept under carpet.

Fostering mature female scientific talent

In 2001, the SNSF decided to suspend the age limit for grants for prospective and advanced women research scientists on a trial basis. Up to then, the age limit had been 33 years for prospective and 35 years for advanced researchers. The motivation for this move was a finding of the "GRIPS Gender" reflection group that the proportion of research proposals submitted by women (24%) was low compared to the proportion of women among university graduates (41%). At the beginning of 2004, the SNSF will decide whether to continue the measure.

Brain drain

Research is international, without borders – one reason why many scientists find it so interesting in the first place. For national research institutions, however, the attraction of other countries can be a problem – especially when the exchange of research scientists is all in one direction.

Fear of a brain drain

The temptation: in 1957 the National Institutes of Health in the USA proposed that the Swiss National Science Foundation establish grants for young research scientists that would enable them to do one or two years of advanced medical research in the USA. The SNSF accepted the offer, but with a safeguard: only on condition that the recipients subsequently return to Switzerland. In the annual report of that year the SNSF explained: "Emigration is a modern form of service as a mercenary in foreign armies, one that affects our country all the more because of the dearth of talented young scientists here."

An undeniable SNFS success right from the start: In 2002, SNSF fellowships enabled 750 young Swiss scientists to undertake research abroad.

A fear of the so-called brain drain runs through the whole history of the SNSF – as does an understanding of its causes. As Alexander von Muralt, then President of the National Research Council, noted in 1967: "Elsewhere, particularly in North America, young emigrants find a much more open and enterprising atmosphere in industry and at the universities. They do not have to put up with the envy, the carping and the pressures an authoritarian older generation exerts on young people. And besides, they soon receive very good salaries."

Financing professorships

The SNSF has resorted to a variety of measures to stem the loss of Swiss research scientists. Whereas in the 1960s, for instance, the SNSF financed a special professorship to keep Werner Arber, a future Nobel prizewinner, in Switzerland, in recent years it has created "SNSF Professorships" for the purpose of, among other things, attracting the best people back from abroad. The interest is enormous: in 1999, the first 25 SNSF Professorships advertised attracted almost 400 applications – many of them from abroad.

What was it Alexander von Muralt wrote in 1967? "And yet: as soon as their children reach school age, Swiss living abroad express a desire to return home." >|

Before becoming a professor of economic science, Swiss government minister Joseph Deiss had been a beneficiary of an SNSF grant.

Famous recipients of grants

Paging through the annals of the Swiss National Science Foundation, one comes across one well-known name after another among prospective or advanced researchers supported by the SNSF – and not only people associated with the SNSF in another function, such as Heidi Diggelmann, the current President of the National Research Council, who was awarded a grant as a prospective researcher in 1966.

He is not the only federal minister to list an SNSF grant in his curriculum vitae. And a future foreign minister spent two years as an advanced researcher at Cambridge, UK, in the mid-70s. His name: Joseph Deiss.

And what have the historian Jean-François Bergier, the writers Adolf Muschg and Etienne Barilier, and Daniel Borel, the IT specialist and founder of Logitech, in common? All received SNSF grants as prospective researchers.

International relations

At the end of October 1952, less than three months after the founding of the Swiss National Science Foundation, Alexander von Muralt set off on his first trip abroad in his new position as President of the Research Council. He had been invited to attend the celebration of the 25th anniversary of the Belgian "National Fund for Scientific Research". In the first annual report of the SNSF, Muralt commented: "This occasion was a very welcome opportunity for us to experience and learn at first hand all that could be of interest for the future work of the Swiss National Science Foundation".

What began in Belgium grew in the course of the next fifty years into a network of relations that spans the globe. Today the Foundation maintains close contacts not only with the countries of the European Union, but also with the USA and states in the Far East such as China, Japan and South Korea.

Science is a global undertaking – one in which all the countries of the world should be able to participate. Motivated by this thought, in particular since the early 1990s, the Foundation has sought to improve its contacts with countries in need of support in the field of science. It has forged research partnerships with Eastern Europe and with developing countries of the South.

High-quality research tends also to be international research, and therefore many Swiss scientists build up their own networks of contacts with colleagues abroad. According to the estimates of the SNSF, about three quarters of all the basic research projects it supports involve international collaboration. Hence, normal project support – even if not declared as such – is in itself an important contribution to Switzerland's international research cooperation.

The European Research Area

Swiss institutions have been involved in European research programmes since the 1970s. But in this anniversary year of 2002, the wish of Swiss researchers to participate on an equal footing in EU research programmes has still not been fulfilled. But there are hopes that it will soon be realized.

The obvious contacts

Rome, 1961. The Research Council of the SNSF held its 100th meeting in the Italian capital "to establish new contacts and as a token of appreciation for the work of the members of the Research Council", as the annual report put it. The visit proved fruitful in many respects: "The concerns we have in Switzerland are shared by our colleagues in Italy and, as it turns out, in every country in Europe."

Shared problems bring people together. November 1974 was the turning point: more than 30 institutions from 16 European countries – including the SNSF – met in Strasbourg to found the European Science Foundation (ESF) with the goal of coordinating research in Europe, sharing expensive apparatus and equipment and organizing the exchange of qualified researchers.

From 1987 onwards, Swiss scientists were admitted to the research Framework Programmes of the European Community, although only on a project-by-project basis.

Full integration into the Framework Programmes was planned for 1992, at the time of Switzerland's accession to the European Economic Area (EEA). But the Swiss research community had not reckoned with the Swiss electorate, which rejected EEA membership in a referendum held on 6 December 1992.

The SNSF went on the offensive

In October 1995, in conjunction with the Federal Office for Education and Science, it opened a liaison office in Brussels under the name of SwissCore (Swiss Contact Office for Research and Higher Education). Switzerland now had a foot in the door of EU research. In the years since then, Swiss researchers have attested to their keen interest in EU programmes.

In 1961, the Research Council held its 100th meeting at the Swiss Institute in Rome, where it played host to its Italian counterpart, the "Consilio Nazionale delle Ricerche".

Developments in the European question have had a great impact on the SNSF's international policy. After the Swiss electorate's "no" to the European Economic Area and the conclusion of the bilateral agreements with the EU, Switzerland is still faced with the challenge of full participation in the European Research Area.

The desire for full integration into European research will not be fulfilled in time for the 50th anniversary of the Swiss National Science Foundation; France and Belgium did not complete the work on the necessary bilateral treaties in time.

Patience pays off in the long run. With ratification in the pipeline, all that is lacking is money. Which brings us back to the Swiss Parliament. It is up to them to allocate, in this anniversary year, the necessary funds that will allow Switzerland to participate in the EU's 6th Framework Programme, as though it were a full member of the EU.

Strengthening scientific cooperation with developing countries develop their high innovative potential: an SNFS objective that raises intercultural problems.

Links with the Far East

In recent years the SNSF has boosted its scientific cooperation with four countries in the Far East: China, Japan, South Korea and Taiwan. In 1999, the Swiss embassy in Japan decided to find out what motivated scientists to take part in research cooperation. It conducted an unrepresentative survey of 95 Japanese and 165 Swiss researchers. The result: Japanese science enjoys a very good reputation among the Swiss. Conversely, few Japanese have a clear perception of Switzerland – at least as a centre of research.

The SNSF had already set up a new fellowship programme in conjunction with the Science and Technology Agency in Tokyo in 1991. As the SNSF noted in its annual report for the same year: "In the case of Japan in particular, there is a danger that language and cultural barriers will deter Swiss research scientists from exploiting existing opportunities to the full."

North-South, East-West

What do the revolutionary changes in the states of the former eastern bloc and the Earth Summit in Rio have in common? In the early 1990s they were causal factors in the rapid expansion of part of the SNSF's international cooperation: research partnerships to assist development in states whose research potential is either unexploited or has collapsed.

Narrowing the gap between rich and poor

"We refuse to see the problems of the 21st century and continue to defend our own research patch, while forgetting that 80% of the world's population is left to share little more than 3% of global spending on science and technology." With these words in an article in "Horizonte" in 1996, Bruno Messerli, geography professor in Berne, pilloried the North's disinterest in the South. Messerli had been a scientific representative in the Swiss delegation to the Earth Summit held in the Brazilian city

of Rio de Janeiro in 1992. A scientific conference at the time had drawn up the “Agenda of Science for Environment and Development into the 21st Century” – “Agenda 21”, for short.

Two years after the Rio summit, the new Swiss Priority Programme (SPP) “Environment” launched its “Development and Environment Module” with the support of the Swiss Agency for Development and Cooperation (DEZA). This module consisted of bilateral research partnerships in which Switzerland and countries of the South collaborated on an equal footing – a model that worked well. In 1999, the SNSF and DEZA launched a new, separate programme to promote partnerships in developing countries.

At about the same time as the SNSF began working more closely with the South, it also started to look towards Eastern Europe, to those states whose economies were collapsing after the fall of the Wall. The SNSF and DEZA set up a cooperation programme that initiated a range of contacts between East and West in the period 1990–1998. The programme was relaunched for the period 2000–2003 under the name of SCOPES.

With SNFS and DEZA support, partnerships between Swiss and African scientists are creating a basis for sustainable development.

A fund for researchers in developing countries

The SNSF has been involved in research in developing countries for the past 25 years. In 1997, it was a founder member of the International Foundation for Science (IFS), whose resources are used primarily to support scientists from the South. The IFS is based in Stockholm and 70% of its budget is funded by the Swedish state. The SNSF has been one of its most important sponsors since the beginning. Although the funds of the IFS are relatively limited, it awards fellowship worth about USD 10000. This may not be much for researchers in the North, but for scientists in the South it is a princely sum.

Heavy tomes

They still get published, the heavy tomes compiled in scholars' studies. Not all knowledge can be condensed into a few pages in an international scientific journal. Since its inception, the Swiss National Science Foundation has helped to defray the publication costs of scientists who want to publish a valuable, but expensive work.

Because there is only a limited market for scientific books, publishing houses usually print only small runs and so their production costs are high. This is as true today as it was 50 years ago, although publication grants as a proportion of the Foundation's total expenditures decreased from 2.2% in the 1950s to 0.8% in the 1990s, and the average grant per proposal fell from about CHF 34 000 in 1990 to just under CHF 17 000 in 2000.

But many research groups still depend on publication grants, in particular those working on costly long-term projects, such as the "Swiss Diplomatic Documents" (1848–1945 completed, 1945–1961 in progress), the history of religious centres in Switzerland ("Helvetia sacra", in which five publishing houses are involved) and the collected works of the Bernoulli family of mathematicians.

The Bernoulli publication is an exception in that it is essentially a mathematical project. As a rule, the Foundation's publication grants are restricted to book projects in the humanities, where the need is greatest. As the Foundation wrote in 1953: "Assistance with publishing a work means as much to a scholar in the humanities as the procurement of an indispensable piece of apparatus does to a natural scientist."

It was a project sui generis: The majority of experts in Swiss constitutional law got together to write a joint publication. Their "Commentary on the Swiss Federal Constitution of 1874" laid the foundation for a clearer interpretation of the law – and even though a new Federal Constitution came into force in 2000, it remains a invaluable source.

A communal venture

Usually too many cooks spoil the broth. But this obviously does not apply to jurists. At the beginning of the 1980s, leading Swiss constitutional scholars decided to write a new commentary on the Swiss Federal Constitution of 1874, then still in force. The previous commentary dated from 1931.

This was the beginning of a bold undertaking, which the editors described in the foreword of the first completed instalment of the work as follows: "This is a hazardous undertaking in so far as this task is not the work of a single academic, or even of a small, homogeneous work group, but of a total of 26 co-authors, including most of the full-time professors and lecturers in constitutional law in Switzerland." When the commentary was completed in early 1996, the number of co-authors had risen to 37.

Not a "cohesive" work

It is obvious that there will be complications and disadvantages to such a large number of authors. As the five editors and the editor-in-chief, Heinrich Koller write: "A lack of uniformity, gaps, overlapping and fundamental differences in approach necessitate an enormous coordination effort in terms of material and time, in the knowledge that it is impossible to produce a 'cohesive' work." This can be

32 hefty volumes on Gottfried Keller

His complete literary works are being published and interpreted: the Swiss author Gottfried Keller.

It will be the most comprehensive SNSF publication ever: the "Critical Edition of the Works of Gottfried Keller". A total of 32 volumes will present and interpret the complete literary oeuvre of the Swiss author, who is regarded as one of the most important writers of the 19th century.

In addition to the 32 volumes, the edition comes with a CD-ROM that contains a text database, all the letters relevant to the history of Keller's writings, additional source material, all contemporary reviews, and reproductions of pictures that illustrate Keller's life and work.

The research project started in 1993 and is financed by the Stiftung für eine Historisch-Kritische Gottfried Keller-Ausgabe (Foundation for a critical edition of the work of Gottfried Keller). The research group, which comprises two full-time and three half-time posts, has been producing two to three volumes a year. The total cost of the project is estimated at a little less than CHF 10 million, half of which will be funded by the SNSF, with the Canton of Zurich and private sources providing the rest. The research project plans to complete its work in 2011.

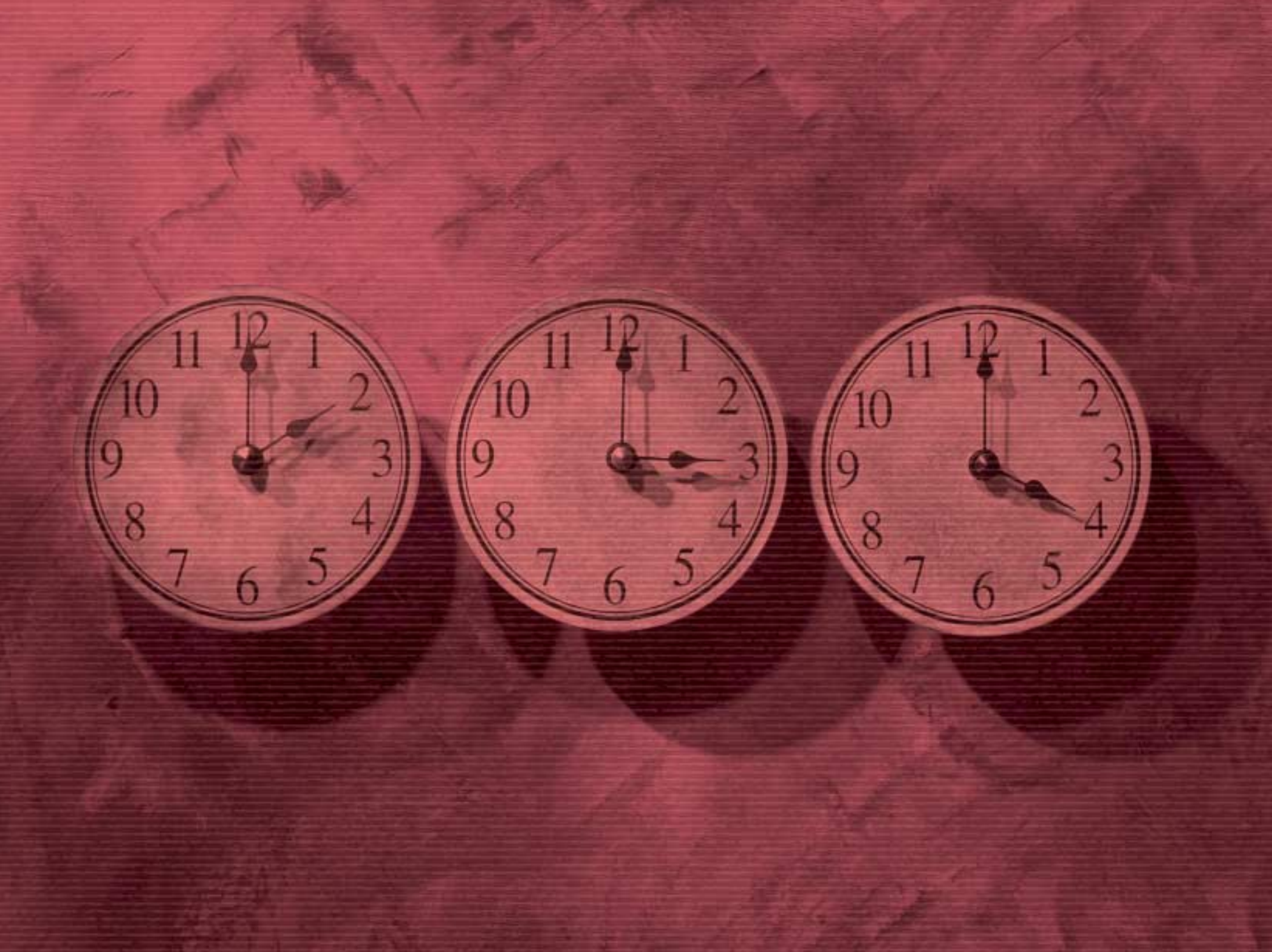
taken quite literally: the new commentary is published as a series of loose leaves that can be collected in files and thus added to as required without any problem.

It was not only the experts in constitutional law that got together. Three leading legal publishers agreed to a joint publication. The work was financed by the Foundation, the Conference of the Cantonal Ministers of Justice and the cantons.

The new Federal Constitution benefited from the "Commentary on the Swiss Federal Constitution of 1874" – to the delight of government ministers Koller, Dreifuss and Villiger.

Foundation for a new constitution

From the very start of their work, those responsible for the project were aware of plans for a thorough revision of the Swiss Federal Constitution. Already in 1987 they wrote: "If a completely revised Federal Constitution comes into effect in this century, a valid commentary on the Constitution of 1874 will provide a reliable foundation for a bridge between the old law and the new." And indeed, the bridge was built: on April 18th 1999 the Swiss electorate voted for a new Federal Constitution, which came into force on 1st January 2000.



1952 > 2002

The light touches of history

Great history is made up of small events. It is with this idea in mind that the various events that marked the passage of 50 years for the Swiss National Science Foundation (SNSF) have to be looked at. A chronicle of political links established on a national and international level, of scientific contacts between scientists promoted by SNSF, and last but not least of the developments within an institution focused on its tasks.

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1952 **Birth of the SNSF** A Federal Ordinance passed by the Federal Parliament on March 21st establishes the Swiss National Science Foundation. The Foundation's inaugural session takes place on August 1st in the chamber of the Council of States | **The Research Council's first meeting** is held at the Theodor Kocher Institute in Berne on September 16th |

1953 **Publications** Special commission set up to liaise with publishers | **Annual Federal grant** overspent for the first time by CHF 1 million | **Premises** Home for the SNSF is a 5-roomed apartment at 55 Effingerstrasse, Berne | **Peter Sutermeister** replaces Gerhard Schürch in the SNSF Secretariat | **The SNSF makes an appearance** at the Comptoir de Lausanne fair from September 12th to 27th with its "Atoms and radiation" pavilion |

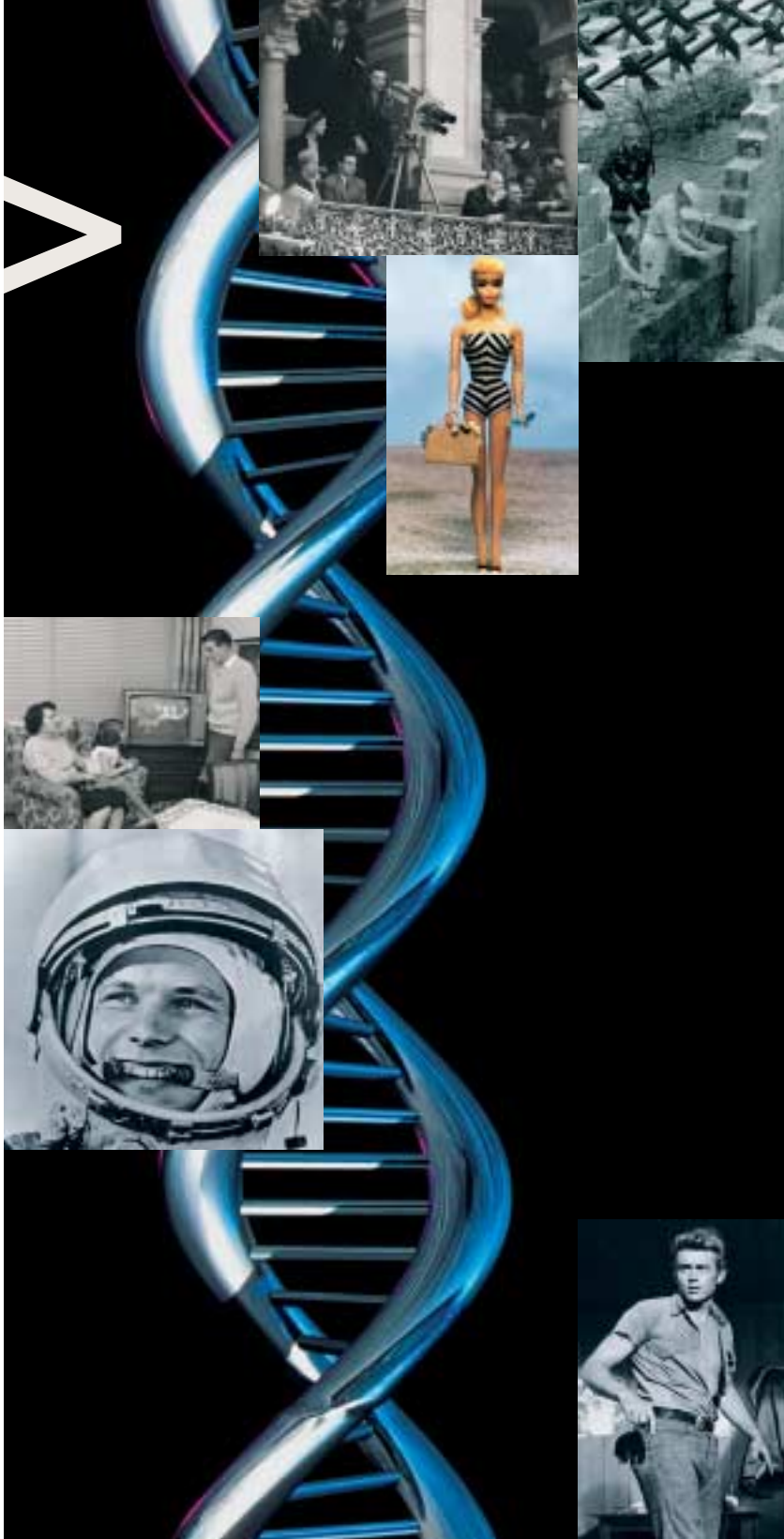
1954 **Ivory Coast** The situation at the Apodioumé tropical research station is critical. The SNSF decides to release funds to provide rapid assistance | **A grant = a donation** The Swiss Confederation stops taxing grants | **An accounts department** is set up with an adviser appointed by the Federal Department of Finance in order to maintain better control of the grants system |

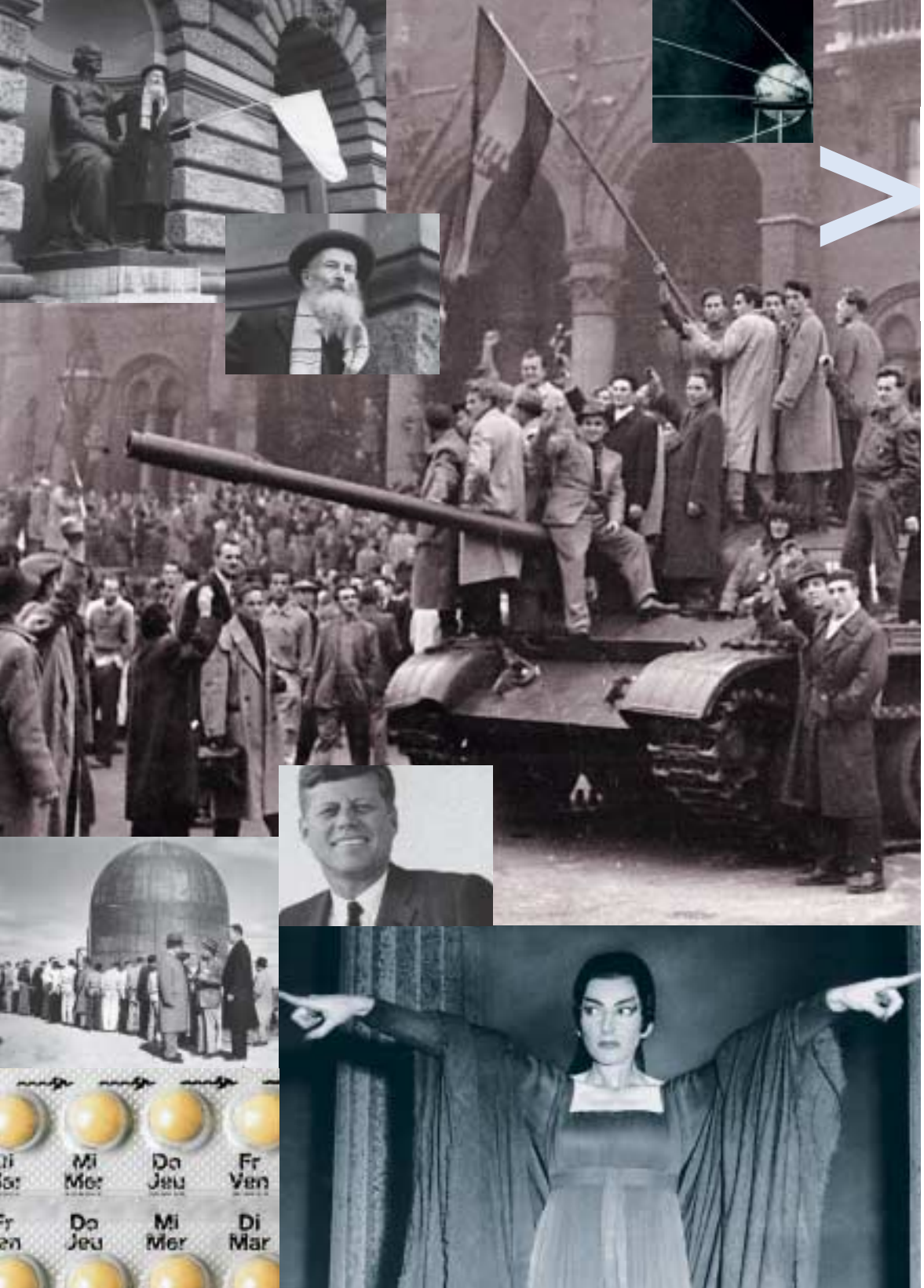
1955 **SNSF approves funding** of CHF 250 000 for participation in the International Year of Geophysics (1957–58) | **Overloaded** The National Research Council has to postpone the assessment of 80 applications to the following year | **Italian-speaking Switzerland** Research Commission set up | **First private donation** The Bernard van Leer Foundation in Lucerne donates CHF 2 000 to the SNSF |

1956 **Annual Federal grant** overspent to the tune of CHF 2 million |

1957 **Sputnik launched** SNSF applauds the achievement but regrets that it should be seen as a symbol of the "superiority of a certain world view" | **Nobel Prize for medicine** awarded to Daniel Bovet, a Swiss from Neuchâtel working in Italy, for his discoveries relating to synthetic compounds that inhibit the action of certain body substances, and especially their action on the vascular system and the skeletal muscles | **Fellowships in medicine** The National Institutes of Health (NIH) approach the SNSF offering to establish fellowships to finance young Swiss citizens studying in the USA. The SNSF accepts, provided that the researchers return to Switzerland after their time there |

1958 **World Fair in Brussels** SNSF exhibits in the international science pavilion, which is primarily devoted to physics | **CSA** The incorporation of the Commission for atomic science (CSA, chaired by Paul Scherrer) into the National Research Council means that SNSF receives





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CHF 50.5 million for basic research into atomic energy over the period 1958–1962 | **H. R. Hahnloser** is the successor of Joseph Kälin as President of the Foundation Council | **Wildhainweg** the SNSF acquires a house at 20 Wildhainweg to accommodate its Secretariat |

1959 **Personal grant** An innovation, this grant is awarded personally to a specific researcher. In this way, the SNSF makes it possible for universities and scientific institutions to benefit from the services of a leading scientist even if they have no vacant post to offer | **Otto Naegeli Prize** Thanks to the legacy of Mrs. Regina Thürlimann, born Rohner, from Rebstein, this prize will be awarded annually to a medical scientist |

1960 **Prizewinner** Franz Leuthardt, professor of physiological chemistry at the University of Zurich, is awarded the first Otto Naegeli Prize worth CHF 100 000 | **The Werner Näf Prize** for studies in ethics is established in memory of this renowned historian, who was one of the first members of the Research Council |

1961 **The National Research Council** holds its 100th session in Rome in the premises of the Italian National Research Council and the Swiss Institute in Rome | **A. Labhardt** is President of the Foundation Council |

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1962 **Budget** The Federal Council increases the SNSF's annual grant to CHF 23 million | **The Commission for atomic science** (CSA) is disbanded at the end of the year; its members join the National Research Council. Over five years, the CSA has awarded 584 grants together worth CHF 50 million | **Divisions** From now on, applications in philosophy, history, theology, law, economics and sociology will be assessed by Group I and those in medicine, natural and engineering sciences, agronomy and forestry will be assessed by Group II | **Appeals** Appeals Commission set up and tasked to settle disputes with applicants |

1963 **Europe** Given the high profile of Swiss scientists in European research projects, a representative of the Federal Political Department is appointed to the Foundation Council | **New organ** The Foundation Council's Control Committee carries out the groundwork for Foundation Council decisions. The Control Committee has ten members: five scientists and five appointed by the authorities | **Biology and medicine** Promotion of projects in these two disciplines is made a priority |

1964 **Success** The number of applications is rising and the average grant awarded per application has risen from CHF 40 000 to 64 300 in five years | **F.-J. Burrus Fellowship** this annual fellowship worth CHF 30 000 donated by the company of the same name is awarded by the National Research Council to a young researcher, with rotation of disciplines | **National fair in Lausanne** The SNSF's stand "Radiation" is an unqualified success |

1965 **Formation** of Swiss Science Council | **Research centres** SNSF finances four centres, previously the responsibility of the Swiss Confederation, and opens the Swiss Institute for Tumour Research in Berne, which it funds completely | **Plasma physics** The Foundation Council decides to build a plasma physics research centre in Lausanne | **The National Research Council** sets up an Executive Committee responsible for the efficient handling of administrative matters | **Submission of applications** is restricted to two dates, March 31st and September 30th |

1966 **Hans Nef** is President of the Foundation Council | **Post of Secretary General established** The first incumbent is Max Blumenstein, from October. The Secretary General manages the SNSF's administrative affairs | **Divisions** The National Research Council divides itself into three Divisions (I = Humanities; II = Natural and Exact Sciences; III = Biology and Medicine) | **Wildhainweg** SNSF receives permission to build an administrative building at number 20 to accommodate the Secretariat |

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1967 **H. Nef** takes over as President of the Foundation Council from A. Labhardt | **Royal Society** Scholarship exchange programme set up with United Kingdom | **A survey** by the Directorate of the Swiss Federation of Commerce and Industry ("Vorort") reveals that private sector applied research and development employs 7312 researchers and spends an estimated CHF 1.15 billion |

1968 **Passing** of the Federal Law on assistance to universities, formation of the Conference of Swiss Universities and establishment of a Science & Research Division in the Swiss Federal Department of the Interior. | **Passing** succeeds Alexander von Muralt as President of the National Research Council on March 31st | **Secretariat** (32 staff) moves into offices at 20 Wildhainweg. The Secretariat is organized into Divisional Secretariats following the pattern of the National Research Council | **The SNSF** introduces grants for scientific conferences or meetings held in Switzerland |

1969 **Moon** The SNSF sets foot on the moon thanks to Johannes Geiss, professor at the University of Berne, and his work on the capture of solar wind | **Liechtenstein** The principality makes an annual grant to the SNSF of CHF 50 000 | **Public health** The SNSF assumes responsibility for promoting research in clinical medicine and public health | **Peter Fricker** succeeds Max Blumenstein as Secretary General |

1970 **Inaugural session** on May 14th of the Health Research Commission in the presence of Federal Councillor H. P. Tschudi. Although part of Division III, the Commission is semi-autonomous | **Ulrich Meyer-Boller** is President of the Foundation Council |

1971 **The National Research Council** celebrates its 200th plenary session at Bad Godesberg with its German sister organization, the Deutsche Forschungsgesellschaft | **The Secretariat** is strengthened by establishing a grants department, a facilities department and an information and documentation department | **The Plasma Physics Laboratory** celebrates its 10th anniversary |

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1972 **Inflation** The SNSF considers itself “hard hit by inflation and its consequences” | **Project database** Purchase of an IBM 3/10 computer for the Secretariat |

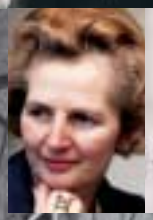
1973 **ESF** Preparatory work to set up the European Science Foundation | **Rising numbers of applications** for Fellowships for Prospective Researchers in experimental biology, biochemistry, physics and history | **Archaeology** The excavation series in Eritrea celebrates its 10th anniversary |

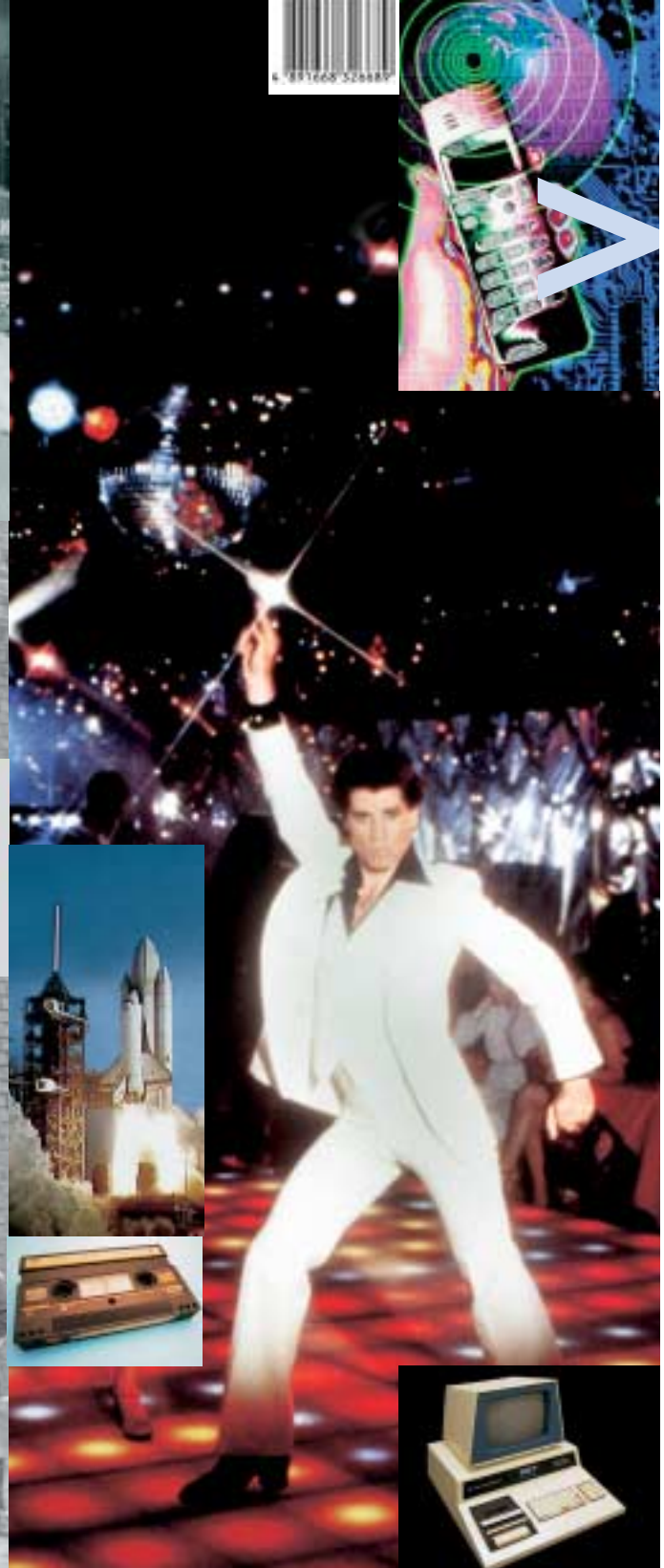
1974 **ESF** European Science Foundation established in November, with Olivier Reverdin as Vice-President | **Creation of NRPs** The Federal Council authorizes the SNSF to organize and manage national research programmes into areas which will make a contribution to solving the problems faced by society | **Ernst F. Lüscher** is the successor of Ulrich Meyer-Boller as President of the Foundation Council |

1975 **Nobel Prize for chemistry** awarded to Vladimir Prelog, a Bosnian scientist working in Switzerland (ETH Zurich) for his research into the stereochemistry of organic molecules and their reactions | **Division IV** The SNSF reorganizes its structure to be able to handle its new tasks. The number of Research Council members is increased to a maximum of 60; a new division is born, Division IV “National Research Programmes” | **NRPs** Four national research programmes are launched in hydrology, medicine, social sciences and energy |

1976 **Message** The Message on the new Federal law on assistance to universities attracts criticism about the SNSF’s autonomy | **Division III** takes over responsibility for research in clinical, social and preventive medicine from the Health Research Commission |

1977 **ISF** The SNSF contributes to the newly founded International Science Foundation, which promotes science in developing countries | **Limits** Applications exceeding CHF 150 000 for





the humanities, CHF 200 000 for NRPs, 250 000 for biology and medicine and CHF 400 000 for the exact and natural sciences are referred to the Foundation Council for approval |

Art The SNSF commissions a “cycle of ten works on paper” from the Fribourg artist Bruno Baeriswyl for its plenary chamber |

1978 **Heinrich Zollinger** is President of the Foundation Council |

Nobel Prize for medicine awarded to Werner Arber at the Biozentrum of the University of Basel for the discovery of restriction enzymes and their application to problems of molecular genetics |

1979 **Stagnation** Federal funding has been stagnating in real terms since 1970, only just keeping pace with rises in the cost of living |

1980 **Alfred Pletscher** succeeds Olivier Reverdin as President of the National Research Council. Successors have to found for ten places on the Research Council | **Appeals** Set up in 1963, the Appeals Commission is abolished. The Swiss Federal Department of the Interior will now handle any appeals by researchers against SNSF decisions |

1981 **SATW** The newly formed Swiss Academy of Technical Sciences has two representatives on the SNSF Foundation Council |

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1983 **The Federal Law on research** is passed by both Chambers in October; the SNSF's mission is set out in article 8 | **Jean-François Poudret** succeeds Heinrich Zollinger as President of the Foundation Council |

1984 **Nobel Prize for medicine** awarded to the Dane Nils K. Jerne and the German Georges J. F. Kohler of the Institute of Immunology in Basel, for theories concerning specificity in the development and control of the immune system and the discovery of the production principle of monoclonal antibodies | **Industry** First industrial exchange grants, jointly financed by the SNSF and the company concerned, are awarded | **Latsis Prize** First Latsis Prize, worth CHF 100 000, is awarded to Jürg Fröhlich from ETH Zurich | **Information** The NRPs have their own press department |

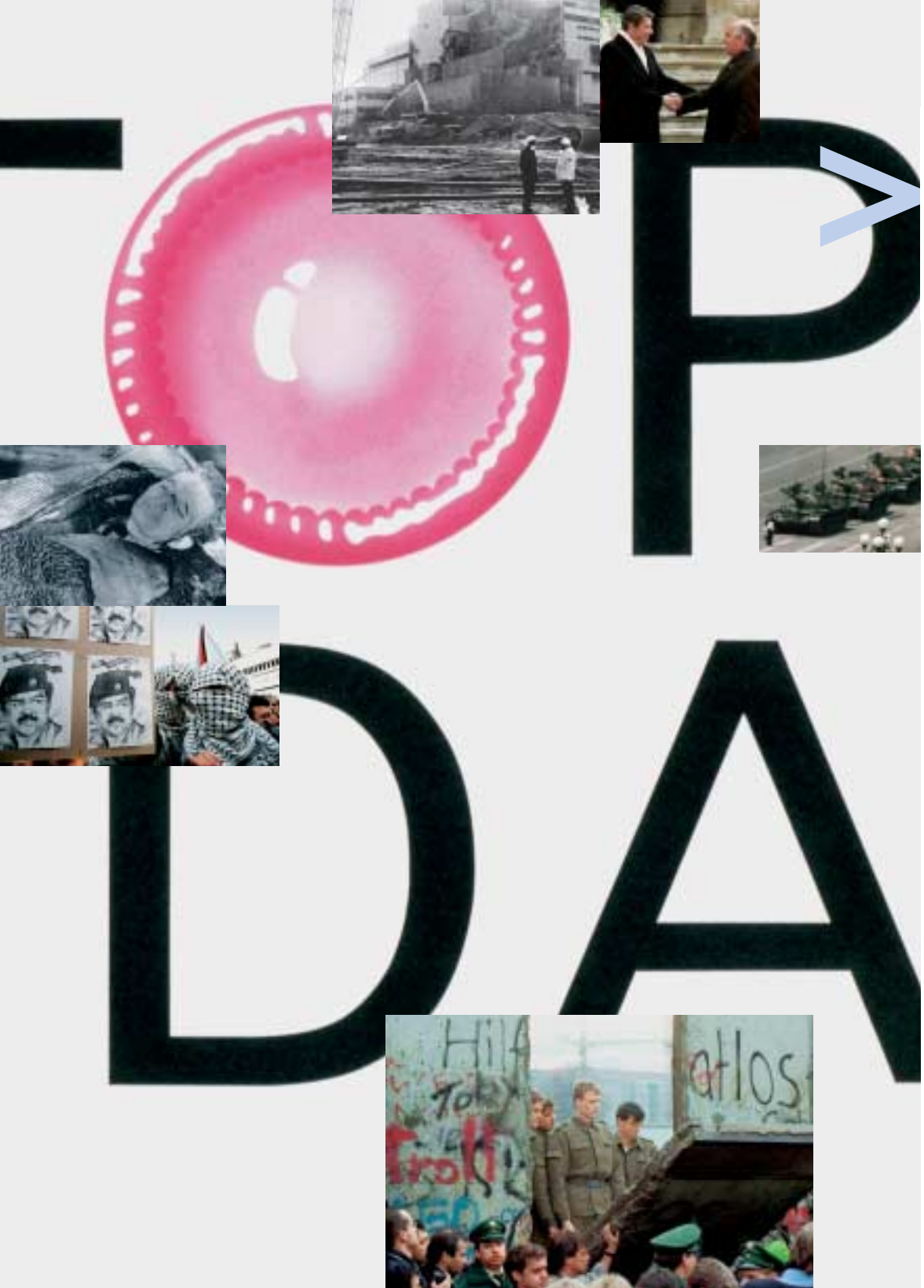
1965 **EUREKA-ESPRIT** The SNSF participates in these two European research programmes: EUREKA focuses on cooperation between science and high technology industries and ESPRIT on the development of information technologies | **Foreign nationals** Non-Swiss researchers who have worked in Switzerland for five years can become members of the Research Council | **Division II** The official name is now "Mathematics, Natural and Engineering sciences division" in order to take account of developments in the latter field |

1986 **Nobel Prize for physics** awarded to Heinrich Rohrer (IBM Laboratory, Rüschlikon) for the design of the scanning tunnelling microscope | **Federal grant** At last, the increase exceeds the rise in the cost of living (from CHF 169 million in 1985 to CHF 195.6 million in 1986) | **Alfred A. Schmid** is President of the Foundation Council |

1987 **Nobel Prize for physics** awarded to K. Alexander Müller and J. Georg Bednorz (IBM Laboratory, Rüschlikon) for their important breakthrough in the discovery of superconductivity in ceramic materials | **Budget** The Federal Parliament accepts the SNSF's new four-year plan, which does away with across the board cuts of 10% | **700th Anniversary** CHF 3.5 million are earmarked for celebrating the Swiss Confederation's 700th anniversary in 1991 |

1988 **Horizonte/Horizons** The first issue of SNSF's quarterly research magazine is published | **The Otto Naegeli Prize** is awarded to Rolf Zinkernagel. From now on, the prize will be awarded every two years | **André Aeschlimann** succeeds Alfred Pletscher as President of the National Research Council |

1989 **Reorientation** The Federal Council redefines the direction of research. New technologies, the environment and the individual, society and the State are among the priorities. The SNSF follows these directions in its research promotion activities |



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1990 **International** Coordination between research groups becomes difficult. Researchers are no longer working simply in bilateral relationships but also in European and international contexts | **National** Science and research group headed by State Secretary Heinrich Ursprung is set up | **Jean Cavadini** takes over as President of the Foundation Council from Alfred A. Schmid | **Alexander von Muralt** dies on May 28th, aged 87 |

1991 **Swiss Priority Programmes** Directed more towards problem-oriented research than the NRPs, the Priority Programmes are launched at the beginning of the year. Parliament selects the subjects and the Federal Council puts the SNSF in charge of managing three Priority Programmes on information technology, the environment and the biotechnology | **Promotion of women** first mention in the annual report. The Marie Heim-Vögtlin fellowships, named after Switzerland's first woman doctor, in Divisions II and III allow women who, for family reasons, have stopped working to resume their scientific careers | **Heurêka** Major science exhibition supported by the SNSF and Switzerland's universities as part of the Swiss Confederation's 700th anniversary celebrations | **Nobel Prize for chemistry** awarded to Richard Ernst for his contributions to developing the methodology of nuclear magnetic resonance (NMR) spectroscopy | **Aids** The SNSF assesses applications in this subject area for the first time |

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1992 **EEA** The Swiss people reject Switzerland's membership of the European Economic Area. The SNSF becomes the point of contact for Swiss scientists for three European programmes | **Hans Peter Hertig** is appointed Secretary General in succession to Peter Fricker | **SUPRA 2** Focused action by Division II to strengthen research into novel superconductive materials | **AGENDA** The first NRP information bulletin is published |

1993 **INTAS** Switzerland joins the International Association for the Promotion of Cooperation with Scientists from the Independent States of the former Soviet Union | **Young scientists** The SNSF launches several programmes to foster young academics: ATHENA in the social sciences, PROFIL in mathematics, natural and engineering sciences, START, SCORE and PROSPER in biology and medicine |

1994 **GRIPS** The National Research Council sets up GRIPS, a number of SNSF working parties charged with examining SNSF procedures and practices in various areas | **Formation** of International Relations department in the Secretariat | **Ralf Hütter** is President of the Foundation Council |

1995 **SwissCore** The Swiss Contact Office for Research and Higher Education, which liaises between Swiss researchers and Europe, is opened in Brussels | **"Switzerland – the Future"** launch of this new Priority Programme | **Information** SNSF expands its press and information service |

1996 **Heidi Diggelmann** is the first female President of the National Research Council | **Focused action** Division II launches R'Equip, intended to finance scientific equipment, while Division III launches TANDEM, intended to promote clinical medicine | **Nobel Prize for medicine** awarded to Rolf Zinkernagel, from the University of Zurich, for discoveries concerning the specificity of cell-mediated immune defence | **Star** In Florence, the astronomer Michel Mayor from Geneva causes a sensation by announcing the discovery of the first planet outside the solar system |

1997 **Swiss-Prot** Division III supports the creation of this protein database, a world-class tool essential in biological research |

1998 **Genetic engineering** The Swiss population's "No" vote in the referendum is a relief to the scientific community |

1999 **The 2000–2003 Pluriannual Programme** is approved by Parliament. The National Centres of Competence in Research, funded to the tune of CHF 148.5 million, can be launched, as can a new tool for fostering young scientific talent – the SNSF Professorships (allocated funding of CHF 61 million) | **SCOPES** The scientific cooperation programme with former

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eastern bloc countries, managed by the SNSF on behalf of the Swiss Agency for Development and Cooperation (DEZA) will continue under this new name | **Fritz Schiesser** is the successor of Ralf Hütter as President of the Foundation Council | **AIDS** The AIDS research coordination commission becomes part of Division III |

2000 **Assessment** of the 34 National Centres of Competence in Research projects (from the 84 proposals received) | **DO-RE** To promote research at the universities of applied sciences, the SNSF and CTI (Committee for Technology & Innovation) launch the DO-RE (Do Research) initiative |

2001 **Assessment** The Federal Council instructs the Swiss Science Council to assess the SNSF. An international group of experts is appointed | **NCCRs** Selected by the Swiss Federal Department of the Interior, the first fourteen NCCRs begin their activities | **Stem cells** The SNSF announces that it will support a project involving the importation of human embryo stem cells | **Women** The SNSF removes a formal barrier to women entering a scientific career by suspending the age criterion for Fellowships for two years

2002 **Survey** A survey conducted by SIDOS among researchers supported by SNSF reveals that they are very satisfied with the organization | **Assessment** The Swiss Science & Technology Council issues its report on the assessment of the SNSF | **Jubilee** The SNSF organizes various events to celebrate its 50th anniversary |

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1981–1987 Prof. Alfred Pletscher
1988–1996 Prof. André Aeschlimann
1997–2002 Prof. Heidi Diggelmann

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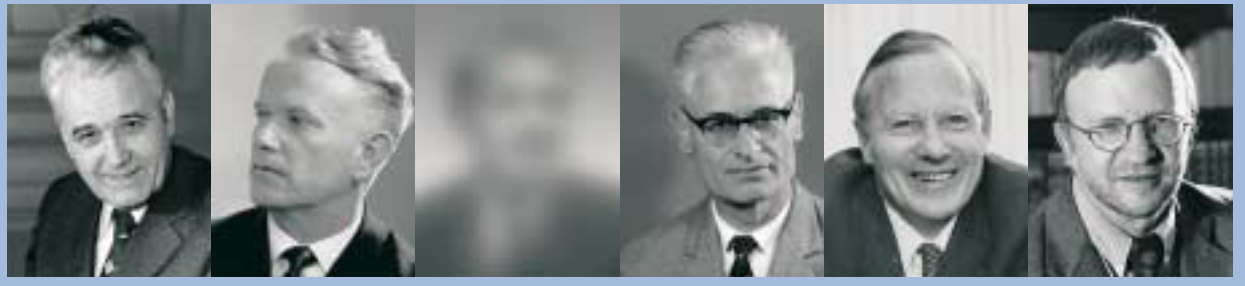

Names and faces

Dedicated to science

The Swiss National Science Foundation could not have thrived without the countless scientists and prominent figures from government, the arts and business who, on an honorary basis, take important decisions in the Foundation Council, Research Council and Research Commissions – assisted by the Secretariat, which manages the day-to-day business of promoting research.

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EPFL	Federal Institute of Technology Lausanne
ETHZ	Federal Institute of Technology Zurich
RC Div. I	Research Councillor Division I
RC Div. II	Research Councillor Division II
RC Div. III	Research Councillor Division III
RC Div. IV	Research Councillor Division IV
SG	Secretary-General
DSG	Deputy Secretary-General
HSG	Federal Institute of Technology/University of St Gall
Ital	Italian-speaking Part of Switzerland
Pres. FC	President of the Foundation Council
VPres. FC	Vice-President of the Foundation Council
Pres. RC	President of the Swiss National Research Council
VPres. RC	Vice-President of the Swiss National Research Council
Pres. RCom	President of the Research Commissions
SAGW	Swiss Academy of Humanities and Social Societies
SAMW	Swiss Academy of Medical Sciences
SANW	Swiss Academy of Natural Sciences
SATW	Swiss Academy of Technical Sciences
SSH	Swiss Society of Humanities
SSES	Swiss Society of Economics and Statistics
SLA	Swiss Lawyers' Association
SSNS	Swiss Society of Natural Sciences
UniBas	University of Basle
UniBe	University of Berne
UniFr	University of Fribourg
UniGe	University of Geneva
UniLa	University of Lausanne
UniNe	University of Neuchâtel
UniSi	University of the Italian-speaking Part of Switzerland
UniSG	University of St Gall
UniZH	University of Zurich

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