

Invitation to the conference

## Perception and the Mind– from Chemistry to Emotions

15-16 September 2014

House of the Estates, Helsinki



The Finnish Society  
of Science and Letters



The Royal Society  
of Arts and Sciences in  
Gothenburg

The Finnish Society of Sciences and Letters  
and  
The Royal Society of Arts and Sciences in Gothenburg  
invite you to the conference

## Perception and the Mind – from Chemistry to Emotions

Date: 15 - 16 September 2014  
Venue: The House of the Estates, Snellmaninkatu/Snellmansgatan 9-11, Helsinki

Chemical reactions in our brains, generating molecules with highly specific properties, govern our senses. Happiness, sorrow, love, horror etc., all have a molecular background which we are now beginning to understand. By stimulating such senses on volunteers in experimental trials one has been able to monitor how the concentration of certain neurotransmitters varies in the brain fluid. With the help of MRI scans one has been able to distinguish the chemistry in the brain of three related senses: desire, passion and devotion. Transmitter substances in the brain, such as dopamine, noradrenalin and serotonin, are important for triggering these senses but endorphins and other hormones also play an important role.

These are fascinating phenomena, lying in the field where chemistry, biology and behavioural science meet. The topic also has a human sciences dimension. The way we experience music or a piece of art when we get carried away with it is also related to brain activities.

Flavours, both natural and synthetic ones, are important for the communication between individuals. Feromones can either attract or repel insects and are now commercially used for such purposes. Human perspiration is usually regarded as something unattractive but may, if the brain so decides, be perceived as attractive. We use fragrances to improve the way we smell and the mixing of fragrances into a perfume is an art based on many centuries of experience.

In this symposium the subject “perception and the mind” will be treated from different viewpoints. The professional background of the invited speakers varies widely but they share a common interest of how the brain functions when we get carried away by our feelings. After each lecture there will be time set aside for comments and questions and we expect that these transdisciplinary topics will encourage stimulating discussion.

The Finnish Society of Sciences and Letters and The Royal Society of Arts and Sciences in Gothenburg wish your welcome to participate in this conference!

Marianne Stenius Carl G. Gahmberg  
President Permanent Secretary

Krister Holmberg Birger Karlsson  
President Secretary General

The Finnish Society of Sciences and Letters

The Royal Society of Arts and Sciences in Gothenburg

# PROGRAM

House of the Estates, hall 15

## Monday, 15 September 2014

### Session 1 Chair: Krister Holmberg, The Royal Society of Arts and Sciences in Gothenburg

- 13.00-13.15 **Marianne Stenius**, The Finnish Society of Sciences and Letters. President Opening words
- 13.15-14.00 **Arvid Carlsson**, University of Gothenburg. Nobel laureate. Pharmacology My 70 years in research – looking back, and ahead
- 14.00-14.45 **Tom Reuter**, University of Helsinki. Sensory biology Emotional aspects of sensory experience, from pain to vision
- 14.45-15.15 *Coffee*

### Session 2 Chair: Carl G. Gahmberg, The Finnish Society of Sciences and Letters

- 15.15-16.00 **Ulf Ellervik**, Lund University. Chemistry The chemistry of pleasure
- 16.00-16.45 **Riitta Hari**, Aalto University. Brain research Movement and social interaction – indispensable ingredients of the human mind
- 16.45-17.30 **Fredrik Ullén**, Karolinska Institute. Neuroscience The neurobiology of musical expertise – from neuroimaging to behavior genetics
- 17.30-18.15 **Petri Toiviainen**, University of Jyväskylä. Music Dynamics of music processing in the brain and the body
- 18.15-19.00 *Finnish Society of Sciences and Letters monthly meeting (members only).*
- 19.15 Conference Dinner at the Bourse Club.

## Tuesday, 16 September 2014

### Session 3 Chair: Birger Karlsson, The Royal Society of Arts and Sciences in Gothenburg

- 9.00-9.45 **Mikael Landén**, University of Gothenburg. Psychiatry and Neurochemistry From despair to euphoria and back again. What we can learn about the neurochemistry of mood regulation from bipolar disorder research
- 9.45-10.30 **Gunnar Bergström**, University of Gothenburg. Chemical Ecology Scents rule! A few examples of behaviour-guiding pheromones in animals, and pollination-stimulating odours among flowering plants: chemistry, biology, and evolution
- 10.30-11.15 **Åsa Ringbom**, Åbo Akademi University. Art History The smile in art – A historic survey
- 11.15-12.00 *Light lunch*

### Session 4 Chair: Marianne Stenius, The Finnish Society of Sciences and Letters

- 12.00-12.45 **Eva Bojner Horwitz**, Uppsala University. Public Health Dance, well-being and memory
- 12.45-13.30 **Jan-Ivar Lindén**, Universities of Helsinki and Heidelberg. Philosophy Apperception as a problem of philosophical psychology
- 13.30 **Krister Holmberg**, The Royal Society of Arts and Sciences in Gothenburg. President Closing remarks

**Each slot extends over 45 minutes; however, the intention is that the actual lecture should be confined to 30 minutes allowing 15 minutes for discussion.**

## REGISTRATION

The conference is open to the public and free of charge but advance registration is required. Registration should be done online at [www.scientiarum.fi](http://www.scientiarum.fi) by **September 1, 2014**.

## INFORMATION AND CONTACT

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## ABOUT THE ORGANIZERS

**The Finnish Society of Sciences and Letters** was founded in 1838 to promote scientific discussion and publication within sciences and humanities. It aims to promote the sciences by organizing lectures, seminars and symposiums concerning current topics, conducting publication activity, distributing research grants and awards, contributing to the research community's contacts both nationally and internationally and offering the Society members multidisciplinary contacts.

**The Royal Society of Arts and Sciences in Gothenburg** was founded in 1778. It is an independent learned society encompassing different disciplines in Sciences, Arts and Social Sciences. Its general objectives are to promote scientific exchange among different disciplines. The activities are mainly focused on lectures, conferences and publications. Support to researchers is given through grants. In addition, a number of prizes are awarded on a regular basis. New scientific needs, not yet recognized in the regular university system, are identified and promoted.

# Abstracts

## Perception and the Mind – from Chemistry to Emotions

Conference, Helsinki 2014-09-15—16

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## **Arvid Carlsson**

### ***My 70 years in research – Looking back, and ahead***

I started my first animal experiments in 1944, in the Department of Pharmacology, University of Lund, Sweden, defended my thesis for M.D. there in 1951, and continued my research there until 1959, when I took over the Chair of Pharmacology at the University of Gothenburg. Throughout, the development in my research field, as in science as a whole, has been far beyond expectations and seems to proceed and actually accelerate.

I was brought into my major area of research, i.e. signal transduction in the brain, during a 5 months sabbatical in 1955 at a Laboratory of Chemical Pharmacology at the National Institutes of Health, USA, at that time one of the world's most creative labs in drug research. My project there dealt with serotonin, which had recently been found to occur in the brain. Back in Sweden, during the following decade, I could thus take part in the work that identified these amines as neurotransmitters in the central nervous system. This paved the way for a paradigm shift of brain research, leading to the recognition of chemical rather than electrical signalling between the nerve cells.

Several drugs with actions on both mental and neurological disorders were discovered in the 50s and 60s, mostly by serendipity. They turned out to be useful not only as medications but also as research tools, and they contributed very much to the development of modern psychiatry and neurology. Today, however, half a century later, our understanding of the brain remains fragmentary and will perhaps never encompass such elusive phenomena as the mind.

The enthusiasm awoken by the discovery of the antipsychotic and antidepressant agents half a century ago seems now to be followed by a period of reflection. The manipulation of neurotransmitters with their complex functions during the entire life time calls for caution and will be discussed.

## **Tom Reuter**

### ***Emotional aspects of sensory experience, from pain to vision***

In October 1913 “Guss” Mattsson, a Finnish polyhistor and journalist, wrote his daily column about a topic which is of some relevance to this symposium; how can it be, he asked, that our society immediately reacts against ugly smells spreading from a dog-kennel, but let somebody torment his neighbours with terrible music – not to speak about awful architecture. Mattsson classified the “five senses”, from the finest to the simplest, in the following way: vision, hearing, tactile senses, taste and smell. And he asked, how can it be that the society pays regard to the simplest senses and lets the finest suffer? Mattsson did not intend to present a scientific hypothesis, and it is easy to disclose many gaps in his reasoning. To give one example: Our sensory experiences are not innate and fixed, they are biologically and culturally shaped throughout life, and thus different persons react differently when exposed to the same view or smell. Still, Mattsson's point is worth of some scientific pondering.

A sensory experience should not be seen as a passive receptive process. It is already a response which can be considered the first step of an action. It may be a reflex, when we immediately withdraw our hand from a hot plate, or it may be a complex action following a conscious analysis of the whole situation around us. It is true that visual and acoustic experiences are based on complex pre-processing in the eye and ear, and in the thalamus (vision) and the cochlear nuclei (hearing), before the signals reach the cerebral cortex where they interact with stored memory data. In that respect it is correct to say that vision and hearing are highly developed senses which involve massive bundles of nerve fibers, and more neurons and nuclei than we find in the pain and taste pathways. It is reasonable to think that this affects the sensory experience we perceive.

In this lecture I do not present solid science. Instead I wish to discuss the observation that some sensory experiences are more emotionally loaded than other, and I propose that there is an inverse relation between, on one hand, the amount of information provided by a particular sensory system, and, on the other hand, the degree of “emotionality” of the sensory experience. The “explanation” which I suggest is that a simple peripheral sensory organ can reach an answer, pro or contra, already close to the primary receptor cells. Such peripheral structures are the taste buds on the tongue, and different skin receptors. We have sweet and bitter receptors on the tongue and in the skin we have tactile receptors but also pain receptors. Thus the afferent nerve signals which they initiate may provide the brain with a ready recommendation, while the messages from a complex sense organ must be centrally analyzed and related to memory data with the result that the response is less emotional and absolute, and may be different for different people.

## **Ulf Ellervik**

### ***The chemistry of pleasure***

The word *pleasure* obviously has different meanings for each and every person. Some pleasures, such as sex and food, are universal and can be explained by a strive for survival of our genes. Others, such as why we love art and music, are not as easily explained. All of our senses, and thus ultimately the sensation of pleasure, can be explained by chemistry – from the volatile molecules from good food, wines and perfumes to the neurochemistry of romantic love. This lecture gives a basic understanding of the chemistry of pleasure – with examples taken from gastronomy, love and art.

## **Riitta Hari**

### ***Movement and social interaction – indispensable ingredients of the human mind***

Characteristics of human mind can be explained at many levels. Here I will argue for the importance of movement and social interaction for the emergence of the human mind. The centrality of motion in human cognition is well evident from studies of “mirroring” that illu-

strate the use of overlapping brain mechanisms for own actions and for the observation of others' similar actions. People tend to move in sync and imitate others, and we have found them to report strikingly similar bodily feelings during emotions. Our brain imaging studies have demonstrated increased synchrony between individual brains when the subjects view emotionally-laden movie clips. Still many of these advanced brain-imaging studies treat the subjects as passive spectators whose mental state do not considerably change during the experiment. In real life, however, people are participants rather than only observers of their world, and their brains likely are interactive rather than reactive only. We are thus heading towards "two-person neuroscience" where we consider a dyad rather than an individual as the proper analysis unit, and we record brain activity simultaneously from two interacting subjects. This new approach is expected to provide new information about the brain mechanisms of social interaction.

### **Fredrik Ullén**

#### ***The neurobiology of musical expertise - from neuroimaging to behavior genetics***

Musicians have become one of the most widely used model populations in psychological and neurobiological studies of expertise. Neuroimaging studies have demonstrated that brains of musicians show extensive anatomical and functional reorganizations in brain regions involved in music processing. These effects typically show strong relations to measures of musical practice, and presumably reflect neural adaptations that enable an efficient perception, performance and creation of music. Here, I will summarize key findings from the neurobiological literature on musicians, and also discuss recent findings from large-scale twin studies where we investigate genetic and non-genetic factors behind musical training and its correlates.

### **Petri Toiviainen**

#### ***Dynamics of music processing in the brain and the body***

Music is fundamentally temporal in nature: musical features, such as loudness, timbre, rhythm, melody, and tonality, change constantly over time. During music listening, these temporal changes give rise to, for instance, musical beat, expectations, and emotions. Furthermore, this temporal evolution elicits various dynamic phenomena in the listener. First, continuous listening to music gives rise to dynamically changing patterns of neural activity. Second, music often induces movement in us, in particular when it has a clear pulse. Music-induced movement may have a role in helping to parse the temporal structure of the music being listened to. Methods of Music information Retrieval can be used for computational extraction of perceptually relevant features from musical recordings, thus allowing the use of naturalistic stimuli to investigate neural and corporeal processing of music. I will review the work carried out in our group that combines methods of functional magnetic resonance imag-

ing, motion capture, and Music Information Retrieval to study the neural and corporeal correlates of music processing. I will show that music listening activates wide networks in the brain, and this processing is affected by musical training. Furthermore, I will highlight both commonalities and variant features in the way music listeners embody the music they listen to.

### **Mikael Landén**

#### ***From despair to euphoria and back again. What can we learn about the neurochemistry of mood regulation from bipolar disorder research?***

A person's temperament and mood is stable throughout life. If you have not met your old friend in ten years, chances are that she is as cheerful or moody, steady or unsteady that she used to be. Positive or negative life events might influence our mood, but less than we usually think and only temporarily. The exception is persons with mood disorders. Patients with bipolar disorder experience manic episodes, characterised by extremely elated mood with increased goal directed activities, increased risk taking, and increased energy with decreased need for sleep. The often ensuing depression features the opposite symptoms. There are not only substances changing brain chemistry that might trigger manic episodes and depressions, there are also substances that prevent mood episodes from happening in bipolar patients. Is good mood or the lack thereof merely the product of the vicissitudes of our neurochemistry composition? We have conducted neurochemical studies of bipolar disorder. What have we learned about how neurochemistry govern mood from bipolar disorders? And what can we learn about what mood is from these studies?

### **Gunnar Bergström**

#### ***Scents rule! A few examples of behaviour-guiding pheromones in animals, and pollination-stimulating odours among flowering plants: chemistry, biology, and evolution***

We now know that volatile chemical compounds are important as behaviour-guiding signals in all living organisms. So far, they have been intensively studied in insects and in plants, and are now being investigated in mammals, microorganisms, marine organisms, and also in humans. They are associated with, in principle, all vital needs such as feeding, nesting, mating, and defense. The studies call for interdisciplinary collaborations, and the application of sensitive, selective, and informative techniques and methods.

Pheromones are compounds given off by one organism, which then releases a specific behaviour in another individual of the same species. Most flowering plants emit volatile substances to attract and guide pollinators. These phenomena are of course interesting and fascinating from a basic science perspective, and also in many cases as a means for selective and non-toxic control.

In this short presentation I aim to give three examples from insects and two from plants. I will touch upon scent signals in mammals in connection with a word about perfumes.

Of the two references given below, the first one (2007) is a short account of the development of this field of science, and the second one (2008) is a summary of several examples of studies of chemical communication in insects and in flowering plants.

*Chemical ecology = chemistry + ecology*, G. Bergström, Pure Appl. Chem., 79:12, 2305-2323, 2007.

*Chemical communication by behaviour-guiding olfactory signals*, G. Bergström, ChemComm., 34:2008, 3959-3979.

## **Åsa Ringbom**

### ***The smile in art history – a survey***

Differently from other emotions, the presentation of joy and happiness has been surprisingly complicated through the ages.

Two major periods are well known, the Archaic Smile and the Gothic Smile. The Archaic Smile belongs to the Classical period in Greece and Etruria ca 610-470 BCE, when everybody seems to smile, Koros and Kore, (boys and girls) and warriors, even when they are suffering and dying. The period coincides with the big revolution in the arts, when Greek artists and sculptors are the first to reach a way to present the human body naturalistically. After 470 the smile disappears for more than 1500 years. Only little children smile, also social outcasts such as prostitutes and drunks. Satyrs and centaurs, mythological fringe figures representing Bacchic feasting, continue smiling. No respected person smiles.

The smile did not return until the early 13<sup>th</sup> century AD, with the Gothic period in French and German Cathedral sculptures. Smiling prophet Daniel from 1180, at the Porta Gloria of the Cathedral of Santiago de Compostela, the final goal of the famous pilgrimage route, the Camino, was seen as a “proto Gothic smile”.

But there is every reason to believe in a third category: “The Romanesque smile” from the 11<sup>th</sup> C invented along the Camino, where pilgrims visiting the grave of Saint James, were blessed by smiling Madonnas and the Child Jesus.

All of these smiles have religious connotations. Smiling people belong to the elite of society; they are themselves divine or they are divinely blessed.

The modern version of the smile is much later. It belongs to the Baroque period with Dutch pioneers such as Rembrandt van Rijn and Frans Hals, when respected persons from different strata of society wanted their portraits painted with a spontaneous smile on their faces.

## **Eva Bojner Horwitz**

### ***Dance, well-being and memory***

In all times, dance movements have been used to create meaning and trust within groups to gather strength before life’s transitions. Today, thanks to refined research methods, we better understand how to use these nonverbal qualities for health strengthening and other learning purposes. Embodied knowledge from dance can be used in many ways, for example to help students to enable identification of new ways of learning and to manage writers block in

academic writing. “We feel therefore we learn” is one way of understanding why dance can be important in learning processes and why it is prioritized to invite the emotional part of the brain within all learning contexts; in health care settings and in educational systems.

**Jan-Ivar Lindén**

*Apperception as a problem of philosophical psychology*

The modern era is profoundly marked by the idea of a subjective consciousness. Not only in Descartes, but in all currents of thought using the distinction between the subjective and the objective this idea remains fundamental – even if not always recognized as such. There is however a difference between perception and apperception which remained unclear in the Cartesian conception of consciousness but was articulated by Leibniz and became a major theme of philosophical psychology in the 18th and 19th century. From the beginning of the 19th century the discussion was also complicated by the concept of the unconscious, which in a sense means a rediscovery of the Aristotelian psyche.

What should we understand by apperception: a self-consciousness, a consciousness of second degree, a retroactive awareness or reflection, a stream of consciousness or perhaps something rather like insight? Which is the relation between sensation, perception and apperception and in which sense are these irreducibly psychic functions?