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Conference Report — ASSC 8

The eighth annual meeting of the ASSC took place between June 25th and 28th in Antwerp, an extremely beautiful Belgian city, a major European port and the home of the Peter Paul Rubens, ‘the prince of painters and painter of princes’. The meeting was held in a University building at the edge of the old town. This part of the city is remarkable both for the elegance of its architecture and for its innumerable short, interlocking, streets with oddly indistinguishable names. The demands on spatial memory were high and some delegates may still be hunting for the conference dinner which took place, magnificently but improbably, in a hotel — the Elzenveld — inside a hospital.

The outstanding themes of the meeting were states of impaired awareness, the science of conscious and unconscious vision, and the study of volition. These themes were linked informally by debate between adherents to three principle views of awareness, whom I shall refer to as back-brainers, front-brainers and beyond-the-brainers. I shall try to give you a (thoroughly prejudiced) view of these themes, the debate and some highlights.

The topic of impaired awareness was visited twice, first at a satellite meeting on the 25th June, organised by Steven Laureys and funded by the Mind-Science Foundation, and again in a plenary session at the conference proper. What was new? There have been advances on two fronts in particular: the classification of states of chronically impaired awareness and their investigation by functional imaging. The classificatory advance has been the definition, by Jo Giacino and others, of the ‘minimally conscious state’ (MCS). It is characterised by the presence of reproducible but inconsistent (or limited but definite) evidence of awareness, for example command-following. The MCS is often a transitional state in the course of emergence from the vegetative state (VS) to full awareness, but it can be the terminus of recovery. The definition of this syndrome may not sound like a dramatic development to those outside the field, but just as the definition of the VS by Jennett and Plum in 1972 made it possible to begin to collect information systematically about this tragic and eerie state of ‘wakefulness without awareness’, so the definition of the MCS should allow us to learn more about the

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processes by which awareness recovers after a period in coma or the VS. It has already given rise to some important findings, as below.

Steven Laureys (who was awarded the ASSC's first William James prize at this meeting) summarised the results from his group's work in Liege. The key conclusions are that the brain's global metabolic rate is reduced by 40–70% in the VS, to levels comparable to those seen in slow wave sleep or under general anaesthesia; primary sensory cortices *can* be activated by appropriate stimuli in the VS, but this activity generally fails to propagate, in the usual way, to downstream sensory and association cortices; recovery of awareness need not be accompanied by any major change in overall brain energy consumption, but is associated with two other key changes — an increase in the activity of a network of association areas in the parietal and frontal lobes, and restoration of connectivity between remote brain regions. This may help to restore a 'global workspace' for consciousness, a model presented to the meeting by its originator, Bernard Baars. Patients in the MCS scanned so far resemble normal controls in these two respects, perhaps suggesting a step change in brain functioning with recovery of awareness. Nicholas Schiff's work, from Cornell, extends these observations. Occasional patients who appear otherwise to be in a VS produce isolated items of behaviour which turn out to correspond to preserved islands of cortical metabolism. Like the Liege group, Nicolas Schiff's team are finding substantial evidence of cerebral recovery in the MCS. He discussed some grounds for hoping that focal brain stimulation may, in the future, prove able to nudge patients in the MCS back towards normal function. Other highlights of the impaired awareness sessions included Adrian Owen's summary of evidence for implicit processing to the semantic level in a minority of patients in the VS, Andrea Kubler's fascinating account of 'thought translation devices' in paralysed patients, Pierre Fiset on functional imaging of subjects undergoing general anaesthesia and Jo Finnn's discussion of his pragmatic approach to ethical medical decision-making. Bryan Jennett himself presided at the satellite session, summarising and discussing the contributions over the course of the day, building a bridge between the early work on the subject and its future.

These impaired awareness sessions were dominated by unashamed front-brainers (FB): FBs subscribe to the currently dominant view of awareness, which holds that awareness depends on the functioning of executive brain systems in the parietal and frontal lobes. Occasionally a back-brainer (BB) spoke up for the thought that activity in sensory areas alone might be sufficient for experience. This conflict turned out to be a recurrent source of debate throughout the meeting. Evidence presented in the impaired awareness sessions for similar, profoundly depressed, levels of brain activity in coma, the VS, slow wave sleep and anaesthesia provides some reassurance that in these contexts at least the BBs have little real cause for concern.

The meeting's visual theme was launched by Stanislas Dehaene on the first full day of the meeting with a virtuosic presentation of his work on masked primes. Taken at face value, the story runs something like this. A briefly presented visual stimulus, the prime, can be made invisible by presenting masking

stimuli just before it, just after it or both. But several lines of evidence suggest that the ‘unseen’ prime can influence both brain activity and subsequent behaviour. If so, the paradigm raises two key questions: first what is the fate of the unseen stimulus, how far can it be processed in the absence of awareness? Second, what are the key differences between stimuli which do and those which do not enter awareness?

To the first question Dehaene answered that the extensive processing of subliminal stimuli occurs at perceptual, semantic and even motor levels, and is influenced by task instructions and, perhaps surprisingly, by attention. His answer to the second question echoed the prevailing (FB) view at the satellite session: information becomes conscious when it is broadcast widely through the brain’s ‘neuronal workspace’, allowing forms of cognitive performance which are otherwise unattainable (he suggested that these include the bridging of delays, inhibition of habitual responses, the planning, evaluation and monitoring of novel strategies and higher level semantics).

The first day closed with a debate between Stan Dehaene and Daniel Holender on the plausibility of unconscious semantic processing. The trouble with this encounter was that neither of the participants really wanted to argue, probably with good reason: some questions are too difficult to settle in public before a large audience. Holender planted the worry in our minds that some of the work on subliminal processing presented by Dehaene in the morning had been contaminated by stimuli which *were* consciously perceived. David Chalmers suggested in discussion that the current acceptance of the evidence for subliminal processing is the result of a change in the *Zeitgeist* over the past twenty years rather than of overwhelming pressure from evidence. Stan Dehaene did not agree, and this dispute, I am sure, will continue.

The key points in Dehaene’s opening paper were mirrored in Geraint Rees’ closing address. Geraint, another FB, described the results of a series of experiments — investigating neglect, extinction, change blindness, binocular rivalry — which converge on the conclusion that while activity in visual areas is necessary for visual awareness, it is not sufficient: coupling between these areas and parieto-frontal regions is also required. The philosopher Ned Block spoke up for the back brain in the closing moments: were Geraint’s data not compatible with the idea that the visual areas generate visual phenomenology, while the parieto-frontal system broadcasts these through the brain? But BB theory had already been proposed from the heart of the vision camp, as you will hear.

The second full day of the meeting, Sunday, opened with a series of talks on ‘visibility, brightness, salience and visual awareness’. Ronald Rensink spoke first. He argued that we must divide to conquer: we need to distinguish multiple senses of attention and awareness, and attack these one by one. He went to supply a thoughtful taxonomy. He was followed by Susana Martinez-Conde and Steve Macknik who gave beautifully illustrated but conceptually difficult talks on early visual processing. In terms of the back brain/front brain debate, the interest came at the close of Steve Macknik’s talk. His functional imaging study of masking suggested that activation in the occipital lobe, alone, distinguished

seen from masked stimuli. Therefore he insisted, true to the evidence he presented, that activity in the occipital lobes subserves visual awareness. Right or wrong this was a refreshingly clear statement of the unfashionable possibility several back-brainers had been plucking up the courage to articulate.

Another voice which made itself heard during the discussion sessions finally had an opportunity to speak freely and clearly on the final day. Kevin O'Regan had already made it clear that in his view both the FBs and the BBs were missing the point: visual awareness, Kevin believes, lies beyond the brain.

Here is a brief attempt to summarise a rich theory. Kevin's refrain is that we are wrong to regard experience as being generated by the brain (this negative claim sounds simply lunatic to a clinical neurologist at the first hearing). Instead, Kevin will tell you, on the first pass by his theory, experience is a form of skilful action, *enabled* by the brain. The distinction, between enabling and generating, is not merely semantic: on Kevin's view experience *consists in* a certain kind of action — the brain enables this, and having done so, there is nothing left, no mysterious residue, for it to generate. Kevin offers you two principle inducements to follow him towards this challenging view — conceptual and empirical. The conceptual reward is that his account of consciousness bridges (or rather dismantles) the 'explanatory gap': it is, he reminds us, utterly mysterious, on the conventional 'generative' view of mind-brain interaction, that processes in the brain should cause experiences, and equally mysterious that different kinds of brain processes should give rise to different kinds of experiences (the problems, in Kevin's terms, of 'phenomenality' and 'sensory qualities'). If we accept an account of experience in terms of action these problems become tractable: different sensory qualities arise from the different kinds of exploration involved in hearing and seeing for example (a well worked-out part of the theory), while phenomenality arises from the 'grabbiness' or alerting capacity and 'bodiliness' or corporality of events (to my mind a less well worked-out part). The empirical inducement is an array of fascinating evidence which I can only gesture to here, supporting his view of experience. This evidence includes Kevin's own work on change blindness and the work of Mack and Rock on inattentional blindness — both suggesting that our 'internal representation' of the world is less rich than we usually suppose, making it plausible that we only have experiential knowledge of those items in the world which our senses are 'manipulating' at a given moment — and from experiments on sensory substitution (for example the fairly successful attempts to provide 'sight' for blind people by feeding an image from a head-mounted camera to an array of electrodes positioned on the skin) indicating that the contingencies between movement and sensation, rather than the neural channels involved, may determine the character of sensory experience.

One natural response to these ideas is to protest that experience self-evidently occurs in the absence of action. How can Kevin deal with the problem posed for his theory by experiences like dreams, hallucinations, awareness while paralysed or during electrical stimulation of the brain? He explains that in these circumstances we engage our implicit knowledge of the sensorimotor contingencies which would be operating if we were moving (to see red is to know how the

pattern of retinal stimulation would change were you to move your eyes while gazing at a red patch...). He denies, though, that a subject unable to move from birth could ever become conscious. The term ‘engagement’ a sentence back, touches on another key element of the theory: to see is not *simply* to exercise the sensorimotor skills which constitute vision but also to have ‘cognitive access’ to it: that is, to be able to use your mastery to guide action or give a report.

Kevin hopes to persuade us that we are deeply mistaken about both the nature and the contents of experience. He aims to provide us with a comprehensive account of awareness revealing that our experience is as it must be, given our repertoire of actions, and the structure of the physical world. This explanation of subjective awareness invokes neither a subject nor irreducible qualities of experience, which, Dan Dennett would be happy to remind us, is just as it should be (for otherwise the explanation would be circular): perhaps this is why it can leave us feeling as if our pocket was just picked (to quote Dennett once again). Kevin is a rare animal among philosophically minded thinkers, one who puts his theory to work, not content simply to argue his case - for a version of functionalism/behaviourism — but determined to put it to the test with ingenious experiments. It is clear from the response to Kevin’s talks that his audience find his ideas entertaining, baffling and captivating in roughly equal measures. If he and his collaborators, including the philosophers Alva Noë and Erik Myin (the main organiser of ASSC 8), turn out to be right about awareness their contribution will have been considerable. It is already a major spur to thought.

Kevin was not the only speaker to look beyond the brain for an explanation of awareness. In a session on ‘dynamical approaches’ the philosopher Evan Thompson explored a conception of awareness rooted in our living, breathing, embodied selves. He emphasised several features of awareness which suggest to him that it is the expression of a ‘metastable dynamic system’ (one I think which moves for ever between an infinity of ‘attractive’ but unstable states): these features include the ‘ipseity’ of experience, the pre-reflective self-awareness which accompanies experience; temporality, the tendency for current states to incorporate memory and intention; spontaneity, the self-generated quality of experience; valence, the modulation of our experience by mood and desire. Alicia Juarrero picked up this torch to argue that an understanding of ourselves as complex dynamical systems — within which the coming together of parts gives rise to ‘emergent’ forms of behaviour by the whole, which in turn affects the parts — helps to explain both the ‘feel’ of experience and our sense of agency.

Agency was the theme of the last full plenary session, with excellent talks on voluntary action and our relatively ‘thin’ awareness of volition. Matthew Rushworth gave a lucid account of the role of the medial motor areas in voluntary action; Jonathan Cole discussed the first-person experience of paralysis drawing on a wide range of examples; Patrick Haggard reviewed the current state of knowledge on the timing of our awareness of intention and action.

It is difficult to do justice to this meeting in a report of reasonable length. For example, Petra Stoerig on self-awareness and Takeo Watanabe on perceptual learning without awareness were both full of interest. The parallel sessions were

consistently good, as were the posters. I won't write about these as it is not humanly possible to attend more than 25% of the parallel sessions or to visit all the posters properly — but there was plenty to learn from and enjoy.

The meeting was also fun. Much Belgian beer washed down much Belgian food, and it was late, late in the evening before many of us made it home to bed. Susan Blackmore was puzzled when I tried to borrow 20 neurons from her but came up with the goods in the end. I realised that age has caught up with me when I had to find my specs to read the map of Antwerp in the lamplight, though neither the specs nor the map seemed to help. Specs were not required to appreciate the beauty of Antwerp nor of many of the delegates — a distraction at times from the meeting, I have to confess, but without such distractions what use would consciousness be?

The study of consciousness is gripping because it stands firmly rooted in science but surveys the totality of experience: its light and its darkness, its griefs and delights. Thank you, Erik Myin, and all the other organisers, for giving us an opportunity to enjoy this most exhilarating of intellectual, and personal, pursuits.

BOOKS RECEIVED

Mention here neither implies nor precludes subsequent review

- Bliss, Collingridge and Morris (ed), *Long-term Potentiation* (OUP, 2004)
 Changeux, Jean-Pierre, *The Physiology of Truth* (Harvard/Belknap, 2004)
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 Farah, Martha, *Visual Agnosia* (MIT Press, 2004, 2nd ed.)
 Gray, Jeffrey, *Consciousness: Creeping up on the hard problem* (OUP, 2004)
 Griffith, Jeremy, *A Species in Denial* (FHA, 2003/2004)
 Hines, Melissa, *Brain Gender* (OUP, 2004)
 Honderich, Ted, *On Consciousness* (Edinburgh University Press, 2004)
 Kanwisher, Nancy and Duncan, John (ed), *Functional Neuroimaging of Visual Cognition* (OUP, 2004)
 Levin, Daniel, *Thinking and Seeing* (MIT Press, 2004)
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 Rosen, Steven M., *Dimensions of Apeiron: A topological phenomenology of space, time, and individuation* (Rodopi, 2004)
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 Shaw, Robert, *The Embodied Psychotherapist: The Therapist's Body Story* (Brunner-Routledge, 2003)
 Wilson, Timothy D., *Strangers to Ourselves: Discovering the adaptive unconscious* (Harvard/Belknap, 2004, paperback ed.)