



**Affective Sciences**  
SWISS NATIONAL CENTER OF COMPETENCE IN RESEARCH

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# **National Center of Competence in Research Affective Sciences**



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**Final Report**

**2005 - 2017**

Front cover image: This picture is part of the photographic documentary “Musique et Metaphore” organized by the Center in 2016 in collaboration with the Cultural Office of the University of Geneva.

# NCCR FINAL REPORT

<b>Title of the NCCR</b>	Affective Sciences: Emotion in Individual Behaviour and Social Processes
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## **1. Executive summary**

During the past 12 years the NCCR Affective Sciences has become a reference institution in the study of emotion worldwide. The framework and resources provided by the NCCR have contributed not only to the development of the affective sciences as an international interdisciplinary domain, but to the consolidation of Switzerland as a lead player in this rapidly growing field. This success has been possible first and foremost thanks to the existence of the NCCR, but it is also the result of a fruitful continuous collaboration between the SNSF, universities, foundations, industry, and other Swiss and European entities and agencies, whose joint efforts served to fund the activities, research and infrastructures reported below. To all of them we extend our most sincere gratitude.

### **1.1 Structural development and perspectives for the affective sciences**

The success of affective sciences in Switzerland is strongly underpinned by remarkable structural accomplishments. The main one is the creation of the first institution explicitly dedicated to the affective sciences as such, that is to say, to the multidisciplinary investigation of emotion including not only psychology and neuroscience, but also literature, philosophy, economy, computer science, and the social and human sciences at large. This Center, known in English as Swiss Center for Affective Sciences, and in French as Centre Interfacultaire en Sciences Affectives (CISA), is a unique interfaculty institution at the University of Geneva that will continue to function after the NCCR. Located since 2013 at the Campus Biotech, site of pioneering research in technology, neuroscience and the life sciences, the CISA will continue to physically host a large community of affective scientists and scholars offering them the best working and networking conditions. At the same time, CISA will maintain its role as “hub” for a vast scientific network with over six times the original number of associates and a large variety of disciplinary orientations including the humanities. The second most important structural development are the 10 professorial positions directly created, or indirectly facilitated, at the University of Geneva thanks to the existence of the NCCR and the active support of the Rectorate of the University of Geneva. These guarantee the long-term operation of the affective sciences as an interdisciplinary field in Switzerland. The third main structural accomplishment are the research facilities created during the NCCR period. They include the laboratories at the Campus Biotech, the Laboratory for Social and Neural Systems Research (SNS lab) at the University Hospital in Zurich, and above all the Brain and Behavior Laboratory (BBL) at the University of Geneva, designed and managed by researchers from the NCCR/CISA. The BBL features a variety of state-of-the art technologies that will continue to be available to our researchers after the NCCR, including among others laboratory facilities for psychophysiological and behavioral measures, EEG, fMRI with custom-made compatible olfactometer and gustometer, TMS, two sleep labs, NIRS systems, and an immersive virtual reality system. A fourth important accomplishment are the permanent positions created to support the long-term functioning of both CISA and the BBL, including five administrative and science-management roles, and eight technical positions. A further structural achievement is the representation of the affective sciences in the academic curricula of several departments, including a master in Cognitive Science with a strong focus on emotion at the University of Neuchâtel, and –within the University of Geneva – a seminar in public law on the links between the legislator and the emotions, a masters course in affective science in the Philosophy Department, and a Master of Science in Psychology with a specialization in Affective Psychology, the only one of its kind in Switzerland and, to the best of our knowledge, in Europe. Another important structural achievement is the establishment of a doctoral program funded by external sources (Swissuniversities) that will continue to organize interdisciplinary training activities for the next generations of affective scientists. Finally, the NCCR/CISA and affiliated researchers are now frequently contacted by organizations and media professionals to comment, advise, or participate in activities concerning emotion, thus frequently appearing in newspapers, radio or TV events, all of which testifies to the visibility and impact achieved by the Center in the past twelve years.

### **1.2 Main research results**

The past 12 years at the NCCR have witnessed outstanding results for the affective sciences as a field, but also in specific subdomains, including psychology, neuroscience, affective computing, philosophy and the humanities more generally.

Among our most important scientific accomplishments within psychology are the theoretical models put forward or refined by our researchers in the past 12 years. These include Scherer's influential Component Process Model of emotion (CPM), Semmer & Tschan's innovative Stress as Offense to Self (SOS) theory in work psychology, and Clement's integrative Affective Social Learning (ASL) model in developmental psychology. Our researchers have also made significant contributions in topics as varied as the determinants of emotional attention, the role of emotion in memory, the effects of emotion on decision-making, the psychophysiology of emotion and motivation, the cognitive underpinnings of procrastination, psychological biases in the perception of female power, success modulators in female leadership tasks, the nature and automaticity of social appraisal, predictors of partner responsiveness perception and the role of responsiveness in relationship quality, and the assessment of emotional competences at the workplace.

The Center's work in neuroscience has greatly contributed to our understanding of the brain circuits mediating emotions and their interplay with cognitive and social processes. In particular, we developed hypothesis-driven neuroscience studies of emotion that connected fundamental research about the emotional brain to theories and models of emotions. Our researchers have also pioneered work on the role of oxytocin on trust, the neural signatures of specific emotions or emotion components, the long-lasting brain effects of emotional episodes, the brain mechanisms involved in emotional prosody recognition and production (and the related motor binding phenomena), the brain processes underlying the interactions between emotion and attention and between emotion and memory, the prioritized reactivation of emotion-relevant information during sleep, the mechanisms underlying odor-elicited emotions, and the role of the amygdala for affective relevance processing.

Within philosophy, our researchers developed a systematic taxonomy of the affective domain and advanced an attitudinal theory of the emotions offering a distinctive understanding of their links with values. Researchers in literature reinterpreted the works of 19th century authors like Stendhal, Balzac, Flaubert, and Hazlitt as true theorists of emotion, investigated the temporal dimensions of affective phenomena, and discussed the link between ethics and aesthetics. Classics used emotion to bridge the gap between Greek and Latin studies that was dragging back the field. And research on the foundations of comparative religion led to the consideration of ancient roots in the interreligious conflicts that still worry us today.

The variety of disciplines represented at the Center has enabled rich synergies resulting in unique interdisciplinary research. In a truly interdisciplinary project on affective computing, psychology and computer science defined a new paradigm to investigate affective processes in computer-mediated collaborative learning using an experimental psychology approach and multimodal signal processing. The humanities have been particularly involved in cross-disciplinary research too, promoting innovations like the creation of an experimental philosophy of art, pioneer interdisciplinary work on the nature and function of "being moved", and the inclusion in French literary studies of thought experiments based on philosophical analysis. The combined efforts of psychologists and philosophers to offer an analysis of the nature of emotion, or that of shame, deserves special mention. Another example of our interdisciplinary research is the creation of intercultural models of emotional responses to odors and music that are now used worldwide, and scientifically validated instruments to measure the meaning of emotion words across languages and cultures.

### **1.3 Swiss standing in the affective sciences international scene**

The NCCR set Switzerland as one of the leading countries for scientific research in the affective sciences across all disciplines. A clear indicator of the impact achieved by the NCCR is the number of international publications (more than 1000 in the past 12 years) in volumes with the most prestigious publishers (e.g. *the Affective Sciences series* with Oxford University Press; *the Handbook of Human Affective Neuroscience* with Cambridge University Press; *the Language and Literature series* with Palgrave Macmillan) as well as in the most prestigious international journals including *Science*, *Nature*, *Nature Neuroscience*, *Philosophical Studies*, *Emotion*, *Emotion Review*, *Cognition and Emotion*, *PNAS*, *Journal of Neuroscience*, *Brain*, *Cognition*, *Journal of Personality and Social Psychology*, *Journal of Experimental Psychology: General*, *Psychological Science*, *Social Cognitive and Affective Neuroscience*, *e-life*, *Scientific reports*, *Critical Quarterly Wiley Oxford*, or *Critique Ed. De Minuit Paris*. The scientific articles published in peer-reviewed journals during these 12 years have been cited more than 27'400 times, with citations from 99 different countries showing how the scientific theoretical developments and findings from the NCCR have spread worldwide. Two of our affective computing articles, for example, have been nominated among the most influential in the reference journal in their field. Other indicators of the Swiss standing in the affective sciences include the prizes won by our researchers, their invitation to edit journal issues and monograph volumes, the invitation to participate in the most prestigious handbooks in the field, their service as editors in several multidisciplinary and disciplinary journals, their invited conference keynote addresses, and their active participation in academic societies, such as ISRE. Furthermore, the visibility of the Center has been reinforced by the organization of major international conferences, key in their respective fields, like ABIM (neuroscience; annually), ACII 2013 (computer science), ICME IV (music and emotion), and ISRE 2015 (affective sciences).

### **1.4 Outreach, communication and knowledge transfer**

The affective sciences are better known outside academia today than they were 12 years ago. This is largely due to an ambitious outreach and transfer strategy encompassing three axes: the organization of communication and knowledge transfer activities, the participation in scientific events outside the affective sciences to advertise our work in those fields, and the operation of an applied research unit responsible for supporting the collaboration between our researchers and public or private institutions in applied research projects. These efforts have yielded major achievements in three general areas: 1) collaborations with public institutions (e.g., museums, music or science festivals), like our project with the Museum of Natural History in Neuchâtel for the creation of the successful exhibit "Emotions...naturally", currently on tour in other countries; 2) the creation of research tools (e.g., databases, software, and varied emotion measuring instruments, many of which are publicly available on our

website); and 3) collaborations with industry, like our research in association with Firmenich, which after 12 years has made the Swiss Center for Affective Sciences one of the world leading scientific institutions on the study of the relationship between emotions and olfaction.

### **1.5 Promotion of young scientists, including women careers**

The promotion of young scientists has always been at the heart of the NCCR goals. The main instrument to pursue this objective is the establishment of a doctoral & postdoctoral program offering interdisciplinary training, conference attendance funding, networking opportunities, regular emailing of relevant information, and support identifying career-funding grants. The recent renewal of the doctoral school thanks to the funding from Swiss-universities guarantees the continuation of the training opportunities at least until 2020. At the end of the NCCR, over 250 graduate students and postdoctoral researchers will have graduated from our program.

The promotion of female careers was specifically supported by the Research Focus Gender, a unit dedicated to research on the role of emotion in gender imbalances, its causes, and possible mechanisms to encourage change. A large part of this research focused on the relationship between women and power, striving for an interdisciplinary approach to topics such as stereotyping, role models, stress and self-esteem. The research was complemented by a number of logistic and financial measures aiming to compensate for gender inequalities (like financial contributions to family support, flexibility in work contracts, and regular information on gender equality measures and family-work harmonization). A third of our project leaders are women, and several members of the Center are intensely involved in mentoring programs and equal opportunity committees in different universities.

The NCCR closes these 12 years of funding with the profound satisfaction of having consolidated the field of the affective sciences in Switzerland and worldwide. Swiss research has achieved a privileged status in the area and, thanks to the outstanding structural achievements of these years, it is likely to remain and even develop further. Our Center will remain committed to research excellence in the international scene, will continue to train new generations of affective scientists and scholars in the spirit of interdisciplinarity, partner with other research institutions to translate our work into practical resources, and communicate our scientific advancements to the general public. In doing so we will continue to demonstrate the importance of an interdisciplinary understanding of emotions to achieve scientific excellence and promote individuals' well-being and the advancement of society at large.

## 2. Structural development and resources available to the NCCR

### 2.1 Starting point and development of the NCCR

The “affective turn” witnessed in the past three decades in all domains of human knowledge started as individual “revolutions” within the behavioral, human and social sciences, as well as in neuroscience, all of which became increasingly aware that many phenomena ranging from individual cognitive processing to social and collective behavior could not be understood without taking into consideration affective determinants. Geneva was one of the leading institutions pushing the affective turn within psychology. At the time, only a few centers existed worldwide interested in exploring emotion beyond disciplinary boundaries, like the Center for the Study of Attention and Emotion at the University of Florida, or the Laboratory for Affective Neuroscience at the University of Wisconsin, Madison – but in all these cases the only two disciplines involved were psychology and neuroscience (a trend still observable in the United States). The Affective Sciences began to take form as a truly comprehensive multidisciplinary field with the conferences of the International Society for Research on Emotion (ISRE). Yet, before 2005, the interdisciplinary domain of the Affective Sciences was not structurally implemented anywhere, that is to say, to the best of our knowledge, before the NCCR no university entity existed in any other country in the world dedicated to the Affective Sciences as such. The first center was created at the University of Geneva in order to lead the newly created NCCR. This was largely possible thanks to the fact that all disciplines potentially interested in the Affective Sciences were well represented within the University of Geneva.

Since 2005, the structural developments and challenges faced by the NCCR Affective Sciences can be described and analyzed at two levels: institutional and disciplinary. On the one hand, the Center set out to create a network of collaborating *institutions* under the leadership of a new research center dedicated to the Affective Sciences. This logistic effort has been accomplished (as described in more detail in section 2.2) and the resulting institutional network, as well as its infrastructures, will continue to exist after the NCCR funding period. On the other hand, the Center aimed to create a network of collaborating *disciplines*. This meant for the disciplines not only to work on the same topics, but also to work together. Interdisciplinarity in this sense is a difficult challenge with internal as well as external constraints. In this section we evaluate our main accomplishments in interdisciplinarity, identify the main difficulties encountered, and describe ways to overcome them.

The NCCR Affective Sciences started its venture in 2005 with 10 projects engaging 17 project leaders, 5 Swiss universities (Geneva, Fribourg, Neuchâtel, Zurich and Bern) and 6 main disciplines (psychology, neuroscience, philosophy, economy, history and law). The network also included 11 associate researchers bringing additional competences in medicine, educational science, literature, and sociology. The number of groups involved and disciplines represented have developed considerably after 12 years. At the end of its funding cycle, the NCCR counts 12 main projects from 7 main disciplines. The number of associate researchers has grown (to 60) and so has the number of disciplines involved in the network (now including classics, linguistics and computer science, among others).

These changes are witness to the Center’s continuous effort to engage more and more varied disciplines in the work of the Affective Sciences. We firmly believe in the ultimate desirability of this goal, as emotions are multi-faceted phenomena that cannot be successfully described without the input provided by different knowledge areas. However, for this input to be valuable to the other disciplines and susceptible of building a common, cumulative body of knowledge about emotion, a minimum of coherence and mutual intelligibility needs to be achieved in conceptual tools, in vocabulary to refer to those concepts, and in methodologies to pursue research goals.

This integration (conceptual and methodological) has been the hardest task for the NCCR Affective Sciences. Aware of the challenge, from the very beginning different measures were put in place. The first was the establishment of transversal modules to bring the various projects together around common topics of interest: gender, prosocial behavior, life-span development, and methods. These broad transversal modules soon morphed into more specific “research foci”, which have proven instrumental for the activity of the NCCR, producing and inspiring very interesting interdisciplinary outputs, and leading to externally funded research projects in some cases. Three out of the original modules (i.e. methods, development, and gender) continue to exist as research foci and have been supplemented throughout the years by an increasing number of transversal topics of interest: language and culture, aesthetic emotions, music and emotion, decision making, empathy, self-reflective emotions/moral emotions, affective computing, videogames and virtual reality, and the so-called applied affective sciences. In most cases, an advanced postdoc was hired to conduct research on these topics, and more importantly, to bring together teams from different domains to collaborate in specific endeavors. In most cases, the foci coordinators were also required to write a survey paper from a multidisciplinary perspective, and to organize interdisciplinary workshops or colloquia.

This format has produced truly unique results. For example, in the framework of the focus Language and Culture, a collaboration between psychology and linguistics produced the GRID instrument, which has measured the meaning of emotion words in more than 25 languages and cultures around the world (Fontaine, Scherer &

Soriano, 2013). The focus Emotion and Music brought together musicologists, neuroscientists, philosophers and psychologists, as well as practicing composers, instrumentalists and singers. As a result, a large number of colloquia and workshops were organized resulting in numerous publications, like a book on "*The emotional power of music*" published by Oxford UP (Cochrane et al., 2013) and an interdisciplinary review article about metaphors, music and emotion (Pannese, Rappaz, & Grandjean, 2016). The latter is also the topic of an SNSF interdisciplinary project funded for three years. In addition, the Focus organized several concerts involving the dynamic measurement of emotional reactions in the audience, and founded the festival "Science and Music" together with the Conservatory and the Opera of Geneva. In the framework of the focus Affective Computing, a collaboration between computer science and cinema studies resulted in the modeling of aesthetic highlights in movies based on the audience's physiological response; the collaboration then earned new SNSF funding as an interdisciplinary project. In the focus Aesthetic Emotions, a collaboration between psychology and philosophy resulted in numerous experiments for the empirical investigation of philosophical claims, including, for example, the study of the emotion "being moved" as compared to "being elevated" and their respective effects on prosocial behavior. The focus Moral Emotions produced a special volume dedicated to moral emotions from various disciplinary and interdisciplinary perspectives (Cova, Deonna & Sander, 2015). The transversal Focus on "Methods" has also been instrumental in bringing disciplines together through the development of shared tools for the study of emotion (e.g., GEOS, FACSgen, the Geneva Voice Toolbox, tools for the fMRI, for virtual reality, or tools used in web experiments), most of which now available to the scientific community.

A second measure to foster disciplinary integration has been our "inter-projects". In 2009 the "incentive funding" instrument was also introduced. Both funding instruments have allowed us to support smaller studies arising from the interactions of two or more disciplinary teams in the NCCR, or their collaborations with associates. These were risky projects by definition, hard to fund through other means, and they allowed the interested parties to explore new and creative forms of collaboration (which is necessary to build common ground, a prerequisite for true interdisciplinary research outputs). Among our list of projects funded through these instruments we count the NEMO ("Negotiation and Emotion") project, a bottom-up collaboration of NCCR students and postdocs from neuroscience and psychology that analyzed brain, physiological, expressive and self-report measures to study the contribution of different factors to behavior and success in interpersonal negotiation. Another interesting example is the collaboration between psychology and literature in the project "Reading the emotions", aiming to model the emotions perceived and felt while reading significant passages of literary works. A third interesting example is the project "Emotion regulation and cognitive control", a study directly emanating from an ISSAS student collaboration for an fMRI study on the relationships between executive functions and emotion regulation processes. The interprojects «The impact of emotions on evaluative attitudes», «As-if emotions» and «Make-believe emotions» brought together philosophers, psychologists and neuroscientists to work on the differences between emotions directed at real and fictional stimuli, and found interesting dissimilarities between the two. This work allowed us to secure a research grant from the Cogito Foundation to fund another project, «Towards an experimental philosophy of aesthetics», which explored the relevance of psychological methods for philosophical aesthetics in the context of our engagement with fictions and for the assessment of standards of aesthetic taste. Finally, one may mention the interproject "The role of emotions in conflict resolution", currently networking with organizations in the domain of conflict resolution and peacebuilding including the Maison de la Paix, Geneva Center for Security Policy, and Interpeace.

Our third measure for disciplinary integration has been the set of workshops and seminars organized in the context of the Education and Training Program. This was designed from the very beginning as a resource for our students and postdocs to meet other disciplines and acquire interdisciplinary skills, and for project leaders and other NCCR researchers to meet their peers. Exposure to various disciplines was guaranteed by a regular seminar series featuring speakers from different domains, and by the Annual Research Forum, which once a year brought together all NCCR members to present and discuss their latest research. In addition, teaching was pursued through workshops. These have adopted different formats and names throughout the years, but they always involve three basic types: (i) thematic workshops around a specific topic of interdisciplinary interest; (ii) skills workshops about transversally useful methods or tools; and (iii) graduate seminars, designed as basic-level introductions to one of the disciplines in the affective sciences. Our summer school complements the offer with a more intensive interdisciplinary "immersion". In all activities we ask our speakers/ instructors to speak for a broad audience and operationalize the key concepts in their domain. We feel the target tone has been achieved, as there is – for example – a clear accessibility difference between the lectures organized by the NCCR and those in seminar series specific to a discipline (e.g., Brain & Cognition for neuroscience, or Thumos for philosophy). Additionally, in the workshops we ask instructors to be explicit about their methodologies, and in the graduate seminars they are required to provide a broad overview of findings in the field. These measures aim to create a "common language" to communicate across disciplines. Our general impression is that this goal has been accomplished too, as attested by the emergence of collaborative projects, or simply by the continuous exchange between researchers from different disciplines that regularly results in conceptual clarity for a research question, a wider framing of

the state-of-the art in a paper, the discovery of convergent evidence, or a new spin in result interpretation. Every young researcher at the Center is likely to have a case to report. For the sake of illustration, we will just mention a collaboration between linguistics and psychology that resulted in a new conceptual framework to analyze emotion metaphors and fresh ideas to measure affect in a virtual reality environment based on metaphorical emotion language.

Towards the end of the NCCR, the Center has started to organize its activities around five main research axes that we believe will guarantee the continuation of our scientific excellence and provide a new framework for interdisciplinary collaboration, as well as a fertile ground for practical applications addressing important societal concerns. These axes explore the interplay of emotions with (1) learning and education, (2) culture and the arts, (3) health and well-being, (4) values and decision making, and (5) interpersonal competences and social skills.

Research Foci, the development of shared methods, interprojects, the Education and Training Program and the Annual Research Forum have all been successful measures to foster interdisciplinarity. But other measures proved less effective. For example, the original goal of the “transversal modules” was for a postdoctoral researcher to coordinate the collaboration of all research projects around one topic of interest. However, the topics were too broad, and the ability of the young researchers was too limited to enforce contributions, given the inherent tendency of project leaders to focus on their own particular research projects. By contrast, the Foci were narrower in scope and were established in a fully bottom-up fashion, based on attested overlap in research interests. This proved more productive. However, not all foci were equally successful either – some never quite got off the ground. This is the case of the Focus on self-reflexive emotions, a topic well represented among various teams at the Center that, nevertheless, never crystallized into interdisciplinary ventures until years later under the narrower label “Moral emotions”. A lesson learned is that much of the success of a Focus depended on the ability of the leading postdoc to conjure a topic and method for suitable collaboration. Another related and crucial factor is the relative distance between the disciplines involved in how the relevant concepts are defined and in methodologies. The obvious example is the difference in research traditions in the humanities compared to experimental psychology or neuroscience; but equally important differences can also be observed between any of those domains and more applied fields like economics or computer science. An additional complication is the different terminology in each field (and even within fields), such that the same words come to refer to fairly different concepts. Serious efforts have been made towards conceptual clarification and the establishment of a common terminological ground for all domains (e.g., through the Oxford Companion to Emotion and the Affective Sciences), but other efforts, like our attempt to create an Ontology of the Emotions, never bore fruit.

Through the experience of the past 12 years some more general lessons about interdisciplinarity have been learned too. Firstly, interdisciplinarity is easier in teams with strong personal links; thus, promoting individual as well as strictly professional ties should be explicitly considered in the organization of a long-term interdisciplinary research structure. This rule of thumb applies to all academic levels, from the doctoral community to the professorial board, and for the relationships between them.

Secondly, interdisciplinarity is more time-consuming than other forms of research. Hence the crucial importance of a long-term funding scheme, with the capacity to assume risks, exercise flexibility and provide the necessary training to enable communication across domains

Third, we found that a very positive element to foster interdisciplinarity is to have researchers share the same working space (in our case the CISA). We think this aspect has been a crucial factor for the success of several interdisciplinary projects.

Finally, an obvious challenge for the success of interdisciplinarity is the lack of suitable positions or project funding schemas that take multidisciplinary profiles seriously. We have had the experience of accomplished researchers who were not selected for jobs because their profile was not sufficiently “focused”. We have also witnessed an explicitly interdisciplinary research project being rejected on account of “not being clear as to whether it wanted to make a contribution to psychology or to philosophy”. In sum, it seems counterintuitive to encourage interdisciplinary academic profiles without promoting at the same time interdisciplinary academic jobs. Until true interdisciplinary positions in the job market and quality interdisciplinary publication outlets become available, a disciplinary focus remains a must.

## **2.2 Structural achievements and perspectives beyond the NCCR**

The first structural goal of the NCCR Affective Sciences was to establish a new research center at its home institution. This goal was accomplished through the creation in 2005 of a new interfaculty center at the University of Geneva, the Centre Interfacultaire en Sciences Affectives - CISA (which we named in English Swiss Center for Affective Sciences). An additional very important contribution of the University of Geneva to the NCCR was the allocation of concrete physical space to the Center. Our first offices (featuring a conference room, a kitchen, social area, and office spaces) were located on the third floor of a building strategically located in the proximity to

both the university campuses and the university hospital (7 Rue des Battoirs). The possibility of working together under the same roof was certainly a key reason for the success of many collaborations. In November 2013, the CISA moved to a new location, becoming the first unit of the University of Geneva to join the Campus Biotech. This new campus brings together the University of Geneva and the EPFL (in addition to other partners) in the context of an extraordinary research environment that is quickly becoming a major player for research excellence in Switzerland. CISA is regularly involved in or consulted on major decisions concerning the structure, infrastructure and future of the Campus, especially through the PI meetings organized every month.



Campus Biotech ©Ryncki

Another important structural accomplishment is that, to enable the continuous operation of the CISA beyond the NCCR, five permanent positions have been created for administrative coordination, administrative support, knowledge transfer and communication, education and training, and applied research, respectively.

The CISA is also serviced by new research infrastructures established during the funding period of the NCCR that will continue to operate after 2017. The most important one is the Brain and Behavior Laboratory (BBL) of the University of Geneva, co-directed by two NCCR members, P. Vuilleumier and D. Sander, with the participation of other NCCR members, who direct several BBL research modules (D. Grandjean, and S. Schwartz). The BBL, created in 2009, offers laboratory facilities for psychophysiological and behavioral measures, EEG, fMRI with custom-made compatible olfactometer and gustometer, TMS, a sleep lab, NIRS systems, and an immersive virtual reality system. To secure the operation of the BBL, the budget assigned to the CISA by the University of Geneva also covers eight technical positions. New experimental platforms at Campus Biotech are also available to the Center, featuring state-of-the-art MRI, EEG, NIRS, a sleep lab, psychophysiology facilities and a new virtual reality immersion system.

But the most important structural achievement may be the creation of several NCCR-related new professorial positions. In the context of the in-kind contributions of the University of Geneva, and given the support received from various departments and faculties, the following positions have been created in association to the Center:

- Neuroscience of emotion and affective neuropsychology. In 2009 D. Grandjean was appointed assistant professor in the Department of Psychology at the Faculty of Psychology and Educational Sciences. D. Grandjean specializes on the cerebral and brain mechanisms involved in emotion recognition and production, especially in the auditory domain, and is one of the NCCR project leaders most involved in the management and functioning of the Center. His appointment contributes importantly to the stabilization of the CISA as a long-term research structure. He was appointed associate professor in 2013.
- Sleep, learning and emotion. In 2012 S. Schwartz was promoted to associate professor in the Department of Basic Neuroscience at the Faculty of Medicine. S. Schwarz specializes on the cerebral and brain mechanisms involved in sleep and learning, and their relationship to emotion, bringing a new and promising angle to the work of the Center while reinforcing our collaboration with the Faculty of Medicine.
- Philosophy of emotions. In 2015, J. Deonna and F. Teroni, both renowned experts in the philosophy of emotion, were appointed associate professors (each of them at 50%) at the Faculty of Humanities, in which they occupy a chair in the philosophy of emotions. J. Deonna is strongly involved in the Management of the NCCR, and together with F. Teroni, they direct Thumos, the Genevan philosophy group for research on emotions, values and norms. These two positions are key to guarantee the strong participation of the humanities in the future of the Center, as they lead an important effort both to develop the philosophy of emotions, and to establish further links between the humanities and other disciplines.
- Emotion and decision-making / Neurofinance and neuroeconomics. In 2014, a new position was created at the Geneva School of Economics and Management (GSEM), and K. Preuschoff was hired as associate professor. After a PhD at CalTech with P. Bossaerts, she continued to develop her expertise on the cerebral and brain mechanisms involved in emotion-driven decision making, which nicely complements the work already carried out at the Center, guarantees our presence at the GSEM, and our collaboration with another interdisciplinary center of the University of Geneva - the Geneva Finance Research Institute (GFRI) (which co-funds the position at 50%).
- Signal processing for the affective sciences. In 2016 D. Rudrauf was appointed associate professor at the Psychology department in the Faculty of Psychology and Educational Sciences. He joined our Center after 12 years in the US, where he conducted a PhD thesis with A. Damasio and taught as assistant professor at the University of Iowa. He is a perfect match for the interdisciplinary objectives of the Center, given his long experience working on emotion, important methodological skills, expertise in neuroscience and psychology, and background in the humanities (Bachelor in literature).
- New position in the process of being implemented. In the context of the in-kind contributions of the Uni-

versity of Geneva to the NCCR for the 3rd phase, a new tenure-track assistant professorship position in the affective sciences is in the process of being created at the University of Geneva, in principle in the area of the humanities and social sciences. Due to some structural challenges with some departments, the creation of this position is taking longer than expected. However, this is a very important position for the Center and worth the time investment to make the best of such an opportunity.

In addition to the creation of these six new professor positions, it is important to consider that some professor positions were probably possible or at least greatly facilitated by the existence of the NCCR. Four of them at the University of Geneva can be mentioned in particular:

- P. Vuilleumier became full professor in 2006 at the Department of Basic Neuroscience at the Faculty of Medicine. P. Vuilleumier has been very strongly involved in the NCCR since its start in 2005, and is now deputy director of the NCCR and co-director of the BBL.
- D. Sander became associate professor in 2009 (and full professor in 2013) at the Department of Psychology at the Faculty of Psychology and Educational Sciences. D. Sander has also been very strongly involved in the NCCR since its start in 2005 as NCCR scientific coordinator, and is now director of the NCCR and of the CISA, and co-director of the BBL.
- E. Gentaz became full professor in 2012 at the Department of Psychology at the Faculty of Psychology and Educational Sciences. He holds the chair on developmental psychology at the Faculty of Psychology and Educational Sciences, which became vacant after the retirement of G. Labouvie-Vief (who was involved in the NCCR as head of the life-span transversal module). The position was kept in the domain of the NCCR, where E. Gentaz is now responsible for the research focus on the Development of Emotion. His position will continue to greatly benefit the Center in our intention to expand the research on “emotion and education” in the post-NCCR phase.
- T. Brosch became tenure-track assistant professor in 2015 on “Efficience énergétique: Affect, décision et comportement” at the Department of Psychology at the Faculty of Psychology and Educational Sciences through funding from the Competence Center for Research in Energy, Society and Transition (CREST) in the field of energy research. The position includes a research group currently comprising 8 people, most of them physically hosted at the CISA. Their work contributes an innovative and pioneering line of research on the role of emotions in environmentally sustainable behavior. This last position particularly nicely illustrates the “accelerator” role of the NCCR, as it is very likely it would not have been possible without the existence of the NCCR (although the funding is not directly related to the NCCR).

All these positions associated to the Center ensure the continuation and development of the research in the Affective Sciences and the international impact that the CISA already accomplished thanks to the NCCR and other funding sources.

Along with permanent positions and infrastructure, another major structural accomplishment of the Center is the establishment of a stable Education and Training (E&T) Program. Its existence is supported by the positions mentioned above, but also by the external funds secured from the federal agency Swissuniversities for the operation of a doctoral training program in the Affective Sciences. The newly founded Swiss Doctoral School in Affective Sciences takes over the NCCR doctoral school and expands its offer with new features, like a wider network of students and faculty, and a mentoring program. After the first funding period, the program has just been renewed for another 4 years (2017-2020) with over six times the original budget. In addition, the Center offers a postdoctoral program, providing its members with varied interdisciplinary training activities, networking opportunities, and funding to attend external scientific events. It also participated in the postdoctoral program BRIDGE (Brain & BehaviouR InterDisciplinary research in GEneva), funded by the University of Geneva and the COFUND instrument of the European Union, which between 2010 and 2015 recruited 31 postdoctoral researchers among more than 300 applicants from all over the world to come to Geneva to work at the BBL. At the end of the NCCR, over 250 graduate students and postdoctoral researchers will have graduated from our Education and Training Program.

Another structural accomplishment related to education, but independent of the E&T program, is the representation of the Affective Sciences in the academic curricula of the University of Geneva. This has been accomplished at bachelor and master levels and in several departments (Psychology, Philosophy, Computer Science, Fine Arts, and Modern French). To the best of our knowledge, the specialization in Affective Psychology in the Master program in psychology is the only one of its kind in Switzerland. This extensive presence of the Affective Sciences at the University of Geneva enables students to familiarize themselves with the domain and may result in an increased interest in the research and training offered by the Center.

Structural achievements can also be reported at the institutions of the network. For example, the University of Neuchâtel offered to each of the two NCCR projects hosted at the University of Neuchâtel at that time (M. Schmid Mast and F. Tschan), a 50% postdoc position for four years to complete the 50% postdoc position financed by the NCCR. The same university offered financial support in the acquisition of an eye-tracker, which served as a crucial

piece of equipment for F. Clement's project. Furthermore, a Master program in Cognitive Science has been created where emotions play a central role, the goal being to send students to the doctoral school hosted by the Center. Another example of structural developments can be found at the University of Zurich, which provided support for the opening in 2007 of the Laboratory for Social and Neural Systems Research (SNS Lab) located at the University Hospital Zurich. Funding for the Philips Achieva 3T whole body scanner was provided by the Branco Weiss Foundation. Other infrastructure at the SNS Lab includes brain stimulation, a behavioral lab in the hospital, EEG equipment, and a pharmacology lab. A large behavioral lab with 36 carrels is also available. All of this infrastructure was crucial for the NCCR project led by E. Fehr and for collaborations with C. Ruff's team and D. Grandjean's team combining TMS and fMRI.

**Table 1a: Structural achievements (data from: April 2017)**

Type of structural aspect	Output
NCCR structures	<ul style="list-style-type: none"> <li>Centre Interfacultaire en Sciences Affectives (CISA) created in 2005 at the University of Geneva. The University of Geneva committed to the unlimited existence of the CISA and its corresponding positions (see below).</li> <li>List of faculties involved in the Center: Faculty of Psychology and Educational Sciences, Faculty of Medicine, Faculty of Humanities, Faculty of Science, Geneva School of Economics and Management, and Faculty of Law</li> <li>CISA integrated into Campus Biotech as the first unit of the University of Geneva in 2013.</li> <li>Five permanent positions at CISA for administrator (Sauge), administrative support (Gumy), outreach (Varone), Education and Training (Soriano), and Applied Affective Sciences and KTT (Mortillaro)</li> <li>Eight permanent positions for the technical staff, in particular those associated to the Brain and Behavior Laboratory (see below under "Infrastructures / platforms") : lab manager (Neveu), fMRI (Bonet and Grouiller), Virtual Reality (Badier), psychophysiology (Delplanque), signal processing (Tamarit), IT (Mermoud and Tailamée)</li> <li>Budget managed by the CISA for hiring an assistant in the following teams: one assistant for "Neuropsychology of Emotion" (Grandjean), one assistant for "Multimodal processing of emotion-feeling" (Rudrauf), one assistant for "Neurofinance and decision making" (Preuschoff), one assistant for 3rd phase professor, and 50% assistant position for "Sleep and cognition" (Schwartz)</li> <li>The CISA has full access to the Brain and Behavior Laboratory, and to the facilities of the Campus Biotech (see the section on Infrastructures / platforms)</li> </ul>
Sustainability NCCR structures	The structures and positions listed above are permanent.
NCCR-Network	<p>Stable and extensive network composed of several research groups at six partner universities in Switzerland and abroad. One stable industry collaboration.</p> <ul style="list-style-type: none"> <li>University of Bern (one research group involved in phases 1-3)</li> <li>University of Fribourg (several research groups involved in phases 1-2)</li> <li>University of Lausanne (one research group involved in phases 2-3)</li> <li>University of Neuchâtel (several research groups involved in phases 1-3)</li> <li>University of Zurich (several research groups involved in phases 1-3)</li> <li>University of Liège (one research group involved in phase 3)</li> <li>Firmenich SA (research collaboration with industry partner, phases 1-3)</li> </ul>
Sustainability NCCR-network	All collaborations with the members of the NCCR will continue after 2017. The collaboration with Firmenich will continue at least until 2019.

Type of structural aspect	Output
Educational programs	<ul style="list-style-type: none"> <li>Specialization in Affective Psychology in Master Program in Psychology, Faculty of Educational Science and Psychology, University of Geneva.</li> <li>Graduate School and Postdoctoral Program of the NCCR Affective Sciences.</li> <li>Swiss Doctoral School (SDS) in Affective Sciences, offering an interdisciplinary emotion-specific training, designed to complement the students' basic doctoral training in their discipline and university.</li> <li>International Summer School in Affective Sciences (ISSAS)</li> </ul>
Sustainability educational programs	<p>The NCCR Graduate School will end but is replaced by the Swiss Doctoral School in Affective Sciences (sustainable for at least an additional 4 years).</p> <p>The specific funding for the NCCR Postdoctoral Program will end with the NCCR, but the program will continue to offer network, information and training for postdocs all over Switzerland. Conference funding will become available if we are successful with our planned COFUND European project.</p>
Infrastructures / platforms	<ul style="list-style-type: none"> <li>Brain and Behavior Laboratory (BBL) (providing psychophysiology, fMRI and EEG facilities, a sleep lab and a virtual reality lab). Created in 2009 at the University of Geneva, and directed by P. Vuilleumier and D. Sander.</li> <li>Additional platforms at Campus Biotech (shared with EPFL, among other institutions) are also fully accessible to the CISA researchers by virtue of our integration in the Campus Biotech.</li> </ul>
Sustainability infrastructures	The infrastructures listed above are permanent.

**Table 1b: Structural positions and recruitments (data from: April 2017)**

Type of structural position	Output
Number of created professorships per type*	<ul style="list-style-type: none"> <li>1 new full professor (Vuilleumier)</li> <li>5 new associate professors (Deonna, Preuschoff, Rudrauf, Schwartz, Teroni)</li> <li>3 new assistant professors (tenure track positions: Brosch, Grandjean, New position to be created)</li> <li>2 successions / replaced positions (Sander, succession of Scherer; Gentaz, succession of Labouvie-Vief)</li> </ul>
Sustainability of professorships*	The listed professor positions are secured. All assistant professor positions with possibility to get tenured; one of the listed 3 assistant professors (Grandjean) has already been promoted to a permanent position (associated professor).
Junior Group Leaders*	This NCCR did not apply the junior group leader category
Careers Junior Group Leaders*	--

\* refer to NIRA report Nr. 8010

### 2.2.1 Structural challenges

We expected to encounter a major structural challenge in the creation of a new entity at the University of Geneva, a truly interdisciplinary center, but with strong ties to the various disciplinary departments and faculties; the difficulty proved to be smaller than expected. A key advantage in this respect was the fact that the University of Geneva is a rich structure with virtually all disciplines represented. Thanks to the availability of varied disciplinary domains, and to the strong support received from the Rectorate and most faculties, the Center rapidly became a fully operational and well-respected structure within the University.

The creation of new professorial positions at the University of Geneva proved to be either very straightforward or exceedingly complex, depending on the specific interests of some departments and their representatives - which highlights again the importance as well as the difficulties encountered to develop interdisciplinarity at a struc-

tural level.

Another structural challenge concerned the definition of what the Affective Sciences are and, more specifically, the association often made between the Affective Sciences and neuroscience. Indeed, some confusion came at times from the fact that our Center was particularly strong in the domain of affective neuroscience, together with the fact that some of the NCCR leaders (e.g., Schwartz, Vuilleumier, Sander, Grandjean) were strongly involved both in the Swiss Center for Affective Sciences and the Center for Neurosciences. We realized this was an epistemologically complex situation, and it was very important to clarify the boundaries of these two domains for colleagues who simply were not aware of them. Thus, we became aware of the importance of a continuous dialogue with the representatives of the already existing structures, in order to demonstrate the specificity and complementarity of the Affective Sciences, which in the end was well understood, and remains the basis for the stability and durability of the CISA.

### **2.2.2 Measures for the future**

In the framework of the Education and Training program, the current most important structural difficulty is the absence of specific means to fund the Postdoctoral Program. The structure as such will continue to exist and it will benefit from the training activities organized for the doctoral school (seminars, workshops), but the funding for conference attendance or lab visits will expire with the NCCR in August 2017. As a follow-up to our previous COFUND grant, an application was submitted in 2016 for a new COFUND postdoctoral program in association with other members of the Campus Biotech. Unfortunately, in spite of positive reviews, the proposal was not retained due to insufficient funding and is currently part of a waiting list. A new application will have to be submitted. A second, slightly less pressing challenge is the financing of ISSAS. Our current budget with Swiss-universities includes a section for the summer school, but the types of expenses and amounts authorized are too constraining for an event like ISSAS. Thus, additional funding needs to be secured to be able to continue to offer a unique learning experience under the best conditions. Fortunately, both of these challenges can be adequately met since the creation by the University of Geneva of a permanent position dedicated to fundraising and coordination of the Education and Training program at the Center.

Concerning the continuation of the network after the NCCR, after several discussions, the Steering Board and the Plenary Meeting decided to take advantage of the strength of the Swiss Center for Affective Sciences at the University of Geneva as a “hub” around which to plan collaborations and coordination with colleagues from other universities, in particular the current groups in Lausanne, Bern, Fribourg, Neuchâtel, and Zurich. At least five ways to strengthen the network have been planned: 1) The status of associate researcher to the Swiss Center for Affective Sciences will be formally defined so that colleagues can, for instance, officially appear on the website of the Center as being part of the network; 2) Collaboration in the context of the Swiss Doctoral School in Affective Sciences: 20 professors from 6 Universities in Switzerland are already members of the scientific board of the school; 3) The submission of collaborative research projects, funded by the SNSF (e.g., individual or Synergia projects), European programs, or other sources; 4) The continuation (now every two years) of the International Summer School in Affective Sciences (ISSAS), with a program committee from the network; and 5) The continuity in the organization of the Annual Research Forum in the Affective Sciences, including posters and talks by all members of the network.

### **2.3 Financial resources and personnel**

The main funding sources available to the NCCR Affective Sciences are SNSF funding, Home Institution funding, funding contributed by project leaders, external funding from other sources, and third-party funding (like our collaboration with Firmenich).

The majority of the available funding has always been the self-funding provided by the project leaders, since a great number of matching-fund researchers, paid by their different Faculties, have been involved in the different research projects funded by the NCCR. This funding has grown over the years, reaching a total amount of more than CHF 40'000'000.- for the 12 years. Fortunately, we will be able to continue enjoying this contribution, although at a lower level for the coming years, since all Geneva teams have Faculty budgets for their junior researchers.

In order to guarantee the sustainability of the CISA after the NCCR, all project leaders were encouraged to apply for additional funding. The results were soon visible, with a rapidly growing complementary budget from Swiss and European funding, as well as 3rd party funding from foundations and industry. If we do not consider the self-funding from project leaders, the total amount of funding for phase 1 is CHF 12'113'530.- (cf Table 2), more or less the amount given by the SNSF and the University of Geneva together. However, a better proportion is observed in Phases 2 and 3, which, still leaving aside matching funds, documented roughly 10'000'000.- CHF more expenses covered by non-SNSF funds (on average CHF 2.5 Mio per year between 2009 and 2017). Considering that these numbers do not even include the funding secured by the CISA researchers through individual SNSF projects, we

can be confident about the financial viability of the affective sciences after the NCCR.

Most of the SNSF funding is devoted to funding research projects, mostly by financing scientific positions (e.g. doctoral students, postdocs and support personnel), study participants, and support measures for young academics in the framework of the Education and Training program (e.g. funds to attend academic activities). Indeed, the human resources are crucial for the NCCR. As shown in Table 3, the personnel of the Center can be divided into management, doctoral students, postdoctoral researchers, senior researchers and other staff. The largest group is composed by the doctoral and postdoctoral researchers, who also exhibit the highest proportion of female compared to male members.

Figures 6 and 9 in Annex 1 show that even if the individual projects received the largest share of the NCCR money (61%), the amount given to interdisciplinary projects and methods development (23%) has proportionally increased in the past 12 years. Since some projects never started or stopped before the intended date, the budget dedicated to them was stored in reserve. These funds were used in dedicated calls for interdisciplinary projects and methods development, allowing for new interdisciplinary research lines to develop. Additionally, it was decided to allocate a larger budget to interdisciplinarity during phases 2 and 3.

From a financial point of view, we also benefitted from special measures offered by the SNSF through “franc fort” projects (CHF 1'112'029.-), doctoral mobility, and 120% measures. This additional funding brought the total SNSF funding from 27 Mio to more than 28 Mio CHF.

Finally, our numbers do not show the additional contributions of the SNSF to our NCCR, namely the R’Equip funding (1 Mio), obtained to equip the Brain and Behavior Laboratory, for which we had received funding from the Société Académique de Genève for the fMRI and from the University of Geneva for all the investments linked to the location of this lab (over 3 Mio). Our project leaders also obtained funding for individual SNSF projects, linked to Affective Sciences but on topics not covered yet by the NCCR projects, as well as Ambizione, Assistant Professor Grant , Marie-Heim Vögtlin and Doc.ch grants.

The Center’s 3rd party funding has also grown over the years. This includes European funding (e.g., more than 3 Mio for K. Scherer’s ERC advanced researcher grant PROPERMO), industry funding (more than 5 Mio over the 12 years, cf Annex 4) and funding by foundations or other institutions. All of the 3rd party funding is dedicated to research projects – it is not used for management expenses.

The amount dedicated for management expenses was 12% of the SNSF funding and 43% of the Home Institution budget. The reasons for this difference are easy to understand. First, we wanted to allocate most of the SNSF resources for research expenses, giving the same proportion of money to all research groups. Second, since all management expenses happen in the Home Institution, it was logical to preferentially use that budget. Finally, as already mentioned in the report on structural aspects, the University of Geneva was extremely supportive to our NCCR, giving us the budget for all the administrative and technical positions of the CISA.

As already mentioned, the University of Geneva has been very strongly supportive to our NCCR since its start in 2005. The cash budget for CISA of CHF 300'000.- per year in 2005 was raised in 2015 and 2016. In 2015 the budget for the eight technical positions within the BBL, as well as one assistant position associated with the position of Prof. Didier Grandjean, became part of the CISA cash budget (as opposed to being an in-kind contribution from the Rectorate, like before). This total budget corresponds to more than 925'000.- CHF. Subsequently, in 2016 the CISA cash budget rose again in 578'000 CHF. with the transfer of 6 positions from the in-kind to the cash permanent budget by the University of Geneva. The 6 positions are: C. Soriano and M. Mortillaro as scientific collaborators, and four assistant positions associated with the positions of professors D. Rudrauf, K. Preuschoff, S. Schwartz and the future professor to be hired in the humanities/ social sciences.

The NCCR was allocated a first annual budget of CHF 2'500'000.- by the SNSF and CHF 562'500.- by the University of Geneva. The UNIGE amount was divided into two different parts: a permanent budget for the CISA of CHF 300'000.- per year and an allocation linked to the NCCR of CHF 262'500.-. This allocation was due to end in 2017, at the end of the NCCR. This leads us to describing the most recent example of the strong support received from the University of Geneva is the fact that the allocation dedicated to the NCCR (CHF 175'000.- in 2017) will not stop at the end of the NCCR; the Rectorate of the University of Geneva agreed to add this amount to the CISA budget in 2018, in order for us to pay for the general operating costs.

Furthermore, after having discussed with the director of the CISA during a series of meetings, all the deans of the Faculties involved in the CISA confirmed that the professors affiliated to those Faculties and working in the domain of the affective sciences will be able to have their grants managed by the CISA, and the collaborators hired on those grants will be able to be physically hosted at CISA as well.

Therefore, we can confirm that the University of Geneva has very strongly contributed to the future set-up of our Center, allowing us to continue working on the affective sciences in the future, beyond the NCCR, with the creation of a permanent structure, and the funding of professor positions, administrative and technical positions,

offices and lab facilities.

**Table 2: Overall funding – expenses (data from: 31.03.2017 (Accounting 1-11, IR12))**

Funding source	Phase 1	Phase 2	Phase 3	Phases 1-3
SNSF-Funding	8'879'834	10'828'142	8'452'073	28'160'049
Self-funding Home Institution	1'873'687	5'901'268	6'699'098	14'474'052
Self-funding from project participants	10'511'989	14'549'813	15'905'632	40'967'433
Self-funding other sources	317'561	255'000	-	572'561
3rd party funding	1'042'448	4'430'715	2'941'463	8'414'627
Total	22'625'519	35'964'938	33'998'266	92'588'722

**Table 3: Persons involved (data from: 31.03.2017 (IR12)) all years**

	Total persons	% female	CH	FR	DE	IT	BE	ES	Other
Management	59.6	57	21	7	5	4	2	1	7
Doctoral students	141	63	65	21	17	7	5	2	28
Postdoctoral students	132	55	31	21	20	15	2	5	40
Research associates	8	63	6	1	2	0	0	0	0
Senior researchers	101	41	38	17	21	5	4	7	12
Other staff	129	62	80	17	9	4	1	2	16

## 2.4 Management

### 2.4.1 Management structures and tools

The operation of a network with the size and complexity of our NCCR constitutes a significant managerial challenge and we believe the design of our managerial structures has contributed greatly to its successful running. The NCCR Affective Sciences has functioned over the years with the following organizational structure:

#### 1. The Director

The Director is responsible for the overall management of the NCCR and makes final decisions, after discussion with the Steering Board, Management Team, or project leaders in the Plenary Meeting (always with the possibility of asking for advice from our International Scientific Council).

Klaus Scherer was the founding director of the NCCR. He directed it from 2005 to 2011. From 2011 to 2013 he co-directed it with David Sander, who became the only director from 2013 to 2017.

Klaus Scherer retired in 2008 as full professor, having reached the legal limit of 65 years of age; but the University of Geneva and the SNSF agreed for him to continue directing the NCCR and the CISA after this date.

David Sander has been active in the NCCR since the beginning, starting as scientific coordinator and head of Education & Training, which gave him the opportunity to be completely immersed in the management of the NCCR from the start. The two years of co-direction permitted a smooth transition between the two directors.

#### 2. The Deputy Directors

The Deputy Directors assist the Director and are members *ex officio* of the Steering Board.

Martial Van der Linden and Kevin Mulligan were Deputy Directors for the first two phases of the NCCR. They were then replaced in the last phase by Patrizia Lombardo and Patrik Vuilleumier.

#### 3. The Management team

The Management team guarantees the good functioning of the activities in all management areas, and is composed by administrative and academic collaborators who carry out the managerial tasks of the NCCR on a day-to-day basis. This team includes the Director, the Administrator of the NCCR (D. Sauge), the Education and Training coordinator (C. Soriano), the Communication and Knowledge Transfer officer (C. Varone), the representative for methods development (D. Grandjean), the representative for the humanities (J. Deonna), the applied affective sciences coordinator (M. Mortillaro) and the administrative assistants (M. Gumy and F. Rapaccioli).

All members of the Management Team meet at least once a week to discuss open issues and make decisions that do not require the approval of the Plenary Meeting or the Steering Board. This operation mode, based on internal

communication and the active participation of all Management members in the discussion and decision process, allows us to be very efficient.

#### 4. The Steering Board

The Steering Board advises the Director in all matters of policy and decision making and meets at least twice a year. The Steering Board consists of the Director, the Deputy Directors, a representative of the project leaders (M. Perrez for the first phase and M. Schmid Mast for the next two phases), the representative for methods development and the Administrator. The overlap between the Steering Board and Management team makes the coordination particularly smooth.

#### 5. The Plenary Meeting

This decision making body is the assembly of all individual project leaders, who meet at least once a year, usually during the Annual Research Forum. During these meetings, the members discuss possible scientific synergies and collaborations, get information by the Director about all important administrative matters, and discuss any issue related to the NCCR.

#### 6. The International Scientific Council

This group of international experts is appointed by the Director to act as internal advice and evaluation council. The members of the International Scientific Council have been: A. Manstead, P. Niedenthal, J. Robinson, P. Salovey and G. Stemmler. They have been involved in strategic decisions, like advice on the choice of the projects to fund in a new phase, and have also been very active in the framework of our Annual Research Forum, giving advice and support to our researchers and to the management.

In addition to these managerial structures, we had to create efficient tools in order to be able to meet the expectations of the SNSF in terms of Education & Training, outreach and administrative activities. For example, we implemented our own database, in order to manage the information processed by the Center. This instrument allows us to have an efficient organization of all the events linked to Education & Training, Knowledge Transfer, and Communication, as well as all administrative matters, including mailing lists, media coverage, management of the graduate students (credits, travel grants, attendance lists), human resources, and finances.

This organization has allowed us to navigate safely and efficiently during this 12-year journey, bringing together researchers from all over Switzerland. After the first eight years no more major changes or difficulties have been reported in the management of the NCCR.

#### **2.4.2 Management challenges, measures, and lessons learned**

The management of a large network like the NCCR Affective Sciences necessarily entailed a number of challenges. The first one was the creation of a sense of community among researchers distant both physically and disciplinarily. To address this challenge, solutions were necessary at both levels, as detailed below.

From a strictly physical perspective, the NCCR has greatly benefitted from the creation, since its start in 2005, of a new center as physical headquarters for the NCCR. The new offices allowed people to work in close proximity, manage administrative tasks more efficiently and welcome guests under a common roof. The physical distance between the NCCR members has also been aided by specific communication measures, like the creation of a regular Newsletter in which to showcase our research and member-related news, and the creation of a common website with a public face as well as an intranet for the members to coordinate their work.

From the point of view of disciplinary distance, although we benefited from the fact that we all work on the same phenomenon, emotion, we still needed to build bridges between disciplinary traditions. As mentioned in section 2.1, this was done through several measures including the organization of Research Foci or the support of collaborative projects through specific funding instruments, in order to encourage the collaboration between professors from different disciplines. Importantly, the organization of the Center's Distinguished Lecture Series, Annual Research Forum, and other seminars and workshops in the framework of the Education and Training program, were very useful to bring colleagues together as well.

These measures enabled the emergence of a common ground of knowledge and created explicit opportunities for academic exchange. But, in order to create a sense of community as affective scientists, other forms of human exchange are necessary too. In this sense, we believe that over the years we have benefited from various measures like the aperitifs organized after lectures, informal lunches together, corporate dinner after the Annual Research Forum, and the CISA Christmas parties. More social events (e.g., yearly excursions) could have been organized to stimulate interactions and personal ties among all NCCR members. This may have also boosted the sense of community of the doctoral school and postdoctoral program specifically.

We also found that the mere fact of having funding available for interdisciplinary research is not sufficient to promote collaborative interdisciplinary research, and realized that – in particular in cases where research traditions are very different – getting to know personally the individuals who actually conduct the research is a prerequisite

for actual scientific collaboration. It was also clear that managing interdisciplinarity was more a question of persons than a question of disciplines: an open, non-disciplinarily-centered mind is necessary to be truly interested in and to accept (sometimes very different) perspectives on topics about which one would believe his or her own discipline “has the solution”.

Another difficult aspect concerned stereotypes towards specific disciplines or approaches. For instance, some prejudices are difficult to shake off, such as the view that “the humanities cannot lead to any substantial advancement because they are not empirical and do no test ideas experimentally”, or the idea that “the neurosciences cannot lead to any substantial advancement because they are inherently reductionists and do not consider the complexity”. Over the years we found that, when interdisciplinary collaborations actually worked, it was when colleagues did not hold such prejudices, or when they realized, thanks to joint conferences for instance, that these stereotypes typically do not apply.

The operation of the E&T program constituted a challenge in itself, since it required much more time and effort than originally envisioned. Thus, a specific position was eventually created to coordinate it. Additionally, it was necessary to appoint a person with a good understanding of the Center and the affective sciences as a field.

At an institutional level, we found a challenge in creating a “corporate identity” as a single research center for those not physically located in Geneva, since the majority of the network was at the Home Institution, and most of our activities took place there.

A final challenge encountered in the management of the Center is the over-engagement of some of its members, mostly those operating both as leaders in several projects and members of management bodies at the NCCR. This may be inevitable, but it incurs in delays in some of our activities. However, the new academic and administrative positions created provide a relief to the project leaders active in the management, and constitute a guarantee of the viability of the Center.

### 3. Scientific achievements and international visibility

#### 3.1 Major scientific contributions – goals and achievements

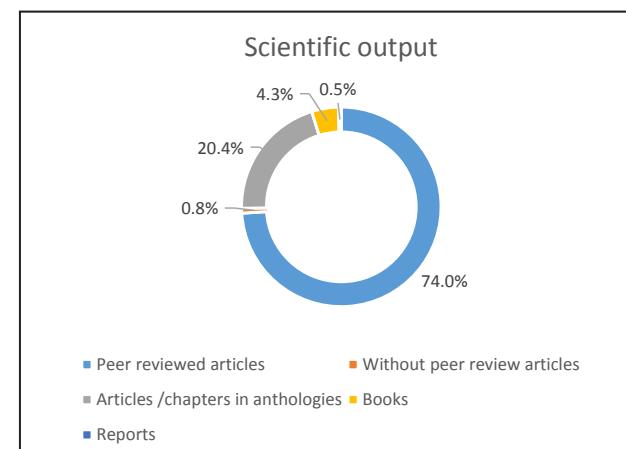
Since 2005 the NCCR Affective Sciences benefits from an interdisciplinary center with physical headquarters at the University of Geneva and an increasingly large network of excellent researchers. The Center has fostered collaborations between disciplines and universities resulting in what we consider outstanding scientific achievements for the Affective Sciences as a field, and in several sub-domains, in particular psychology, philosophy, neuroscience, economics, literature, and computer science. The NCCR successfully established itself as one of the most important centers in the international Affective Sciences scene thanks to its specific research projects and its capacity to establish collaborations with some of the most influential researchers in the field across disciplines. Research collaborations, participation in European networks and projects, and an active role in international scientific societies and events (for example the organization of ISRE 2015, see section 4) all ensured that the NCCR participated in shaping the emerging trends and research findings of the scientific community in the Affective Sciences.

The major scientific results, original contributions and innovations accomplished by the NCCR in each disciplinary area are discussed in this section. Inherently interdisciplinary projects and the added value of interdisciplinary research in the past 12 years are summarized in section 3.2. In addition, some indexes of scientific output of the NCCR in the past 12 years are summarized in Table 4 below. For a list of the 25 most important publications by the NCCR, see Annex 2.

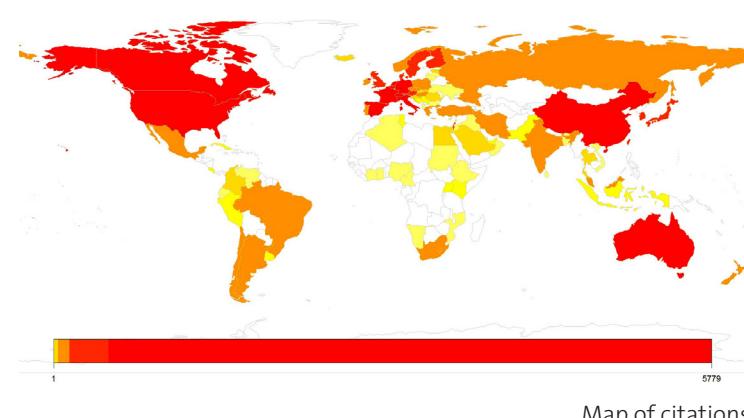
**Table 4: Scientific outputs / NCCR book series**

Type	Number
Peer reviewed articles	1'129
Without peer review articles	12
Articles /chapters in anthologies	312
Books	66
Reports	7
Total	1'526

Presentations at congresses	1'868
NCCR book series	0



Data from March 2017, IR 12 (source: NIR report 4270, all years)



The NCCR Affective Sciences has helped establish Switzerland as one of the leading countries in Europe for the neuroscientific study of emotions and other affective phenomena. Fehr, Grandjean, Sander, Schwartz, and Vuilleumier led the research projects that were mostly responsible for this achievement.

An interesting research line addresses the relation of emotions, memory and sleep. In the projects led by Schwartz, researchers demonstrated that stimuli associated with positive (e.g. a reward) or negative (e.g. through aversive conditioning) affective value are processed in priority during subsequent periods of sleep. Specifically, using a combined behavioral and brain-imaging approach, they showed that memories with an affective relevance: 1) are consolidated during sleep, supporting a long-term value-based stratification of memory stores, and 2) are spontaneously reactivated during sleep in the form of a neural replay. These NCCR studies also showed that emotions experienced in dreams correlate with individual differences in brain responses to emotional stimuli during wakefulness. Thus, this research demonstrated that the prioritized reactivation of emotion-relevant information during sleep has major adaptive functions, including memory reorganization and emotional homeostasis (Igloi et al., 2015, *eLife*; Sterpenich et al., 2014, *Neuroimage*).

Over the last twelve years the NCCR researchers involved in the projects led by Fehr have developed a highly successful research program on the relation of emotions to social behavior, motives, and norms. The results of many of these impactful and innovative studies have been published in globally leading journals such as *Science*, *Nature*, *Neuron*, or the *Journal of Neuroscience*. The studies were highly interdisciplinary, bringing together psychology, economics and neuroscience. The interdisciplinary integration was aided by the advanced laboratory infrastructures available in Zurich, featuring an fMRI scanner, TMS, EEG, pharmacology and behavioral labs. Among the many projects, two merit a special mention. First, using non-invasive brain stimulation, these researchers found that the stimulation of the pre-frontal cortex can affect participants' compliance to social norms without altering awareness (Ruff et al., 2013, *Science*). Second, in a series of seminal studies on the role of oxytocin on trust, NCCR researchers examined the neural circuitry of trusting behavior by combining fMRI with the intranasal, double-blind, administration of oxytocin. Subjects in the oxytocin group maintained trusting behavior after trust had been breached, while those with placebo lost trust. Recently these researchers have also published a very influential article on the brain's functional network architecture and its relationship with human motives (Hein et al., 2016, *Science*).

The projects led by Grandjean investigated the facial and vocal production and recognition of emotion, and published several influential studies about the brain mechanisms of emotional prosody recognition and production. These studies illustrated a model of emotion processing in the auditory domain involving medial temporal structures including the amygdala, hippocampal regions, and the basal ganglia (Frühholz et al., 2015, *PNAS*). Grandjean's group also pioneered the study of motor binding phenomena in emotion processing of face and voice, including the role of the basal ganglia (Péron et al., 2013, *Neuroscience and Biobehavioral Reviews*). Using intracranial recordings, the group has also shown the complex neuronal interplay between amygdala and orbito-frontal regions in the context of face and voice emotion recognition.

Several NCCR studies contributed heavily to our understanding of the brain circuits mediating emotions and their interplay with cognitive and social processes. Vuilleumier's lab pioneered the study of interactions between emotions and attention processes, demonstrating a key role for the amygdala in rapid emotional processing and subsequent attention orienting effects mediated by cortical areas. Similarly, Sander's lab suggested that the key role of the amygdala is to process affective relevance and it is not limited to the processing of fear or a simple manifestation of arousal. The research on attention and affective relevance showed that concern-relevant positive stimuli, for example baby faces, bias attention (Brosch, et al., 2008, *Psychological Science*; Pool et al., 2016, *Psychological Bulletin*), and that current goals and core values are critical determinants of appraised affective relevance and amygdala activation.

The projects led by Vuilleumier also contributed to the identification of neural signatures associated with different categories or components of emotions. It was found that medial regions in the prefrontal cortex hold distinctive activation patterns for specific emotions across different sensory modalities, and that they thus contribute to recognize emotions together with other regions of the temporal cortex that encode cognitive and affective features in mental states attributed to other people (Peelen et al., 2010, *Journal of Neuroscience*). These projects also studied whether emotional events may lead to lasting changes in brain activity and connectivity patterns, how these changes may in turn bias various other cognitive functions (e.g. memory, decision making), and to what extent such effects depend on individual personality factors (Eryilmaz, et al., 2014, *Journal of Neuroscience*). Many of these neuroscientific studies combine complementary methodologies from psychology and neuroscience in-



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cluding brain imaging (MRI), electrophysiology (EEG), behavioral measures, neuropsychology tests, and intracranial recordings in neurological patients.

Several NCCR projects had a significant impact in psychological research through original research findings, theoretical advancements, and method development. These contributions were carried out by the researchers in several Research Foci and Interprojects, as well as by the teams led by Scherer, Van der Linden and D'Argembeau, Sander, Grandjean, Tschan, Semmer and Elfering, Schmid Mast and Kaiser, Clément, Perrez and Reicherts, Betrancourt and Pun.

The team led by Van der Linden investigated how emotion regulation relates to mental processes that control thoughts and behavior by focusing on impulse control. These researchers confirmed the construct validity of the four-facet UPPS model of impulsivity (Urgency, lack of Perseverance, lack of Premeditation, Sensation seeking) by showing that each facet made a unique contribution to various psychopathological and neuropsychological problems. Specifically, emotional regulation and thought control strategies were found to mediate the link between facets of impulsivity (lack of perseverance and urgency) and depression/ sleep problems; this research also

showed that urgency relates to counterfactual thoughts and emotions (regret, shame, and guilt) at bedtime, thereby contributing to insomnia; a third finding was that urgency and lack of perseverance involve distinct executive mechanisms, namely response inhibition and resistance to proactive interference, respectively (Billeux et al., 2010, *Behavior Research and Therapy*). NCCR researchers also developed an intervention program designed to improve the recognition of emotional and social cues in children with impulse control problems.

On a different line of research Van der Linden and D'Argembeau's team looked at the relation of emotion and future thinking, showing that procrastination is associated with a reduced consideration of future consequences and with diminished sensory-perceptual qualities of episodic future thought (Barsics et al., 2016, *Quarterly Journal of Experimental Psychology*). Importantly the research also showed that future thoughts can affect people's well-being.

Researchers led by Schmid Mast investigated the role of power and emotion with a particular focus on gender differences. Results showed that women faced with leadership tasks such as public speaking do a better job in the presence of a successful female role model, and that implicit stereotypes about women (cognitive component) but not implicit evaluations of women (affective component) held by male interviewers predict lower performance of female job candidates in job interviews (Latu et al., 2013, *Journal of Experimental Social Psychology*). Researchers analyzed several studies on power and affect and found that felt power was positively related to positive affect and negatively to negative affect, whereas position power did not show any significant relation with any of the affective states. Results of their research also showed that power reduces responses related to social stress and increases performance in social evaluation situations (Schmid & Schmid Mast, 2013, *European Journal of Social Psychology*)

The original projects led by Betrancourt and Pun linked psychology with computer science through a series of studies that defined, conceptualized and experimentally investigated the notion of emotional awareness in computer-mediated collaboration. These researchers analyzed human-human computer-mediated communication in education, cooperative work, and mediation, as well as human-machine interaction (with virtual characters, and gaming). Importantly, an innovative method for assessing human emotional states from physiological and behavioral signals was also designed, applicable in laboratory and real conditions (e.g., Muszynski et al., *Proceedings of the 2016 ACM on Multimedia Conference*).



Among the NCCR's most important scientific accomplishments are the theoretical models put forward by our researchers, which are gaining high consideration in their respective fields.

Scherer's team further developed the Component Process Model of Emotion (CPM; Scherer, 2009, *Cognition & Emotion*), one of the leading appraisal models of emotion, and conducted an extensive set of empirical studies to test the theoretical predictions of the model in several domains. These include (1) Appraisal-driven emotional response patterning, testing the dynamic appraisal sequence hypothesis and confirming that novelty, pleasantness, conduciveness and power are appraised in this order; (2) Response synchronisation as constituent of emotion, providing evidence for central-peripheral coherence (e.g., Gentsch et al., 2014 *Biological Psychology*); (3) Varieties of valence appraisal, showing that effects of different kinds of valence appraisals differ for response modalities; (4) Appraisal driven expression of emotion in voice, face and body, confirming that expressions can be largely explai-

ned by sequences of appraisal patterns; (5) Psychophysiology of emotion elicitation and regulation processes, providing evidence for somato-visceral and motor mechanisms; (6) Understanding emotions in affective disorders, in particular the role of appraisal biases. Considerable progress was also made in developing and testing computer models of the emotion process put forward by the CPM (including nonlinear relationships).

Researchers in the projects led by Semmer, Tschan and Elfering published the theory of Stress as Offense to the Self (SOS), which is gaining ground in the discipline and has been confirmed with respect to several areas of stress: illegitimate tasks, appreciation, subtly offending feedback, social stressors, lack of fairness and incivility (Semmer et al., 2015, *Work & Stress*). The research on stress has become one of the most prominent applied research areas of our NCCR, with 10- and 20-year-long longitudinal studies on the presence of stressors and resources at work and their influence on health and well-being, as well as several applications to different work contexts in Switzerland (Igic et al, in press, *Journal of Applied Psychology*).

Projects led by Clément have also made a significant contribution to current theoretical debates in the affective sciences, for instance by recently developing the concept of Affective Social Learning. This concept spurred an ongoing debate on the nature of social referencing and social appraisal, notably with a special issue and a target article in the journal *Emotion Review* (Clément & Dukes, 2017). This research had also relevant implications for developmental studies, as it shows how social appraisal informs newcomers (children or members of a different culture) of what is socially relevant, even if this process is not addressed directly at them (Clément et al. 2013, *Cognition & Emotion*). The nature of social appraisal was also investigated by Sander's team. These researchers published a series of empirical papers that demonstrated that social information is integrated in the recognition of expressions of emotion, and that such social appraisal can be automatic (Mumenthaler & Sander, 2012, *Journal of Personality and Social Psychology*; Mumenthaler & Sander, 2015, *Journal of Experimental Psychology: General*).



NCCR researchers have also developed intercultural models of emotional responses to odors and music that are now used worldwide. For instance, the Emotion and Odor Scales developed to characterize odor-borne feelings is considered as a major tool for fundamental research as well for applied research on emotion and odors. In particular, within the Focus Music and Emotions, and inter-projects on music and musical performance, researchers investigated the dynamics of emotion recognition in music showing the strong impact of musical structure and acoustical features. They also demonstrated the role of the motor and basal ganglia regions in the recognition of musical gestures, and characterized how a music group can be a model of proximal social interactions of human groups with a common goal.

An original line of research that emerged within the NCCR is concerned by the relationship between emotions and the negotiation process. Three main contributors can be singled out: the inter-projects "Negotiation and Emotion (NEMO)" and "Anger elicitation and anger regulation", and the Research Focus "Emotion and Decision making". The NEMO project created one of the largest multilevel datasets on dyadic social interactions in a negotiation context. The dataset includes measures at the behavioral (vocal and visual communication), physiological, and subjective levels, which allows for an integrated approach to social interaction. The inter-project "Anger elicitation and anger regulation" developed, implemented and validated a novel paradigm - the Inequality Game - to assess emotional, behavioral and neural responses to anger provocation (Klimecki, et al., 2016, *PLoS One*). Similarly, in the Focus on Emotion and Decision making, NCCR researchers developed new methods to study emotions in conflict resolution. They successfully designed new paradigms, such as the "ultimatum game with production" (Bediou et al., 2012, *Social Justice Research*; Bediou & Scherer, 2014, *PLoS One*) and the "conflict arbitration task", which allowed them to induce feelings of entitlement, and thereby to study inter- and intra-individual differences in the perception and application of equality and equity justice principles.

Some other methods developed within the NCCR are similarly important contributions to the scientific community. For example, NCCR researchers directed by Reicherts and Perrez developed a new ambulatory method to assess affective states and emotion regulation in couples' daily life. The computer-aided tool, integrating a time- and event-sampling strategy, yields high reliability and validity and constitutes a significant methodological advancement in the field (Reicherts et al., 2007, *European Journal of Psychological Assessment*). Based on this tool, the NCCR researchers showed that one's perception of the responsiveness of the partner depends on the affective responsiveness he or she enacts in daily life (by words and bodily expression). Responsiveness augments one's own and the partner's feelings of intimacy and strength of relation (Debrot, Cook, Perrez & Horn, 2012, *Journal of Family Psychology*).

Another important methodological development came from the inter-project “Scent-VR”, in which the researchers designed and built one of the most advanced odour delivery devices (i.e., olfactometer) for a virtual reality system.

Finally, the inter-project “Emointelligence” opened a new line of research within the NCCR and gave further visibility to the Center in the domains of emotional intelligence and organizational psychology. The project produced one of the first instruments to measure emotional intelligence in the workplace and was well received at several scientific meetings. The related publication is currently in the second round of revisions and the scientific community is expecting the instrument to be officially released.

Philosophy was undoubtedly one of the strongest areas of research during these 12 years and the NCCR offered a unique opportunity for philosophy to inform other fields and to benefit from direct exposure to the latest empirical findings in other disciplines. The philosophers at the Center (the Thumos group), led by Deonna, Teroni and Mulligan, have become increasingly influential in the philosophy of emotions in the international scene. Their expertise lies on the nature of emotions, of values, and on the relation between them. They have developed a systematic taxonomy of affect (character traits, sentiments, moods, emotions, feelings) and promoted an attitudinal theory of the emotions that offers a distinctive understanding of their links with values (Deonna & Teroni, 2012, *The Emotions: A Philosophical Introduction*). They have also argued for the positive role that emotions play in knowledge and understanding of value properties and have argued in favor of an evaluative approach to pleasure. Particular attention has been dedicated to self-reflexive emotions, with a book-length defense of the moral goodness and personal dimensions of shame, of shame’s role in the public sphere, and of the role of emotions in well-being, with an emphasis on the positive value of negative emotions (Deonna et al., 2012, *In Defense of Shame: The Faces of an Emotion*).

Within the focus “Moral emotions”, the investigation of the feeling of ‘being moved’ has contributed to the creation of a new and burgeoning area of research in the affective sciences (Cova & Deonna, 2014, *Philosophical Studies*). The inter-project ‘Towards an experimental philosophy of aesthetics’ aimed to develop experimental methods to tackle traditional issues in philosophy of art and contribute to the creation of a new research field. It was influential enough to have its members invited to produce a systematic survey of the field and to edit a collective volume on experimental philosophy of art (Cova et al., 2015, *Philosophy Compass*).

In addition to the philosophers, other NCCR researchers in the humanities have had a major impact on their disciplines, especially literature. Scholars involved in the focus “Aesthetic emotions” and in the projects led by Lombardo initiated research on authors who were not traditionally regarded as true theorists of emotion, and confirmed a non-canonical interpretation of some 19th century literature proving the interpenetration of the emotions and reason for Stendhal, Flaubert, Balzac and Hazlitt (Lombardo 2013, *Philosophiques*; Lombardo 2014, *Mind, Values, and Metaphysics*). The team has succeeded in linking narratological approaches with the study of emotions, motivations, and values. Furthermore, our literary scholars introduced the theme of thought experiments in the field of French literary studies on emotion and investigated the neglected emotion of contempt in ethics and aesthetics.

Projects led by Borgeaud examined emotions in rites and beliefs, and generated general considerations on the appropriateness of the traditional method across the field. The original research on the foundations of comparative religion led to the consideration of ancient roots in the interreligious conflicts that still worry us today. Research groups in these projects have worked on the limits of religious relativism and the mechanisms of intolerance (Borgeaud, 2006; *Rites et Croyances dans les Religions du Monde Romain*; Fabiano & Borgeaud, 2013, *Perception et Construction du Divin dans l’Antiquité*).

The project led by Nelis had an original approach to the study of emotions in the field of Classics aiming to bridge the gap between Greek and Latin studies that was dragging back the field. The group focused on poetic intertextuality, and demonstrated what can be gained from a close reading of the representation of the emotions in literary texts (Cairns & Nelis, 2017, *Emotions in the Classical World. Methods, Approaches and Directions*).

The Focus on Language and Culture and the inter-project “Metaphor and emotions” introduced a new methodology (Metaphorical Profile Analysis) for the identification and analysis of emotion metaphors and a new theoretical framework (Semantic Foci) inspired by psychological theories of emotion for the linguistic analysis of emotion metaphors (e.g., Ogarkova et al., 2016, *Review of Cognitive Linguistics*). The collaboration between linguists and psychologists in the inter-projects CoreGRID and MiniGRID resulted in the development and publication of several scientifically validated instruments to measure the meaning of emotion words across languages and cultures



(GRID questionnaires).

Beside the general success of our projects, research foci, and inter-projects, we should acknowledge those cases in which the final results did not meet our original plans.

First, while it is true that the empirical sciences and the humanities were very well integrated in the NCCR, we regret that the important and broad domain of the “social sciences” was not represented enough during the past 12 years. One of the relevant disciplines, economics, was very central to the NCCR, and adopted a behavioral and neuroscientific perspective through the work carried out by Fehr’s group and with the recent appointment of Preuschoff in Geneva. But other domains such as sociology or political sciences were underrepresented. Given their obvious relevance for the study of emotion, an important objective is to integrate such approaches into future projects of the Swiss Center for Affective Sciences.

Second, the NCCR originally integrated a project focused on emotional development across the lifespan under the direction of Labouvie Vief. Unfortunately, she retired during the first phase of the NCCR and only one PhD thesis was accomplished. Developmental studies were, therefore, interrupted for a few years. Research on the development of emotions started again in 2011. Clément initiated research on affective learning in babies and children and Gentaz was hired in 2012 and became the coordinator of the Focus on Emotional Development, which investigates how, why and when emotion appears and the factors that impact on its development. We are very optimistic about the increase of research concerning the development of emotion within the Swiss Center for Affective Sciences, in particular as one of our research priorities for the future concerns the roles of emotion in education.

Third, two projects that were originally part of the NCCR never started because the respective PIs left for new professorships: Eid (University of Berlin) and Singer (Max Planck Institute Leipzig). Another project (directed by Elhert) never started because the ethical committee of the University of Zurich did not accept it in its original form.

Fourth, some of the ambitious goals that we set out to achieve at the beginning of this enterprise were not entirely met because of reasons that are not specific to our institution or area of research, but are typical of the modern academic world. The turnover among the postdoctoral researchers and the general pressure on PhD students to immediately leave for a post-doc had implications on the projects. For example, despite its success, the project led by Nelis was interrupted after two years because the post-doctoral researcher left Geneva and a suitable replacement could not be found.

### **3.2 Main scientific value added by the NCCR**

Research collaboration and cross-fertilization between disciplines is one remarkable success of the NCCR. We feel that cross-disciplinary collaborations and interdisciplinary research resulted in the advancement of the affective sciences as an integrated field, and in several notable projects and publications.

Two disciplines of the affective sciences constantly collaborate - in our Center as well as worldwide – in the study of emotion and other affective phenomena: psychology and neuroscience. Typically, the domain of “affective neuroscience” involves researchers in psychology or neuroscience departments who test psychological hypotheses using neuroscientific methods. In this respect, we feel that our NCCR was very strong in bringing together psychology and neuroscience in the study of emotion (see above for examples). An aspect that was more specific to our Center is the strong link with the humanities. Indeed, the humanities were extremely active in this sense, and at the core of several interdisciplinary projects. One of the most interdisciplinary ones featured the collaboration of computer scientists and literary scholars with the goal of illustrating how affective computing, using psychophysiological signals, can benefit the research on the arts and how scholars in the humanities can provide important value to IT applications (Inter-project “Films, emotions and affective computing”).

Literary scholars of the NCCR were also the first to investigate “thought experiments” in Baudelaire’s writing, defining a new theme of research in French literary studies based on philosophical analysis. Research on the language of emotion has looked at both literal and metaphorical linguistic expressions of emotion across languages and cultures using an interdisciplinary approach that combined linguistics and psychology. Our researchers published several scientifically validated instruments to measure the meaning of emotion words across languages and cultures - GRID questionnaires – that have become a standard measure in the field (Fontaine et al., 2013, *Components of Emotional Meaning: A Sourcebook*). A database of the meaning of emotion words in more than 20 languages worldwide has also been compiled with potential applications in affective computing, psychology, and linguistics.

Deonna, Teroni and Rodogno’s novel account of shame (2011, *In Defense of Shame*) engages with all current debates on this emotion as they are conducted within disciplines as varied as ethics, moral, experimental, developmental and evolutionary psychology, anthropology, legal studies, feminist studies, politics and public policy. This influential work is very representative of the kind of major interdisciplinary effort that was made possible thanks to the NCCR.

Many other collaborations across disciplines emerged thanks to the NCCR, including: (1) Grandjean, Rendu, MacNamee, and Scherer's reflection about how psychology and the history of religion can explain the role of appraisal in the relationships between emotion and beliefs (Grandjean, Rendu, MacNamee, and Scherer, 2008, *Social Science Information*); (2) joint research by psychologists, psychiatrists and neurologists for the psychopathological and neuropsychological exploration of impulsivity and emotion regulation; (3) the combination of psychology, behavioral economics, philosophy and neuroscience to show how emotions and core values influence our perception and decision-making (Inter-project Types of Values; Brosch & Sander 2016, *Handbook of Value*); (4) the collaboration of neuroscientists, psychologists and philosophers on ethical issues (Vuilleumier et al., 2014, *Brain Topography*); and (5) the combined effort of psychologists and philosophers on the definition of the nature of emotions (Deonna & Scherer, 2009, *Emotion Review*; Mulligan & Scherer, 2012, *Emotion Review*).

Another ambitious project linked law studies and the affective sciences ("The importance of emotions in social and legal regulations", Flückiger, Niels-Robert, and Roth) and put this relationship at the center of attention of several researchers, triggering the development of a multidisciplinary analytical perspective in a field that is still underdeveloped. Notably, this project has led to the creation of a law philosophy seminar, and from 2017-2018, of a seminar in public law at the University of Geneva on the links between the legislator and the emotions.

The project EATMINT led by Betrancourt and Pun defined a new paradigm to investigate affective processes in computer-mediated collaborative learning using an experimental psychology approach and multimodal signal processing. Notable is the collaboration between computer scientists, experimental psychologists and clinicians who used advanced classification techniques to distinguish individuals with Autistic Spectrum Disorder from healthy control individuals based on fMRI data (Chanel et al., 2016, *Neuroimage: Clinical*).

The NCCR constantly nurtured the development of new interdisciplinary programs around themes that have international significance and are ideally located at the intersection of several disciplines. This is the case for our recently launched interdisciplinary project on "emotion categorization in humans and apes", or our planned programs on "emotion and conflict", "emotion and education", "emotion and health", and "emotion and the arts" that will continue even after the official end of the NCCR.

### **3.3 International standing – goals, achievements and perspectives**

During the last 12 years, the NCCR researchers have constantly increased their international visibility and scientific reputation. It is clear that the strong support provided by the NCCR has made the individual researchers stronger and more visible internationally. Although some of the project leaders of the NCCR were already figures in the emerging field of the affective sciences in 2005, or in their respective disciplines (e.g., M. Betrancourt, P. Borgeaud, E. Fehr, P. Lombardo, K. Mulligan, D. Nelis, T. Pun, K. Scherer, N. Semmer, F. Tschan, M. Van der Linden and P. Vuilleumier), other researchers developed their careers in the context of the NCCR and became professors during the NCCR period (e.g., F. Clément, J. Deonna, A. Elfering, D. Grandjean, D. Sander, M. Schmid Mast, S. Schwartz and F. Teroni). In addition, very recently appointed professors who are not directly involved as project leaders in the NCCR strongly benefited from the existence of the NCCR (e.g., T. Brosch, E. Gentaz, K. Preuschoff, D. Rudrauf). Their positions were created to a large extent thanks to the NCCR, and they will be able to progress in their careers within the permanent Swiss Center for Affective Sciences, one of the most important structural achievements of the NCCR.

Several indicators attest to the deep impact of the NCCR researchers on the domain of the Affective Sciences. First, the sheer number and the level of publications are remarkable, with over 1000 international publications in peer-reviewed journals (cf Table 4, p. 20). This is true for all disciplines, with neuroscience, psychology, economics and philosophy publications in the most prestigious international journals (for example, *Science*, *Nature*, *Proceedings of the National Academy of Sciences*, *Neuron*, *Nature Neuroscience*, *Brain*, *Psychological Bulletin*, *Psychological Science*, *Journal of Personality and Social Psychology*, *Journal of Experimental Psychology: General*, *Philosophical Studies*), but also with monographs and articles in all disciplines from the humanities, and with computer science and affective computing articles like those by Soleymani et al. (2012) and Glowinski et al. (2011) nominated among the most influential articles in the reference journal of the field, *IEEE – Transactions on Affective Computing*. Some publications became target articles of monographic issues in prestigious journals (Clément & Dukes, 2017, *Emotion Review*) and our researchers were invited to coordinate an international replication project (F. Cova, *Review of Philosophy and Psychology*).

NCCR researchers serve as associate editors in several multidisciplinary (e.g., *Science*) and disciplinary journals, especially in psychology and neuroscience (e.g., *Emotion*, *Emotion Review*, *Cognition & Emotion*, *Social Cognitive and Affective Neuroscience*, *Journal of Nonverbal Behavior*, *Leadership Quarterly*, *Cortex*) and in philosophy (*Dialectica*).

Project leaders and collaborators have often been solicited in several countries for colloquia and conferences as keynote speakers. Among others (to give a representative list for the variety of disciplines), our project leaders have spoken at CERE 2010 (Sander), British Academy 2015 (Lombardo), Congress of the European Society of Family

Relations 2006 (Perrez), European Society for Philosophy and Psychology 2006 (Mulligan), American Philosophical Association (Deonna and Teroni), Royal Institute of Philosophy - Durham (Deonna and Teroni), London School of Economics (Fehr), Cambridge University and Harvard University (Fehr), Royal Society (Scherer), ISRE 2013 (Scherer), InterSpeech 2015 (Scherer), or the American Association of Communication in Healthcare 2017 (Schmid Mast).

Our professors were awarded several prizes and international acknowledgment: Scherer received honorary doctorates from the University of Bologna and the University of Bonn and the lifetime achievement award of the German Society of Psychology; Vuilleumier won the APA Award for Distinguished Scientific Early Career Contributions to Psychology. Fehr was awarded the Gottlieb Duttweiler Prize, the Gustav Stolper Prize, the Marcel Benoist Prize and the Austrian Cross of Honor for Science and Art. He has also received five honorary doctorates (Graz, Lugano, Lausanne, Munich, and St. Gallen); Sander won the National Latsis prize in 2013.

The international standing of the NCCR was further reinforced by the large international conferences hosted by the Center. In 2013, members of different projects of our NCCR were co-chairs and organizers of ACII 2013 – Affective Computing and Intelligent Interaction Conference, the most important of the field, which attracted more than 200 international researchers to Geneva. Another major event that fostered the international leading role of the NCCR in the emotion community was the organization of the Conference of the International Society for Research on Emotion (ISRE), the largest interdisciplinary society in the affective sciences. Around 500 international scholars gathered in Geneva in July 2015 and this made ISRE 2015 the largest and most successful edition of ISRE conferences so far. Our international impact was also established by initiating an international conference on brain imaging (Alpine Brain Imaging Meeting, ABIM) with a strong focus on the affective sciences, which takes place every year since 2006 in Champéry (Switzerland) and now attracts neuroscientists from the whole world. Finally, the NCCR considerably contributed to the International Conference on Music and Emotion IV (2015) organized in Geneva.

The involvement of the NCCR with the international community in the affective sciences has been reinforced by the active participation of our members in several academic societies (e.g., in the board of ISRE for Deonna and Sander, or in the board of the Integrative Science Initiative of APS for Scherer) and by the creation of new research communities (e.g., Perrez and Wilhelm were involved in the foundation of the new Society for Ambulatory Assessment, with world-wide impact, and played an important role in its 1st International conference, hosted in Greifswald in 2009).

We frequently hosted prestigious visiting scholars (P. Niedenthal, A. Moors, U. Hess, B. Schuller, J. Diaz-Vera, J. Tsai, B. Knutson) and we invited more than 400 researchers and professors to give seminars and talks within our weekly series; we feel that our seminar series is highly regarded and being invited as a guest speaker to our Center is considered very prestigious.

The NCCR was key for obtaining several prestigious grants (e.g., Swiss Network for International Studies, to Scherer and Lee-Jahnke), SNSF professorships (C. Corradi-Dell'Acqua, J. Deonna, F. Teroni, S. Frühholz, G. Pourtois, T. Aue, F. Prescendi, O. Massin) and international funding, including two ERC advanced grants (K. Scherer in Geneva, and E. Fehr in Zurich), an ERC consolidator grant (T. Singer, who moved to Leipzig), an ERC starting grant (G. Pourtois, who moved to Ghent), participation in European Networks of Excellence (for example, HUMAINE and SSPNet), in several European projects (e.g., SIEMPRE project in music and emotion; Medit'Ageing Project/ Silver Santé Study, investigating the determinants of health and well-being in the ageing population of Europe) and projects funded by the European Science Foundation (e.g., Conflict and Emotion Regulation).

A final indicator of the international standing and visibility of the NCCR is the large number of partnerships (with public as well as private institutions) established outside the NCCR. These are described in detail in sections 4 and 7 (cf. also Annex 3).

The NCCR clearly set Switzerland as one of the leading countries for scientific research in the Affective Sciences across all disciplines. This scientific success is likely to continue, as some institutional changes will help to attract the most promising students and researchers. For example, the Swiss Doctoral School (SDS) in Affective Sciences hosted at the University of Geneva is a unique program for doctoral students, one of the first – and few – programs of this type in the world. Both the doctoral and post-doctoral programs have been highly successful during the NCCR. Notably, many of our collaborators (PhD students or postdoctoral researchers) subsequently obtained competitive grants (Ambizione, Marie-Curie, SNSF Professorship, ERC grants) or faculty positions in Swiss institutions and abroad, including Ghent, Tuebingen, Zurich, Trento, Vienna, Innsbruck, Bern, or Geneva. Others pursued their postdoc training in prestigious universities such as Harvard, Princeton, Yale, or Berkeley.

Structural achievements have always been a top priority for the NCCR. Now, with the existence of 10 local professor positions who are strongly committed to the future of the CISA, the maintenance and even the improvement of a strong network of Swiss professors in the Affective Sciences is a reality. With the stabilization of our administrative, management and technical staff, the professors involved in the CISA are in a position to be able to submit collective and individual national or European grants that will be managed by the CISA. Thanks to these

and other developments, like the emergence of an international network of alumni, the directorship of the Brain and Behavior Laboratory, and the integration in the Campus Biotech, we envision a very promising future for the Affective Sciences in Switzerland and a leading role for the country in the international scene.

## 4. Knowledge and technology transfer to society and the economy

### 4.1 Strategies, aims and resources

The affective sciences are better known outside academia today than they were 12 years ago. There is increased interest in the emotions and affective phenomena in numerous countries, and we feel that our NCCR contributed a great deal to promote awareness of the role of emotions in personal life and professional activities across society in Switzerland and elsewhere.

Our overall strategy focused on three complementary sets of activities: 1) communication activities and participation in knowledge transfer events open to the general public; 2) active participation in scientific events or conferences that were not directly related to the world of the affective sciences and emotion research, but in which we were able to promote these fields; 3) a research unit dedicated to foster and manage the relationship with external partner institutions with the goal of establishing mutually beneficial collaborations in the domain of the affective sciences, including fundamental and applied research jointly performed with private partners.

First, Switzerland regularly celebrates several scientific events for the general public, and our researchers were present in these events as speakers, or as organizers of workshops, ateliers, and other outreach activities. We had several collaborations with museums or music festivals (see chapter 7 of the report) that largely increased our visibility across Switzerland. Notably, one of our most successful and long-standing collaborations with industry was initiated thanks to our participation in the outreach science festival “La Nuit de la Science” in Geneva, where some of our researchers organized activities for visitors around the theme of emotions and odors. A chance encounter with one of the visitors, a leading researcher in industry, started our collaboration with Firmenich, which after 10 years has significantly contributed to make the Swiss Center for Affective Sciences one of the world leading scientific institutions in the study of the relationship between emotions and olfaction.

Second, during the last 12 years NCCR researchers actively participated in several events and conventions that were not directly related to the affective sciences but in which we were able to attract attention to this domain – for example Peace Building events, Hotel Industry meetings, Sensory Science conventions, or Environmental Science symposia. In all these cases, our participation had the goal of raising awareness on the role of emotions in the respective applied domain. Remarkably, most participants in these events are affiliated to private companies or public institutions, and our participation has often reached interested parties outside academia. For example, our participation in Eurosense 2012 provided the occasion to meet researchers working at Laboratoires Clarins; this encounter resulted in an innovative scientific collaboration on emotional reactions to cosmetic products. Another interesting example is our collaboration with the Ecole Hoteliere de Lausanne: we contributed to one of their most important publications - “Lausanne report – Shaping the future of hospitality – outlook 2030” - in which emotions and affective experiences are profiled as central themes for the future of the hotel industry.

Third, the scientific reputation of the NCCR paired with its international visibility was very effective in initiating relationships with industry. Still, in order to fully develop a research project and to manage the complexity of the collaboration between universities and external partners, a research unit specifically dedicated to this task was needed. The Applied Affective Sciences research focus was created in 2010 with this purpose, and its facilitation role contributed to the NCCR increasing the number and the quality of its collaborations with industry and other partner institutions. This research focus now has the responsibility of managing the first steps of the collaboration, to establish contact between NCCR researchers and industry, to facilitate the dialogue, and to provide support on the scientific and practical aspects of the collaboration. The work of the Applied focus also ensures continuous interaction with other services of the University, for example the Technology Transfer Office (UNITEC), the legal service department, and the Euresearch office in Geneva. The support to our researchers and pursuit of knowledge and technology transfer collaborations will continue after the end of the NCCR thanks to the Swiss Center for Affective Sciences. The University of Geneva created and fully funded a permanent position for this role within the Swiss Center for Affective Sciences, a position that since its inception has been occupied by Marcello Mortillaro.

The knowledge and technology transfer activities are, to a large extent, funded through means independent from the NCCR. Only the focus coordinator's salary and general public outreach activities are paid by the NCCR and the University of Geneva. All other activities (sections 2 and 3 above) are paid through third-party funding.

### 4.2 Highlights and overall achievements

Research produced by the NCCR has a great potential for applied studies, and its major achievements can be grouped in three general areas: 1) tools for researchers, 2) collaboration with public institutions, and 3) collaboration with industry (cf. Annex 4 on NCCR transfer partners).

The first type of achievements concerns tools for researchers. We developed several instruments and databases that were made available to other researchers in academia, in the private sector, or in public institutions for re-

search purposes only. We released three main categories of scientific products: (1) **Databases**, like the Geneva Multimodal Emotion Portrayals (GEMEP), a collection of dynamic multimodal expressions of emotions that is now used by hundreds of researchers worldwide; or the various databases released by the focus Affective Computing and the interproject EATMINT, which include (i) CSEM-25 (a dataset of 5 object classes used to enhance computer vision applications); (ii) the GIF and Images Interestingness databases (two collections – one of GIFs and one of pictures - with labels on emotions, aesthetic values and interest ratings); (iii) the Emotion in Music database (2700 songs with emotion annotations); (iv) the MAHNOB-HCI database (a collection of emotional reactions to videos including, facial expressions, physiological signals and eye gaze); and (v) the DEAP database (a database of emotional reactions to music videos including, facial expressions and physiological signals). (2) **Questionnaires**, for example the GRID (an instrument to investigate the meaning of emotion words, currently available in over 20 languages), the Emotion and Odor Scale (EOS, a set of scales used to measure specific feelings elicited via olfactory stimulation in different cultures), the Geneva Emotion Music Scale (GEMS, a set of scales used to measure emotional responses to music), the Musical Entrainment Questionnaire, the Bern Illegitimate Tasks Scale, the French adaptations of several standard questionnaires, and a web experimentation platform with a collection (SCASRI) of over 80 questionnaires and tests; (3) **Software**, for example FAS (Faces for Affective Sciences, software that can be used to manipulate the attractiveness of 3D faces), ZTree (software for developing and carrying out economic experiments), Elephy (software for the analysis of electro-physiological signals), Geneva Voice Toolbox (software for the audio processing of voice recordings), Computer-Generated Figure Rating Scale, (software to measure own and ideal body perception amongst women), and TEAP (open software toolbox for extracting emotion related features from physiological signals).

Two instruments in particular should be highlighted. The first is FACSGen, a computerized program that allows researchers to generate static pictures and dynamic videos of facial expressions of emotion through a user-friendly interface. The software is based on the state-of-the art method for coding facial expression (the Facial Action Coding System) that is used in FACSGen as a generation tool. FACSGen has been validated in two international peer-reviewed publications (Roesch et al., 2010, *Journal of Nonverbal Behavior*; Krumhuber et al., 2012, *Emotion*), has been used to produce stimuli for several studies that were published in prestigious journals (e.g., Cristinzio et al., 2009, *Brain*; Vrticka et al., 2014, *Emotion*), and has been requested by dozens of labs over the years. We are currently finalizing the process to officially license FACSGen to other interested researchers.

The second instrument deserving special attention is the Geneva Emotional Competence Test (GECO), the result of an SNSF-NCCR “Franc Fort” project. This test is one of the first scientifically-validated task-based instruments to measure emotional intelligence in the workplace. The high potential impact of the GECO in terms of human resources activities, (e.g., recruitment, assessment, and training) has already been recognized by the industry; the GECO has been officially licensed in Switzerland to an HR company based in Bern and has been requested by other companies located outside Switzerland.

The second main type of Knowledge and Technology Transfer (KTT) achievement has to do with public collaborations. In the past 12 years we have collaborated with more than 40 public institutions with the goal of raising awareness about the role of emotions and to benefit society in general. Most of these activities - done in collaboration with museums, science fairs, and music events - are summarized in point 7 of this report (Communication). In addition to those communication events, our researchers were involved in initiatives promoting health and well-being in society. Collaborations with Health Promotion Switzerland and the Federal Institute for Occupational Safety in Germany were indeed focused on the measurement of stress and well-being at work and on interventions to improve the health of workers. This research program includes a longitudinal study (10 years already done, and with an outlook of 20 years) on stressors at work, as well as online outreach activities to raise awareness about stress and ways to cope with it. Our researchers are also working with hospitals to improve the communication between doctors, nurses, and technicians in the operating room, with the goal of reducing mistakes.

One of the most important and recent applied initiatives is the collaboration with the Services Industriels de Genève (SIG) to investigate the impact of affective aspects of tariff design on customer acceptance of energy-saving tariff structures. This applied research has clear implications for Swiss politics and society, as its objective is, in the long run, to change the behaviour of consumers and reduce their energy consumption.

The NCCR also paved the way for a collaboration with the department of Forensic Psychiatry at the University of Geneva for a new applied research line in judicial contexts. NCCR researchers analysed an extensive database of forensic interviews of children and provided the concerned institutions with an evaluation of the reliability of a qualitative assessment procedure widely used to assess children’s statement credibility in judicial contexts.

We have also built relationships with international organizations based in Geneva, like the United Nations and the International Committee of the Red Cross, and we had rich exchanges with the peace-building community in Geneva, including talks and teaching at the Geneva Centre for Security Policy.



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The third main type of KTT achievement relates to collaborations with the private sector. During these 12 years we had several productive scientific collaborations with industry. The topics varied significantly from one project to another, but they all possessed clear scientific value (i.e., the aim was always to publish the results) and industrial relevance. We were particularly successful in the cosmetic industry, where our seminal collaboration with Firmenich helped us establish the NCCR as one of the reference institutions for the relationship between emotions and odors in both the academic and the industrial sectors (together we published more than 20 international peer-reviewed articles, e.g., Coppin et al, 2010, *Psychological Science*; Coppin et al., 2016, *Nature: Scientific Reports*). The collaboration has been extremely beneficial for Firmenich as well. Thanks to the prototypes, processes and protocols that have been jointly developed during the project, the company benefits from new expertise in advanced techniques in sensory research and is nowadays recognised as a leader in research on olfactory elicited emotions. The University of Geneva and Firmenich have also recently filed a patent for an original fMRI method for determining brain activation patterns in response to odor-elicited feelings. Furthermore, this company has just created a new scientist position filled by one of our former collaborators.



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A major collaboration financed by the Research Foundation of the Gesellschaft für Marktforschung (GfK) over several years linked NCCR researchers to GfK and the German Fraunhofer Institute to examine the possibility of using computer-detected facial expressions to infer appraisals and consequently infer emotions. Jointly with GfK and Fraunhofer, a number of experimental laboratory studies and a field study were conducted.

We also collaborated with Laboratoires Clarins on the role of touch on emotion experience; with Wrigley Inc. on the relationship between stress and self-efficacy; with Mars Inc. on the role of emotions and values in ethical choices; and with Coty Inc. on the effects of odors on sleep and emotions. We have also recently obtained a new applied project with the Philharmonie de Paris in order to study the impact on the quality of social interactions of forming an orchestra with children and teenagers in different social contexts.

**Table 5: Other forms of output**

Type	Number
Services	13
Patents	--
Licences	--
Spin-off / start-up companies	--
Prototypes / demonstrators	--
Processes	46
<b>Total</b>	<b>59</b>

<b>Other forms of knowledge transfer</b>	<b>82</b>
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Data from March 2017, IR 12 (source: NIRA-report 4490, all years)

#### 4.3 Experiences and outlook

The creation of a fruitful collaboration with industry and public institutions is generally quite demanding, especially because of the time that is necessary to find an agreement that is acceptable for all parties in terms of rights and obligations.

Applied research in the context of the affective sciences is not very common and we basically had to create the conditions for the technology and knowledge transfer to happen by working with both decision-makers in the industry and researchers. Most decision-makers in industry do not really know what the affective sciences are and how their industry can benefit from this research. For many large companies, emotion is a theme for the marketing department, where experimental research is not very frequently considered. Thus, the first difficulty was to convince potential partners of why the affective sciences can be useful to them and to provide clear examples of what can be accomplished together. This is a critical point for us: as a public research institution, we look for partnerships that are relevant for our basic and applied research programs; therefore, we are interested in collaboration only if the project can deliver scientific results worth of publication. To manage this difficulty, we created the Applied Affective Sciences focus, which had the role of translating NCCR basic research for the industry.

A second difficulty is that the Swiss market is relatively small when compared to neighboring countries like France or Germany. International collaboration suffers from the fact that research costs in Switzerland are significantly higher than in other countries. Public and private institutions sometimes decided to drop the collaboration with us for economic reasons and looked for research partners in their own countries, where the cost of labor is cheaper and taxes on the investment can be deducted (for instance, we heard from a partner that three PhD students could be hired in their country for the salary that we were asking for one PhD student in Switzerland). The NCCR helped us in this respect, as it gave great visibility to our research. In that way, we could profit from our excellent reputation to attract partners who were eager to invest more in order to work with us.

A third difficulty, especially at the beginning, was within the NCCR. Some researchers did not envisage collaborations with industry because they worried it would impose limitations on their scientific freedom. Our policy clearly defined scientific interest and publication rights as necessary conditions for any project. We never considered any collaboration in which there was any form of control on the data analysis or on the publication of the results (with the exception of delaying a publication for a few months in order to file a patent).

The fourth and last difficulty concerned the legal issues related to the foreground and background intellectual property, the respect of our right to publish the results, and general legal obligations. In this area we could profit from the exceptional support of the legal offices (Unitec and Services des Affaires Juridiques) of the University of Geneva. They took care of the legal aspects of the contracts and their biggest priority was the protection of the researchers and the University. This close collaboration with existing and efficient offices of the University of Geneva was necessary for the KTT aspects.

In comparison to the beginning of the NCCR, in recent years more researchers from our NCCR joined industry after their doctorate or the post-doctoral period. In absolute terms they are still a minority (cf. Figure 2 in section 5.2.) and this may be due to the specific content of our research, which has less immediate applications in industry compared to engineering or the natural sciences. In collaboration with the Education and Training program of the Center, we tried to bridge the gap between researchers and industry by providing dedicated training workshops open to PhD students and postdoctoral researchers. In these workshops participants learned skills that are useful also outside academia (e.g., presentation skills), were trained to understand the requests of industry, the job market, and identify the skills that they learned during their PhD that could be valuable for the industry. In the past few years, we've started to witness some notable exceptions to the academic professional path, with one researcher who now works full-time at Firmenich, a researcher who started a very successful career as scientist in industry after a few years as postdoc at the Center, another working as Lead Data Scientist in a large Health insurance company in the USA, and another in a multinational company. Some of our researchers were also supported to participate in business creation and startup courses organized by the CTI. One of the main goals in the next years is to keep supporting our researchers to increase their chances and options to continue doing research not only in academia but also in industry. This not only helps them find attractive jobs, but also enhances our visibility and influence outside academia.

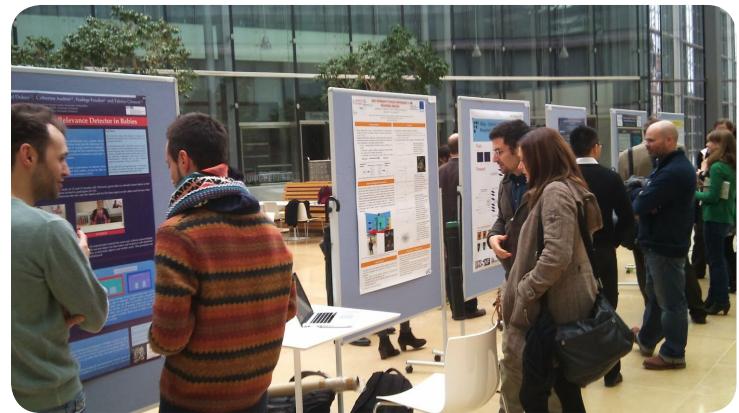
The general outlook for KTT at the Center is extremely positive and several new and important collaborations are currently being discussed, for example with a world-leading software house and with a large pharmaceutical company. Established collaborations will continue too, and the Applied unit at the Swiss Center for Affective Sciences will assure the presence of Switzerland in the field of applied affective sciences in years to come.

## 5. Education and training - promotion of scientific careers

### 5.1 Strategies, aims and resources

The overarching goal of the NCCR Education and Training (E&T) Program throughout these 12 years has been to educate the first generations of affective scientists, which means both to create this new kind of interdisciplinary identity in the young (doctoral and postdoctoral) researchers working on affect in Switzerland (and around the world), and to provide the program members with varied training opportunities to build up their profile with disciplinary and interdisciplinary skills.

In addition to a varied palette of training opportunities (described in 5.2), the program has progressively evolved to provide its members with other forms of career support, including funding to attend external scientific events, information mailing (e.g. jobs, grants, conferences), grant advice, peer support and mentoring. It has also fostered networking and interdisciplinary collaborations through events at which to learn about the work of other members (e.g., the Annual Research Forum, designed for all members of the NCCR to showcase their work) and promoting informal occasions of exchange (e.g., private meetings with visiting lecturers, Peers meetings, informal social events after lectures, etc.).



Starting in 2005, the E&T program was first run by David Sander as a complement to his activities as the scientific coordinator of the NCCR. But, as the program grew in complexity (larger number of students, institutional collaborations, types of activities), Pablo Achard was hired in 2009 as executive scientific officer. The role was taken over by Cristina Soriano in 2010, and became a permanent position funded by the University of Geneva in 2016. The program is also supported by the general administrator of the Center and an administrative assistant, two CISA permanent positions funded by the University of Geneva.

The NCCR allocates funding to the E&T program for two main types of expenses: the organization of training activities and personal travel grants to attend external events. These funds are available to the members of the Doctoral School and of the Postdoctoral Program of the Center. The latter also benefitted from BRIDGE (<http://bbl.unige.ch/bridge/>), an FP7 COFUND grant from the European Commission for postdoctoral researchers to come to work at the Brain and Behavior Laboratory of the University of Geneva. BRIDGE was largely possible thanks to the existence of the NCCR, and for five years it provided complementary scientific events to support postdoctoral careers specifically. As for the doctoral program of the Center, its continuation is assured through the creation of the Swiss Doctoral School in Affective Sciences (SDS Affective Sciences), funded by Swissuniversities. Our first application for the period 2013-2016 was accepted, and it has been recently renewed for the period 2017-2020 (with a total budget of 249'570.- CHF).

### 5.2 Highlights and overall achievements

During its 12 years of functioning E&T has become a wide-ranging program of regular training opportunities for a total number of 141 doctoral and 132 postdoctoral researchers (as of 31.3.2017). For a summary of training status of our PhD students throughout the years see Fig. 1

The program is truly interdisciplinary, having featured speakers from many disciplines such as psychology, philosophy, neuroscience, literature, history, anthropology, classics, linguistics, sociology, economics and computer science. The training activities currently include a monthly lecture series, monthly graduate seminars, scientific workshops, transversal skills workshops, and a summer school - all of them aiming to support its members' professional careers with scientific training as well as technical and soft skills. Targeting a more general audience, a MOOC in the affective sciences is currently in preparation, as well as a collaboration in a course (Certificate of Advanced Studies) on emotional competences. In the same vein of outreach efforts, our lectures are now advertised in the agenda of the University of Geneva and are more regularly attended by the general public.

The program has created an active community of young researchers that support each other. They have created the so-called "Peers" group, a self-managed meeting place for all researchers at the NCCR, used by its members to share knowledge and experiences. They also administer a mailing list and webpage. Based on this experience, in the past year a few of the Peers members have created a new committee to foster communication and exchange among the young researchers at the Campus Biotech.



The E&T program has also succeeded in creating a world-renown summer school in the affective sciences: the International Summer School in Affective Sciences (ISSAS). Since its foundation in 2009, ISSAS has hosted a stellar panel of speakers from very diverse disciplines and the most reputed institutions worldwide. In its later instantiations, ISSAS has also hosted practitioners, artists and other non-academic professionals to share their expertise with the rest of the community. The result is an occasion for very intensive learning and personal exchange that has powerfully fostered the spirit of the affective sciences, advertised worldwide the work carried out at the NCCR, provided immensely valuable networking opportunities for the upcoming generations of researchers, and spurred new and interesting interdisciplinary collaborations, some resulting in funded research projects and articles.

All of our activities are voluntary, a resource made available to our students to improve their disciplinary doctoral training with a unique interdisciplinary profile. This is an asset inside and outside the academic job market. Most of our students (82%) have successfully continued their career in academic settings (see Fig. 2), but we expect our workshops in communication skills, self-promotion or statistics (among others) to have also been useful to those following a non-academic path.

The program prides itself in having nurtured a lot of successful careers in Switzerland. As a way of example one may mention Petra Schmid, former member of the postdoctoral program, who joined ETH Zurich as assistant professor; Tobias Brosch, who also conducted his doctoral research at the Center, and is currently associate professor at the University of Geneva; Katja Schlegel, who received doctoral and postdoctoral training at CISA, and is now lecturer at University of Bern; Christelle Gillioz, former postdoc, now lecturer in Fribourg; Kerstin Brinkmann and Benoit Bediou, former postdocs and now maître assistant(e)s in Geneva; or Corrado Corradi-Dell'Acqua and Sascha Frühholz, former members of the postdoctoral program, who are now Professeurs Boursiers in Geneva and Zurich, respectively. Many other doctoral and postdoctoral students have found positions abroad. As a way of illustration of the variety of institutions currently hosting former members of the program, one may mention Gilles Pourtois (associate professor, Ghent), Astrid Hopfensitz (associate professor, Toulouse), Etienne Roesch (associate professor, Reading), Camille Ferté (chargée de recherche, CNRS), Sona Patel (assistant professor, CalTech), Jacobien van Peer (assistant professor, Nijmegen), Martijn Goudbeek (assistant professor, Tilburg), Chiara Battistella (assistant professor, Udine), Marc Mehu (assistant professor, Vienna), Ioana Latu (lecturer, Queens University Belfast), Tom Cochrane (lecturer, Sheffield), Ursula Beermann (lecturer, Innsbruck), Clare Mac Cumhaill (lecturer, Durham), Petra Vetter (lecturer, Royal Holloway University London), Eduardo Coutinho (lecturer, Liverpool), Sylvia Kreibig (senior research associate, Stanford) or Eva Krumhuber (assistant professor, University College London).

Our program is now beginning to target undergraduates. For example, bachelor and master students from the US and Europe are regularly welcome at the Center for a semester of research collaboration in the framework of the Euroscholars and STREAM-LERU programs, respectively. Additionally, the Center hosts an increasing number of bachelor students and master students from the Master in Psychology and the Master in Neuroscience at the University of Geneva, who are supervised and mentored by our more advanced researchers, in many cases paving the way into doctoral research.

More recently, a number of activities for children have also started to take shape. With the support of the outreach officer at the Center, a program of educational activities for primary education students is currently being developed in collaboration with Bioscope, the outreach laboratory for Life and Biomedical Sciences of the University of Geneva. In addition, some of our researchers are designing games to teach granularity in emotion vocabulary and cognitive reappraisal strategies to children between 9 and 11 years old. A training has also been created to teach emotion regulation skills and increase positive emotions in children (autistic and typically developing ones) and is going to be implemented in Geneva, Luxembourg, Vienna and Stanford.

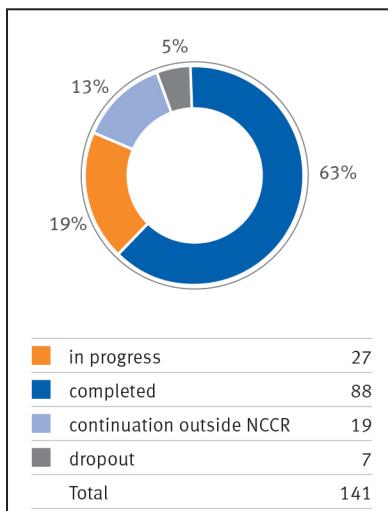


Fig. 1: Training status of the PhD students  
(data from 31.03.2017 (IR12))

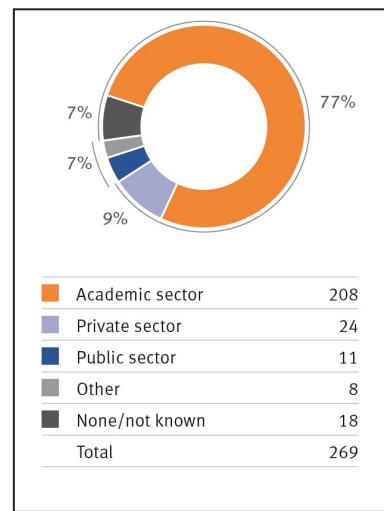


Fig. 2: Next employment of PhD and postdoctoral students after leaving the NCCR (data from 31.03.2017 (IR12))

### 5.3 Experiences and outlook

During the past 12 years, the collaboration within our home institution has always been productive and our synergies have clearly contributed to an improvement of E&T. For example, in the past three years the number of visiting scholars hosted at the NCCR from the US and Europe in bachelor and master studies has increased considerably thanks to the programs managed by the International Affairs Office. The University of Geneva has also allowed the expansion of our educational offer by funding a MOOC. The UNIGE branch of Euresearch regularly provides us with valuable information concerning project and personal grants for our members. Furthermore, the UNIGE was instrumental in consolidating the doctoral program through the funding provided by Swissuniversities.

Some difficulties were also encountered in the running of the program. One of them is the challenge to mobilize students to regularly attend events away from their home base. This has generally been the case for students outside of Geneva, since most activities are organized at CISA, but more recently it has also been the case for Geneva students, particularly for events purposefully organized outside the University of Geneva in order to increase the Center's visibility in other universities of the network.

To address this difficulty, different strategies were implemented throughout the years. One was to combine several types of activity (lecture, workshop and soft skills training) in a one-day program, to make it more appealing, especially for those coming from other cities. In spite of the good initial response, numbers progressively dwindled all the same. We then tried to hold our various types of events separately but always on the same weekday, and advertise our activities in block well in advance (e.g., per trimester). Both measures proved challenging too because of the scheduling constraints of the many people involved (speakers, hosts) and the dynamic flow of opportunities arising in the course of the academic year, which are not always foreseeable. Thus, our best strategy so far consists of: (a) No closed schedule advertised for the trimester: events can be added on the go as needed (although a basic offer is designed by the E&T team at the beginning of the academic year); (b) Students as well as faculty can propose speakers/ activities to organize; (c) A survey of interest is routinely run among the students for any activity proposed, to guarantee a minimum of audience if organized; (d) Events are advertised as soon as they have been scheduled and are announced on our webpage. A reminder is sent to the students by email a week in advance; (e) With occasional exceptions, activities are organized in the NCCR headquarters in Geneva; (f) The lecture series is held in collaboration with another lecture series from the Lemanic Neuroscience Doctoral School, so as to capitalize on our respective audiences; (g) When possible, workshops and graduate seminars are scheduled on the same days as lectures; (h) Given the large number of activities organized, attendance is not compulsory, but students require a minimum number of credits to graduate. Thanks to these measures the attendance numbers are regular.

A few more lessons have been learned concerning activity organization. One of them is to keep the number of events reasonable and to maintain a main annual meeting for networking among all members of the Center. This was the function of the Annual Research Forum so far, and it is important given that not all researchers (e.g. postdocs, associates, and project leaders) can attend our events regularly. Another lesson learned is that bottom-up activities are often more successful than top-down initiatives, which stresses the importance of giving a voice to students and postdocs to contribute to the program.

In spite of our accomplishments, some of our original ideas were never implemented. One of them was the goal to establish regular laboratory rotations among the network members. The logistics of the rotations made it difficult to implement. Nevertheless, our students have always been able to request funding for short lab visits

(national or international), and many of them have benefitted from this measure.

In the future two major challenges will have to be addressed concerning the continuation of our postdoctoral program and ISSAS. The Postdoctoral Program will continue to exist as a networking structure, and the members will be able to attend the training activities organized for the doctoral school, but in the absence of specific funding, the offer of the program will have to be redesigned to remain equally attractive. An application for a new postdoctoral program in collaboration with other partners at the Campus Biotech was submitted to Horizon 2020 last year. The proposal received good reviews but did not go through. New applications will have to be submitted.

The continuation of ISSAS is another challenge in the near future. While the funding from Swissuniversities includes a budget for the organization of a summer school, complementary funding will have to be obtained for this event to maintain some of its current characteristics.

With these and other activities, we hope to continue to provide a source of interdisciplinary training for the affective sciences, beneficial for master and doctoral students, postdocs, advanced researchers wishing to expand their disciplinary boundaries, and even the non-academic public in a broad sense. In sum, we aim to continue to be a home and a reference institution for the new generations of affective scientists in Switzerland and abroad.

## 6. Equal opportunities

### 6.1 Strategies, aims and resources

Although women generally outnumber men in doctoral and postdoctoral positions, men overwhelmingly outnumber women at the higher levels of academic positions, especially professors. In other words, there are very few women in high-power academic positions. The general reasons may be: 1) some fields may attract relatively less women than men (for example electrical engineering; but this does not apply to our NCCR); 2) women might be interested more in the field than in an academic career per se; 3) women interested in the field and in an academic career have more severe constraints than men. In order to address reasons 2 and 3, from the beginning of the NCCR onwards we decided to work on two types of activities to strengthen equal opportunities.

First, a scientific-related strategy was to develop research on gender issues with the formal creation of a “Research focus on gender issues” that started in 2005 and existed for the whole duration of the NCCR. We were, for instance, interested in identifying some of the emotion-related causes of gender inequality with respect to academic careers, such as motivation, self-image, self-esteem, attitudes of female academics themselves and, on the other hand, attitudes, motivations and affective reactions of their colleagues and of decision makers in institutional contexts. We were also interested in identifying change mechanisms, such as issues of entitlement and perceived injustice, social regulation of emotion, and stress.

The second strategy to strengthen equal opportunities at the NCCR involved a series of practical measures. The first was the policy to preferentially hire women if job competencies are comparable in order to have a high percentage (above 50%) of women working in the NCCR; we tried to attract women by offering part-time positions and supporting those who wanted to go back to academia after a career break. A second type of measure was economic and included offering grants to support dissertation writing (grants-in-aid for women or for men with family obligations), travel funds (to visit other research institutions), and funding baby-sitting during our longest events (e.g., the summer school). A third measure was to offer part-time employment and temporal leaves (made possible by the length of the NCCR project: 12 years instead of 2-3 years). A fourth measure is currently in preparation: a mentoring program between professors and students, or between advanced researchers and junior students. The advantages of this NCCR mentoring program is that the researchers already know each other and have similar scientific interests, but the professor is not the student's supervisor, which guarantees independence. Finally, we planned to establish or to expand collaborations with the academic Equal Opportunities Offices and programs in the relevant universities, at Federal and international levels.

These aims were to be achieved in collaboration with the two project leaders in charge of the Gender research focus: Marianne Schmid Mast and Susanne Kaiser, assisted by the doctoral student Birgit Michel. However, we soon realized that the gender research part of our objectives could be the team's responsibility, but not the other measures. For this reason it was decided that Daniela Sauge would have a 10% additional contract to give administrative support to the Gender team. Susanne Kaiser was replaced by David Sander when she retired as project leader and the Gender focus was assisted in the two last phases by a postdoctoral student, Ioana Latu and then Elena Cañadas.

### 6.2 Highlights and overall achievements

#### 6.2.1 Research on gender issues

Women and men are associated with different emotions. Such gender-emotion stereotypes are well documented but we do not know much about how they affect behavior and evaluations in actual social interactions. Also, whether women and men express and experience different emotions is not entirely clear either.

Thus, the research questions we specifically addressed were: What are the causes and consequences of gender differences in emotional expression and experience? How does the expression of differently gendered emotions in women and men affect the perception and evaluation of targets? How does the expression of differently gendered emotions in women and men affect how we interact with the target? Do gendered emotion stereotypes influence hiring decisions? What are the mechanisms of bias against women in leadership and how can this inequality be reduced? How can women in leadership positions be empowered when faced with stressful leadership tasks?

Our results show that women in leadership positions are evaluated more negatively than men in comparable positions and even more so if they adopt a male-typical (e.g., directive) as compared to a female-typical (e.g., participative) leadership style. It was also found that a female role model improved women's performance in a stressful leadership task, whereas men's performance was not affected by a (female or male) role model; additionally it was found that women mimic the expansive body posture of successful role models and this partially explains their



better performance. A third finding was that implicit stereotypes about women in managerial roles (e.g., women are incompetent) predict lower performance ratings of female job applicants, but only in male recruiters. At the same time it was also found that people expressing gender-inconsistent emotions (sad men; angry women) were evaluated more positively and more socially rewarded: participants indicated wanting to interact with them more.

Most of the research on gender issues illustrated above was conducted through the Gender focus, however other research projects also had interesting results regarding gender differences. For example, the Bern-Neuchâtel group have medical data which indicate less leadership behavior and more stress among females. They also found that higher resources at work predict more self-esteem for men. For women the effect is the reverse: higher self-esteem predicts more job-related resources. Betrancourt's project in turn identified gender as a variable mediating the impact of their emotion awareness tool for computer-mediated interactions. This result is in line with recent research on emotion expressivity and perceived social power. Within Grandjean's projects a study on gender differences in the neural network of facial mimicry indicated that the primary motor and the somatosensory cortices play a role in the mimicry and in the use of facial feedback for accurate processing of smiles in female participants, not in male participants.

In addition to all these achievements, we published a white book on gender in emotion research, consisting of a review of the literature by each project of the state of the art of research on gender differences in their respective research domains.

### **6.2.2 Academic advancement of women**

Our main objectives were to (A) sensitize project leaders to equal opportunities issues and (B) offer tools to young women in the NCCR to enable them to successfully compete for academic positions, even if they have a family.

A. Project leaders were regularly sensitized to the importance of facilitating the hiring of women researchers at all levels. We also gave them regular updates on the gender distribution of NCCR collaborators, and made them aware of the need to particularly encourage women to apply for NCCR positions, present and publish their research internationally, and apply for grants, fellowships, and other funding opportunities. All projects have actively searched for female candidates for their doctoral or post-doctoral positions, in many cases with notable success. We now have 24 female and 15 male PhD students and 18 female and 14 male postdocs (cf. Fig. 3 for details on gender distribution in the NCCR). In order to strongly promote the advancement of women in academia, key positions in Geneva are those of Maître-Assistant and Maître d'Enseignement et de Recherche, which typically open the possibility to apply for an assistant professor position. At this level, we have xxx

B. The tools offered to women in the NCCR to foster their academic career are: (1) measures for work and family life balance; (2) Encouragement of mobility of female researcher to the NCCR; (3) Information; (4) Workshops, mentoring and advanced courses; (5) Active participation of the Gender Team in University equal opportunity offices. They are described in more detail below.

1. To foster work and family life balance several measures were implemented throughout these years:

1.1 Stipend for NCCR collaborators with parental obligations, including 10% of supplementary salary for young researchers who raise preschool children alone, and 5% to those who raise them in couple.

This measure was first applied for Anna Ogarkova, who thanks to this measure came for a postdoc in Geneva with her 2 year-old son. The following other researchers, working part-time, benefitted from this measure; all of them got a 5% of supplementary salary; by chronological order: Birgit Michel, PhD student; Chiara Cristinzio, postdoc; Valérie Milesi Sterk, PhD student; Ioana Latu, postdoc; Solange Denervaud, PhD student; Olga Klimecki, senior researcher.

1.2 Reimbursement of travel expenses and hotel for accompanying children of a researcher attending a scientific conference to present results. Baby-sitter in our summer school (ISSAS).

1.3 Reduction to an 80% position (instead of the planned 100%) for a male postdoc researcher to be able to stay at home one day to take care of his young child.

1.4 Optional unpaid leave after maternity leave. Optional reduction of working hours for a few months after maternity leave, which makes it possible for female scientists with families to remain active in research.

1.5 Our original idea to organize an information day on «how to combine academic career and family life» has now been turned into a brochure, edited by the «Bureau de l'Égalité» of the University of Geneva, in collaboration with the NCCR. This format allows more researchers to be informed about the legal and financial aspects related to maternity and children (e.g., work contract, possibility of extensions of their grants, health insurance). This brochure is called «Parents, suivez le guide»; it is available in paper version, but it can also be downloaded from the university website.

1.6 Finally, the postdocs paid by the Bridge COFUND project also received financial support to move to Geneva. The amount was higher if they came with their family.

2. Encouragement of mobility of female researchers to the NCCR:

Role modeling at the NCCR was aided by encouraging female researchers from outside the NCCR to visit the center for a scientific stay, including presenting and discussing their work. They include K. Misselhorn, I. Vendrell Ferran, U. Hess, J. Louise, A. Moors, A. Schacht, J. Kissler, I. Comeig, A. Bartsch, and G. Colombetti.

3. In order to make equal opportunities information even more accessible, we created on the last year of the first phase a dedicated website (<http://www.affective-sciences.org/en/links/>) containing information about the NCCR equal opportunities activities and team, upcoming gender events, funding opportunities, mentoring, gender equality offices, network and research links.

4. Workshops, mentoring and advanced courses were offered to women collaborators in the NCCR on career planning and career advancement. For example, Marianne Schmid Mast organized a workshop on «Career Development» for NCCR female researchers. In terms of training, many researchers regularly took part in the courses organized by the «Bureaux de l'Égalité» of the French-speaking Swiss universities (REGARD courses) and the transversal-skills workshops organized by the Conférence Universitaire de Suisse Occidentale (CUSO). As for mentoring, N. Dael, A. Debrot, K. Gentsch, A. Montagrin, E. Pool, P. Schmid, and C. Soriano took part in a mentoring program of French-speaking Swiss Universities for the advancement of young female researchers. Similarly, S. Denervaud enrolled for the «Fix the leaky pipeline» program of the ETH Domain's Group of Equal Opportunities for Women & Men. Also important for role-modeling, K. Iglo was nominated Ambassadrice L'Oréal pour les Filles et les Sciences. As for our professors, M. Betrancourt participates in the mentoring program «Relève» and in the «Tremplin» follow-up for female junior researchers at the University of Geneva. She is supervising a total of 10 women in those programs. M. Schmid Mast is a mentor to several women within the mentoring program of Switzerland.

5. The active participation of NCCR members in university equality offices gives us the opportunity to be better informed about what is done for the advancement of women at the various universities and to inform the universities about what is done at the NCCR. The local university committees are linked to the national level, which guarantees the dissemination of information. The following persons are or have been members of the «commission égalité» at the psychology department of the university of Geneva: D. Sauge (invited member since 2009), M. Betrancourt (head of this commission for a few years), S. Kaiser, D. Rudrauf and G. Coppin. M. Schmid Mast was the president of the equal opportunity committee at the University of Neuchâtel; she now is the president of the equal opportunity committee of the Business School (HEC) at the University of Lausanne and the president of the equal opportunity committee of the University of Lausanne ad interim for the academic year of 2016-2017. D. Sauge and D. Grandjean are also part of the Equal Opportunity committee at the "Assemblée de l'Université".

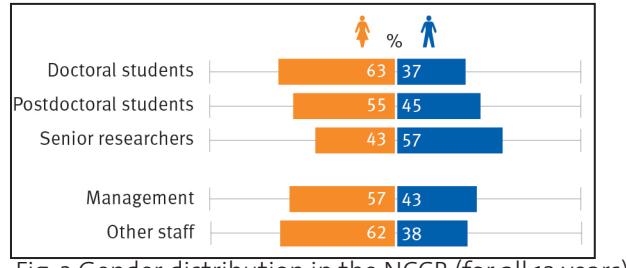


Fig. 3 Gender distribution in the NCCR (for all 12 years)

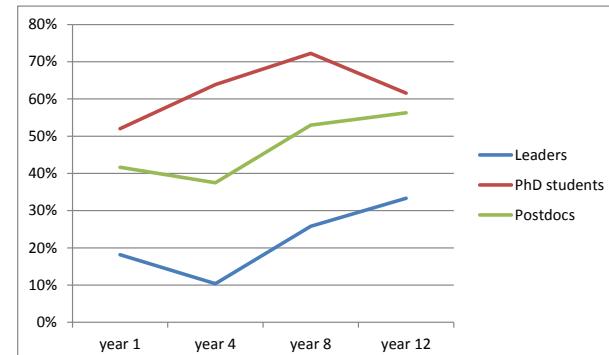


Fig. 5: Proportion of women for years 1, 4, 8 and 12 (data from 31.03.2017/IR12)

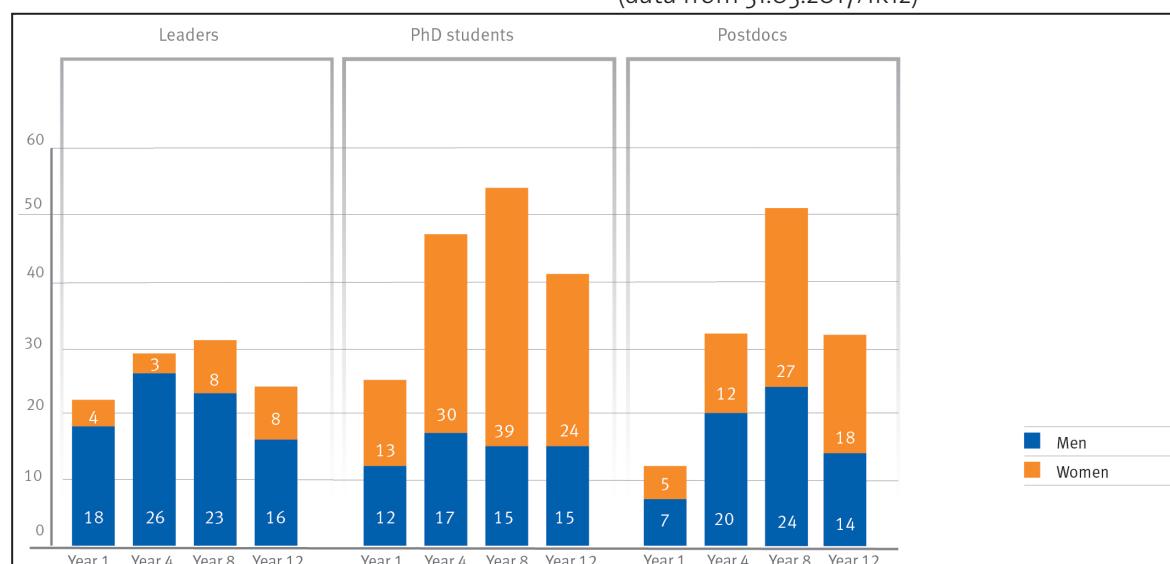


Fig. 4: Number of male/female leaders, postdocs and PhD students for years 1, 4, 8 and 12 (data from 31.03.2017/IR12)

### *6.2.3 Impact of our measures*

Besides increasing the number of female researchers hired within the NCCR (cf. Figs. 4, and 5), our measures were also effective in helping our female researchers obtain fellowships. Our female researchers were very successful in obtaining stipends to cover their salary and research expenses, travel expenses, or the possibility to hire someone else to do their teaching activities while abroad for a scientific stay.

At doctoral level:

- A doc.mobility grant was obtained by C. Labb  , A. Montagrin, N. Fernandez and D. Warrot
- A. Montagrin also visited the laboratory of Jorge Armony thanks to the grants for Advancement of Women given by both the NCCR and the Facult   de Psychologie et des Sciences de l'Education.
- L. Messerli was awarded the stipend for advanced doctoral candidates from the Office for Equal Opportunities of the University of Neuch  tel.
- B. Michel received a grant by the «Fondation Ernst et Lucie Schmidheiny» to finish her PhD thesis.

At postdoctoral level:

- S. Keller received a scholarship from the University of Neuchâtel for a research stay abroad.
- An SNSF postdoctoral fellowship was awarded to S. Kreibig, A. Achaibou, A. Ponz, L. Koban, G. Coppin, E. Pool and A. Montagrin.
- J. Péron, K. Iglo and K. Apazoglou received an AXA Fellowship.
- P. Schmid got a «Tremplin» grant from the University of Neuchâtel.
- C. Piguet obtained a Synapsy clinical scientist fellowship for female doctors. She also obtained an MD-PhD fellowship from the Faculty of Medicine at the University of Geneva and the neurosciences doctoral school.
- J. Dominguez Borras obtained research grants from the Spanish Catalan Science Program and from the Marie Curie BRIDGE Program.
- C. Ferdzeni obtained an ANR grant for a postdoctoral stay and has just obtained a permanent position as chargée de recherché at CNRS.
- J. Malster obtained a grant from the Boninchi Foundation.

At senior researcher level:

- U. Rimmeli obtained a Mare Curie Reintegration grant, in addition to a Pierre Mercier Award and von Meissner grant.
- J. Péron was nominated maître assistante and then hired as “Chargé de Cours” at the Psychology and Educational Sciences Faculty.
- V. Sterpenich obtained a Gertrude von Meissner grant. She was nominated maître assistante and obtained a permanent part-time position via a position opened at the Campus Biotech.
- A. Ettlin, G. Coppin and E. Pool were nominated maître assistantes.
- N. Jacobshagen received a grant by the «Mittelbauvereinigug der Universität Bern». She now has received an additional grant to support her «Habilitation».
- L. Bayer obtained a permanent position as an independent advanced researcher/lecturer.
- C. Battistella left the Center to take up a post at the University of Udine. She did so under the auspices of the Italian program «Rientro dei cervelli», which aims to attract back to Italy high-level researchers working abroad. Under the terms of the program, after an initial period of research, C. Battistella’s post will become a permanent university position.
- C. Soriano received an ESF visiting scholar grant and a Tremplin grant from the University of Geneva. She also obtained travel grants from the Société Académique de Genève and from the Swiss Academy of Humanities and Social Sciences. She was nominated collaboratrice scientifique, and later promoted to a stable staff position at the Center, providing stable anchor for language and communication activities at the CISA.
- R. Krings became scientific collaborator at the Institute of Medical Teaching at the University of Bern.
- J. Seelandt became patient safety officer at the University Hospital of Zurich.
- T. Aue, I. Latu, U. Rimmeli, J. Dominguez and A. Samson received an Ambizione Fellowship from the SNSF.
- J. Dominguez and M. Seek received funding for a project on Intracranial EEG (500K CHF).
- P. Schmid received a fellowship for prospective researchers of the SNSF and a Tremplin grant of the Commission Égalité des Chances from the University of Neuchâtel.
- E. Dayer-Tieffenbach obtained an SNSF Marie-Heim Vögtlin grant .
- V. Sacharin-Shuman obtained an SNSF project with Prof. Goette and later moved to the University of Minnesota.
- A. Pizzone obtained a visiting scholar grant, an SNSF conference grant and a travel grant from the Swiss Academy of Humanities and Social Sciences.
- O. Klimecki received together with Patrik Vuilleumier an ERC H2020 funding of 850K euros.
- A. Bourgeois received a 50K CHF research grant from the Geneva Hospital research & development department.

ment.

- K. Igloi, obtained a position of Maître de Conférence at Paris-Descartes University, which she declined to apply for an ERC starting grant next fall

At professor level:

- F. Prescendi and T. Aue obtained an SNSF «Professeure boursière».
- A. Konzelmann Ziv received a Bourse d'Excellence University of Geneva (3-year professorship).
- S. Schwartz was nominated associate professor.
- M. Schmid Mast obtained seed money from the University of Neuchâtel to conduct the study «Empowering women in leadership tasks».
- J. van Peer became assistant professor at the University of Nijmegen.
- A. Moors, who had been invited professor at the Center, obtained a permanent position as professor at Leuven University.
- I. Latu became assistant professor at Rutgers University Camden, USA and is now lecturer at Queens University Belfast.
- K. Preuschoff was appointed associate professor in economics on the position «emotion and decision making» created by the University of Geneva in the context of the in-kind contribution to the NCCR, linking the Swiss Center for Affective Sciences and the Geneva Finance Research Institute (GE-FRI), she is second female professor to be appointed in the context of the NCCR.
- S. Schwartz was elected a member of the «Bureau de direction» of the Department of Neuroscience, which is now directed by a team of 3 professors. She is also co-head of the new clinical neuroscience research center at the Campus Biotech, with O. Blanke (EPFL).
- P. Lombardo is deputy director of the NCCR and member of the Steering Board.
- M. Schmid Mast is member of the Steering Board.

In sum, there are many success career stories among our female students and postdocs in all universities of the network. For example (as a way of illustration – as there are more cases), two doctoral students from Geneva (Géraldine Coppin and Eva Pool) obtained SNSF fellowships to do their postdoc abroad and have afterwards secured Maître-Assistante positions at the University of Geneva; two postdoctoral researchers at the University of Neuchâtel (Petra Schmid and Ioana Latu) obtained SNSF grants for postdoctoral research abroad and have since been awarded assistant professor positions.

### **6.3 Experiences and outlook**

We tried to act on many levels to foster equal opportunity: coaching, mentoring, training, information, work-life balance, encouragement of mobility, sensitizing PIs and gender-equality relevant research. The tables above reveal an increase of female researchers at all levels, which could indicate that some if not all measures were successful.

However, we would like to emphasize the shortcomings associated to some measures. Regarding the mentoring, the role modeling is of course taken care of by female professors or advanced researchers, which takes away time from their own research or teaching - a difficult challenge. Part-time work, for men or women, seems a good option but, if it is for too long, it can be a serious disadvantage for building an academic career, given that the hours necessary for an academic career cannot simply be reduced.

Although we did not collect data on this, the female researchers in the NCCR face some of the same challenges that are well-identified for female researchers in general such as the fact that they are more easily involved in non-academic tasks, like organizing conferences. Moreover, at University of Geneva women have lower salaries than men even though they have the same educational background, because they are more likely to take jobs for which they are overqualified.

Regarding the future after the NCCR, we will continue our equal opportunity activities, with less financial support (although we will look for specific grants), but at least with equal engagement in mentoring, coaching, training, information, and involvement in existing university structures.

## 7. Communication

### 7.1 Strategies, aims and resources

Our communication strategy aimed at informing as widely as possible about the scientific approaches and findings of the NCCR Affective Sciences researchers (in particular multi- and interdisciplinary teams). This was achieved through the organization of numerous public outreach activities and diversifying the target groups and the media that could be actively used to support our communication goals.

The original NCCR communication objectives defined in 2004 identified three main types of activities :1) keeping close contact with the Swiss and international press for external communication; 2) regularly publishing an electronic newsletter for internal communication; and 3) creating and maintaining a website for both internal and external communication.

We rapidly put in place and regularly updated the NCCR website and newsletter, which have been our basic communication tools. They have been complemented by more than 100 outreach activities organized in collaboration with prestigious public and private companies and foundations (exhibitions, conferences, workshops, festival, etc.) (cf. Annex 7). These events gave us great visibility across Switzerland, offered us the opportunity to reach several target groups and inform them about our activities, and helped us enlarge significantly our network of contacts.

During the whole 12 years of the NCCR, our communication officers have always worked closely with the University of Geneva Press office.

Our communication activities predominantly targeted the general public and were organized in Geneva, in other places of Switzerland, and also abroad, for example in collaboration with the swissnex offices in San Francisco, Boston and Singapore.

In order to reach a broader public, our key priority was to develop partnerships with private and public institutions (in particular museums and festivals) and benefit from their network and communication support. This strategic choice proved to be very fruitful and led us to collaborate with museums in Neuchâtel, Lausanne, Geneva and San Francisco.

The content of the communication activities varied according to the topic of the collaboration and involved different researchers with their distinct scientific expertise. Most of them were psychologists, neuroscientists, philosophers, literary theorists, economists and computer scientists from the University of Geneva, as well as from the Universities of Fribourg, Neuchâtel, Bern and Zürich.

A communication officer has always been part of the NCCR management team, taking the responsibility of planning and coordinating communication activities. Terence McNamee (2005-2008), Pablo Achard (2008-2009) and Carole Varone (2009-2017) successively managed these tasks over the whole funding period. After the departure of Pablo Achard in July 2009, the communication activities have been coordinated by Carole Varone, who was already in charge of Knowledge Transfer since 2007. Since 2012, Carole Varone has been working closely with Marcello Mortillaro (Coordinator of the Applied Affective Sciences focus) with the aim of integrating the typical “knowledge transfer” with “technology transfer” activities (applied research). This team-work increased the visibility of the applied research done within the NCCR Affective Sciences and had the potential to attract new research partners (public institutions and private companies). Carole Varone is in charge of the knowledge transfer projects for the large public and Marcello Mortillaro focuses on the applied research projects with public and private companies and institutions.

### 7.2 Highlights and overall achievements

The four following communication projects are amongst the most successful outreach activities of our NCCR and substantially contributed to increase the national reputation and international standing of the NCCR Affective Sciences:

1. The exhibition entitled **EMOTIONS...naturally** was co-organized with the Museum of Natural History of Neuchâtel thanks to the additional SNSF funding “Franc Fort” awarded to the NCCR. This exhibition was open from November 2014 to January 2016 at the Museum of Natural History of Neuchâtel. More than 25 researchers contributed to thematic workshops, conferences, and public events. The edited Museum Catalogue gave an overview of the state-of-the art of the NCCR research projects on emotions. The interest elicited by the exhibit greatly surpassed our expectations, with more than 60'000 visitors and the exhibition generating broad media coverage. The quality and the success of this exhibition was so high that it was then also displayed at the Forum de Meyrin (Geneva) in 2016 and it will be further shown in 2018-2019 at Forum des Sciences, Villeneuve d'Ascq, France.



2. From 2011 to 2016, the NCCR Affective Sciences co-organized with the Foundation Montreux Jazz 2 more than 20 workshops (3-4 every year) that attracted a wide audience in the framework of the Montreux Jazz Festival. The topics addressed were, for example, the brain mechanisms involved during aesthetic and emotional experiences in an artistic context, how music influences our brain, or how music is a source of inspiration for the filmmaker as well as for the spectator.
3. The NCCR Affective Sciences participated in three exhibitions organized by the photography museum Musée de l'Elysée in Lausanne: Stigmates (2009), Frank Schramm (2011) and Philippe Halsman (2014). This innovative collaboration lead to important outreach publications. For example, as follow up of the exhibition Stigmates, a volume was published by Thames and Hudson entitled «Afterwards» («Jours d'après» in French); two exhibition catalogues were the outputs of the «Frank Schramm» and «Philippe Halsmann» exhibitions too. Notably, many NCCR researchers gave public lectures during these exhibitions and contributed to guided tours for a large public.
4. Our recurrent joint projects with swissnex in Boston, San Francisco and Singapore best illustrate our outreach activities abroad. For example, we were the special guest of the Nightlife event at the California Museum of Sciences in 2013 in San Francisco. More than 1000 people attended this event that contributed to the international visibility of the NCCR and the Center.



We have also developed very intense and productive collaborations with other museums in Geneva. For instance, we co-organized the exhibition “L'expression des émotions chez l'homme et l'animal” with the Museum of Natural History. A catalogue was edited and workshops were organized during two months for a broad public. We also developed projects with the Conservatoire et Jardin botaniques, the MEG (Musée d'Ethnographie de la Ville de Genève), the International Red Cross and Red Crescent Museum, and the Forum de Meyrin. Our upcoming “Museums Night” event (Nuit des Musées) on May 20th, 2017, is the culmination of these past successful collaborations, and will be one pillar of the Phasing Out activities of the NCCR Affective Sciences. Concretely, more than 1000 visitors are expected at the Campus Biotech to discover the activities of our Center, meet with our interdisciplinary teams and learn about our major research findings.

Notably, most of these activities, except the exhibition EMOTIONS...naturally have been carried out with a limited budget, mostly relying on the voluntary participation of all our researchers to carry out these projects. More than 200 collaborators of the NCCR were strongly involved in public outreach events over the twelve years. Their contributions was not limited to the participation in outreach activities, but also included an active involvement to support the media coverage of our research, and the identification of additional transfer partners. Annex 6 of this report presents some figures on the number of media articles and other outputs of the communication activities.

Our main tools to reach internal and external audiences were and continue to be our newsletter and the website (constantly updated), as well as the NCCR Affective Sciences twitter account. Since 2005, 26 issues of the NCCR Newsletter called “Affect & Emotion” have been published. These Newsletters are sent by email twice a year to more than 1000 people, and a paper version is also distributed to closer contacts. Our database of contacts includes more than 3700 people, from different professional categories: academics, private and public companies and institutions, museums, journalists, and artists.

The NCCR also produced a one sheet folding brochure available in four languages (English, French, German and Italian) as well as an A4 paper folder created with professional graphic designers, which is regularly distributed at public events. It is a standard handout in response to inquiries from the general public.

We also use the communication channels offered by the University of Geneva: the UNIGE newsletter, sent to the contacts of the University (3000 people), and the UNIGE web portal, which is a web-based interface developed by the UNIGE Press Office for university collaborators. Furthermore, we regularly disseminate information through the official website of the UNIGE.

Since 2005, 568 articles were published on the work of the NCCR and its staff in the popular press and other media. Researchers of the NCCR Affective Sciences also participated in 133 radio and 54 TV broadcasts that gave us the opportunity to present our activities to a large public.

In collaboration with the Swiss publisher Benteli, we are preparing a bilingual (English and French) science book entitled “Emotions” with the goal of popularizing the research done in the affective sciences. The book adopts a

real interdisciplinary perspective and constitutes one of our phasing-out activities. This is an ambitious project that has already been running for two years with 39 NCCR researchers involved.

Finally, in May 2017 in the context of our phasing-out activities, we will publish a new brochure for the general public that briefly reviews our activities since 2005. It will be distributed during outreach activities, and it will also be downloadable from the website of the Swiss Center for Affective Sciences. The Press Office of the University of Geneva contributes to the graphic design of this brochure.

### **7.3 Experiences and outlook**

The Press Office of the University of Geneva was our main partner for communication to the general public, at both the local and national levels. This service always supported us and we will keep benefiting from their professional competences in the future.

Since the Swiss Center for Affective Sciences moved to the Campus Biotech, our active participation in the communication strategy and activities of this Campus has become a new challenge. Establishing the Affective Sciences as one of the major pillars of the Campus Biotech is an ambitious goal. Indeed, the EPFL and the University of Geneva are co-leading the Campus, and other world-class centers and private partners are also present in it. This competitive environment offers new opportunities for promising research collaborations and KTT activities.

Throughout the years, our outreach program has experienced other challenges as well. Since most of our activities took place in Geneva, the researchers located in other parts of Switzerland were comparatively less involved in them. Additionally, it was relatively hard to involve the younger generations, a difficulty ameliorated by the decision to make knowledge transfer activities a mandatory part of the doctoral training.

#### **7.3.1 Communication beyond the NCCR**

Our communication strategy beyond the NCCR encompasses both internal and external measures.

**Internal communication.** Our aim is to foster a sense of identification (corporate identity) with the Swiss Center for Affective Sciences by sending information through the website, e-mails, newsletters, and social-media tools to all members. We also plan to organize, on a yearly basis, our already successful Annual Research Forum (ARF). This national event gives the members of the Center the opportunity to meet their peers (alumni and new), to be updated on the research carried out at the Center, as well as to obtain information about the latest education and training, practical, and facilities-related developments, as well as to hear about the last outreach activities organized.

**External communication.** Our objective is to make potential knowledge transfer partners in the private, public and non-profit sectors even more aware of our organization, our work, and our consultancy services. We will keep this public updated on our latest scientific results. We also want to provide a training program to this non-academic public that includes conferences, seminars, and workshops.

We have identified the most important external knowledge transfer partners for the coming years, related to the five main areas of research that we want to put forward at the Center after the NCCR period: Health and Well-Being, Learning and Education, Culture and the Arts, Values and Decision Making and Interpersonal Competences and Social Skills. For each of these five areas, we plan to develop a strategic communication program, including external fundraising activities, with the aim of increasing our network and encouraging financial investment in our activities from these partners.

Participation in public events will remain part of our priorities, and will hopefully come with regular media exposure at both local and national levels. This will take the form of public lectures, stands in conferences and exhibitions, or displays at events such as La Nuit de la Science and la Semaine du Cerveau. For instance, we are already working with the Fondation de l'Hermitage in Lausanne on an exhibition ("Shadow in paintings") that will be held in 2019. We are also talking with the Montreux Jazz Festival on a new music project. Finally, we will start an important project with the Bioscope, a Life Science Outreach Lab at the University of Geneva to offer workshops for secondary school students based on games to develop emotional competences.



#### **7.3.2 Communication channels**

Website. The transition to the post-NCCR phase will also be visible on our website; we want to showcase the NCCR Affective Sciences through three different pages:

- The scientific achievements of the NCCR research projects over the 12 years will be summarized, on the basis of the final report;

- The NCCR Affective Sciences Alumni will be listed, with indication of their current position, as well as some information about their activity at the NCCR Affective Sciences (position, PI, 3 major publications). This will allow showcasing the career successes of previous NCCR doctoral students and postdocs, working now in high-ranking research centers, universities, public and private institutions in Switzerland and abroad.
- The complete list of publications will of course still be visible on the new website.

The other website pages will be dedicated to the post-NCCR activities of the Swiss Center of Affective Sciences (e.g., research groups, publications, communication, applied research, research material and agenda). We are confident that our website will continue to be a resource for academics, journalists, and the general public.

Newsletter. We will continue to issue a newsletter twice a year. It will be distributed to the same mailing lists, including academics and the relevant professionals with whom we are in contact.

Social Media. We will further use our twitter account and are currently evaluating the possibility of having a Center LinkedIn page.

University of Geneva communication channels. It should be observed that we will continue to benefit from the use of the communication platforms offered by the University of Geneva: the “Journal” and the “Campus Magazine”, the UNIGE front Page, the UNIGE Agenda, the UNIGE Newsletter (more than 3000 people), the UNIGE Portal (a web-based interface developed for the UNIGE Community) and the UNIGE social media network (Twitter, Facebook, Google+).

### ***7.3.3 Communication and fundraising***

An important goal for the Swiss Center for Affective Sciences in the coming years is to maintain and strengthen its structure by securing external funding for our communication activities and, in particular, for outreach activities (Museums, Festivals, Conferences, etc.), which will compensate for the loss of the Center’s funds provided by the NCCR.

## 8. Conclusions of the NCCR Directors

This final report provides a detailed account of an extraordinary success story that has unfolded over the last 12 years. The establishment of the NCCR Affective Sciences in 2005 was possible due to the confluence of a number of major factors. To name but a few: the explosive growth of emotion research in many different disciplines, the existence of an internationally known Geneva Emotion Research Group at the University of Geneva, the opening by the Swiss National Science Foundation of the innovative NCCR program for the social and behavioral sciences, a Home Institution with major domains of excellence in many disciplines, the visionary leadership of the Rectorate at the University of Geneva, and last but not least, the existence of talented researchers at all levels of their careers, and more generally an exceptional research network in Switzerland. The most important factor was the enthusiasm with which the original group of project leaders involved themselves in the task of creating a community of scholars, at all ages and career points, devoted to the multidisciplinary study of affect and emotion, an enthusiasm which has never waned, and allows us to envision a very promising future for the Affective Sciences.



Soon after the establishment of the NCCR, we created, with strong support from the University of Geneva, the interdisciplinary Centre Interfacultaire en Sciences Affectives (CISA, to which we gave the English name Swiss Center for Affective Sciences to reflect its national status as leading the NCCR), the first such truly multidisciplinary center worldwide, including the humanities. Currently, a certain number of centers and laboratories working on emotions with an interdisciplinary approach, in particular connecting psychology and neuroscience, use this or a similar title (e.g., at the University of Wisconsin, Northeastern University, or Stanford University) and the term "Affective Science(s)" is increasingly encountered in scientific publications (e.g., the Series in Affective Science published by Oxford University Press). While this is hard to document, the pioneering role of the Swiss NCCR seems to have served as powerful model for other researchers and institutions.

The major impact of the NCCR is due to the wide variety of research projects in the Center and the hundreds of prestigious publications generated during the last 12 years. Frequent citations of these publications and the massive participation of NCCR collaborators in national and international networks and conferences demonstrate the degree to which work at the Center has contributed to better understand the emotion process in many different contexts, both for specific fields and from an interdisciplinary perspective. The following (unsystematic) list provides a rough overview of the breadth of work in the NCCR: theoretical models of emotion, the emotional brain, affective computing, determinants and consequences of stress, emotion elicitation, response differentiation and organization, emotional competence - in particular in understanding and recognizing emotions in others-, the regulation of emotion, the role of values in emotions, emotional disorders, the emotional effects of odors, the effects of emotion on attention, on memory, and on decision-making, the role of emotion in music and other forms of art, the importance of historic and sociocultural contexts, the links between emotion and social cognition, semantic profiles of emotion words, emotion in the family and at work, emotion and illness, epistemic and aesthetic emotions, conceptual clarifications of emotions and other affective phenomena. Over the 12 years, various disciplines were formally represented in the NCCR projects: Law, History, Anthropology/Sociology, Classics, Computer Sciences, Economy, Education Sciences, Literature, Neuroscience, Philosophy, and Psychology. In addition to these disciplines, other important domains are represented by associate members (e.g., Musicology, Linguistics, Psychiatry). Importantly, these disciplines were not only formally "represented", but researchers worked closely together in integrated projects.

In addition to the large number of articles in prestigious, internationally peer-reviewed journals (e.g., *Science*, *Nature*, *Nature Neuroscience*, *PNAS*, *Journal of Neuroscience*, *Neuron*, *Brain*, *Cerebral Cortex*, *Philosophical Studies*, *Psychological Bulletin*, *JPSP*, *JEP:G*, *Psychological Science*, *Emotion*, *Emotion Review*), and in proceedings of key international conferences (e.g., IEEE), members of the NCCR have edited, contributed to, or published important international volumes and handbooks (e.g., *The Oxford Companion to Emotion and the Affective Sciences*, *The Blueprint of Affective Computing*, *In Defense of Shame*, *Emotions in the Classical World*, *Exploring Text and Emotions*, *The Emotional Power of Music*, *Neuroeconomics: Decision Making and the Brain*, *The Handbook of Value*, *The Cambridge Handbook of Affective Neuroscience*). A major reason for this resounding success is the fact that the NCCR ranges over many different disciplines and universities, which is very strongly facilitated by the fact that the University of Geneva, as the home institution, is an "université polyvalente", a university providing teaching and research covering an extremely wide variety of fields.

The scientific achievements enabled by the active involvement of a vast community of researchers were accompanied by equally intense communication programs, knowledge and technology transfer activities, efforts for equal opportunities, and developments in our education and training curriculum.

A key strategy in our communication policy was to team up with established cultural institutions in Geneva and Switzerland to promote the work of the NCCR. We, therefore, organized, co-organized or participated in a number

of exhibitions in museums (e.g., the Natural History Museums in Neuchâtel and Geneva, the Red Cross Museum and the Ethnological Museum in Geneva, the Geneva Botanic Gardens, and the Musée de l’Elysée in Lausanne), and also collaborated with other cultural institutions, such as the Grand Theatre de Genève, the Haute Ecole de Musique de Genève, the Montreux Jazz Festival, the science festival Nuit de la Science, and the science network swissnex. An excellent illustration of these collaborations is the creation of “Emotions... Naturally”, an exhibition entirely devoted to the emotions carried out in partnership with the Museum of Natural History in Neuchâtel. Our widely distributed newsletter and the website of the CISA have also been crucial to inform both the scientific world and the general public about the research and activities conducted at the Center. As a result, for example, we are now frequently invited by the media to contribute an opinion or to showcase our work. We also edited an interdisciplinary popular book on emotion with texts by many members of the NCCR, and a particular focus on the relationship between emotion and photography.



The NCCR was particularly involved in knowledge transfer, not only to the general public, but also to academic and industry partners. Many of our groups participated in European Networks of Excellence or other European programs, and we collaborated very closely with key industry partners. Our major long-term industry collaborator is Firmenich, with whom we have developed a large and successful research program on emotion and odors. The central goal shared with our industry partners has always been to jointly conduct scientific research allowing publication in prestigious international journals.

Concerning our efforts in the domain of equal opportunities, we aimed, since the beginning of the NCCR, not only to apply high standards in terms of policy towards the advancement of women in academia, but also to conduct research on the links between gender and emotion with a particular focus on the roles of power, stereotypes and attitudes in gender differences that are emotion-related. These efforts have paid off in the form of a number of highly visible publications.

During the NCCR, we also created an Education and Training program which remains, to the best of our knowledge, the only one in Europe dedicated to the Affective Sciences. Two central instruments in this program, apart from a varied offer of seminars and training courses, are the doctoral school in Affective Sciences and the International Summer School in Affective Sciences (ISSAS). Their continuation after the NCCR has been assured for the next four years by the creation of the Swiss Doctoral School in Affective Sciences funded by Swissuniversities. Together, these instruments have trained an extraordinary group of young scientists under the guidance of field experts from different disciplines. Many of those young researchers now occupy positions as professors or leading researchers in prestigious institutions all over the world.

The success of the NCCR is the result of a collective effort, and we would like to express our deepest gratitude to all those who helped in the process, starting with those who participated in the foundation of the NCCR by drafting the pre-proposal in 2003, over those who accompanied the NCCR during its progress, to those who paved the way to a permanent Swiss Center for Affective Sciences after the NCCR period. We sincerely thank all those who supported the NCCR in one way or another, in particular: the Swiss National Science Foundation, especially Division IV, and the members of the International Review Panel; the University of Geneva as our Home Institution, with all its subdivisions, departments and faculties; all the Universities of the NCCR Network, i.e. the Universities of Bern, Fribourg, Lausanne, Neuchâtel, and Zurich; the different bodies of the NCCR: its Management Team, Steering Board, Deputy Directors, Project Leaders, and International Scientific Council; Swissuniversities; the State of Geneva; the museums and cultural institutions that collaborated with us; the Société Académique de Genève and other funding associations and foundations; the Fondation Campus Biotech Geneva; Firmenich and our other industry partners; the European Commission and our other funding agencies; all researchers, associates, administrative and technical collaborators, and students who have contributed to the success of the NCCR throughout the years.

The outstanding results achieved by the coordinated efforts of so many individuals and institutions over the last 12 years demonstrate two key facts: 1) NCCRs are extraordinary instruments to develop new areas of knowledge, and 2) the Affective Sciences as a multidisciplinary field of innovative theorizing and research is now firmly implanted both in Switzerland and internationally. The NCCR certainly served as an “accelerator” for the development of the field. We can now look toward the future with great optimism, based on the NCCR’s achievements, both structural and scientific. These achievements include our international visibility, the existence of a permanent administrative, management and technical staff, the creation of the Brain and Behavior Laboratory, the successful integration in the Campus Biotech, the Swiss Doctoral School in Affective Sciences, and – above all – a critical mass of faculty members, from many disciplines relevant to the Affective Sciences, at the University of Geneva and other universities, who are strongly committed to the future of the Swiss Center for Affective Sciences. All of these developments have laid the ground for a very promising future for the affective sciences in Switzerland, and a crucial role for the country in the field worldwide.

Prof. David Sander and Prof. Klaus Scherer



## **ANNEX DOCUMENTS**

Annex 1: Financial and personal input to the NCCR

Annex 2: List of most important publications of the NCCR

Annex 3: Cooperation with partners outside the NCCR

Annex 4: Transfer partners in Universities of Applied Sciences, public administration and companies

Annex 5: List of CTI-projects / spin-off or start-up companies

Annex 6: Communication outputs

Annex 7: Outreach events details (2009 - 2017)



## Annex 1: Financial and personal input to the NCCR

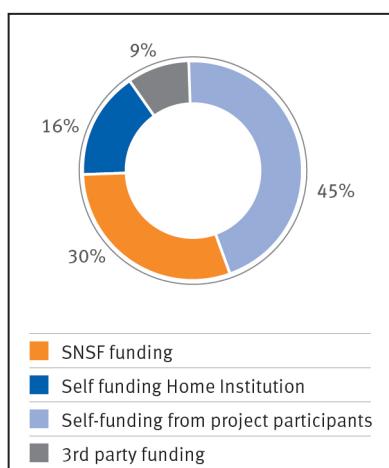


Fig. 6: Expenditures of the NCCR for the phase 1, 2 and 3, grouped by the four funding sources, and diagram of them in percentage (data from 31.03.2017 (IR12))

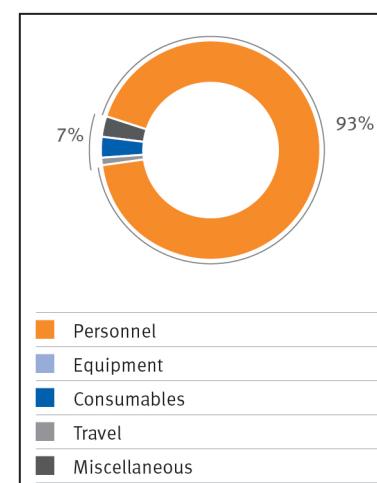


Fig. 7: Total of SNSF-funding per type of costs (data from 31.03.2017 (IR12))

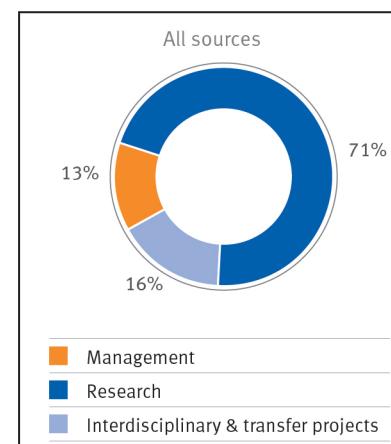
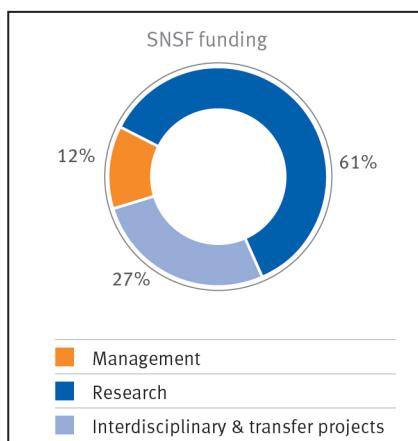


Fig. 8a/b: Division of costs for all management activities, research projects and other purposes (interdisciplinary projects, platforms and transfer projects) (data from March 2017, IR 12)

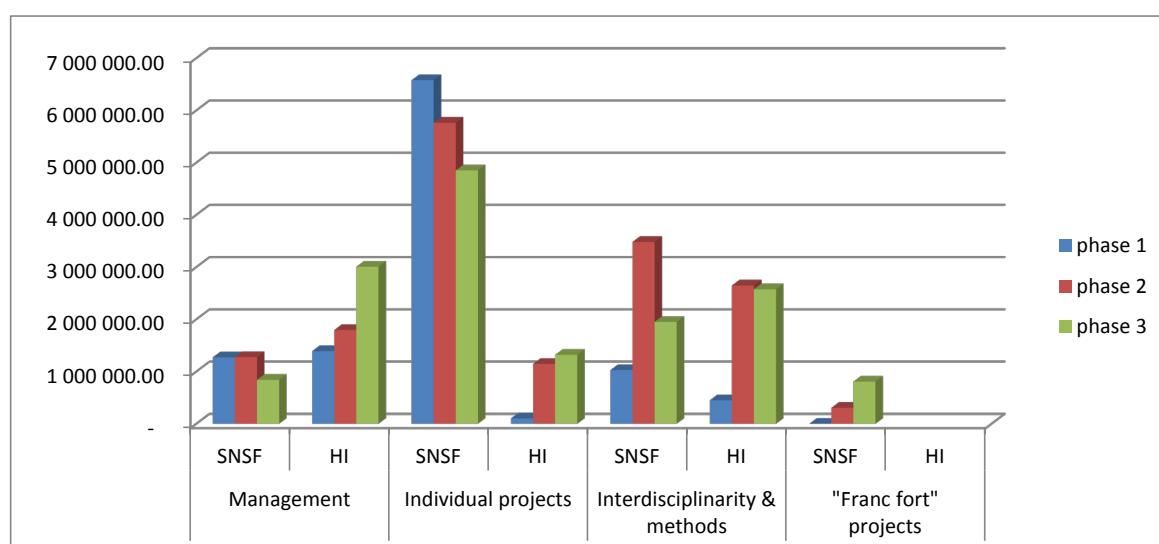


Fig. 9: Details of expenses by type of activity for SNSF and HI funding (data from March 2017, IR 12)

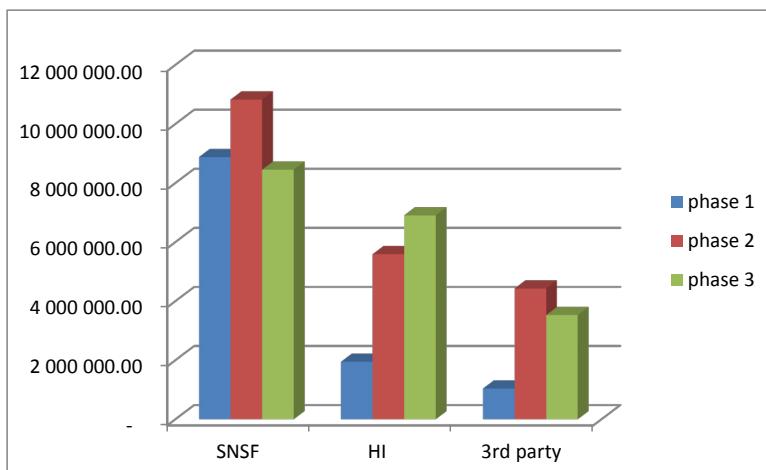


Fig. 10: Total expenses by phase for SNSF, HI and 3rd party funding (data from March 2017, IR 12)

Table 6a: Management activities – expenses per phase all sources (data from: March 2017 (IR12))

Management areas	Phase 1	Phase 2	Phase 3	Total
Office (general management)	2'239'786	1'831'549	1'832'854	5'904'189
Education	435'447	1'436'408	1'317'109	3'188'964
Knowledge and technology transfer	394'211	214'682	1'023'002	1'631'895
Equal opportunities	166'920	502'176	265'093	934'189
Communication		254'320	94'545	348'865
<b>Total</b>	<b>3'236'364</b>	<b>4'239'135</b>	<b>4'532'603</b>	<b>12'008'102</b>

Table 6b: Management activities – expenses per phase SNSF funding (March 2017 (IR12))

Management areas	Phase 1	Phase 2	Phase 3	Total
Office (general management)	751'984	681'432	427'896	1'861'312
Education	182'544	429'223	140'993	752'760
Knowledge and technology transfer	306'701	23'655	110'500	440'856
Equal opportunities	31'547	100'751	102'318	234'616
Communication		42'946	60'500	103'446
<b>Total</b>	<b>1'272'776</b>	<b>1'278'007</b>	<b>842'207</b>	<b>3'392'990</b>

Attached to Annex 1:

NIRA Report 2570 (Year 1-13)

NCCR:	Affective Sciences	Start Date:	01.09.2005
Director:	Sander David	Report:	Year 1-13 Intermediate Report
Home Institution:	Université de Genève - GE	Period:	-



SWISS NATIONAL SCIENCE FOUNDATION

### Gender and nationalities

Function	Total functions	Total persons	Total female	%	Total male	%	Total CH	%	Most represented nations				Total other nations
									FR	DE	IT	US	BE
Management	44	44	25	57	19	43	21	7	5	4	2	1	8
Master student	3	2	0	0	2	100	0	0	2	1	0	0	0
Doctoral student	225	141	89	63	52	37	65	21	17	7	5	2	28
Postdoctoral student	215	132	72	55	60	45	31	21	20	15	2	5	40
Research associate	9	8	5	63	3	38	6	1	2	0	0	0	0
Senior researcher	136	87	37	43	50	57	29	15	19	8	4	6	11
Project leader	73	25	9	36	16	64	11	2	6	2	0	1	5
Other staff	166	129	80	62	49	38	80	17	9	4	1	2	16
Project co-leader	18	12	3	25	9	75	6	2	4	0	0	1	0
	889	580	320	55	260	45	249	86	84	41	14	18	108

## Annex 2: List of most important publications of the NCCR

- Barsics, C., Van der Linden, M., & d'Argembeau, A. (2016). Frequency, characteristics, and perceived functions of emotional future thinking in daily life. *Quarterly Journal of Experimental Psychology*, 69, 217-233.
- Brosch, T., Sander, D., Pourtois, G., & Scherer, K. R. (2008). Beyond fear: Rapid spatial orienting toward positive emotional stimuli. *Psychological Science*, 19, 362-370.
- Brosch, T., & Sander, D. (Eds.) (2016). *Handbook of Value: Perspectives from Economics, Neuroscience, Philosophy, Psychology and Sociology*. New York: Oxford University Press.
- Borgeaud, P. (2006). "Rites et émotions. Considérations sur les mystères", in C. Bonnet & al., eds., *Rites et Croyances dans les religions du monde romain*. Genève: 188-229.
- Cairns, D., & Nelis, D.P. (Eds.) (2017). *Emotions in the Classical World. Methods, Approaches and Directions*. Steiner Verlag, Stuttgart.
- Clément, F., & Dukes, D. (in press). Social Appraisal and Social Referencing: Two Components of Affective Social Learning. *Emotion Review*.
- Cova, F., & Deonna, J. A. (2014). Being moved. *Philosophical Studies*, 169(3), 447-466.
- Debrot, A., Cook, W. L., Perrez, M., & Horn, A. B. (2012). Deeds matter: Daily enacted responsiveness and intimacy in couples' daily lives. *Journal of Family Psychology*, 26(4), 617-627.
- Deonna, J., R. Rodogno, & Teroni, F. (2012). *In Defense of Shame: The Faces of an Emotion*. New York: Oxford University Press.
- Eryilmaz, H., Van de Ville D., Schwartz, S., & Vuilleumier, P. (2014). Lasting impact of regret and gratification on resting brain activity and its relation to depressive traits. *Journal of Neuroscience*, 34(23), 7825-7835.
- Fontaine, J., Scherer, K. R. & Soriano, C. (Eds.) (2013). *Components of Emotional Meaning: A Sourcebook*. Oxford: Oxford University Press.
- Frühholz, S., Hofstetter, C., Cristinzio, C., Saj, A., Seeck, M., Vuilleumier, P., & Grandjean, D. (2015). Asymmetric effects of unilateral right or left amygdala damage on auditory cortical processing of vocal emotions. *Proceedings of the National Academy of Sciences*, 112(5), 1583-8.
- Hein, G., Morishima, Y., Leiberg, S., Sul, S. & Fehr, E. (2016). The brain's functional network architecture reveals human motives. *Science*, 351(6277), 1074-1078.
- Igic, I., Keller, A. C., Elfering, A., Tschan, F., Kälin, W., & Semmer, N. K. (in press). Ten-year trajectories of stressors and resources at work: Cumulative and chronic effects on health and well-being. *Journal of Applied Psychology*.
- Igloi, K., Gaggioni, G., Sterpenich, V., & Schwartz, S. (2015). A nap to recap or how reward regulates hippocampal-prefrontal memory networks during daytime sleep in humans. *eLife*, 4, e07903.
- Latu, I. M., Schmid Mast, M., Lammers, J., & Bombari, D. (2013). Successful female leaders empower women's behavior in leadership tasks. *Journal of Experimental Social Psychology*, 48, 444-448.
- Lombardo, P. (2013). Stendhal: 'La vérité, l'âpre vérité', *Philosophiques* 40/1, 87-105.
- Mehu, M., Mortillaro, M., Bänziger, T., & Scherer, K. R. (2012). Reliable facial muscles activation enhances recognisability and credibility of emotional expression. *Emotion*, 12(4), 701-715.
- Muszynski, M., Kostoulas, T., Lombardo, P., Pun, T., & Chanel, G. (2016). Synchronization among Groups of Spectators for Highlight Detection in Movies. In Proceedings of the 2016 ACM on Multimedia Conference.
- Peelen, M. V., Atkinson, A. P., & Vuilleumier, P. (2010). Supramodal Representations of Perceived Emotions in the Human Brain. *The Journal of Neuroscience : The Official Journal of the Society for Neuroscience*, 30(30), 10127-10134.
- Péron, J., Frühholz, S., Véritin, M., & Grandjean, D. (2013). Subthalamic nucleus: a key structure for emotional component synchronization in humans. *Neuroscience and Biobehavioral Reviews*, 37(3), 358-373.
- Pool, E.R., Brosch, T., Delplanque, S., & Sander, D. (2016). Attentional bias for positive emotional stimuli: A meta-analytic investigation. *Psychological Bulletin*, 142, 79-106.
- Ruff, C.C., Ugazio, G. & Fehr, E. (2013). Changing Social Norm Compliance with Noninvasive Brain Stimulation. *Science*, 342(6157).
- Scherer, K. R. (2009). The dynamic architecture of emotion: Evidence for the component process model. *Cognition and Emotion*, 23(7), 1307-1351.
- Theurel, A., Witt, A., Malsert, J., Lejeune, F., Fiorentini, C., Barisnikov, K., & Gentaz, E. (2016). The integration of visual context information in facial emotion recognition from 5- to 15- year-olds. *Journal of Experimental Child Psychology*, 150, 252-271.

## Annex 3: Cooperation with partners outside the NCCR

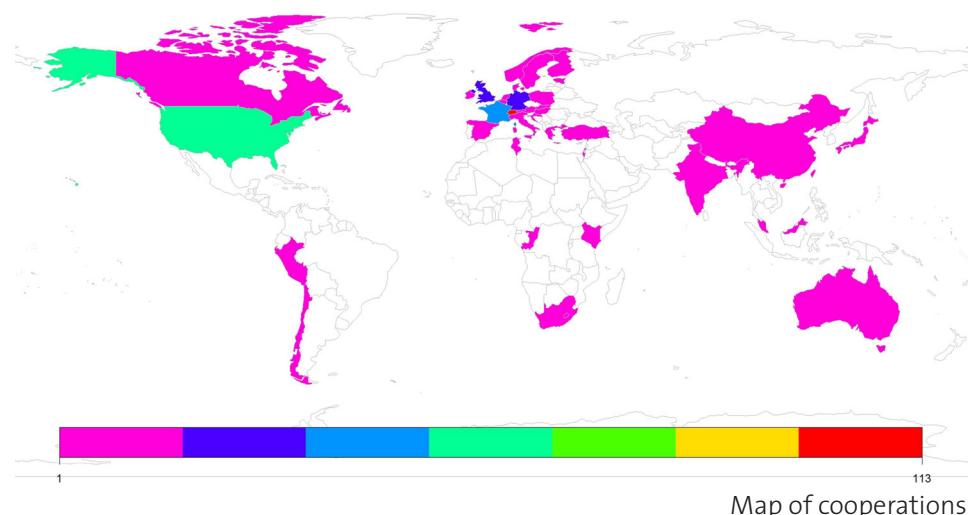
### Overview cooperation outputs

#### Category of Cooperations with parties outside the NCCR (all three periods)

Category	Number
<i>Programmes:</i>	<b>18</b>
Participation FP – EU	5
ERC Grants	1
Cost	-
Other	12
<i>Research Institutions:</i>	<b>322</b>
Swiss	82
Europe	165
North America	58
Asia	9
Other	8
<i>Companies:</i>	<b>12</b>
Swiss	4
Other	8
<i>Other institutions:</i>	<b>36</b>
Public sector	9
Foundations	12
Other (Culture, Education)	15
<b>Total</b>	<b>388</b>

Data from March 2017, IR 12

(source: spreadsheet cooperation and international grants, downloaded and analyzed 06 Apr. 17)



#### **Annex 4: Transfer partners in Universities of Applied Sciences, public administration and companies**

(all three periods)

##### **Universities of applied sciences**

Name	Place	Country
Haute Ecole de Musique	Geneva	Switzerland

##### **Public authorities, administration, foundations**

Name	Place	Contract amount
AXA SA	Paris	169'360
Bial Foundation	Portugal	54'312
Evens Foundation	Belgium	36'143
Fondation Ernest Boninchi	Switzerland	70'000
Fonds Universitaire Maurice Chalumeau	Switzerland	246'630
Haslfer Stiftung	Switzerland	211'544
Institut Jacques-Dalcroze	Switzerland	6'000
Services Industriels de Genève	Switzerland	25'555
The Cogito Foundation	Switzerland	189'000
	<b>Total</b>	<b>1'008'544</b>

See also annex 7

##### **Companies**

Name	Place	Contract amount
Clarins	France	51'204
Coty Geneva SA	Switzerland	197'910
Firmenich SA	Switzerland	3'752'070
GfK-Nürnberg e.V.	Germany	887'301
Mars Incorporated	USA	90'799
Nantys SA	Switzerland	--
Wm Wrigley Jr. Company	USA	164'391
	<b>Total</b>	<b>5'143'675</b>

## **Annex 5: List of CTI-projects / spin-off or start-up companies**

**Based on NIR report: 7050**

*No CTI-projects were led within the NCCR Affective Sciences*

*No spin-off or start-up companies were created within the NCCR Affective Sciences*

## Annex 6: Communication outputs

Table 7: Communication and outreach outputs (data from: 31.03.2017)

Form of output	Number (Total)	Periodicity*	Remarks
Newsletters / e-Newsletters	26	twice a year	Sent by email to more than 3700 people
Portraits / brochures	3		A folding brochure and an A4 paper folder, produced in 2007. A new brochure edited for the phasing out
Website / number of relaunches	1		Regularly updated. Two modifications of the graphic line
Media coverage (total)	755		
News	452		
Radio	133		
TV	54		
Internet	116		

\*optional

Source NIRA / IR 1 - 11:

Other forms of output – Services; Report 4410

Other forms of knowledge transfer; Report 4470

**Annex 7: Outreach events details from 2009 to 2017**

- Highlights		2009-2017			
Project	Dates	Partners	Researchers involved	Output	Public attendance
<b>Collaboration with Museum</b>					
<b>Emotions des collections</b> collections d'émotions	May 1- October 4, 2009	Conservatoire et Jardin botaniques Genève	17	Workshops, Demos, Posters May 16-17, 2009 September 5-6,2009	About 1000
<b>Stigmates</b>	March 3 - July 27, 2009	Musée International de la Croix-Rouge et du Croissant Rouge, Genève Musée de l'Elysée, Lausanne	9	Book edited by Thames & Hudson "Jours d'après" - "Afterwards" Exhibition guided tours by researchers, March 24, 2009	no information
<b>L'expression des émotions chez l'homme et l'animal</b>	October 2009 to January 2010	Muséum d'histoire naturelle de Genève	3	Co-realization of the exhibition Edition of the catalogue of the exhibition 8 workshops (15 children /workshops)	no information
<b>Frank Schramm</b>	September 13 to November 20, 2011	Musée de l'Elysée, Lausanne	11	Edition of a catalogue for the exhibition Exhibition guided tours by researchers, September 24, 2011 during the "Nuit des Musées" Conférence	no information
<b>Philippe Halsman, Etornez-moi!</b>	January 28 to May 11, 2014	Musée de l'Elysée, Lausanne	11	Edition of a catalogue for the exhibition Exhibition guided tours by researchers, April 30, 2014	Exhibition guided tours: about 30 people
<b>Emotions, une histoire naturelle</b>	November 29, 2014 to January 1st, 2016	Muséum d'histoire naturelle de Neuchâtel	26	Co-realization of the exhibition. Edition of a catalogue for the exhibition Conferences Workshops and Demos at several special events (Journée du Bonheur, Journée Internationale des Musées, Colloque Frans de Waal, NIFF, Colloque Frans de Waal, NIFF, Journée de la peur, Société Nauchâteloise des sciences)	Visitors exhibition : 61500 Journée du Bonheur March 22, 2015 : 1100 people Journée Internationale des Musées May 22, 2015 : 650 peoples Colloque Frans de Waal April 13, 2015 : 200 people NIFF July 5 and 7, 2015 : 30 people Journée de la peur November 1st, 2015 : 100 people Société Neuchâteloise de sciences naturelles November 18, 2015 : about 30 people

-Highlights

2009-2017

Project	Dates	Partners	Researchers involved	Output	Public attendance
Emotions	March 9, 2016 to May 28, 2016	Forum de Meyrin	2	2 Conferences	about 20 people
<b>Nuit de la Sciences</b>					
<b>Le temps d'une nuit de la science</b>	2008	Musée d'histoire des sciences Genève	2	Demos	about 500 people
<b>Extrêmes Limites</b>	2010	Musée d'histoire des sciences Genève	6	Demos	about 500 people
<b>Cherchez l'erreur!</b>	2012	Musée d'histoire des sciences Genève	8	Demos	about 500 people
<b>Tout ce qui brille n'est pas or</b>	2014	Musée d'histoire des sciences Genève	9	Demos	about 500 people
<b>Les règles du jeu</b>	2016	Musée d'histoire des sciences Genève	7	Demos	about 500 people
<b>Semaine du cerveau</b>					
<b>Les neurosciences de demain</b>	March 2009	Centre interfacultaire en neurosciences, UNIGE	5	Conferences and Demos	1200 people
<b>La peur, notre meilleure amie ou notre pire ennemie</b>	March 2014	Centre interfacultaire en neurosciences, UNIGE	3	Conferences	1200 people
<b>Le geste dans la tête</b>	March 2015	Centre interfacultaire en neurosciences, UNIGE	1	Conference	600 people
<b>Souvenirs, souvenirs</b>	March 2016	Centre interfacultaire en neurosciences, UNIGE	2	Conferences	1200 people
<b>En quête d'émotions</b>	March 2017	Centre interfacultaire en neurosciences, UNIGE	6	Conferences	3000 people
<b>Montreux Jazz Festival</b>					
	2009	Fondation Montreux Jazz 2	4	Conferences/ workshops	100 people
	2010	Fondation Montreux Jazz 2	6	Conferences/ workshops	150 people
	2011	Fondation Montreux Jazz 2	2	Conferences/ workshops	100 people
	2012	Fondation Montreux Jazz 2	6	Conferences/ workshops	150 people
	2013	Fondation Montreux Jazz 2	5	Conferences/ workshops	120 people
	2014	Montreux Jazz Artists Foundation	2	Conferences/ workshops	100 people
	2015	Montreux Jazz Artists Foundation	5	Conferences/ workshops	200 people
	2016	Montreux Jazz Artists Foundation	4	Conferences/ workshops	200 people
<b>Other significant KT activities</b>					
<b>Brain and Behaviour Laboratory Inauguration</b>	March 12, 2009	Brain and Behaviour Laboratory	10	Scientific and public conferences	no information
<b>Festival Herisson</b>	June 18, 2011	Manep and IM2	4	Demos for children	500 people

**- Highlights**

**2009-2017**

Project	Dates	Partners	Researchers involved	Output	Public attendance
<b>Jeremie Gindre Residence Amis Imaginaires</b>	March 1, 2011 to November 30, 2011	CIN-UNIGE, ZHdk-Artists in labs program, Office fédéral de la culture	4	Residence Public conference 3 books	80 people (conference)
<b>The emotional Power of Music</b>	June 25-27, 2009 November 6, 2010 January 19, 2011 April 4-5, 2011 December 10-12, 2014	Fondation Brocher Studio Ernest Ansermet Grand Théâtre de Genève	6	Colloquium Experimentation	about 300 people
<b>Festival Musiques et Sciences</b>	April 2-6, 2014 October 11-17, 2015	HEM, genève Grand Théâtre Genève	3	Colloquium and Festival	no information
<b>Et moi, émois et nous!</b>	November 27, 2014 to June 4, 2015	Théâtre du Grütl	10	Conferences and Texts edited on the web-site	about 200 people
<b>Reportages photographiques sur les émotions</b>	October 2015 to December 2016	Activités culturelles de l'UNIGE	18	Exhibition at the Campus Biotech in forthcoming event May 2017	



Back cover image: This picture is part of the photographic documentary “Don’t stop me now” organized by the Center in 2015 in collaboration with the Cultural Office of the University of Geneva.



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**Affective Sciences: Emotion in Individual Behaviour and Social Processes**