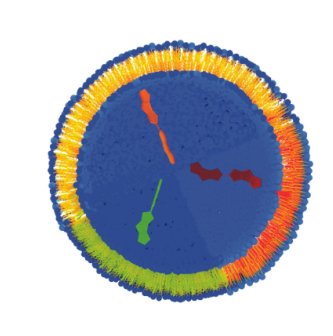
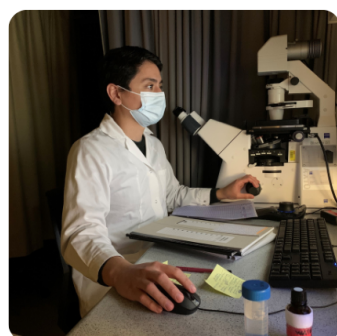
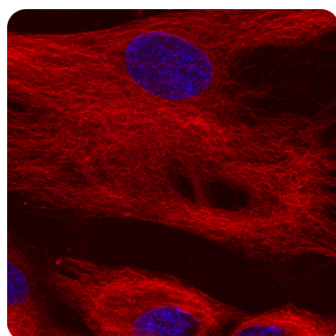
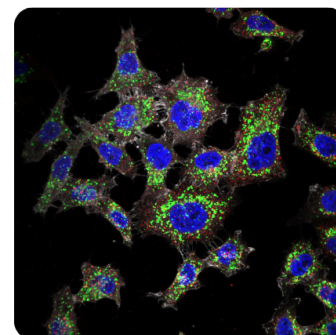
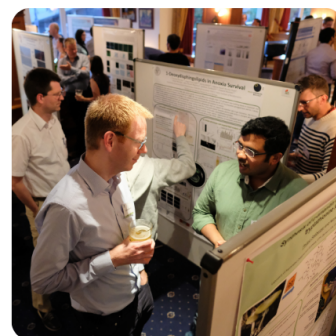
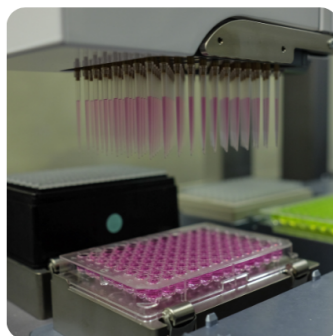


**NCCR CHEMICAL
BIOLOGY**

NCCR CHEMICAL BIOLOGY FINAL REPORT

2010-2022



12 years of cutting edge research in chemical biology

In 2010, a number of outstanding researchers in chemistry and biology were present in the Lemanic region, but very little interdisciplinary research was being done and collaborations between chemists and biologists were minimal. The NCCR Chemical Biology broke down the borders between disciplines allowing investigation of biological questions that were previously impossible to address.

Over twelve years, **the NCCR Chemical Biology has fundamentally changed the research landscape**, at the EPFL and University of Geneva, by promoting interdisciplinary research, not only through collaborative projects, but also by recruitment and training of interdisciplinary scientists. A symbol of the open, collaborative, and interdisciplinary approach is the addition of physics to this collaborative effort adding another dimension to the way biological questions can be addressed.

The original goal of the NCCR Chemical Biology, to visualize and control biology processes using chemistry, has been kept throughout the 12 years, and many seminal discoveries, novel tools and infrastructure permitting this line of research have been developed and will reinforce future efforts towards this goal. Additionally, the interdisciplinary approach has also led to the creation of startups and opportunities for technology transfer.

The rise of interdisciplinary research has been accompanied by **major structural changes at the EPFL and the University of Geneva**. With the retirement of faculty, several positions have been reoriented from other areas of chemistry and biochemistry to focus on chemical biology and the needs for interdisciplinary research. During the tenure of the NCCR four new faculty positions have been created and filled with

investigators in the fields of chemical biology, chemical genetics, and theoretical physics. The NCCR has been instrumental in attracting the best scientists to the region. These hires have focused on stellar, relatively young faculty members ensuring the continuity of chemical biology in the region.

The NCCR Chemical Biology has reinforced and established **technological platforms** that were necessary for its goal of visualization and control of biological processes. These platforms are not simply service providers, but most importantly, are involved in training the researchers and accompanying the research beyond the initial interactions.

Our landmark platform is called ACCESS and is centered at the EPFL (BSF-ACCESS) with an important, independent node at the University of Geneva (ACCESS Geneva). The mission of the platforms is to provide the know-how for genetic and chemical screens in efforts to intervene in physiological pathways. ACCESS helps in all stages of the process as well as the follow up medicinal chemistry, a discipline involved with the design, chemical synthesis, and development for market of bio-active molecules, that adds great value to the discoveries. Several potential therapeutics have emerged from the platform, and they have also led to technology transfer opportunities. ACCESS has increased its visibility and usefulness to the whole of Switzerland and is

used by colleagues from most of the Swiss universities. In addition to the basic screening projects ACCESS provides additional support in high-throughput technologies, including microscopy, which allow the generation of large-scale data and a more quantitative and unbiased approach to doing cell biology research.

The NCCR has been involved in the development of two other platforms, a mass spectrometry platform, providing crucial support to biomedical research by offering state-of-the-art equipment and expertise in high-end proteomics research solutions in Geneva, and, to a lesser extent, the Dubochet Centre for Imaging, providing access to structure determination by electron diffraction of microcrystals amongst other techniques. Importantly, the provisions have been made so that all the platform activities can continue beyond the NCCR, as long as they are beneficial to the scientific community.

The NCCR Chemical Biology has had **remarkable success in publication of its scientific research with several high impact articles** that have received major recognition in the scientific community and have been reported in the press.

The most illustrious and illustrative discovery of the NCCR Chemical Biology has been the development of a new tool that has the potential to revolutionize research in mechanobiology. This tool is called Flipper-TR[®] and is now commercially available so that the entire scientific community can use it. Flipper-TR[®] is a compound that inserts into membranes and changes its physical properties when the membrane changes its own. Prof. Matile, an organic chemist, imagined this compound based on the color change of lobsters when they are heated. However, from the synthesis of the compound, the road was long and full of obstacles. Together with biologists and many back-and-forth interactions Flipper-TR[®] was finally perfected and published leading to a highly cited publication (top 1% of all publications in its field). Based on this finding several new versions of Flipper-TR[®] were developed that will further studies in cell, development and mechanobiology. The

utility of most of the Flipper-TR[®] probes is that they can be simply added to cells before making the measurements and no genetic modifications are required.

Such research and other seminal findings in the field have also contributed to the current **high international visibility of Chemical Biology in the Lemanic region**.

Furthermore, the international standing has also been promoted by our organization of a biennial **International Symposium in Chemical Biology** which has been an enormous success with over 200 participants at each event and will be continued after the end of the NCCR.

Another important contribution to our reputation comes from our high quality **Master's program** where we recruit outstanding scholars from all over the world. These students get an excellent interdisciplinary training, which is showcased when they finish and go abroad for subsequent training to further their nascent scientific careers.

Excellence in research is not enough. One needs to be able to communicate it to the scientific community and transfer the knowledge benefits to society. The NCCR Chemical Biology has developed a **robust communication policy**, including e.g. a strong social media presence, a popular newsletter and a dynamic website to communicate with the scientific community and beyond.

In addition, we have regularly organized a **great variety of outreach activities for lay audiences** of different ages. Our dedicated staff and researchers have made these programs highly successful and many of them were recorded and can be seen online.

In parallel, constant efforts to encourage technology transfer have led to **several startups that have been spun-out by NCCR members**. We have also initiated a Pre-seed workshop (Bench2Biz), that has filled an important gap in the entrepreneurial landscape in Switzerland by providing a tool for researchers in high-technology to rapidly evaluate the translational potential of their discoveries. This initiative will be continued

with the help of a consortium of active NCCRs.

Finally, the future of chemical biology in our region and institutions depends upon the young scientists who will be the superstar researchers of the future. The NCCR has taken several approaches to increase their chances of success and **promote equality**. We implemented an equal opportunity management policy, organized workshops around career skills such as soft skills, grant writing and oral communication which were favorably evaluated by the participants and seem to be of high value in establishing good procedures and confidence. A tangible result in the gender equality area is the increase in the percentage of female professors in the network from 14% at the beginning to 33% at the end.

In summary, the 12-year lifespan of the NCCR Chemical Biology has allowed us to reach our main goal of creating a culture of interdisciplinary research to visualize and control biological processes. In the process, we acquired international renown within the scientific community and made our presence and virtues known to lay communities.

The National Centres of Competence in Research (NCCRs) are a funding scheme of the Swiss National Science Foundation.

The NCCR Chemical Biology received the support of:



EPFL



**UNIVERSITÉ
DE GENÈVE**