

## 1. Summary

On Sunday the 2<sup>nd</sup> of May, immediately following the insula meeting, a one-day workshop on a very related topic, the neural and cognitive basis of hallucinations was held in Granada. This workshop was organized by Martine van Zandvoort and Chris Dijkerman and supported by the ESF grant for the European Research Network for Investigating Human Sensorimotor Function in Health and Disease. The workshop is a follow-up from a previous meeting on this topic held in Utrecht, in June 2009 sponsored by the Dutch Research Council (NWO).

In the morning, a plenary lecture session was scheduled to which all attendants to the insula meeting were invited. The hallucinations workshop was held in the same inspiring accommodation as the insula meeting in the Carmen de la Victoria, Granada.

The plenary session started off with a short overview and evaluation of the Utrecht Workshop in 2009 (van Zandvoort). In the following lectures speakers of international high standard discussed current issues related the neural and cognitive basis of hallucinations presented. The main aim of this plenary sessions was to exchange ideas about the cognitive and neural mechanisms involved in hallucinations in a range of conditions, modalities etcetera and to define common grounds and cross links.

Jan Dirk Blom started of with a historical overview of research on hallucinations and the nomenclature with respect to misperception and hallucinations and to the various sensory modalities. Peter Brugger provided new insights into bodily awareness issues, especially with respect to misperceptions of phantom limbs and its cognitive biases. In this lecture a clear cross-over was realized between the insula meeting and the current workshop. Iris Sommer shed new light on the question 'where do the voices come from' in auditory hallucinations in schizophrenics. She hypothesized that the differentiating factor between the various populations (e.g. psychiatric and neurologic) might lie in the period (sec.) *before* the experienced percept of the hallucinations. In an fMRI study she found evidence for activation in the hippocampal area just prior to the conscious experience of the hallucinations. This might suggest a role of memory processes in the occurrence of auditory verbal hallucinations. Within the field of hallucinations a constant issue of debate concerns 'consciousness'. To what extent do patients as well as healthy individual who experience hallucinations, have insight in their hallucinatory experience? Where does normal perception cross the line to misperception and further to a hallucinatory experience? To deepen insights in this discussion the ESF ERNI suggested to invite a scientist from the field of humanities and we were more than happy to have Frédérique de Vignemont and Fiona MacPherson in the plenary lectures. They ended the plenary session with inspiring talks on the cognitive beliefs behind body representation disorders and hallucinations from a metacognitive perspective.

In the afternoon a constructive brainstorm session was held for those scientist who were invited on the basis of serious intentions to contribute and participate in new research programs and projects to unravel the neural and cognitive basis of

hallucinations, as concretized in the Utrecht Workshop. This resulted in a group of 12 enthusiast scientist, the session was chaired by van Zandvoort and Dijkerman. The following issues were listed. Topic 1: What is the role of Forward Mechanisms in Hallucinations? Topic 2: Phenomenology of hallucinations. A vivid constructive discussion resulted in concrete ideas for international (European) set ups for Grant Proposals and the develop multidisciplinary network including regular meetings for which a date for a follow-up meeting in Utrecht was planned.

## 2. Summary of the scientific content of the meeting

### Plenary Session

The plenary session focussed on setting the stage for a multidisciplinary approach to scrutinize the neural and cognitive base of hallucinations across different (patient) populations and across modalities. This was a further elaboration of the workshop in June 2009 in Utrecht in which researchers from multidisciplinary background agreed on the need for this discussion in order to gain further understanding why some individuals (or patients) under seemingly similar conditions experience hallucinations whereas others do not. Why some of these hallucinations are unimodal whereas others are multimodal, and why some hallucinations have an affective component and others are neutral. Especially themes of ownership and agency fitted very well with the insula meeting to which this workshop was linked. The plenary session was not only to set the stage to the brainstorm session in the afternoon for a group of invited scientist but also to encourage other researchers in the field to contribute to the discussion. For those who were interested to collaborate in this network, the possibility to participate in the international network was offered.

Jan Dirk Blom started with an historical overview of research on hallucinations in which he explained issues on nomenclature and phenomenology of uni- and multimodal hallucinations. In this lecture a firm basis was built for a multidisciplinary discussion in which we all were familiar with the various descriptions of hallucinations and a so to speak "Babylonian confusion" was prohibited.

Peter Brugger succeeded to cross-link the insula meeting to the current workshop in discussing bodily awareness up to excruciating experiences, phantom limbs and hallucinations in the tactile and somatosensory modality. Themes as sense of ownership and cognitive beliefs were discussed.

Iris Sommer took the discussion further and included neuroanatomical correlates of hallucinations in her presentation. She emphasised earlier findings that during the experience of hallucinations the primary sensory cortical areas were as active as during 'normal' perception and that this could be considered as a common ground. The diversity, she hypothesized was in the phase prior to the conscious experience of the hallucinations and in an excellent fMRI study of her group they found activation in the hippocampal area just prior to the experience of hallucinations, suggesting a role of memory processes in the occurrence of hallucinations.

Frédérique de Vignemont and Fiona MacPherson closed the plenary session by contributing from the field of philosophy. They both did a great job in reaching out to the cognitive neuroscience based on experiments and 'proofs'. They seduced the cognitive scientist to leave their comfortable experimental frame of reference and challenged these paradigms with metacognitive insights in the bases of perception.

The success of the plenary session was especially in the active contribution of the audience and the discussion after each (and even during) talk. This strengthens our

belief that the theme of the workshop really tapped fundamental issues that were shared across disciplines and researchers.

### **Afternoon Brainstorm session**

Martine van Zandvoort and Chris Dijkerman set the goals for this afternoon in launching two main topics after which brainstorm for concrete research programs and collaborative networks could start of. The focus was on:

*Topic 1. The Role of Feedforward Mechanisms (Dijkerman)* in which preliminary data presentation, experimental designs, methodology and analyses were presented. Possibilities for new to develop tasks implementing the current available knowledge within the group were explored and common ground was sought for programming and compatibility for experimental set ups. In addition, the (im)possibilities of the experiments in patient populations were discussed.

*Topic 2. Phenomenology (van Zandvoort)* in which in- and exclusion criteria patient populations, questionnaires for 'standardised' assessment and issues of potential cultural limitations were tapped. In this aspect the contribution of the philosophers was crucial to find common ground in the description of phenomenology and to take cultural assumptions into account. This topic ended in the formation of three different subgroups to explore the phenomenology within the different modalities (auditory ( Jan Dirk Blom& Iris Sommer); visual (Martine van Zandvoort & Dominic ffytche (absent at the meeting but member of the network); and tactile modality (Peter Brugger & Chris Dijkerman). These three groups could work in parallel and in the next meeting intergration between the groups was planned.

*Topic 3 Future: Formulating joint research hypotheses:* including possibilities for starting (small) collaborative studies and exchange of concrete research proposals and deadlines. Also the possibilities for the exchange of PhD students and undergraduates, as well as educational programs were discussed.

During the vivid discussion, Stephen Jackson launched to combine the current rise of an European network for research on cognitive and neural basis of hallucination with the initiative to establish an European database for scans which has the unique linkage to behavioural measures. This initiative and its possibilities was welcomed with great enthusiasm and gave rise to the planning of a next meeting to further explore these ideas. This ended in the July meeting in Utrecht as organised by Stephen Jackson and Martine van Zandvoort (see for further details report by Stephen Jackson).

### **3. Deliverables**

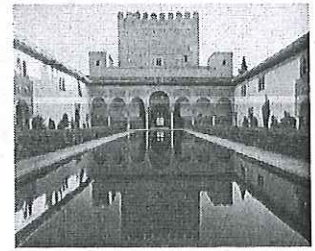
**Workshop on building an European imaging database linked to behavioral phenomenology Utrecht July 2010 (organisator Stephen Jackson & Martine van Zandvoort)** for further details on this meeting see report by Stephen Jackson.

**Symposium at the second meeting of the Federation of European Societies for Neuropsychology Amsterdam 2010 entitled "On the origin of Hallucinations"** *organised by Martine van Zandvoort.*

- **Speakers: Jan Dirk Blom, Iris Sommer, Fiona MacPherson, Martine van Zandvoort** (in collaboration with Dominic ffytche)

**Research collaboration (Iris Sommer, Martine van Zandvoort, Dominic ffytche)**

In sum, the workshop established an European Research Network for research on the cognitive and neural bases of hallucinations. Because this workshop was framed in the ESN-ERNI, a cross-link with the program to build an European databank for scans linked to behavior. This cross-link is really promising to enable future European collaboration, not only on concrete research projects but also with respect to the set-up of meetings and educational programmes.



**2<sup>nd</sup> of May 2010 Granada Carmen de la Victoria**

**2<sup>nd</sup> international workshop on:**

**The Neural Mechanisms of Hallucinations**

**Program:**

<b>9.30</b>	<b>Opening &amp; introduction</b>	<b>M. van Zandvoort (NL)</b>
	<b>Historical overview</b>	<b>JD Blom (NL)</b>
<b>10.20</b>	<b>Phantomology – Selected Topics</b>	<b>P. Brugger (CH)</b>
<b>11.15</b>	<b>Coffee Break</b>	
<b>11.30</b>	<b>Where do the Voices come from?</b>	<b>I. Sommer (NL)</b>
<b>12.15</b>	<b>Hallucinations: Philosophical Perspective</b>	<b>F. Macpherson (UK)</b>
		<b>F. De Vignenont (FR)</b>
<b>13.00</b>	<b>LUNCH</b>	
<b>14.00- 17.00</b>	<b>Topical Brainstorm Session</b>	

<b>name</b>	<b>city</b>	<b>country</b>	<b>institution</b>
Stephen Jackson **	Nottingham	UK	University of Nottingham
Martine van Zandvoort **	Utrecht	The Netherlands	Utrecht University
Catherine L Jones	Brighton	England	Brighton and Sussex Medical School
Alfred Veldhuis **	Veenendaal	Netherlands, The	University Utrecht
Amy Parkinson	Nottingham	England	University of Nottingham
Georgina Jackson	Nottingham	UK	University of Nottingham
Haike van Stralen **	Utrecht	The Netherlands	Utrecht University
María Tortosa Molina	Granada	Spain	Universidad de Granada
Mónica Triviño	Granada	Spain	Hospital Universitario San Rafael
María Ruz	Granada	Spain	Universidad de Granada
Elisa Martín Arévalo	Granada	Spain	Universidad de Granada
Maryem Torres	Granada	Spain	Universidad de Granada
Pedro M. Paz- Alonso	Granada	Spain	Universidad de Granada
Sonia Alguacil	Granada	Spain	Universidad de Granada
María Hurtado	Granada	Spain	Universidad de Granada
Simon Eickhoff		Germany	Universitätsklinikum Aachen
Christian Keysers	Amsterdam	The Netherlands	Netherlands Institute for Neuroscience
Marcel Brass	Ghent	Belgium	Ghent University Hertie-Institute for Clinical Brain Research, University Hospital of Tuebingen
Hans-Otto Karnath	Tuebingen	Germany	
Zoltan Vidnyanszky		Hungary	
Juan Lupiáñez	Granada	Spain	Universidad de Granada
Chris Dijkerman **	Utrecht	The Netherlands	Utrecht University
Catherine Reed	Claremont	USA	Claremont McKenna College
Manos Tsakiris	egham	UK	Royal Holloway University of London
A.D. (Bud) Craig	Phoenix	USA	Barrow Neurological Institute
Eva Hoogland **			European Science Foundation
Fiona Macpherson**			University of Glasgow
Frederique De Vignenont**			Institut Jean-Nicod EHESS-ENS-CNRS, Transitions NYU-CNRS, USA
Iris Sommer**	Utrecht	The Netherlands	University medical Centre Utrecht
Jan Dirk Blom**	Groningen	The Netherlands	BAVO-groep, Universiteit van Groningen
Peter Brugger**	Zurich	Switzerland	

\*\* also participated in the Brainstorm session