To see and not to see

Sight Unseen: An Exploration of Conscious and Unconscious Vision
by Melvyn Goodale & David Milner
Oxford University Press: 2003. 160 pp. £25, $49.50

Manfred Fahle

This book was published at the wrong time, I think. Judge for yourself. It tells the story of two patients, D.F. and Ruth Vickers, and their astonishing perceptual deficits. At the age of 35, D.F. suffered from carbon monoxide poisoning caused by a defective Italian gas heater. (By the way, did you know that carbon monoxide poisoning is the number one cause of unintentional poisoning deaths in the world?) As a consequence, D.F. is unable to visually recognize the forms and shapes of objects — shapes seem to "run into each other". This disorder is called apperceptive agnosia, or form agnosia. Nevertheless, D.F. appears normal when walking, even negotiating mountain paths, and so must have retained the ability to use vision to navigate through the world.

Ruth Vickers, on the other hand, suffered from bilateral lesions of another part of the cortex, has unimpaired perception of objects and can name objects presented to her visually. Ruth's motor system is also intact. However, she struggles to grasp objects that she can clearly see — a deficit called optic ataxia. The dissociation of defects in the perception of objects and in handling visually presented objects indicates that two relatively independent subsystems exist in the human brain: one specialized for identifying visually presented objects, the other for visually guiding actions.

Given the the authors' clear and precise language and their stated aim to write an accessible book (which they achieve), this volume is a perfect Christmas present for anyone even remotely interested in the brain. And that's why it was published at the wrong time — you will have forgotten this review by Christmas.

If the description so far resembles one for another book by Oliver Sacks, it should not. *Sight Unseen* is not just a book for readers of popular science, demonstrating how much can be learned about brain function from patient studies; even specialists in neuroscience and neuropsychology could learn something. For example, separate text boxes review specific topics; one lists about ten different brain regions to which retinal fibres directly project. The text, too, contains a lot about cortical specialization that most neurobiologists probably do not know, making it easy and rewarding reading for specialists who are willing to accept that some problems cannot be thoroughly discussed in a book of this sort.

The main purpose of the book is not to describe the surprising symptoms that arise in patients after damage to the brain, but to produce a general picture of brain function. This bigger picture starts with the generally accepted insight that our nervous system has to make sense of the world. Hence, the brain cannot simply reproduce the world but must interpret it. (Who would be there to look at the television screen inside our head?) The authors argue that part of this interpretation takes place at a subconscious level. They claim throughout the book that there is a system for the conscious analysis of visual objects, and a faster one that acts outside consciousness to guide our actions.

This separation, derived from patient studies, makes sense from a computational point of view. To identify objects reliably, the visual system must abstract them from such accidental and varying factors as their position, distance and orientation — a rose is a rose irrespective of its position and distance. When I intend to pick up the rose, on the other hand, these factors become very important. So it makes sense to use one system that generalizes over space to identify objects and another, faster one that only cares about their position and orientation, without worrying too much about their identity or involving the conscious 'I'. Combining both tasks — identification and localization — in a single system would be asking too much.

Don't start feeling smug, though, simply because you have two visual systems rather than just one. In 1973, D. J. Ingle published a paper entitled "Two visual systems in the frog" (*Science* **181,** 1053–1055), and then L. G. Ungerleider and M. Mishkin reported that the same is true for monkeys, in *The Analysis of Visual Behaviour* (MIT Press, 1982) edited by Ingle, R. W. Mansfield and Goodale.

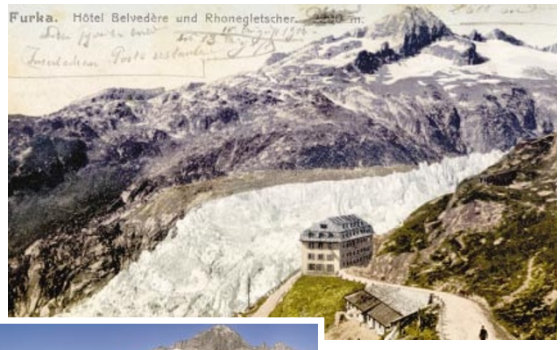
In conclusion, Goodale and Milner emphasize that much of what goes on in our brains, and even in our cortices, escapes our conscious 'I', partly because of the separation of the visual systems for perception and action. As a result, some patients can see and not see — being unable to visually guide their actions — whereas others can navigate visually without seeing what objects are there.

The book illustrates the enormous amount of knowledge to be gained from analysing deficits of specific stroke patients. It closes by stating: "Studying the way the brain reorganizes itself in response to severe damage presents one the most important challenges to neuroscience in the twenty-first century." How true. ■

Manfred Fahle is at the Center for Cognitive Sciences, Bremen University, 28211 Bremen, Germany.

Exhibition

Retreat of the ice giants



They are a playground for summer skiers, a challenge for mountaineers, and their dazzling whiteness under a deep-blue sky is of other-worldly beauty. But glaciers are also crucial for Alpine water balance — and they are a unique indicator of global warming.

Since the Industrial Revolution, glaciers in the Alps have decreased by more than one-third in size and by a half in volume. This dramatic retreat of supposedly eternal ice has now been visualized by a couple of German photographers who are also environmental scientists.

Wolfgang Zängl and Sylvia Hamberger collected hundreds of historic postcards of glaciers in Germany, Austria, Switzerland, Italy and France. They carefully determined the month and time of day when each picture was photographed or painted, and identified the artists' viewing points. Then they took similar shots of the landscapes as they appear today. The pictures shown here are of the Rhône glacier in Vallais, Switzerland.

The results are now on show in the Alpine Museum in Munich, Germany. The exhibition "Glaciers in the Greenhouse", which runs until 16 January 2005, also provides some numbers and diagrams to illustrate the problem of global warming in the twentieth century. But its visual centrepiece, the pairs of old and new glacier photographs, depict much more shockingly what climate change is doing to the Alps. **Q.S.**