

Bill Faw

Consciousness Science Is Alive and Well In Global Psychology

Report From ICP-2004 in Beijing, Aug 8–13, 2004

International Psychology

The International Union of Psychological Science ('Union') co-hosted, with the Chinese Psychological Society its 28th International Congress of Psychology ('Congress'). The first Congress was held with the World's Fair in Paris in 1889. In recent decades, they have been held every four years in different parts of the world. The Union has member organizations from 67 nations, representing one half million psychologists. Pretty scary stuff!

With close to 6000 participants from some 80 countries, involved in 5,500 presentations over 6 days, this was the largest scientific conference yet held on mainland China. As such, the Chinese media featured it and the government issued five postage stamps and a postcard honouring it, suggesting an international 'coming of age' for Chinese psychology, with its pledge to observe and actively uphold the 'Principle of the Universality of Science and the Principle of Free Circulation of Scientists' as set out by the International Council for Science.

Needless to say, this conference seemed very different from the minuscule consciousness meetings (ASSC and Tucson) from which I have filed reviews for *JCS* over the past three years. I will therefore give something of the context and feel of this conference before turning to issues at the heart of consciousness studies. Those who prefer 'mainlining' pure consciousness-science findings can skip over the next few 'embedded' paragraphs.

Compared to other big-tent events I have attended, this conference had some intriguing weaknesses and strengths. Communication prior to the Congress had holes in it, probably due to the size of the conference, the inexperience of the local hosts, and the language barrier. My many attempts to find out how to submit my abstract for a presentation were never answered. Evidently 5,499 people were smarter than me! Responses to my pre-registration and hotel selections

Correspondence: Bill Faw, Dept of Psychology, Brewton-Parker College, Hwy 280, Mount Vernon, GA 30445, USA. Email: bfaw@bpc.edu

were slow and erratic. This may be why an inordinate number of presenters and even session moderators never showed — and presumably never announced that fact in advance. This seemed strange compared to other conferences.

A problem at any international gathering is the huge challenge for thousands of people to give talks in their second or third language. Many presentations were made by Chinese scholars and students, some of them literally projecting every paragraph of their talk onto the screen and then reading it word for word. When I felt irritation over this, I would remind myself that I couldn't even BEGIN to do that in Mandarin — or even in Spanish or German, which I have studied. The official language of the Congresses is English (except in Montreal where it's English *and* French!) and with that come challenges and the need for humility. Bravo to those who give presentations beyond their comfort zone!

In sharp contrast, the actual running of the Congress (except the absences of presenters) had some interesting strengths that reflect Chinese hosting style. There were large numbers of young conference helpers — all in yellow shirts — who took a more active role than I have seen before (where you knew that 'Sid' was on the sound system, but couldn't find Sid). There were 2–4 such helpers in each session room — at times in 28 different rooms — to locate the session moderator and first speaker. According to need they asked people to turn off their cell phones, adjusted mikes, turned lights on and off, helped speakers exchange PowerPoint floppies, and spontaneously helped to change overhead-projector transparencies.

The helpers' hosting style actually drew chuckles at the opening plenary session. On the stage were 12 men seated on one side of 4 tables, with a podium over on one side. Their various remarks contained the information in my first two paragraphs. Such formalities help define and make self-conscious the international aspect of psychology. As each person finished his opening remarks at the podium, he was escorted back to his chair and seated by one of the women helpers. When the opening remarks were over and Union president, Michel Denis, was in the process of introducing the Nobel-laureate speaker, Daniel Kahneman, male helpers moved 2 of the tables off the stage, left Kahneman with a mike at one of the tables, and moved the fourth table over to the other end of the stage, setting up two table mikes and placing water there for Denis and Kahneman to use after the talks. They then quickly removed the remaining furniture after Kahneman's talk to prepare for the Chinese Acrobats. I had thought of skipping out before the Acrobats started, having seen them two weeks before at their own theatre, but their 45-minute show for this largest grouping of scientists in Chinese history was stunning and breathtaking — much more exciting and unbelievable than the acrobatics we have since watched on TV from the Olympics.

This conference — with its high-level scholarship interspersed with oriental hospitality, daily options for tours in and out of Beijing, and luncheon options of Chinese cuisine or dippy hamburgers and hotdogs — fit well with the grand blend of old and new, Oriental and Occidental that my wife and I had found in our pre-conference two-week tour of Beijing, the Great Wall, Yangtse River cruise, Xi'an's Terra Cotta Warriors and Shangi. Great stuff!

Major Presentations Relating To Consciousness Issues

- Michel Denis (France), the very president of the Union, is a long-time researcher in Mental Imagery and brain mechanisms thereof, doing consciousness research well before consciousness research was cool.
- Daniel Kahneman (Princeton), the only psychologist to sneak into the Nobel family through Economics, was the opening speaker, contrasting Intuition and Reasoning as two distinct largely-unconscious and largely-conscious systems.
- Axel Cleeremans (Brussels) who had organized the ASSC conference at his home university, spoke on unconscious and conscious processing as being graded and not discrete mechanisms, in distinction to Kahneman.
- Talis Bachmann (Estonia) on the editorial board of *Consciousness and Cognition*, introduced the concept ‘pertention’ as the process that makes percepts conscious and, along with Colin Blakemore (Oxford), mentioned the days-old news of the death of our beloved Francis Crick.
- Colin Blakemore (Oxford) covered the waterfront, talking about mental imagery, face, house and object processing, ambiguous figures, change blindness, binocular rivalry, touch encroachment on visual areas in blindness, and Braille synaesthesia.
- Bob Desimone (NIMH), demonstrated Change Blindness with the picture of MAO on the Forbidden City South Gate moving up and down and the switching from a solid to dotted white line in a Beijing street, and showed a picture of his own brain scanned in Beijing.
- Tim Shallice (London), who has done solid consciousness studies for a long time, ‘fractionated’ the prefrontal executive mechanisms involved in ‘controlled’ processing.
- Anne Triesman (Princeton) talked about perceptual binding and consciousness and mentioned that she has begun to test Buddhist monks, but has not yet tested different meditation traditions.
- Carlo Umiltà (Padova) talked on neuropsychology of mathematical cognition, conscious and implicit ‘number lines’ in the parietal lobe and number-line representational neglect.
- Fergus Craik (Toronto) led a symposium on age-related differences in human memory and talked about divided attention’s effect on memory encoding and retrieval.
- Hans Markowitsch (Bielefeld) with a comprehensive treatment of the anatomy of memory and memory disorders. Absolute heaven/nirvana for us neuroanatomy wonks!
- Alan Baddeley (York), led a symposium on working memory in which he sketched developments of his framework of Executive Control and three slave modules: visual-spatial sketchpad, articulatory phonological loop, and his new episodic buffer.
- Michael Corballis (Auckland), waxed evolutionarily on the divided brain. The human left hemisphere is involved in actual tool use, pantomiming tool

use, imagining tool use, and naming tools; with the right hemisphere more involved in emotional and global perception.

- Henry Wellman (Michigan), talked on several stages of development of Theory of Mind

Selected Topics of Consciousness Interest

It would take forever to list all of the facts and findings from the conference — even those just related to consciousness studies — so I will list some basic things that our readers would have learned or had confirmed from attending, arranging them by topics not chronology.

Controlled and Automatic Processing. Focusing on implicit sequence learning, **Axel Cleeremans** demonstrated that mental representations move from being non-existent to implicit, to explicit, and finally to being automatic, in a clearly graded manner. Implicit sequence learning is mediated by the right caudate nucleus (of the basal ganglia) and explicit learning by the anterior cingulate gyrus and polar frontal areas. **J. Doyon** (Montreal) presented evidence that the second half of sleep (a mixture of REM and Stage 2) provides off-line consolidation for such tasks.

Unconscious to Conscious Perception. There is a major running debate at consciousness conferences over what it takes for a percept to go from being unconscious to being conscious. According to **Ann Treisman**, the primary visual area (V1) feeds forward both dorsal stream (location) and ventral stream (identity) information. The latter includes *implicit* representations leading to decisions of object type ('animal') and *conscious* representations needed to select features ('brown dog?'). The binding of these streams is pre-attentive, but if our *focused* attention is too brief binding errors can occur. *Distributed* attention, while helpful for seeing global shapes or spotting a single feature, cannot bind objects (thus Change Blindness). It takes about 880ms to detect a second target in our focused attentional search (Attentional Blink). *Identification* takes more attention time than does *detection*. According to **Talis Bachmann**, attention is *not* what brings pre-attentive objects into explicit consciousness — because we are already focusing attention on masked stimuli of which we cannot become aware. What leads to conscious perception is '*perception*', the conjunction of feed-forward specific thalamic processors and feed-forward non-specific thalamic arousal circuits. The non-specific feed runs behind the specific feed by 40-100ms. Attention then 'modulates' the conscious activity. Walking away from the Bachmann session, **Treisman** told me that she prefers 're-entry' models of what makes percepts conscious. I did not have a chance to pursue her remark, but in her earlier talk she had referred to the binding of the 'where' and 'what' streams as 're-entry'. If this is Treisman's meaning, then she and Bachmann would agree that it is *the binding of two feed-forward paths* (either two thalamic paths or two cortical paths) that creates conscious perception, instead of relying on *feedback* activation. **Irina Harris** (Macquarie) also argued in similar fashion, that

explicit recognition involves a binding of identity to spatial-temporal information, including orientation. In distinction, other scholars (implied in the next paragraph) refer to ‘re-entry’ as a *feed-back* re-activation of early visual areas by later visual areas (e.g. IT → V2 → V1) or even as feed-back re-activation by *attentional* systems. Pinning down these distinct models will be a key step in the science of consciousness.

Perceptual Attention. Many speakers dealt with Desimone’s ‘biased competition theory’ of attention. **Charles Bundeson** (Copenhagen) spoke of the pathways from V1 through V4 to inferior temporal as a ‘selective mechanism’ for competition and filtering out, with activations either increased or dampened as attention resolves the competition in about 100s. **Desimone** added that attention feeds back in a reverse hierarchy, activating inferior temporal (IT) first (about 150ms post stimulus onset), then prestriate, and finally V1 (about 230ms post!); as the higher processing areas ‘recruit’ V1 and even the LGN in the thalamus to get more detail. **Jim Haxby** (Princeton) amplified this in face identity cells: the first 200ms process feed-forward *between-category* information, while later feed-back firing in the same cells code for *within-category* discrimination, implying attentional and memorial feedback. Unfortunately, *fMRI picks up only later processes*. **Steven Yantis** (Johns Hopkins) explored *goal-driven* selective attention in terms of shifts within and across perceptual modalities (e.g., sight to hearing). In all kinds of perceptual attentional shifts, the Superior Parietal Lobe (SPL) is activated – but space, objects, features and cross-modal shifts activated slightly different SPL areas

Face Perception. Haxby built on the message many of us have heard from Nancy Kinswisher about the fusiform *face* area (FFA), perihippocampal *place* area (PPA), and lateral occipital *object* area (LO). According to Haxby, each of these areas is involved in each type of object processing. In terms of face-processing specialties: the FFA processes invariant structural face ‘identity’ information; the superior temporal sulcus encodes face changes through movement to determine emotion and gaze; the auditory area superior temporal gyrus is involved in viewing fearful faces; the inferior temporal encodes both identity and expression; the intra-parietal sulcus is involved in seeing averted gaze; and the amygdala face cells are activated by even neutral expressions, but more so by fearful faces. **Y.J. Luo** (Chinese Academy of Sciences) dealt with neural correlates of face recognition by oriental subjects processing either oriental or occidental faces. In the FFA, the N100 and N170 waves show significant differences between oriental and occidental faces. According to **Ide Gobbini** (Princeton), face familiarity modulates response in the FFA, not in its N170, but in its N400 and P600 responses. Emotional attachment and ‘untrustworthy’ faces activate the amygdala. In possible contradiction, **Jie Sui** (Peking) reported that perceiving *ones own face* generates a greater face-sensitive N170 than other faces. According to **Andy Calder** (Cambridge), the amygdala focuses on processing fear, the insula disgust and the dopamine D-2 ventral striatum anger and aggression.

Age Effects on Face Processing. **Lars Bachman** (Karolinska) reported that older people score as many ‘hits’ as younger in differentiating fearful from neutral expressions, but make more false alarms. While both age groups use their amygdala, hippocampus, and frontal lobes in processing fearful expressions, fMRI scans show more *subcortical limbic* (especially right) hippocampus and amygdala activation in the young during successful encoding and more *cortical* right ventral prefrontal in the aged. Bachman suggested the older persons may be more ‘realistic’, having learned to regulate emotions and integrate emotions and cognitions, processing them consciously, a point picked up by **Gus Craik** in the Q/A. Another questioner suggested this represents a ‘de-reptilization’ in human development — a truly inspiring note for us 60-something academics to hear!

Age Effects on Memory. Related to the previous paragraph, **Denise Park** (Illinois) also showed that older people rely more on the frontal part of the hippocampal-frontal circuits, in experiments where they looked at and held in working memory complex visual pictures. **Shu Chen Li** (Berlin) traces frontal lobe age changes and cognition to a 50% decline in the motivational dopamine (DA) projection from the midbrain’s VTA to D2 receptors in the frontal lobe, a projection crucial to regulate attention, bind context to remembered events, and to use mental representations in the absence of environmental cues. **Fergus Craik** finds that the age deficits in name retrieval involve deficits in self-initiated processing and in remembering the source and context of the names. Divided attention has a stronger effect on *encoding*, while age has a stronger effect on *retrieval*. Attention’s effect on encoding is stronger with conceptual than perceptual material (**Neil Mulligan**, North Carolina). Aerobic exercise by those in their sixties improves declining executive functioning through improving oxygen circulation (**David Bunce**, London).

Memory Encoding During Sleep. We are long past the days when REM sleep was seen as a time for memory consolidation and slow wave sleep a time for bodily recuperation. Instead, each stage of sleep seems involved in various forms of memory consolidation — a fact that I had not appreciated before this conference! **Doyon** linked consolidation of the implicit learning of a motor sequence with the second half of sleep (REM and Stage 2 sleep). Learning to compensate in reaching a target in a force field involves the cerebellar circuits, with a more automatic consolidation, even without sleep. **C. Smith** (Toronto) reported that REM sleep seems to be involved in the consolidation of procedural learning involving heavy cognitive elements (Tower of Hanoi); while Stage 2 sleep consolidates procedural learning involving a simple motor task (pursuit rotor). **Jon Born** (Lubeck) reported that declarative paired associate learning consolidation, involving the hippocampus, occurs best in the first half of sleep — during Slow Wave Sleep. Hippocampal place cells store the acquired learning and then reactivate the circuits to store the information back into the cortex, through the thalamic sleep spindles during the positive phase of slow cortical oscillations. **Phillipe Peigneux** (Liege) summarized several anatomical changes between waking and sleep stages

Working Memory. In addition to **Baddeley's** remarks, **Akira Miyake** (Colorado) distinguished between simple 'short-term-memory' holding-capacity tasks (like digit span) and more complex 'working memory' processing tasks (like reading span). **Nelson Cowan** (Missouri) showed how children move from 'short-term-memory' to more active 'working memory' abilities. **Robert Logie** (Aberdeen) raised an item intriguing in consciousness studies, of 'representational neglect' as dissociable from 'perceptual neglect', which implies that ones "mental workspace" is not a direct link with perception. **Caiqi Chen** (Southern China) looked at the role of working memory content in determining both the location and object of visual selective attention. When a location has been WM-cued, the spatial-location P1 and N1 waves are longer in the lateral occipital-parietal juncture, implying an attention-like modulation.

Theory of Mind and Self-Reflection. **Henry Wellman** charted several stages of the development of Theory of Mind: from 0–9 months children focus on faces and voices; 9–15 mos differentiate intentional actions in others; 18–36 mos understand simple desires; 3½–7 yrs understand belief and desires; 7 yrs have advanced TOM. Both Western and Eastern children have the same framework of TOM at about age 2-3. **Jie Sui** (Peking) dealt with neural mechanisms underlying self-reflection. Perceiving ones own face generates a greater face-sensitive N170 than another's face, with attention modulating self recognition. Thinking about oneself involves the medial prefrontal cortex and frontal pole, with waves from 500-800 differentiating self from other.

Last but not least, a Tucson-Reminiscent Talk. While all of the topics above can be heard at both the ASSC and Tucson conferences and at many of the ersatz consciousness conferences, there was one talk I heard that would only be heard at Tucson. **Maurits Van den Noort** (Nijmegen) spoke on what seemed to be a straightforward topic: 'unconscious information processing of emotions'. In the processing of fearful and neutral faces, the N2 and P3a waves reflect *unconscious* processing, while the late P3b and N4 represent *conscious* processing. Unconscious processing prepares us for an appropriate response, but is quite limited. Then van den Noort moved to the topic that many of us heard Dick Bierman speak on at Tucson in 2002 about finding various forms of autonomic responses 3 seconds or so *before stimulus presentation*. There are many such studies involving galvanic skin responses, activation of the amygdala and evoked potentials in the frontal polar areas — prior to emotional, but not neutral, stimulus being presented — even when careful randomization steps are taken. Van den Noort claims that there is evidence for this in earthworms, single-celled organisms, and perhaps in subatomic particles. *Unfortunately, he did not spell out what kinds of stimuli would lead to emotional responses in these groups!* I wonder if Van den Noort chose the more innocuous title of 'unconscious processing of emotion' instead of 'pre-stimulus emotional responses' in order to get his abstract accepted. Van den Noort stated several times that he does not know what to make of this evidence or even if it is important, but it is clear that one cannot escape 'Tucson' just by coming to Beijing.