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A (Mostly) Sunny and Sober Anniversary

Diary of the ASSC10 Conference at St Anne's College, Oxford, June 2006

Thursday, June 22

The Great Debate

Back in Oxford! Some 30 years ago I participated here in a week-long seminar called 'Students for a United Europe'. Days of passionate love for the lovely American co-ed who had come along with me. It was springtime then …

The focus of my passion has since switched. In the autumn of my life I'm now more inclined to ponder on the difference between the neural correlates of conscious and unconscious passion. That sort of mental activity is, in the long run, less devastating than a passionate and sensual love life.

No time for nostalgic feelings. I rushed to the Department of Pharmacology where the pre-conference 'Distinguished Debate in Consciousness' organized by *The Mind Science Foundation* took place. The topic: 'Neural Assemblies versus Visual Feedback'. The debaters: two of the biggies in the field: **Susan Greenfield** and **Christof Koch**.

Greenfield maintained that neuronal assemblies are an ideal NCC because they can/might explain self-, sub- and unconsciousness, the latter vs. consciousness, non-human vs. human consciousness, dreams vs. wakefulness, and hearing vs. vision. They also can/might explain depression, schizophrenia, the workings of anaesthetics, psychoactive drugs and placebos.

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Journal of Consciousness Studies, **13**, No. 6, 2006, pp. 79–100

Koch emphasized that the great moral of twentieth-century biology is 'specificity'. Natural selection has come up with an amazing 'specific' molecular machinery that strains credulity. The same story is likely to be true for the NCC. He admitted that he is allergic to holistic and vague approaches (such as neural assemblies) whereupon Susan quipped that she would rather be vague and right than specific and wrong. **Joseph Dial** cleverly moderated the heated debate thus preventing a major clash between the two. From rebuttal via rebuttal to rebuttal: both opponents barely agreed on anything else than that consciousness comes in degrees.

The witty, humorous, easy going and girlish looking baroness elegantly resisted the tough-minded and passionate Californian rock-climber. He 'who speaks like his Governor' exhibited a flashy outlandish apparel featuring a new copper-colour hair dye well-assorted with a yellow shirt, a violet tie, a violet vest, reddish sneakers, a black jacket and black trousers with a black and pink coloured belt. After the debate the two antagonists shook hands and gave one another a kiss. So much for intellectual warfare …

This was a memorable *prolegomenon* for the anniversary conference I'm back in Oxford for, an anniversary of the scholarly kind! Its code name: ASSC10.

A scholarly life without scholarly anniversaries would be like a long, strenuous, sometimes monotonous journey, were it not for anniversaries highlighting the road to that elusive consciousness. The 10th meeting of the Association for the Scientific Study of Consciousness is just such an event. It was reason enough for the ASSC officials to have it celebrated this year in Oxford, a cultural, educational and historic setting illustrious enough to be worthy of the occasion.

Oxford University: a federation of fiercely independent colleges. A rather small one, St Anne's College, was the central venue, a medium-security place where you needed to have door pass codes to get in and out off the campus, the student dorms and the buildings with the meeting rooms (if you were the first one to arrive).

Friday, June 23

A perfect sunny day spent in lecture rooms

First thing in the morning: I got the conference paraphernalia at the registration desk under a tent. A badge, a program document, 2 photocopies of maps and no bag, which meant that I was left without a safe way to identify fellow participants from a distance (my long-term memory of faces being at its worst ever). I thus approached and

disconcerted some people I talked to and who didn't wear a badge yet. They had serious and smart faces, but they nonetheless belonged to a different group using the campus facilities that day, too.

The program document: the usual orderly, slightly impractical set of spiral bound pages. It is nicely done but a far cry from the professionally done high quality, handy, compact, solid and aesthetically pleasing paperback Program Book we got at the Tucson meeting last April. Created by the producers of the *JCS* the Tucson pocket book can stand up all by itself on a shelf, which the ASSC10 document in its DINA4 format and with its consistency cannot.

Continuous learning: The traditional pre-conference tutorials

There were four concurrent pre-conference tutorials offered this morning.

Eduard Marbach presented the 'Phenomenological methods for investigating consciousness', **Kevin O'Reagan** revisited the sensorimotor approach to phenomenal consciousness and **Rolf Verleger** discussed event-related EEG potential correlates of conscious perception.

I went to **Naotsugu Tsuchiya**'s and **Christof Koch**'s well-organized workshop on 'The relationship between selective attention and consciousness'. **Koch** introduced the theme. He stressed that by attention both of them mean 'selective attention' in contrast to the more general term 'arousal' and 'alertness'. They think that other perceptual modalities are likely to function along similar principles as the visual domain they concentrate on. Attention to him is a selection strategy that has evolutionarily evolved to make information available. A notorious critic of fruitless philosophical discussions, Koch nonetheless gave credit to Ned Block's famous distinction between access consciousness and phenomenal consciousness. 'This is one of the few times that a philosophical concept makes empirical sense and can be worked with,' Christof said, thus eliciting a happy smile on Ned's face.

Nao who had received the 'Best Student Presentation Award' at the ASSC9 meeting at Caltech last year, then explained that attention and consciousness are two distinct processes with different neural mechanisms. He expanded on studies that support the following conclusions: attention and consciousness have different biological functions, invisible stimuli can attract attention, attention without consciousness is possible and vice versa, the effects of attention and consciousness can be opposite.

A delicious vegan lunch got me — fittingly — ready for the afternoon tutorial on animal consciousness. It ran parallel to the tutorial on machine models of consciousness offered by **Igor Aleksander**, **Ron Chrisley** and **Murray Shanahan**; **Alan Cowey'**s tutorial on exploring aspects of consciousness by TMS; and **David M. Rosenthal's** tutorial on higher order theories of consciousness.

In their excellent session 'A scientific framework for the study of animal consciousness' **David Edelman** and **Anil Seth** presented examples that show that primates, birds, dolphins, octopuses and other animal groups exhibit problem-solving and other behaviour that can be interpreted as cognitive or emotional. They pointed to the supporting data from anatomical, physiological and comparative psychological studies, briefly discussed seventeen what they called 'widely recognized' properties of consciousness and argued that a scientific framework for the study of animal consciousness can be established, a framework within which one need not seek proof but weight of evidence.

Their basic premises: (a) the benchmark of consciousness studies in humans is the *accurate report* of conscious experience, and (b) alternative strategies (based on evolutionary homologies and analogies in anatomical structures and physiological patterns) can be used for amassing evidence for consciousness in non-human mammals, birds and possibly other animal groups. Indeed! But even a method that allows monkeys to make a metacognitive comment on a previous discrimination (which is, according to the two speakers, consistent with consciousness) should not obliterate the fact that we humans posit what the properties of consciousness (higher order, sensory or other) are. These properties are supposed to be expressed in a way that makes sense to *us* — as if *our* way of making sense out of anything, and more particularly of consciousness, sensations, emotions and mental activities, was *the* reference for all other species.

Anil and David maintained that, given the nature of evolution and development, the dogma of corticocentrism must be abandoned. Yes! Even if an intact thalamocortical system may be an organism's means of interpreting/giving meaning to (being conscious of) the world, itself and its relation to it, we cannot be sure that it is the only possible means of consciousness in the animal kingdom and hence that it is necessary for consciousness in the above sense. Maybe one day we will have amassed enough knowledge to equally abandon the dogma of braincentrism and neurocentrism.

Four 'guest-speakers' (**Andreas K. Engel**, **Giorgia Mason**, **Ilya Farber**, **Thomas Metzinger**) made very short statements during the

tutorial. Metzinger briefly explained that ethical thought has to come to grips with the need for moral objects (i.e. 'things or beings we have to be nice to'). This implies, Thomas said, that we then would have to establish a cut-off point between moral objects/beings and non-moral ones. But he did not specify where that would be.

But why does there have to be a cut-off point anywhere among living beings and for what reasons? Why are we so persistently eager to 'cut ourselves off' from other forms of life, to draw a borderline between 'us' and 'them'. Aren't all living beings at least sentient? And if not, what's the point of being alive, when you are as sentient as dead matter supposedly is? All living beings, not only complex brains, have to confront — and survive in — an unlabeled world. And sentience is what they have in common for that job.

The tutorial on that very sensitive topic was definitely worth the money … if you paid for it, that is. As there was no check at the entrance of the meeting rooms for the tutorials, some participants who had paid had to sit on the floor while others getting a free ride were comfortably seated.

Tutorials or workshops?

I take it that a tutorial is a meeting where one can learn about a topic one is not so familiar with. For that reason it has to be a more general, rather introductory event for 'advanced beginners'.

If the ASSC wants to increase the number of its affiliate members among non-professionals interested in the scientific approach to consciousness it can use 'easier-going' tutorials as 'attractors' for a less specialized general public. In the tutorials offered at this and the past three ASSC conferences I encountered a few 'lay' people. Some of them felt that the tutorials prepared them well for some of the hardcore stuff in the plenary and concurrent sessions. I usually would see them again the next time around, which was not the case for those who found the tutorials as advanced and technical as the other sessions and of no help whatsoever.

Opening remarks on an anniversary to be proud of

Anniversaries are meant to celebrate the recurrence of important and meaningful events or to prevent them from sinking into oblivion. **Patrick Wilken,** a major driving force of the ASSC from its very start, was just the right person to present the birthday statistics. In a very easy going and humorous talk, Patrick, who with William Banks got ASSC1 off the ground in 1997, portrayed the ASSC's

development from the beginnings in 1994 up to now. The ASSC's birth was almost contemporaneous with a significant rise of scientific publications in which the terms 'brain' and 'consciousness' appeared in the title or the abstract. (From 1965 to 2005 inclusive, the number of 'appearances' of the term 'brain' went from 0 to 10,000 and that of the term 'consciousness' from 0 to 400.)

ASSC10 rounds off an uninterrupted series of meetings held ever since the first one took place in California back in 1997. Quite a feat considering that the ASSC has no office and no paid employees anywhere. Moreover, the very fact that four meetings took place in the USA (California 2x; North Carolina 1x, Tennessee 1x), one in Canada and five in Europe (Belgium 2x, Germany 1x, Spain 1x, and now England) testifies to the unbroken will and unfailing commitment of those who, during that period and in addition to their scholarly research and academic duties, still managed to run the organization.

The ASSC puts its emphasis on science, but philosophers (usually about one third of the conference attendees) are welcome as members. Patrick gave many more details too numerous to mention. As he did not present the gender proportion of presenters for all the ASSC meetings, I quickly checked it for this meeting.

Tutorial speakers	1 ♀ out of a total of 12
Plenary speakers	1 ♀ out of a total of 15
Concurrent speakers	8 ♀ out of a total of 36
Keynote speakers (Gordon Holmes lecture incl.)	1 ♀ out of a total of 5
Presidential address speaker	0 ♀ out of a total of 1
William James Prize speaker	0 ♀ out of a total of 1
Opening remarks: speaker	0 ♀ out of a total of 1
Tom Slick Award in Consciousness speakers	0 ♀ out of a total of 4

Table 1. ASSC10 and the gender gap

Male conference participants were also visibly more numerous than their counterparts (attendance was over 300). There were, according to the schedule book, 132 poster presentations. Women were 60 times involved (as authors/co-authors) in the poster sessions, men 205 times. (NB. I counted a person as many times as their name appeared as author or co-author of a poster presentation, whether s/he was physically present or not.)

Why not include data of this kind in the conference documents along with an index of the presenters, and a list of the participants with mention — as is fitting for an international organization — of the countries they hail from?

Something that struck me at this and the past three conferences: I have never come across a person from the African continent. ASSC meetings mean mostly North Americans and Europeans. The number of South American participants is rather reduced, the number of Asians seems on the rise. There are usually also a few Australian and Middle Eastern participants.

But let's return to Patrick's talk. Good to hear: 'our' ASSC is the second most popular ASSC hit on Google. It ranges between two other respectable ASSCs: the ***A****rchaeological* ***S****ociety of* ***S****outh* ***C****arolina* (third position) and the ***A****ssociation of* ***S****cottish* ***S****elf-* ***C****aterers*. The latter's popularity might just be due to a more understanding and rewarding way to handle the *self*!

With all the positive data and with the way the organization is run Patrick had to conclude that ASSC was a highly democratic association with a bright future.

2006 William James Prize Speaker

Phil Merikle announced that **Sang-Hung Lee** from Seoul National University is the third recipient (after Stephen Laureys in 2004 and Hakwan Lau in 2005) of the William James Prize, a $1000 US award for an outstanding empirical or philosophical contribution to the advancement of our understanding of consciousness. Sang-Hun also got a beautiful glass sculpture with a neuron in it. Once the applause had calmed down, he started his talk on the role of attention in the propagation of perceptual and cortical waves during binocular rivalry. In his studies he found that with attention diverted response amplitudes were reduced and response latencies shortened. When attention was diverted and no waves perceived, cortical waves were preserved in V1, but abolished in V2 and V3. His findings imply that neural circuits in V1 play a critical role in the competition between two rival stimuli without directly evoking a percept. Moreover: perceptual waves during binocular rivalry are mediated by neuronal waves arising from an interplay between multiple areas in the visual hierarchy. Within this hierarchy the neuronal waves triggered in V1 necessarily advance to later visual areas to promote perceptual waves.

Presidential Address

Stan Dehaene briefly introduced **Daniel Dennett**, the father and standard-bearer of heterophenomenology.

'Si, abbiamo un anima. Ma è fatta di tanti piccoli robot.'

'Yes, we have a soul, but it is made of lots of tiny robots.' The quote Dennett got from the Italian *Corriere della Sera* could have been the title of his talk. All the work done by the imagined homunculus in the 'Cartesian Theater', Dennettt said, would have to be distributed around in space and time to various lesser agencies in the brain. But as we descend to the sub-personal level, we are no longer talking about the person or consciousness. We might call these lesser agencies homunculi but they are not conscious and don't know who you are. Neither are they capable of performing fully-fledged speech acts. These homunculi might be better called *psittaculi* (*Psitta* = parrot). (Would Irene Pepperberg, who studies the potential for conceptualizing in parrots, see it the same way?) In a brain composed of interacting *psittaculi*, there is nobody home.

Dennet also talked about 'maximal bland computationalism' (a model that is so non-committal that everybody is going to accept it), the *hard question* concerning the rise of consciousness (which can only be determined retrospectively and timed roughly), and, connected with this, the Biological Correlate of Speciation. There is no BCS, since we couldn't tell which birth in any lineage is *the* speciation event C.

An Opening Reception amidst Dinosaurs

'Just like these guys' — **Andrew Ross** pointed to the giant skeletons of the dinosaurs — 'are now the remnants of our distant past, we humans will be the remnants of the distant past of robots which will replace us humans. From the point of view of those future machines the world as we know it will be their primeval soup and humans will have been some biological dirt one could dispense with.'

Was it a sacrilege to talk like that in the University Natural History Museum (where the opening reception took place) amidst millions-of-years-old Dinosaur skeletons? I don't know. But these words surely shook my neurons out of a deep slumber. So far I had always carefully avoided exposing them to science fiction and they seemed quite happy to live in a romantic biologist's brain full of butterflies, dandelions and bumble bees. And now this brutal realization that they belong to a 'no future' generation of neurons to be replaced in a not so far future by silicon chips. They will never be the same again!

Thank goodness that soon after that shock **David Edelman** joined us and brought the conversation down to earth and into the present, as something had stimulated him to expound very passionately and vividly his view on international economics and US policy … until we were gently (but much too early) pushed out of the museum.

Saturday, June 24

Another perfect sunny day spent in lecture rooms

In his early morning keynote lecture **Jon Driver** talked about selective attention, multisensory integration, and perceptual awareness in the normal and damaged human brain. He showed that spatial attention often operates crossmodally: it has modulatory influences on perceptual awareness. Attending a particular location for one sensory modality (e.g. vision, touch or hearing) often leads to that locus being selected in other modalities, too. Thus, the space in which attention gets directed is often a multisensory construction. The neglect syndrome, for example, is not necessarily just visual, it often involves many multisensory aspects. Some similar principles apply to spatial extinction. Most of such phenomena, Driver emphasized, are now thought of as reflecting causal interactions between remote but interconnected brain regions (e.g. multisensory brain regions within the parietal and frontal cortex, plus sensory-specific cortices for vision, hearing and touch). He rounded off his talk outlining some new approaches to studying such causal interactions.

Plenary symposium 1: Recurrence gains currency

The first plenary symposium dealt with recurrent processing and visual consciousness.

In his talk **Vincent Walsh** discussed the 'micro-consciousness' and the 'sensory gateway' view. For him, the former is unable to encompass a range of stimuli of which we can become aware. It is anatomically unparsimonious, unsupported by neuropsychological evidence and falsified by brain stimulation evidence. The 'sensory gateway' view, which assumes a role of recurrent feedback to primary sensory cortex and which views primary areas as the key nodes (rather than loci) in awareness, is partly supported by neuropsychological evidence. It is anatomically parsimonious because of the role of recurrent feedback. It is also supported by brain stimulation evidence in neurologically intact and brain-damaged subjects. The prefrontal cortex and the right parietal lobe are neither anatomically nor physiologically suited to make key contributions to normal visual awareness. In short

and according to Walsh: primary areas are necessary to awareness, but not all primary activity reaches awareness. Primary areas are not sufficient and higher areas do make some contribution.

Ned Block then formulated the methodological problem he has with what he calls the 'correlational methodology' (the NCC) as follows: any evidence for or against the existence of phenomenality without cognitive access to it would have to derive from cognitive access to a phenomenal state. So how could such evidence inform us about the existence of phenomenality without cognitive access to it? His abstract solution: abduction. Rather than correlating brain states with reports of presence or absence of phenomenal states, all data are analysed for the 'best' neural account. If we adopt an 'abductive methodology', we can see the case that the neural basis of perceptual consciousness is recurrent processing in the *back* of the head, which can occur without cognitive access, whose basis is in the *front* of the head.

According to **Victor Lamme** there is a confusion of conscious experience with the cognitive processes enabling report, such as action, language, memory or attention. He therefore proposed to attack the problem from the other end: dissecting the neural machinery so that we can identify more or less fundamental aspects of neural processing, and then identify the MCs (mental correlates). As we define the MCs of two aspects of cortical processing we get to two separate definitions of attention and consciousness. Moreover, we can argue for the existence of (at least) two different types of conscious, i.e., recurrent visual experience: the *local* recurrent processing, rather elusive, precognitive and independent of attention and reportability (phenomenal consciousness) and the *widespread* recurrent processing, cognitive, attended, and reportable (access-consciousness). There is no need to bridge the explanatory gap. All we have to do, says Victor, is to move our notion of mind towards that of the brain.

Hakwan Lau had decided not to present data but some reflections of his own on recurrent processing (RP) and phenomenality (P). He started out with two statements and an argument for each one of them:

Statement 1: RP contributes to phenomenality.
Argument 1: Disrupting RP *disrupts* P, therefore RP contributes to P.

Statement 2: RP is phenomenal even without access.
Argument 2: RP is *distinct and independent* from the access system (their capacity and their anatomical location are different), therefore it is natural and *parsimonious* to characterize RP independently from the access system.

But objections can be raised: RP and the access system, for instance, form a hierarchical system and thus are mutually interdependent. Lau's methodological proposal to sort things out: to demonstrate a double dissociation between subjectively reported phenomenality and objectively measured forced-choice performance.

The animal consciousness question briefly revisited

In an off-schedule lunch-time discussion on animal consciousness and ethics organized and animated by **Kristina Musholt** one could hear about the concerns many of the participants and researchers had about conscious animals being used for consciousness studies. **Christof Koch** was sincere: 'We do consciousness research on animals because we assume that animals are conscious. We try not to face the fact they can suffer, simply because our curiosity outweighs any ethical considerations, I guess.' **Thomas Metzinger** pointed out that there are thousands of published pages on colour consciousness but almost nothing on animal suffering. **Petra Stoerig** said that it is commonly accepted that because we are mental we suffer more than supposedly non-mental animals even though it should be the other way around. **David Edelman** in a short talk mentioned that bees have a very sophisticated behaviour and that at certain tasks they can learn faster than monkeys. Despite the fact that they have no thalamocortex to their name.

Maybe we will realize one day that our exclusive focus on the nervous system is a dead end road and that we will have to start seeing the nervous system in the context of its interaction with the endocrine and immune systems. The three systems are, after all merely evolutionary tools of complex organisms to get around in the world. Less complex organisms or even unicellular beings may have evolved analogous tools to at least *sensori*-consciously handle *their* world.

Concurrent sessions

In the afternoon there were concurrent sessions on implicit processes (with **Axel Cleeremans**, **Edmund Rolls**, **Petroc Sumner and Paul Azzopardi),** sensorimotor questions (with **Jean-Christophe Sarrazin**, **Romi Nijhawan** and **Janet Bultitude**), and philosophical topics (with **Colin Klein**, **Erik Myin**, **David Philipona** and **Roblin Meeks).**

An inroad into a long-standing stubborn prejudice

In his keynote lecture **J. David Smith** summarized and compared existing and new research showing a strong isomorphism between the

uncertainty-monitoring capacities of humans, monkeys and dolphins. Low-level associative interpretations have been shown insufficient to explain animal uncertainty awareness. On the contrary: they use uncertainty responses abstractly, decisionally, generally and instantly. They also show memory monitoring. The challenge for researchers: to find out the corresponding uncertainty behaviour in other species. How do they say 'I don't know' when they don't have any words at all? This, so it seems to me, is the major challenge for all animal consciousness researchers: to translate animal emotional, mental, conscious, self-conscious and unconscious behaviour from their world of experience into ours.

David's take home message: animals show functional parallels to human metacognition. This makes him one of the important pioneers in overcoming the prejudice that if animals don't express anything of their inner worlds that is recognizable to us it doesn't exist.

His talk was a refreshingly pleasant and humourous event to round off the day's lecture program. Somehow the audience must have felt like me. The applause at the end of his lecture was more intense and longer than usual. And David was visibly moved.

Oh yes … why don't we send him all our unused condoms? And thus spare him the embarrassment of having to buy 'that stuff' … for his dolphins, of course!

Student reception

A very popular event with the future leaders of the consciousness field. It even attracted some pretty old 'students' (aren't we all students of consciousness?), who, amidst that youthful vitality might have forgotten for a few exhilarating moments that they are slowly and irrevocably homing in on eternal 'a-consciousness'.

Sunday, June 25

The third perfect sunny day spent in lecture rooms

Plenary Symposium 2:
2005 Tom Slick Research Award in Consciousness

Joseph Dial, the Executive Director of the San Antonio (Texas) based *Mind Science Foundation*, explained in his opening remarks for the Symposium 2 that the Tom Slick Award in Consciousness supports various scientific studies of consciousness. The MSF has also been supporting ASSC meetings in the past. Moreover: for ASSC10 they had granted travelling and accommodation awards to six needy

students, half of them presenting their empirical and the other half their philosophical work at the meeting. The MSF: generous, unassuming and efficient!

When **Christof Koch** (one of the four Tom Slick Award recipients making up this symposium) started his talk we knew that we were in for a fast talk. But this time he was fast as never before, at least until he was halfway through his lecture. He then suddenly stopped, had a worried look at his watch and announced desperately that he had to talk faster to cover what he had intended to say. Some more practice and his audience will hear his words even before he gets his larynx, his vocal cords and his lips to utter them! Can 'thought neurons', motor neurons and neuronal circuits fire that rapidly? Since fast talking isn't an Olympic discipline yet, Caltech will have to wait some more before it can boast the first Olympic gold medal winner side by side with its already impressive collection of Nobel Prize winners.

In the meantime Koch keeps speed-talking about a theoretical model that places an upper bound on the sparseness and the number of neurons activated by any one specific concept. With ca. one billion MTL neurons and 0.23% sparseness, each concept is stored in an invariant manner in two million binary neurons. Assuming 10–30,000 distinct concepts that humans access, then each neuron represents 20–70 concepts. This is compatible with the storage capacity of an association network of 10,000 neurons.

Christof also discussed a study that decoded, from the firing of a handful of firing cells during a single trial, which image the patient was currently seeing. This is a simple form of mind-reading. The delicate, deliberate, transient and reversible interventions (at the level of specific neural populations in behaving animals) necessary for studying the principles and the circuitry underlying any conscious perception require a mouse-model of consciousness. He then briefly discussed such newly available tools as millisecond-time scale, genetically targeted optical control of neural activity, silencing specific neural populations and the complete expression at high-spatial resolution of all the 20,000 genes in the mouse brain.

After a refreshing coffee, juice and water break **Jim Blascovich** talked about virtual reality and consciousness. Arguably humans have created virtual worlds for as long as they have dreamed, daydreamed and communicated with each other. (I take it then that many non-human animals have also created virtual worlds of their own.) The history of virtual reality 'technology', from the early story telling and cave paintings to the internet and now digital immersive virtual environment technology, is as old as communication media. In our

virtual environments we are better able to facilitate and control our presence in places and times other than where we are physically grounded in space and time, so he said. Blascovich then reported on various digital immersive virtual environment experiments designed (1) to help separate conscious from unconscious contributions to emotional responses such as fear, and (2) to evaluate the contribution of metaconsciousness to these effects.

Aaron Schurger started out his talk with clear definitions of what he meant by perception ('the presence of neural activity in the brain that carries information about a stimulus, such that the information might be accessible to direct report, verbal or otherwise') and awareness (as in 'awake' and 'alert' and as in 'aware of X'). Pointing to the difficulty to distinguish correlates of awareness in particular from correlates of perception in general, he said that in order to isolate the neurodynamics associated uniquely with awareness it is necessary to find evidence of perception-*without*-awareness. Its neurodynamics can then be compared to the neurodynamics of perception-*with*-awareness of the same sort of stimulus.

In a study of a hemianopic patient they tested the relationship between induced gamma-band oscillations and awareness. Discrimination accuracy served as an independent measure of perception without awareness. They found that oscillatory activity in the gamma band (44–66Hz) over the left occipito-parietal region was not correlated with accuracy or reaction time, but was significantly and uniquely correlated with awareness.

As to the confusion between awareness and attention, Aaron said that where there is awareness there is attention, that attention is necessary for awareness, although this is not necessarily true the other way around. Within his blind hemifield the hemianopic patient can exhibit awareness (presumably) with attention, and attention without awareness.

Michael Snodgrass suggested that unconscious perception research can ultimately illuminate fundamental aspects of consciousness itself. Researchers take two approaches to operationalize consciousness:

(1) the *subjective threshold* approach (Manipulate stimulus intensity and ask participants when the relevant stimuli can no longer be seen. Discrimination performance robustly exceeds chance. Subjective effects are weakly conscious and possibly low-confidence.)

(2) the *objective threshold* approach (Further degrade exposure conditions until discrimination performance no longer exceeds

chance. Conscious and unconscious influences, not to be confounded with control, risk to be eliminated.)

Most scientists assume that both methods index a single underlying unconscious process, with the objective approach yielding weaker effects than the subjective approach. Snodgrass however argued that both approaches index separate, qualitatively distinct unconscious processes, which in turn imply two rather than one kinds of consciousness: (1) phenomenal consciousness which refers to experiential contents and qualia per se; and (2) reflective consciousness, a higher-order metacognitive process which involves reflecting upon and evaluating various phenomenal contents. In his 'tripartite model' all reflectively conscious perceptions are also phenomenally conscious, but only some phenomenal contents are also reflectively conscious at any given time. Snodgrass finally presented supporting evidence for the model he proposed.

Standard, vegetarian and vegan lunch

Many hungry participants gathered around the vegetarian dishes. Some of them also fitted vegan sensibilities and were excellent, at that. I assume that the standard dishes were tasty, too.

I was pleasantly surprised about the number of consciousness folks that are also genuine vegetarians. 'The times they are a-changing!' (B. Dylan)

A very good idea to have lunch on site rather than let people fend for themselves in the food places around St. Anne's! Socializing and discussing while eating tends to take the edge off any point of view.

Concurrent sessions

The concurrent sessions were on capacity limits (with **Hélène Gauchou**, **Ilja Sligte**, **Bruce Bridgeman** and **Ilya Farber**), clinical insights (with **Mélanie Boly**, **Tristan Bekinschtein**, **Caroline Schnakers** and **Andrea Eugenio Cavanna**) and philosophical topics (with **Michael Beaton**, **Douglas Meehan**, **Dan Lloyd** and **Wayne Wu**).

Fact-sense and object-sense

In a keynote talk **Fred Dretske** made a difference between the *fact-sense* of seeing a difference and the *object-sense* of seeing a difference and rejected the description of change blindness as a failure on the part of normally sighted individuals to be aware of visible and often prominent objects. According to him, most cases of change

blindness show that one *can* be consciously aware of objects one doesn't notice. 'Taking off your clothes in a nudist camp', Dretske said, 'makes you less noticeable, but not less visible'. What makes perception of x conscious is not a higher order belief or thought that one perceives x, but a lower order knowledge of x grounded in and justified by one's experience of x. If you can see (and thus know) x is F by the way x looks, x is being perceived consciously.

Of all the plenary and keynote lectures, Dretske's solicited the most vivid reactions in the Q/A period. Only Ned Block asked a 'friendly' question.

Conference dinner

A pleasant evening, excellent food, and a good talk with Christophe Menant (an engineer) on biosemiotics and the many common viewpoints we had when talking about the evolution of consciousness. Dennett proposed a toast to Geraint Rees and Patrick Wilken, the masterminds behind ASSC10.

Monday, June 26

Just a regular drizzly day spent in lecture rooms

In his early morning keynote lecture **Anthony Greenwald** resorted to logical inference to establish what conscious cognition does. Rather than to start from the bright light of qualia (there is no consensus offered by introspective analysis), he suggested, we can start from the darkness of unconscious non-experience, using the reasoning device of *modus tollens*. This means in plain language: if something *can* be done by unconscious cognition (i.e. unconsciously), then conscious cognition is *not needed* for that function. If something *cannot* be done unconsciously, then conscious cognition *must* be needed for it. It then is a function of conscious cognition. In sum: this offers a (fallible) method that can expose elementary functions of consciousness. If a cognitive achievement is humanly possible and cannot be shown to be done unconsciously, that achievement is (or uses), according to Greenwald, an essential function of consciousness.

He gave examples of a number of experiments and concluded that there are (at least) two levels of unconscious cognition. He then ended his talk with questions: does consciousness differ sharply from unconsciousness and why shouldn't both be understood as a continuum? Why does unconscious cognition have trouble doing some things that are trivial for many existing machines? And: do other species do some

of what our unconscious minds can do? For him the questions remain open.

Best student posters

After the break and once Geraint Rees, who 'visibly liked playing traffic cop' (this was Bill Faw's very pertinent observation), had bullied participants into returning to their seats, the awards for the best student posters could be given to **Mélanie Boly** (science poster), **Rasmus Thybo Jensen**, **Tobias Schlicht** and **Gottfried Vosgerau** (philosophy posters).

Plenary Symposium 3: Action, Perception, Consciousness

Alessandro Farnè discussed several experiments showing the dynamic interactions between space representation and action execution in humans, as revealed, for example, through the phenomena of visual-tactile or auditory-tactile extinction. (We have extinction, when, according to Farnè, a brain-lesioned patient, 'able to detect a single stimulus presented to the ipsi- or contra-lesional side of the body, is not able to report the stimulus delivered to the contra-lesional affected side when it is presented with a concurrent stimulus on the ipsi-lesional side'.)

Sensory extinction, cross-sensory extinction, sensory-motor extinction: the findings concerning these phenomena disclosed the intimately *rival* nature of cerebral somatosensory representations. This rivalry applies within as well as between hemispheres.

Referring himself to the first formal demonstration of a tactile extinction-like phenomenon in *normal* subjects based on the same task usually employed in patients, Farnè could assert that tactile extinction is normal. Clinical extinction may thus be a pathological exacerbation of a physiologically limited access to consciousness.

Sean Kelly started off his talk reflecting on what philosophers can do for neuroscientists. He distinguished between a laboratory type of consciousness with its lab constrictions and a much richer, normal, 'everyday world' type of consciousness philosophers ought to be spending more time on. He then discussed perceptual constancy, i.e., the experience of objects as having constant properties throughout variations in presentational context. According to him, our direct visuo-motor engagement with an object and its visual properties is essential to, although not identical with our experience of those very properties. He argued that our visuo-motor engagement with an object is an essentially normative way of taking account of the context in

which it is presented. We experience a kind of normative draw, i.e., the environment/context draws out of us an experience/behaviour. It's our capacity to resist the environment/context drawing out an experience/behaviour that constitutes, according to Kelly, our human freedom.

David Milner explained that when we reach out to grasp an object our visual system needs to process the shape, size and location of the target, the properties of other objects that could potentially be obstacles to our grasping and the 3-D trajectory of our hand. There has been little or no research concerning the processing of the non-target information. He presented evidence for his argument that the human dorsal stream mediates these kinds of visuo-motor processing as well, and that this processing can go on efficiently without the mediation of visual awareness. Milner concluded that our grasping of target objects seems to be calibrated *without* visual awareness. Moreover: automatic visual processing of potential obstacles, and our use of online visual feedback during reaching, proceed without visual awareness. He finally concluded saying that maybe unconscious visual processing is a general operating principle of dorsal stream visuo-motor mechanisms.

The concurrent sessions

The concurrent sessions after lunch were on sensation and perception (with **Roi Cohen Kadosch, Susana Martinez-Conde, Gijs Brouwer** and **Michael Prouxl**), the Self (with **Petra Stoerig**, **Manos Tsakiris**, **Henrik Ehrsson, Navindra Persaud** and **Peter McLeod**), and on philosophical topics (with **Elisabeth Irvine**, **Robert van Gulick**, **Alan Thomas** and **Nicolas Shea**).

Small and narrow is not always beautiful

During the break I browsed through some of the books on the bookstands. So far I had avoided doing this because the stands were just outside the main lecture hall and behind the main entrance of the building, i.e. they were right on the throughway the crowds used to get to the refreshments area or outside the building. This meant that during the breaks you could easily get your feet stepped on, pushed around or simply crushed when you tried to leaf through the books at your ease. The tables were also so small that the representatives of the publishing companies had to resort to a generous amount of creativity to get at least the greater part of their books decently exposed. Add to this that the events were spread over various buildings on and off

St Anne's campus, and you understand that an ideal central and spacious place for the bookstands could not be found.

Plenary Symposium 4: Brain reading of consciousness

Like it or not: the *art* of mind reading via the interpretation of behaviour and body language is being complemented with the *science* of brain reading of conscious and unconscious mental states.

John-Dylan Haynes started out the afternoon symposium with a fascinating talk and plenty of examples showing that fMRI signals can be used to predict the precise time course of conscious visual percepts with high temporal precision while they undergo many rapid spontaneous changes. This simple form of 'mind reading' works by decoding the information present in spatial patterns of brain activity using multivariate pattern recognition. Two stimuli may be presented so briefly that they are effectively invisible, the information present in single 'snapshots' of brain activity is nonetheless sufficient to predict which of the two stimuli a subject is currently seeing. The decoding of 'contents' is currently possible for simple conscious sensations, conscious perception of objects, unconscious feature-selective processing, dynamic perception ('stream of thought'), imagery, and even for what we are currently covertly attending or intending.

Rainer Goebel then reported on a novel type of neurofeedback for fMRI signals that allows scanning two subjects simultaneously while they compete in a simple video ping pong game. The subjects saw the same screen showing the tennis field, the two rackets and the ball. Each subject was instructed to move her racket to the correct position using the BOLD signal. Before running the game the subjects were trained to modulate regional brain activity to reach specific target levels and to adapt to the hemodynamic response delay.

Subjects succeeded in controlling the up and down movements of the racket by regulating voluntarily the activity in selected regions of interest achieving a hit rate of 60–80%. This revealed that with extensive practice, the subjects learned to reach and maintain intermediate levels of brain activity with high accuracy. In other words: subjects are able to gain conscious control over activity in local brain regions and to interact with each other solely on the basis of the fMRI BOLD signal. It is possible to simultaneously measure two subjects engaged in joined attention during social interactions and to use the subjects' brain activity in real-time during these interactions. fMRI neurofeedback studies allow to separate 'controlling' areas from 'receiving' areas using effective connectivity analysis.

The two philosophers that followed didn't take up the torch unquestioningly.

Thomas Metzinger, Mister 'No One' in person, tried to debunk decoding as a myth. In a well organized talk he first presented several definitions of the term 'code' and retained the following two for his further argumentation (the ones that best suited his intentions, as Haynes commented after the talk): A code is a mapping function; a code is a rule established by social convention. Metzinger then observed that there is no alphabet in the brain, that phenomenal contents are neither letters nor numbers and that the evolutionary process that determined the causal microstructure of our brains in the relevant domains was *not* goal-directed, *not* intention-driven and *not* a process of establishing social conventions. In encoding and decoding there are receivers and senders, but the brain is not a sender, and scientists using fMRI are not receivers. And a BOLD signal is not a part of a process of intentional communication or information transmission. This lead him to conclude that there is no mapping rule and that there can be no decoding.

As, according to him, phenomenal contents can be located in a phenomenal state-space and the minimally sufficient NC of every form of phenomenal content is located in a physical state-space, philosophers and scientists could investigate together the notion of 'topological equivalence'.

Once he had made the difference between intentional and phenomenal content, he argued that phenomenal content is exclusively determined by contemporaneous and spatially internal properties, and that what is actually read out are not the detailed contents of a person's mental state, but a functional property of the carrier.

'What would happen if you report that you see vertical lines while the scientist reads in your brain that you are seeing horizontal lines?' asked **Frédérique de Vignemont** at the beginning of her talk. Indeed it seems possible that a brain scientist knows better than us what we feel, see and believe, especially our unconscious states. This would mean that we don't have a privileged access to our mental states anymore. But is this really the case, she asked, especially when one considers that what matters is the phenomenal content of the subjective experience? Brain reading is thus limited in scope. While it can be used independently of a subject's report, it cannot see what the subject sees outside itself and what intentional movement s/he's engaged in. Self-knowledge is far from infallible and incorrigible and the neuroscientist still needs to rely on the subject's introspective reports to

detect the correlations between brain activations and intentional content.

Frédérique discussed various aspects of the topic, including multiple realizability, and then concluded that multiple realizability is not an argument against brain reading, which scientists can do and which indeed is a challenge to the privacy of our mind. But she also added that brain scientists cannot know better than we can. Multiple realizability, in this case, is an objection against a reductive explanation of the mind. Which means, according to her, that we remain the best authority on our mind.

Gordon Holmes Lecture

Martha Farah was the last keynote speaker of the meeting. Her 'Gordon Holmes Lecture' was an introduction to neuroethics. The more you understand how the brain does ethics (i.e. the neuroscience of ethics), she said, the better the ethics of neuroscience you can develop. She distinguished between *'What we can do'-issues* (brain enhancement, brain control, brain reading) and *'What we know'-issues* (legal and moral responsibility issue, especially the free will vs. determinism issue; the 'who or what has a mind?'-issue; the religion/spirituality vs. science issue, which she thinks will be increasingly problematic).

Brain enhancement includes cognitive, emotional, learning and attention enhancement with pharmaceuticals or TMS. (The future of the 'Chipocampus' is not far off.) And with all these there are the questions of safety (What are the long-term effects?), fairness (Who can afford brain enhancement? Who has access to it? Will it exacerbate the existing social stratification?) and freedom (Can people be forced to use it?).

And while she was talking about the enhancers she suddenly had a bout of malaise. She tried to fight it, but then rushed to her handbag, mumbling something about diabetes and conceding that she now had better take enhancers herself. She hastily and audibly crushed several pills in her mouth and gulped down the pieces all the while continuing her exposition. The audience was visibly relieved when she finished her talk without any further malaise. The intense applause expressed a mixture of recognition for the quality of her talk and admiration for her *tour de force* getting through it.

Post conference drinks

No wild 'End of Consciousness Party', just a decent get-together. No boisterous poetry slam, no Zombie or other Blues, no delirious dancing. ASSC conferences just ain't like the Tucson ones. No extravagant personality to light the candle of joy and to remind us that we shouldn't be so serious about taking ourselves seriously.

I had come to an anniversary conference where there was no special festivity, no mesmerizing event to imprint itself forever on the emulsive sheet of my mind.

ASSC10 was nonetheless an excellent, very enriching conference with plenty of brilliant and friendly scholars and researchers committed to their cause. An important meeting like all the preceding ones. A bright light among other conferences on consciousness. And a (mostly) sunny and sober anniversary …