WEB WATCH

The brain museum

What does a dolphin's brain look like? And an elephant's? Let's face it, with the exception of a cursory look at a human brain during graduate school, rat and mouse brains are as good as it gets for most neuroscientists. But if you want to expand your repertoire, you should definitely pay a visit to the Comparative Mammalian Brain Collections (CMBC) web site, which features an extraordinary collection of brains from a broad spectrum of mammalian orders. There you will find neuroanatomical information on species as exotic as the manatee or as ordinary as the cow and the pig.

The CMBC site contains complete brain atlases of at least 15 species, which can be displayed as photographs or as movies that allow you to take a quick look through sections of the whole brain. There are also whole-brain photographs from nearly 200 different mammals, most of which are accompanied by at least one coronal section to get a glimpse of the inner structure of these nervous systems. In addition, there is a page devoted to 'paleoneurology' — the analysis of brain endocasts from extinct vertebrates — which provides a useful introduction to the study of brain evolution.

It is clear that the CMBC site is work in progress and that much needs to be done to exploit the full potential of the available material. For example, the brain sections would benefit from some labelling and tools could be made available to allow for direct anatomical comparisons between species. As the collections will soon be moved to the National Museum of Health and Medicine (which itself contains a remarkable collection of human brain sections), their relocation will be a good opportunity to further improve what is already a valuable resource.

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PERCEPTION

Why is the C blue?

Synaesthesia is a weird and, some say, wonderful perceptual anomaly in which stimulation of one sense can cause vivid sensations in another modality. So, for example, musical notes might cause a synaesthete to see bright colours or patterns; or seeing a particular shape might produce a strong taste.

Although these effects have always fascinated researchers, it has been hard to gain any real insight into the processes involved. But Jason Mattingley and colleagues have just published a study showing that, in one group of synaesthetes at least, the abnormal binding of different sensory properties — in this case, colour and form — occurs only after the visual system has carried out the first stages of recognition.

Mattingley *et al.* studied a group of 15 colour-graphemic synaesthetes. These individuals see letters and digits as being a particular colour. The colour–grapheme associations are remarkably stable across time in any given synaesthete, although they vary widely between individuals. This association between colour and form means that people with synaesthesia show a particular pattern of interference on an adaptation of the Stroop test. In the standard version of this test, subjects have to say what colour a word is printed in. If the word is a colour name printed in a different colour (for example, the word 'red' printed in green) it takes significantly longer to name the colour of the print than if there is a match between them ('green' printed in green).

When Mattingley *et al.* tested the synaesthetes on a version of the Stroop test in which letters or digits were printed in various colours, they found that, as had been seen in previous single-case studies, incongruent colours took longer to name than congruent colours.

The question that the researchers really wanted to address was at what stage in visual processing the involuntary binding of form and colour — and therefore the interference — occurred. We know that stimuli presented for very brief periods can undergo some processing in the visual system even if they do not reach consciousness, because they can influence performance on subsequent tests. For example, presenting the letter 'B' (the prime) for 56 ms (too brief a period for it to be consciously perceived) will make a subject slower to identify a letter 'A' (the target) presented immediately afterwards, because of interference between the two letters. Mattingley *et al.* used achromatic letters or digits as primes, and coloured patches as targets. If the prime was presented for 500 ms — long enough for the subjects to consciously perceive and identify the characters — the synaesthetically induced colour influenced their ability to name the colour of the target patch, causing a delay in reaction time for incongruent pairs. But if the prime was presented for only 28 or 56 ms, so that it was not consciously identified, there was no interference for incongruent pairs. So it seems that the synaesthetic colour association is induced only after the initial stages of visual processing.

Although we still know very little about how synaesthesia occurs, the new findings are an important step in understanding the processes involved. And they may also tell us something about how normal 'binding' of the different visual attributes of a stimulus takes place. It is possible that, like the abnormal binding of colour and form in synaesthesia, normal binding of the colour, shape, brightness and other attributes of an object occurs relatively late in processing, perhaps only when the object is consciously perceived.

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References and links

ORIGINAL RESEARCH PAPER Mattingley, J. B. *et al.* Unconscious priming eliminates automatic binding of colour and alphanumeric form in synaesthesia. *Nature* **410**, 580–582 (2001)

FURTHER READING Grossenbacher, P. G. & Lovelace, C. T. Mechanisms of synesthesia: cognitive and physiological constraints. *Trends Cogn. Sci.* **5**, 36–41 (2001)