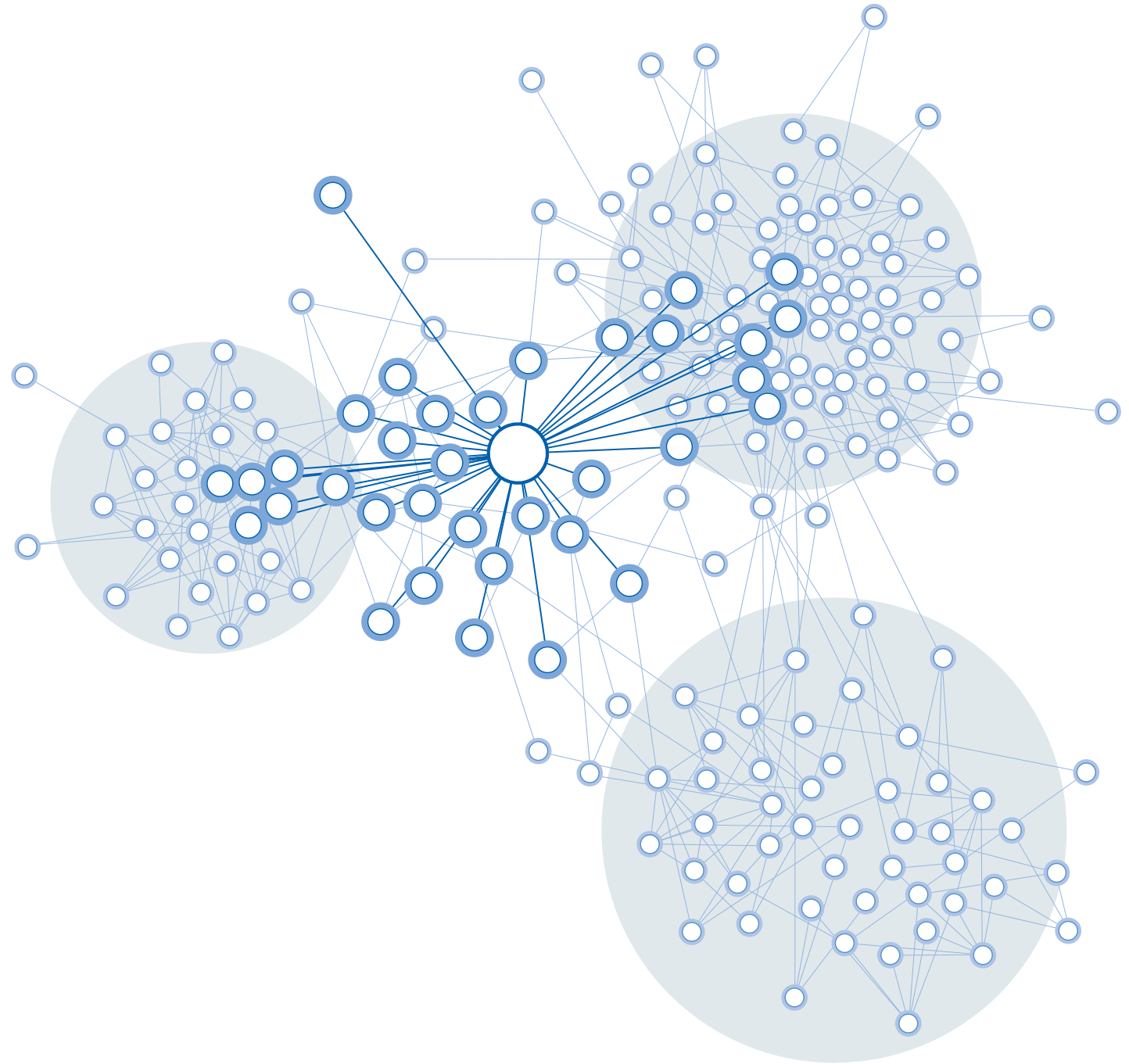


# The National Centres of Competence in Research NCCRs

Research in networks









SWISS NATIONAL SCIENCE FOUNDATION



*Research in networks – the NCCRs'  
recipe for success*

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# The National Centres of Competence in Research - An overview

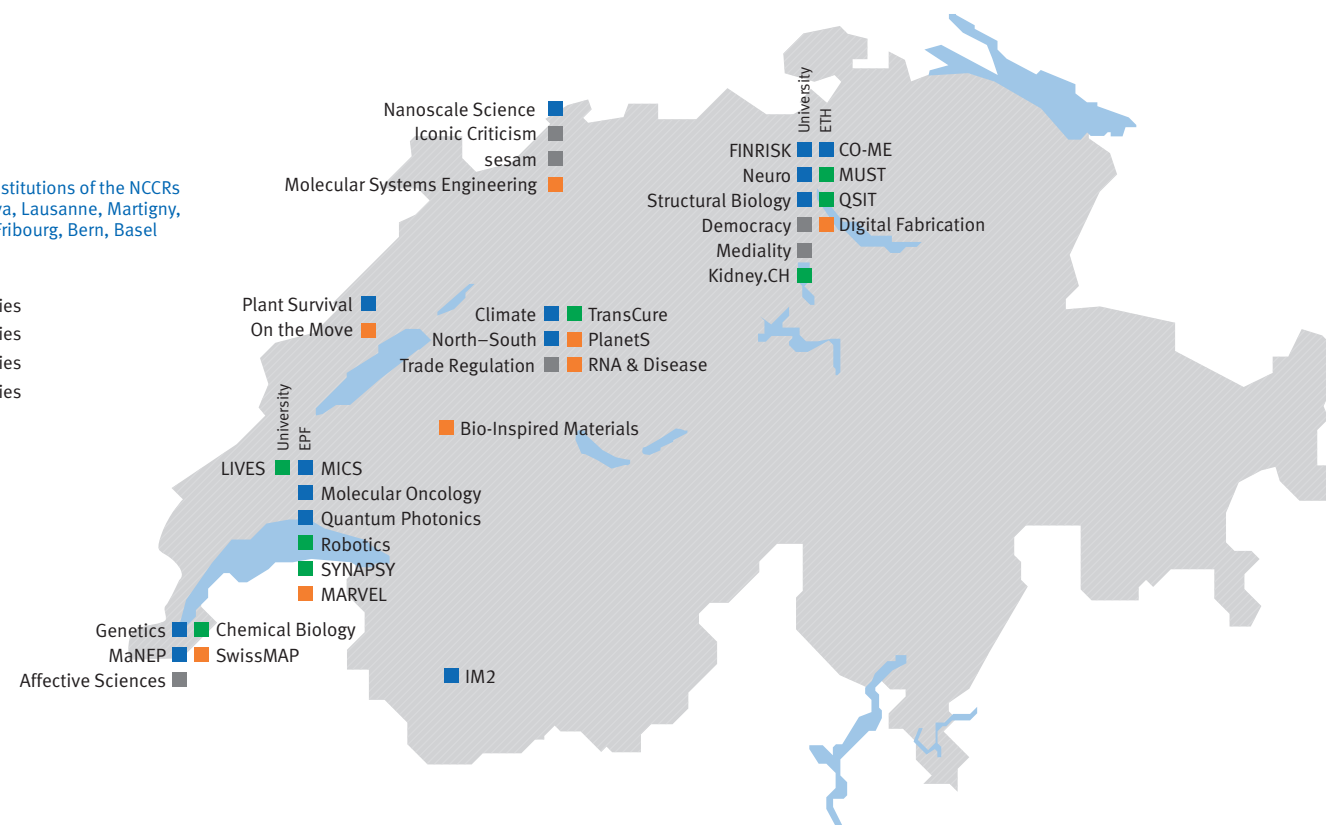
**The National Centres of Competence in Research (NCCRs) are an innovative funding scheme aimed at outstanding scientists in Switzerland. Researchers are currently working together in 21 networks. Their topics range from robotics via quantum physics through to the study of global trading or the importance of our kidneys for our overall health.**

In order to enhance the scientific competitiveness of Switzerland, the Swiss National Science Foundation (SNSF) has so far launched four series comprising 36 NCCRs in total. The NCCRs also study topics of strategic importance for Swiss science, the Swiss economy and Swiss society. The NCCRs have strengthened Swiss research and made it internationally visible. This is confirmed by experts who scientifically evaluate the Centres of Competence. However, the NCCRs are

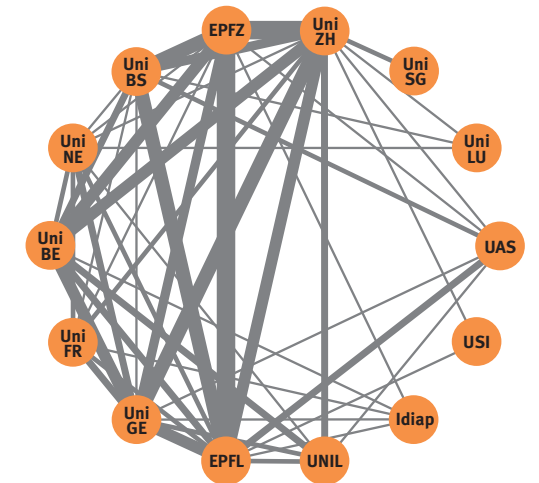
not only at the cutting edge of research, they also aim to promote young researchers, gender equality and knowledge transfer. This is how the NCCRs work: they strengthen the Swiss research scene in areas where outstanding research has already been done or wherever excellent researchers aim to push the boundaries of science. To this end, the initiators – starting out from their home institutions – establish a network of partner institutions in which the

The home institutions of the NCCRs are in Geneva, Lausanne, Martigny, Neuchâtel, Fribourg, Bern, Basel and Zurich.

- 2001 series
- 2005 series
- 2010 series
- 2014 series



The NCCRs coordinate Swiss research and facilitate exchanges between the higher education institutions.



concerned research groups work across disciplines. Swiss universities or other research facilities close to academia serve as home institutions. The NCCRs thus generate a critical mass of competence and new insights, allowing Switzerland to keep pace with other research-intensive nations and become scientifically more competitive.

## Attractive long-term prospects

In the meantime, the long-term centres of competence have become an integral part of the Swiss research landscape: the NCCRs of the first series came to an end in 2013 after twelve years, those of the second and third series are in full swing and the fourth series started its research work in 2014. A total of 63 proposals

were made for the eight NCCRs of the fourth series, indicating the high level of interest in the NCCRs. Yet the scientific selection is stringent and is carried out in several stages based on recommendations from panels composed of international experts.

There are many reasons why researchers join together in consortia and compete to be awarded an NCCR. For example, the instrument promises a comparatively wide range of funding on a timescale that is unprecedented in Switzerland. A twelve-year perspective is invaluable to the research sector because it allows new research fields to be developed and research approaches to be adopted on a trial-and-error basis.

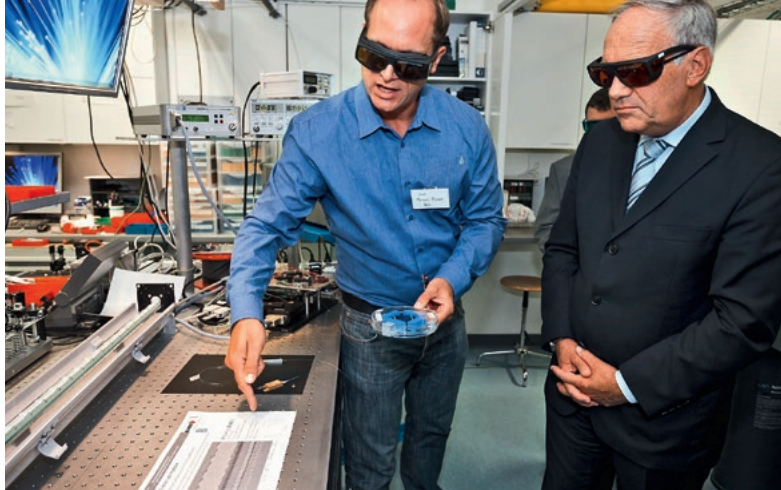
*“The world is envious of our NCCRs. The running time of twelve years is a major competitive advantage.”*

Thomas Feurer, co-director of NCCR MUST

## Higher education institutions focus on their strengths

It is not only the researchers, but also the universities that benefit from being involved in an NCCR. Being the host institution of an NCCR brings the promise of prestige and recognition. Moreover, the universities use the NCCRs to press ahead with structural change in their institutions. They make a substantial contribution towards the overall costs of the NCCRs. “With the National Centres of Competence, the SNSF is encouraging the higher education institutions to focus on their strengths and set priorities,” says Martin Täger, Rector of the University of Bern.





Before making his decisions on the fourth series of NCCRs, Federal Councillor Schneider-Ammann visited the NCCRs "Trade Regulation" and "MUST" at the University of Bern.

### Nationally established, with international appeal

The NCCRs have proven their worth for the individual research teams as well as for the Swiss academic landscape. Above all, however, the NCCRs are a scientific success. Their reputation has attracted talented scientists from all over the world, reinforcing Switzerland's status as a centre of research. Without foreign researchers who bring their know-how with them to Switzerland, NCCRs would be unthinkable.

Research at the University of Bern, the Interfaculty Centre for Affective Sciences at the University of Geneva and the Swiss Nanoscience Institute.

- They operate as a network in which a large number of scientific partners are active. The work in these networks has proven to be fertile ground on which original and innovative research approaches can flourish.
- An interim assessment of the Swiss National Science Foundation has shown that approximately 30,000 scientific publications were produced by the NCCRs between 2001 and 2014.
- They have proven to be a successful means of knowledge and technology transfer. The way they are structured helps ensure that the results of basic research are channelled as directly as possible into society. Since their launch, the NCCRs have entered into 870 partnerships with companies and founded or supported 86 start-up enterprises. In addition, they have generated 370 patents and their expertise has aroused the interest of corporate global players.
- They are a hotbed of talent. The NCCRs have created 138 assistant professorships, in addition 5,200 young researchers have completed their doctorates in the NCCRs' doctoral programmes. The specific advancement of young researchers has allowed them to fast-track their academic careers and has helped other NCCR doctoral students to succeed in business and administration.

**The NCCRs are clearly a success. This brochure is intended to provide an overview of the content and scope of the 36 National Centres of Competence in Research.**

## Short profiles of ongoing NCCRs

**The 21 ongoing National Centres of Competence in Research address a wide range of topics: culture and society (7), environment and technology (8) as well as biology and medicine (6). They started their research work in three series: 2005, 2010 and 2014.**

36

NCCRs launched until now

CHF 3.5 million

SNSF funding per NCCR per year (average)

CHF 1.5 million

Contribution by home institutions per NCCR per year (average)

CHF 2.3 billion

Total budget\* of the NCCRs 2001–2013

\* SNSF grants / home institution / participants in projects, third-party funds

### The NCCRs have an impact

Thanks to the specific approach to their work in the form of intensive inter-institutional and cross-disciplinary collaboration, the NCCRs create added value in various areas.

- They leave a lasting mark that far outstrips the period for which they run. By focusing their content, the NCCRs have permanently changed structures in the research landscape. In this way, over a dozen new research centres emerged from the NCCRs. Examples include the Oeschger Centre for Climate





## Young researchers analyse “images in our minds”

**Never before have humans been confronted by so many images. Within the scope of the National Centre of Competence in Research “Iconic Criticism”, young researchers from different disciplines are studying the power and significance of images. Thematically, the images range from Egyptian hieroglyphs through to online video art.**

Digital images shape our daily lives. While this insight is not new, we are continually lagging behind in our attempts to gain a deeper understanding of it. No wonder, given the breathtaking speed at which technical innovations are emerging. We may ask ourselves whether computer games are harmful for children or whether newspapers are still needed in printed form, but the pros and cons of the digital revolution have for the most part still not been brought to light.

### Expanding the network

Young researchers are now working to fill this gap within the scope of the National Centres of Competence in Research “eikones. Iconic Criticism – Power and Importance of Images”. They come from ten disciplines of the humanities and social sciences and are pursuing their own projects focused on images and their phenomena. But the integration of their work within the NCCR means that they are benefiting from an excellent environment: various Swiss and international higher education institutions, research institutes and museums, in particular the Schaulager in Basel, are involved. Basel is also the geographical centre and the home institution of the NCCR.

Around 40 scientific collaborators discuss each other’s work at weekly colloquiums. But there is more to the NCCR than just this interdisciplinary approach, says head of communication Heike Freiburger: “We also organise public workshops and invite renowned speakers and visiting professors so that our researchers can expand their network.” This improves their career prospects, be it in the research domain or in other areas. Indeed, numerous former

researchers seamlessly found good jobs after completing their projects.

### When museums think globally

A quick look in the online archives ([www.eikones.ch](http://www.eikones.ch)) reveals the thematic diversity of the projects, although the main emphasis is on art history and philosophy. The topic of Mechthild Widrich’s project “National-Global Art Geographies”, for instance, is the role of new national museums in relation to contemporary art. “This may sound like a paradox,” says Widrich, “because the notion of nationality, which arose in the 19th century, is something of a taboo in contemporary art.” Widrich is able to show, however, that the idea of the national has not disappeared in our age of globalisation – it can



still be found in museums in Washington D.C., Bucharest and Singapore. The museums are not intended solely for one’s own people, they



also address a global audience. The chief curator in Singapore, for instance, points out that the Formula One race passes just beside the museum. So the poster on the facade will be seen by the entire world. “Curating is no longer what it used to be,” says Widrich. “What counts now is a sexy cityscape.”

By contrast, the psychologist Mirella Walker is looking at “images in our minds”. She is studying how the perception of portraits is influenced by processes of categorisation and stereotyping. Her project combines different perspectives from which images can be viewed: aesthetic, phenomenological and semiotic on the one hand, historical and sociological on the other. Both perspectives lead us to the main goal of “eikones”: to reflect critically on the omnipresent images of our times.



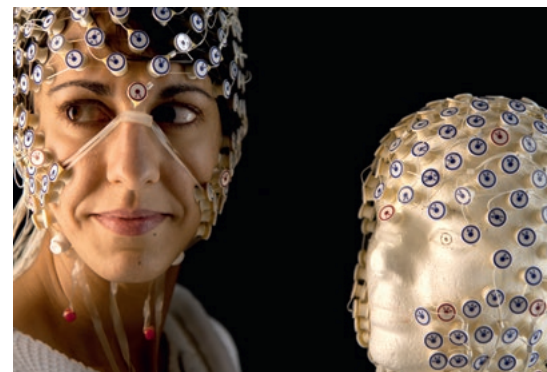
The NCCR Iconic Criticism gives images the attention they deserve.

## NCCR Iconic Criticism

The digital revolution has brought forth a new, image-based society, albeit one that has only a limited understanding of the particularities, functions, power and effect of images. The NCCR “Iconic Criticism – Power and Importance of Images” gives images the attention they deserve. The NCCR brings together ten disciplines of the humanities and social sciences and studies images from areas as far apart as the arts, the sciences, economics, urban planning, philosophy and the history of languages and writing. Although the different disciplines and topics complement each other, their constellation within the NCCRs also brings to light the specific preconditions and research questions of each discipline.

[www.eikones.ch](http://www.eikones.ch)  
University of Basel  
Start: 2005

Brain activity is recorded by means of an electroencephalography helmet.



## NCCR Affective Sciences

The NCCR “Affective Sciences – Emotions in Individual Behaviour and Social Processes” is one of the world’s first research networks to examine emotions in a comprehensive manner. The influence of emotional factors is becoming increasingly important in explaining human behaviour: not only in research, but also in politics and economics. In this NCCR, psychologists, neuroscientists, medical researchers, philosophers, literary scholars, historians, social scientists, economists and computer scientists are working together to explore the emergence of emotions and feelings, their regulation and their social functions. Their findings may help to improve physical and mental health, foster well-being in the family and the workplace, and develop skills in the handling of emotions.

[www.affective-sciences.org](http://www.affective-sciences.org)  
University of Geneva  
Start: 2005



A “show of hands” at the gathering of the electorate in Glarus – one of the oldest forms of direct democracy.

## NCCR Democracy

The NCCR “Democracy – Challenges to Democracy in the 21st Century” explores how democracy is developing under the current conditions of globalisation and mediatisation. On the one hand, decision structures at nation-state level are increasingly being called into question in the face of globalisation and growing European integration; on the other hand, the media are exercising an ever-increasing influence on politics and public debates that are important aspects of democracy. The NCCR combines the political sciences with media studies and communication sciences. In so doing, it aims to develop proposals for improving political decision-making processes, political education and the quality of media reporting. The NCCR also launched the Centre for democracy studies Aarau.

[www.nccr-democracy.uzh.ch](http://www.nccr-democracy.uzh.ch)  
University of Zurich  
Start: 2005

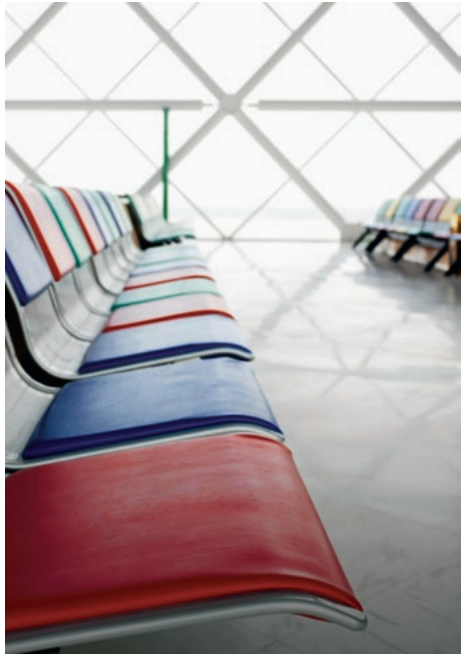


The illustrated Spiez chronicle of Diebold Schilling Sr. (1484/85) lavishly presents the town fire of Bern of 1404 as a historical event.

The NCCR “Trade Regulation” examines how WTO dispute settlement functions and how it affects domestic regulation.



The NCCR LIVES studies life courses looking at vulnerabilities as well as psychological and social resources.



In the waiting room: the new form of migration is shaped by global markets and involves increasing temporary mobility.

## NCCR Mediality

The NCCR “Mediality – Historical Perspectives” focuses on the historicity of media and mediality. It investigates forms of communication before the era of mass media and technologically oriented media discourses. Based on texts, images, sculptures, architecture, textiles, sounds and films, particular situations are examined in which changes in communication practices and reflection on the conditions of communication take place. The main question is what can act as a medium and what are the specific conditions that make mediacy possible. The following disciplines are participating in the NCCR: German literature and linguistics, history, history of art, film studies, Scandinavian studies, and law.

www.mediality.ch  
University of Zurich  
Start: 2005

## NCCR Trade Regulation

Preferential trade agreements, both multilateral and bilateral, are becoming increasingly broad in scope, often stretching beyond mere commercial matters into areas such as climate and development policy, migration issues, human rights and the promotion of innovation. Researchers at the NCCR “Trade Regulation – International Trade Regulation: From Fragmentation to Coherence” are identifying and analysing these and other aspects of international trade relations, in close collaboration with national and international governmental and non-governmental organisations. This allows for the development of innovative approaches to the problem of reconciling different regulations.

www.nccr-trade.org  
University of Bern  
Start: 2005

## NCCR LIVES

Economic globalisation, the pluralisation of family forms, population ageing and welfare state reforms have been generating new forms of insecurity and social inequalities. The NCCR “LIVES – Overcoming Vulnerability: Life Course Perspectives” analyses the effects of post-industrial societies on individuals. Led by the universities of Lausanne and Geneva, it conducts longitudinal and interdisciplinary studies involving the trajectories of approximately 25,000 people living in Switzerland in order to observe the dynamics of stress and resources across all life domains, in social interactions and over time. One of the major objectives is to contribute to the development of innovative social policy measures.

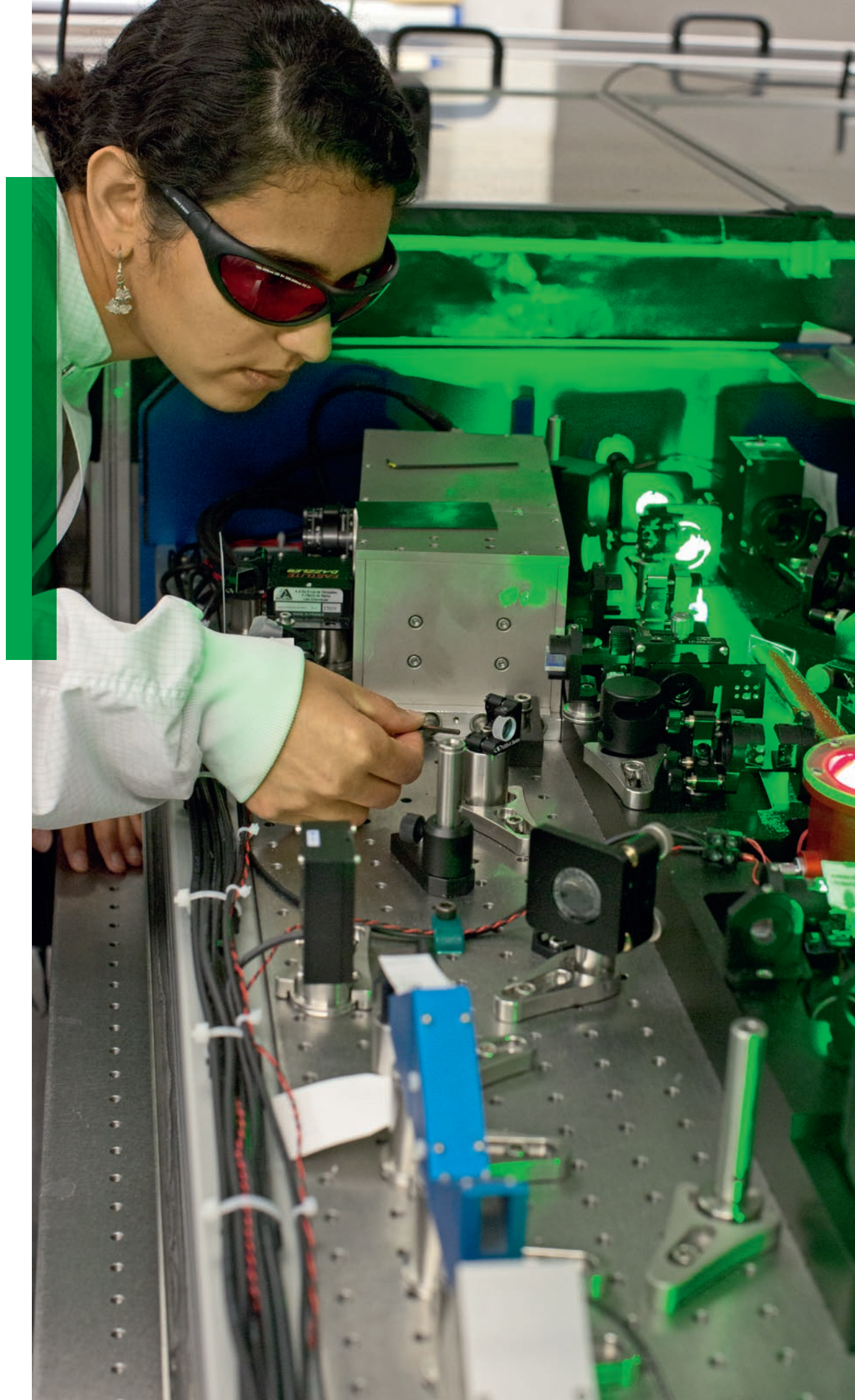
www.lives-nccr.ch  
University of Lausanne | University of Geneva  
Start: 2011

## NCCR On the Move

Migration to Switzerland has undergone a fundamental change in the past decade. Traditional migration patterns consisted of long-term migration. However, the situation has changed radically due to changing national and European legislation and economic agreements between countries. National and global markets form dense networks, and this in turn leads to more temporary mobility. The situation today is thus more complex than ever and barely any research has been conducted into it. The NCCR “On the Move – The Migration-Mobility Nexus” aims to better understand the changes affecting migration today and their consequences for the state, the economy and society at large. This will enable it to develop a basis for political discussions to establish an informed, forward-looking and sustainable migration policy.

www.nccr-onthemove.ch  
University of Neuchâtel  
Start: 2014





## In support of women

**Although nearly half of all students are women, the number of women researchers declines steadily as we move up the academic ladder. This is particularly true for technical fields. From day one, the NCCR MUST has striven to improve this situation through numerous initiatives.**

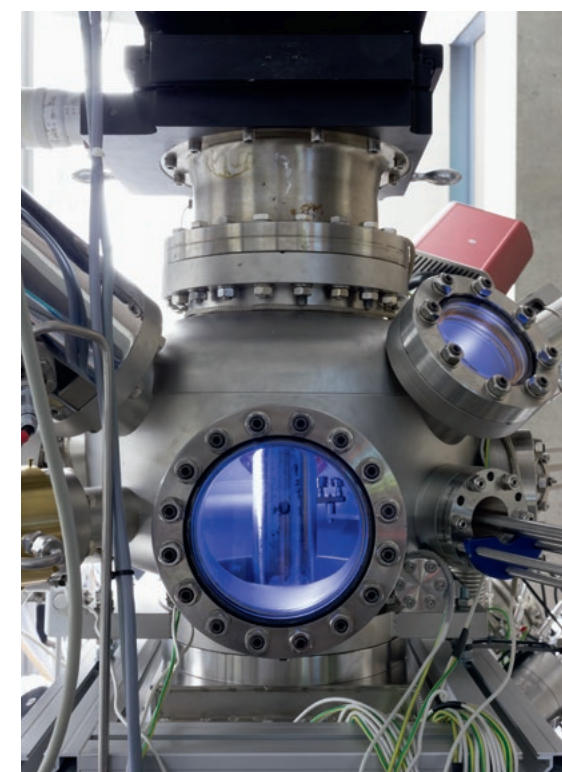
The figures speak for themselves: at master's level, 44 per cent of Swiss students are female, but only 16 per cent of full professorships are held by women. This imbalance is even more pronounced in the MINT subjects (mathematics – informatics – natural sciences – technology), i.e. in the research fields addressed by the NCCR "MUST – Molecular Ultrafast Science and Technology".

### **The careers are decided at postdoc level**

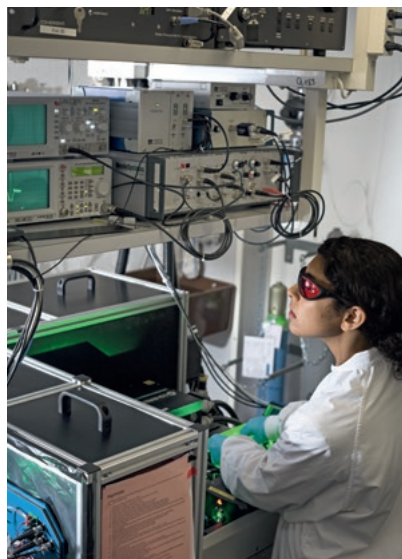
The NCCR MUST has launched numerous initiatives to increase the presence of women in its sphere of activity. These initiatives are aimed at both doctoral students and professors, but their main emphasis is on the postdoc stage, a crucial time in a scientific career, when too many women quit research for reasons of career-related mobility, the need for both members of a couple to find jobs, and family responsibilities. Anna Garry, representative for the promotion of women and gender equality issues of the NCCR MUST, explains: "We are not reinventing the wheel. Many measures are already in place. We are trying to align ourselves with them and to develop and institutionalise them." In its initial phase, the NCCR MUST established an internal network of women researchers, held workshops on specific career issues affecting women, organised an international conference for women researchers, created two women postdoc grants to increase the number of women in the MUST domain, invited a new female SNSF professor as junior group leader and was crucial to the establishment of the ETH Women Professors' Forum.

### **Raising awareness**

Another important aspect is to raise awareness of the problem within the scientific community and society at large. In this context, communication is key. The NCCR MUST has therefore launched a series of columns in the publications "Optics & Photonics News" and "ETH Life". In its second phase, the NCCR MUST aims to pursue the implementation of these initiatives and involve, on the one hand, other NCCRs and the cantonal gender equality offices and, on the other hand, the Swiss and European networks for the promotion of women in science.

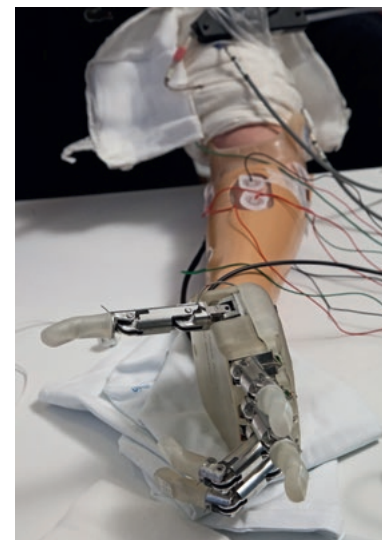
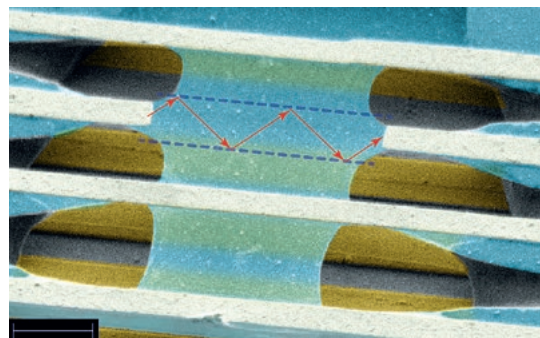




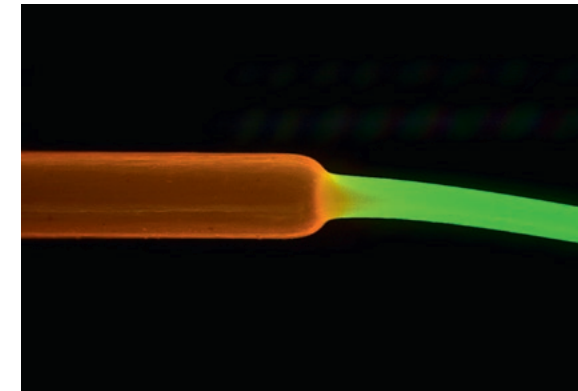


The NCCR MUST gains insights into ultrafast chemical and physical processes.

Understanding new materials with hitherto unknown electronic properties, such as graphene (blue structure in image), opens the way for technologies based on quantum physics.



Amputee wearing sensory feedback enabled prosthetic in Rome, February 2013.



The NCCR Bio-Inspired Materials takes a close look at nature in order to develop smart materials for instance materials that change their colour when under pressure.

## NCCR MUST

The NCCR “MUST – Molecular Ultrafast Science and Technology” opens up new perspectives for time-resolved structural investigations in physics, chemistry and biology. The main objective is the multidisciplinary development of experimental and theoretical tools. In this context, the NCCR MUST penetrates the smallest, atomic dimensions in time and space and makes it possible to observe hitherto inaccessible dynamic processes. More than once in the history of natural sciences, scientists venturing into uncharted territory made discoveries that led to unexpected advances in their fields. Following in this tradition, a network consisting of nineteen Swiss groups is studying the dynamics of elementary quantum-mechanical processes of atoms and molecules up to strongly correlated materials.

[www.nccr-must.ch](http://www.nccr-must.ch)  
ETH Zurich | University of Bern  
Start: 2010

## NCCR QSIT

The NCCR “QSIT – Quantum Science and Technology” is active in the field of quantum physics and information theory. Research in this field will strongly influence science and technology in the future. Applications are possible mainly in the area of computer science and sensors. The NCCR QSIT takes a multidisciplinary approach, combining concepts from physics, chemistry, engineering and computer sciences. Researchers from Swiss universities and basic researchers from industry are working together in the NCCR network. Their two common goals are to develop applications in the area of quantum computer science and to investigate new paradigms in physical basic research such as the order and states of matter.

[www.nccr-qsit.ethz.ch](http://www.nccr-qsit.ethz.ch)  
ETH Zurich | University of Basel  
Start: 2011

## NCCR Robotics

NCCR Robotics – “Intelligent Robots for Improving the Quality of Life” is at the forefront of robotics research and develops robots that co-exist symbiotically with humans in order to enable them to help both individuals and society. NCCR Robotics promotes three main strands of research: “Wearable robots” to increase the mobility and autonomy of disabled people, “Rescue robots” to help with the search for victims after disasters and “Educational robots” to support the training of the next generation of scientists and engineers. In order to progress towards this vision, the NCCR “Robotics” is advancing fundamental insights in terms of technology, materials and control mechanisms.

[www.nccr-robotics.ch](http://www.nccr-robotics.ch)  
EPF Lausanne  
Start: 2010

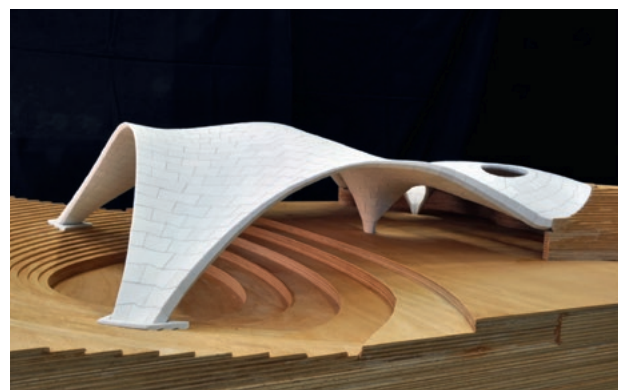
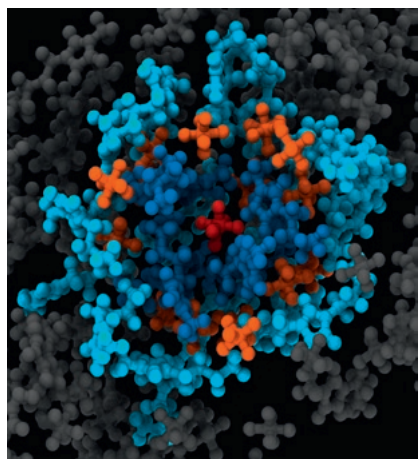
## NCCR Bio-Inspired Materials

The NCCR “Bio-Inspired Materials – Using Concepts from Nature to Create ‘Smart’ Materials” aims to pool the expertise of its members in the fields of chemistry, physics, materials science, biology and medicine in order to study and find applications for new smart materials inspired by living things. This involves devising new design strategies and rules to create and assemble macromolecules and nanoparticles into ordered structures to produce smart materials with the desired properties. The NCCR plans to conduct the relevant research in three interdisciplinary modules: adaptive materials responding to mechanical stimuli, adaptive materials created through self-assembly and interactions of adaptive materials with living cells.

[www.bioinspired-materials.ch](http://www.bioinspired-materials.ch)  
University of Fribourg  
Start: 2014



Charge-ordering in an organic room-temperature ionic liquid, to be used for safer lithium-ion batteries.



A 3D printed model of a futuristic structure: designed using advanced structural analysis software, and to be realized at full scale by cutting stone using digitally controlled stonemasonry machines.

## NCCR MARVEL

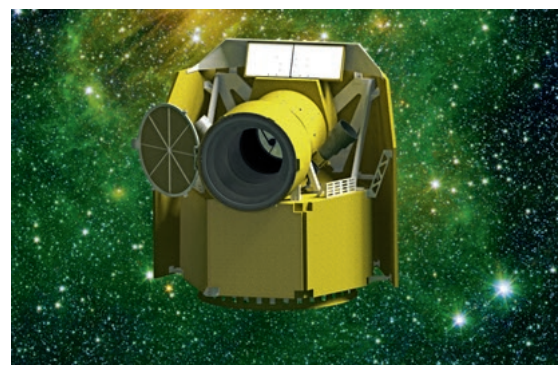
Up until now, the development of new materials was based on intuition and trial and error. The NCCR “MARVEL – Materials’ Revolution: Computational Design and Discovery of Novel Materials” aims at bringing about a scientific and technological revolution, whereby discoveries and inventions will come from quantum mechanical simulations and the information and communication technologies (ICT) of big data. With computers becoming more and more powerful, it is now possible to screen rapidly for tens of thousands of materials at the same time. This computational approach to the discovery and development of materials will be applied to the fields of energy, ICT and pharmaceuticals.

www.nccr-marvel.ch  
EPF Lausanne  
Start: 2014

## NCCR Digital Fabrication

The NCCR “Digital Fabrication – Innovative Building Processes in Architecture” aims to secure a leading position for Switzerland in this new and highly interesting sector, which is fast becoming a core discipline of architecture. Through a multidisciplinary approach the disciplines of architecture, engineering, robotics, and material and computer sciences are brought together in an ambitious partnership to establish digital technology as an essential part of future building processes. This new approach combines digitally mediated architectural design with robotic construction technologies to augment contemporary construction processes. The benefits of digital construction are evident: efficient use of production resources, material-specific concepts and durability, thanks to the seamless integration of design and fabrication.

www.dfab.ch  
ETH Zurich  
Start: 2014

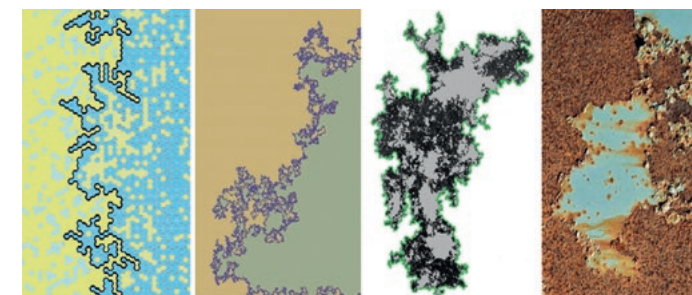


The CHEOPS satellite will use its telescope to search for planets outside our solar system.

## NCCR PlanetS

The discovery of the first planet outside our solar system by Swiss astronomers in 1995 sparked a revolution in the field of astronomy. Not only did it help us to understand how planets are formed and evolve, but it also contributed to the development of instruments dedicated to the discovery of further exoplanets. By combining astronomical observations, measurements of solar system bodies using spacecraft, laboratory work and theoretical modelling, the NCCR “PlanetS – Origin, Evolution and Characterisation of Planets” aims to contribute to a better understanding of planets. In addition, the NCCR will coordinate the use of CHEOPS (CHAracterising ExOPlanets Satellite), whose launch into orbit is scheduled for 2017.

adonis.unibe.ch/planets  
University of Bern | University of Geneva  
Start: 2014



An observer trained in mathematics and physics will see similarities in seemingly unrelated phenomena, for instance the flow analysis on the left, Brownian motion at centre and rusty metal on the right.

## NCCR SwissMAP

Physicists use the language of mathematics to describe the processes that they observe. However, mathematics is more than a language. It is also a collection of complex, evolving ideas. At the threshold between theoretical physics and mathematics – where the mathematician’s stringency and the physicist’s intuition bear the greatest fruit – both sides benefit from closer cooperation. The NCCR “SwissMAP” aims to take this melding of minds to the next level and establish an internationally renowned Swiss Institute for Advanced Research in Mathematics and Physics. The objective is to create a place where researchers can focus on fundamental questions, such as whether string theory really is suitable for describing all of the known force fields and interactions in a uniform Theory of Everything.

www.nccr-swissmap.ch  
University of Geneva | ETH Zurich  
Start: 2014



## Rummaging in the chemical treasure chest

**Just ten years ago, only big pharmaceutical companies were doing tests on large collections of chemicals. Then, in 2006, an academic version of a screening facility became operational at EPF Lausanne. The National Centre of Competence in Research “Chemical Biology” is now extending the platform and the network of users across Switzerland.**

“ACCESS” is not only an abbreviation for “Academic Chemical Screening Platform of Switzerland”, it also expresses the fact that the platform is accessible for a large research community. No specific biological discipline or therapeutic application is given preference, says Gerardo Turcatti, the director of ACCESS. Often in collaboration with their industry partners, researchers have come to Turcatti and his team with a large variety of projects: topics range from the characterisation of olfactory receptors through to the search for molecules that are, for example, derived from the glands of poisonous snakes and can kill cancer stem cells.

### Swiss chemicals collection

In his chemical treasure chest, Turcatti keeps approximately 100,000 different substances – and the number is steadily increasing given that chemists in Switzerland are invited to contribute their self-made compounds to the collection at EPF Lausanne. True to the principle “all for one, one for all”, a unique Swiss chemicals collection is to be created in the coming years. “ACCESS would play the role of an intermediary,” says Turcatti. When a biologist in search of a suitable agent comes upon the substance of a chemist, Turcatti unites the two of them so that they can continue doing research together.

### Wide-ranging mission

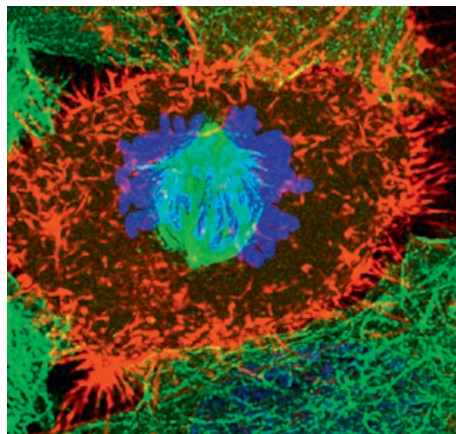
Although the academic screening platform often uses the same instruments and methods as similar facilities run by pharmaceutical companies, ACCESS is clearly distinct from its industrial counterparts, says Turcatti. On the one hand, this is because the academic structures are smaller; on the other hand, its mission is more wide-ranging, i.e. not limited to the discovery of potential new remedies.

Which is why, for many projects, preparations take longer than the actual testing, Turcatti adds. Each new test needs to be developed and validated before any reliable results can be gained from it. Advising and supporting the researchers at this early stage in their projects is an important – and particularly rewarding – part of the creative work of Turcatti and his team.

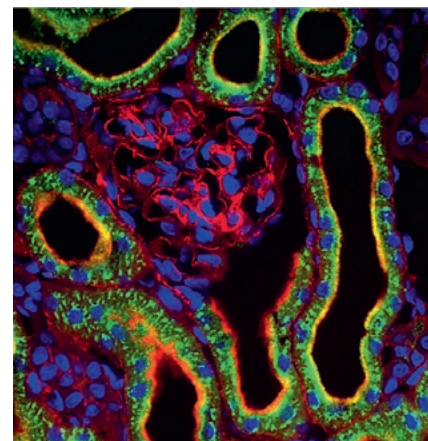




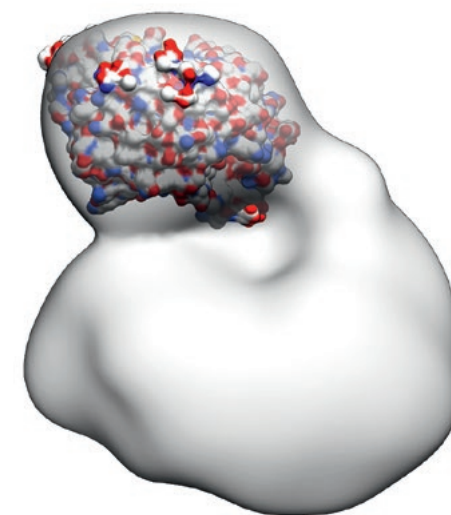
Fluorescent dyes illuminate the processes at work inside living cells.



A three-dimensional model of the largest synaptic connection between brain cells: the calyx of Held plays an important role in the processing of auditory stimuli.



Microscopic images of a cross-section of a mouse's healthy kidney. Fluorescent antibodies make the cells glow.



By combining electron microscopy and single-particle analysis, it is possible to create three-dimensional images of transport protein complexes. This complex is about eight nanometres wide and nine nanometres long.

## NCCR Chemical Biology

The NCCR “Chemical Biology – Visualising and Controlling Biological Processes Using Chemistry” employs chemistry tools to obtain a better understanding of life at the molecular level. In this NCCR, chemists, biochemists, physicists and cell biologists are developing innovative techniques that enable them to describe and control the innumerable biochemical activities of a living cell. The new tools will be applicable to various biological phenomena, for example when visualising the activities of specific proteins during cell division. The NCCR also operates a platform for chemical screening aimed at developing a new generation of molecules with biological effects.

[www.nccr-chembio.ch](http://www.nccr-chembio.ch)  
University of Geneva | EPF Lausanne  
Start: 2010

## NCCR SYNAPSY

The NCCR “SYNAPSY – Synaptic Bases of Mental Diseases” aims to discover the neurobiological mechanisms of mental and cognitive disorders, since one of the major challenges in psychiatry is to achieve a better understanding of how these illnesses originate. It is hoped that this research will lead to the development of improved diagnostic tools and therapeutic approaches. The NCCR SYNAPSY focuses on the interface between preclinical research and clinical development, combining neuroscience with psychiatry. This research focus will help train a new generation of psychiatrists, who will possess both high clinical expertise and a sound knowledge of the basic neurobiological aspects of mental functions and dysfunctions.

[www.nccr-synapsy.ch](http://www.nccr-synapsy.ch)  
EPF Lausanne | University of Lausanne |  
University of Geneva  
Start: 2010

## NCCR Kidney.CH

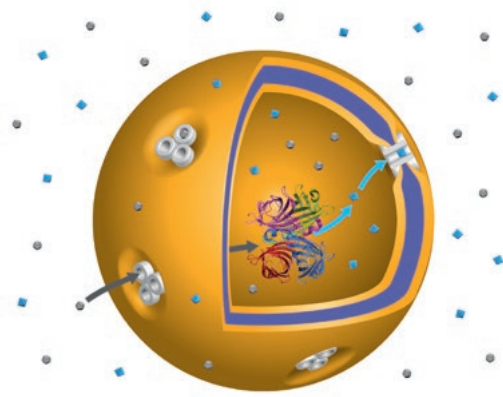
The NCCR “Kidney.CH – Kidney Control of Homeostasis” is the world’s first research network to explore the physiological processes in healthy and diseased kidneys across a broad thematic spectrum. The aim is to seek insights for new preventive, diagnostic and therapeutic approaches to treating kidney patients. Kidney diseases have increased dramatically in recent years. Patients with chronic kidney diseases risk exposure to further secondary ailments such as high blood pressure or osteoporosis. Reduced kidney function has drastic consequences for the body as the kidneys are responsible for maintaining the balance between a wide range of substances in the body (homeostasis).

[www.nccr-kidney.ch](http://www.nccr-kidney.ch)  
University of Zurich  
Start: 2010

## NCCR TransCure

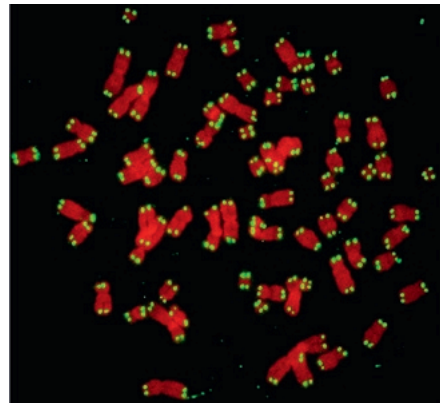
The NCCR “TransCure – From Transport Physiology to Identification of Therapeutic Targets” seeks to integrate physiology, structural biology and chemistry with a focus on membrane proteins to develop new therapeutic strategies for human diseases. Transport proteins and ion channels play a key role in all physiological processes in the human body. Malfunctions in these proteins contribute to diseases such as diabetes, high blood pressure, cardiac arrhythmia and osteoporosis and also play critical roles in diseases of the central nervous system as well as in cancer. The NCCR “TransCure” aims to achieve a more profound understanding of the structures and mechanisms of these proteins and to develop new strategies for the next generation of therapeutics.

[www.transcure.org](http://www.transcure.org)  
University of Bern  
Start: 2010



The molecular production lines inspired by living cells are expected to produce new substances.

RNA molecules also play an important role at chromosome ends, also known as telomeres (here in green).



## NCCR Molecular Systems Engineering

The NCCR “MSE – Molecular Systems Engineering” combines the life sciences, chemistry, physics and engineering sciences in order to transfer the synthesis processes of biological cells to synthetic systems. Such molecular systems are the equivalent of tiny factories in which new compounds and substances are made. These can be used in energy supply and the chemical industry as well as in medical diagnosis or treatment.

The NCCR intends to break through the barriers of the traditional focus on individual molecular modules and develop new engineering principles that reveal how individual molecular modules can be combined to form working molecular production lines. The research findings could be used to meet future economic and technical challenges.

[www.nccr-mse.ch](http://www.nccr-mse.ch)  
University of Basel | ETH Zurich  
Start: 2014

## NCCR RNA & Disease

The NCCR “RNA & Disease – The Role of RNA Biology in Disease Mechanisms” studies a class of molecules that has long been neglected: RNA (ribonucleic acid) is pivotal for many vital processes and much more complex than initially assumed. For instance, RNA defines the conditions, in a given cell, under which a given gene is or is not activated. If any part of this process of genetic regulation breaks down or does not run smoothly, this can cause heart disease, cancer, brain disease and metabolic disorders.

The NCCR brings together Swiss research groups studying different aspects of RNA biology in various organisms such as yeast, plants, roundworms, mice and human cells. By identifying the regulatory mechanisms that go off course during an illness, the NCCR will also be able to point out new therapeutic targets and help counter the biggest causes of death.

[www.nccr-rna-and-disease.ch](http://www.nccr-rna-and-disease.ch)  
University of Bern | ETH Zurich  
Start: 2014

## Concluded NCCRs

The fourteen National Centres of Competence in Research (NCCRs) of the first series completed their work in 2013 after twelve years of operation. They have a remarkable track record in terms of scientific results, patents, start-ups and the promotion of young researchers.



# Impressive results after twelve years of research

More than 6,000 researchers were involved in the first fourteen NCCRs, which ran from 2001 to 2013. They developed cutting-edge technology for the operating theatre, such as instruments for minimally invasive surgery, or new methods for laser measurement, which has also been used to explore the surface of Mars. Others offered a forecast of how climate change might affect water supply, farming and the insurance industry. In addition, scores of researchers from the NCCRs took their knowledge and know-how with them to their new field of activity in business and society at large.

## An overview of the concluded NCCRs

Amounts in CHF million

	SNSF funding for 12 years	Total budget for 12 years	Home institution
<b>NCCR Climate:</b> Climate Variability, Predictability and Climate Risks	26.6	137.8	University of Bern
<b>NCCR CO-ME:</b> Computer-Aided and Image-Guided Medical Interventions	43.4	117.9	ETH Zurich
<b>NCCR FINRISK:</b> Financial Valuation and Risk Management	28.1	60.6	University of Zurich
<b>NCCR Genetics:</b> Frontiers in Genetics – Genes, Chromosomes and Development	42.9	141.1	University of Geneva
<b>NCCR IM2:</b> Interactive Multimodal Information Management	33.8	88.4	Idiap, Martigny
<b>NCCR MaNEP:</b> Materials with Novel Electronic Properties	51.0	215.4	University of Geneva
<b>NCCR MICS:</b> Mobile Information and Communication Systems	38.3	106.5	EPF Lausanne
<b>NCCR Molecular Oncology:</b> From Basic Research to Therapeutic Approaches	43.7	118.2	EPF Lausanne
<b>NCCR Nanoscale Science:</b> Impact on Life Sciences, Sustainability, Information and Communication Technologies	49.9	165.1	University of Basel
<b>NCCR Neuro:</b> Neural Plasticity and Repair	42.8	233.5	University of Zurich
<b>NCCR North-South:</b> Research Partnerships for Mitigating Syndromes of Global Change	36.4	98.8	University of Bern
<b>NCCR Plant Survival:</b> Plant Survival in Natural and Agricultural Ecosystems	33.8	87.8	University of Neuchâtel
<b>NCCR Quantum Photonics</b>	45.4	131.7	EPF Lausanne
<b>NCCR Structural Biology:</b> Three Dimensional Structure, Folding and Interactions	36.6	122.9	University of Zurich
<b>Total</b>	<b>552.7</b>	<b>1,825.7</b>	

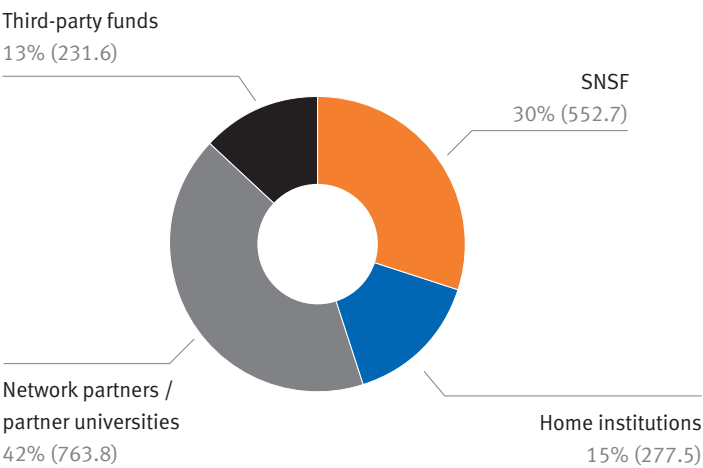
## Knowledge and technology transfer – output data



## Funding sources

Amounts in CHF million

Total 1,825.7



# Further information

## General information

[www.snsf.ch/nccr](http://www.snsf.ch/nccr)

## Publications

This brochure is also issued in French and German. In addition, the SNSF publishes an annual guide to the NCCRs in English. Both publications can be ordered free of charge from the SNSF and are also available electronically at:  
[www.snsf.ch/Publications](http://www.snsf.ch/Publications)

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## Publishing information

### Published by

Swiss National Science Foundation  
Wildhainweg 3, P. O. Box 8232, CH-3001 Bern  
+41 (0)31 308 22 22  
[com@snf.ch](mailto:com@snf.ch)  
[www.snsf.ch](http://www.snsf.ch)

### Editing and production

Thomas Griessen, Urs Hafner, Philippe Morel, Ori Schipper,  
Martina Stofer Inocencio, Helen Zwahlen-Jaisli

### Translation

Corinne Ammann, Omar Solanki,  
BMP Translations, Basel

### Proofreading

notabene, Bachenbülach

### © Graphic design

kong.gmbh, Bienne

### Printing and dispatch

Ediprim AG, Bienne

### Paper

Cover: profibulk, semi-gloss coated, 250 g/m²  
Content: profibulk, semi-gloss coated, 135 g/m²

Edition: 3,600 German copies | 3,400 French copies | 3,500 English copies

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## The National Centres of Competence in Research:

- *create and disseminate knowledge*
- *are internationally recognised*
- *strengthen structures*
- *foster talents*



