

ing or explanatory circumstances than the distinguished DDR historian Hubert Laitko. Connelly was born in 1960; Laitko was born in 1935 and forced to retire in 1992.

Kristie Macrakis's own two contributions reveal a predilection for the spectacular: she notes with some disappointment, in an interesting article on espionage and technology transfer, that real undercover agents rarely have the fantastic adventures that one associates with spying. She has interviewed double agent Werner Stiller (from the Ministry of State Security — the Stasi) and political celebrities such as the late Politburo member Kurt Hager and the legendary chief of the Information Division, Marcus Wolf.

The authors are diverse not only in temperament, viewpoints and expectations, but also in their approach to their subjects. Thus, a primarily sociological account of biomedical research by Rainer Hohlfeld stands next to Eckart Förtsch's theoretical systems presentation about science, higher education and technology policy, based on the interaction of partial systems and on the structure and functions of apparatus. These contrasts make the book readable and colourful.

The present volume can only provide a first step, however, towards a more powerful theoretical conception of the DDR's role in the larger system of science. Meanwhile it challenges both east and west, despite all their differences and disappointments, to continue the conversation. ■

*Petra Werner is in the Alexander von Humboldt Research Group, Berlin-Brandenburgian Academy, Berlin, Germany*

.....  
**Hidden wealth of data in the depths**

**From Monsoons to Microbes: Understanding the Ocean's Role in Human Health**

by the Committee on the Ocean's Role in Human Health, National Research Council

National Academy Press: 1999.  
 \$34.95, £24.95,

**Franciscus Colijn and Sebastian Lippemeier**

Many years ago, a good friend came out of the sea after a swim and looked disoriented. Had he suffered *Pfiesteria piscicida* poisoning? In fact he had lost his spectacles, although nowadays you might pick up that toxic organism when you go swimming in some US estuaries. But on the other hand, the anti-cancer agent is collected from marine organisms. These and various other aspects of humankind's relation to the sea are explored in this kaleidoscopic text, which is



**A multilingual view of the sea**

*Deep Water* (Ellipsis, £16 UK/£19 international) by Julian Caldecott and Melanie Salmon claims to be a celebration of the waterworld. The parasitic isopod shown above is just one of many photographs in a book that is published in English with French and Spanish translations on each page.

The book focuses on the need to protect the sea's fragile and inter-dependent ecosystems. It is produced by the charity Living Earth, which works through hands-on education and grassroots action to help people to resolve local environmental issues and issues concerned with human development. All royalties from the sale of the book will be used by Living Earth to fund marine-education programmes.

suited for every interested reader with a background in natural sciences.

*From Monsoons to Microbes* ranges broadly from the ocean's threats — natural disasters, infectious diseases and toxic algal blooms — to its possible benefits for humankind as a source of new medical and pharmaceutical products, and of marine organisms which can be used as tools for biochemical research. But the extent of humanity's interactions with the oceans is immense: no book can cover more than a fraction of it.

This book makes you aware of the potential hazards, but also of the enormous impact the ocean has on our daily life. After all, our global climate is regulated by oceanic currents and the little-understood interaction between the ocean and the atmosphere. Climatic predictions depend on our knowledge of such interactions. Recent studies have documented that we do not have sufficient insight into the regulatory mechanisms of the oceans to predict potential alterations of

ocean currents, which could lead to a new ice age within 10–50 years, an unexpected sea-level rise, a steady mean global temperature increase of 2 °C or maybe nothing at all. These uncertainties can only be overcome if interdisciplinary studies in ocean sciences continue and the cooperation of biological and physical oceanographers is reinforced.

The ocean's currents can also distribute infectious diseases to humans who eat infected shellfish, via pathogenic bacteria, viruses or toxic algal species. One wonders why these hazards do not cause more problems in coastal communities, especially in the tropics, which are by far the most vulnerable sites for health and climatic threats.

Public health problems arise most often in heavily urbanized coastal areas, where humans still tend to accumulate. This human behaviour enhances all potential hazards such as eutrophication effects, and concurrent toxic algal blooms. Without mitigation these problems may even prove to be synergistic.

New technologies within the framework of the Global Ocean Observing System (GOOS) enable us to improve our environmental observations of the oceans, which have lagged far behind those on land. In turn, this will strongly improve the predictive capabilities of physical and biological operational models.

Furthermore, we know little as yet about the extent of oceanic biodiversity. A wealth of biological information still awaits us (as long as we control pollution) in the form of marine compounds, which may prove to be of medical and pharmaceutical use. Of course, we have to start new research programmes to deal with this information, but there is a fascinating invisible world below the ocean surface. We've already reached the Moon; now it's time to take a better look inside our oceans. ■

*Franciscus Colijn and Sebastian Lippemeier are at the Research and Technology Centre, Westcoast, 25761 Buisum, Germany.*

.....  
**Story of an obsession**

**Prion Biology and Diseases**

edited by Stanley B. Prusiner  
 Cold Spring Harbor Laboratory Press: 1999.  
 710 pp. \$125, £???

**Colin L. Masters**

By my count, this is the fifth time Stanley Prusiner has edited a multi-authored book on the subject of his life-long obsession: the prion, a proteinaceous-infectious particle responsible for the transmissible spongiform encephalopathies (Creutzfeldt-Jakob disease (CJD) and kuru in humans; scrapie and bovine spongiform encephalopathy

(BSE) of domesticated herbivores). Considering that more than half of the 17 chapters are actually co-authored by Prusiner, this is the closest yet to a monograph from his laboratory. And, it has to be admitted, the book is by far the most authoritative introduction and summary of the complex data that form the basis of our understanding of the molecular basis of this esoteric group of diseases. While the human forms of the diseases are rare, their economic impact, particularly in the United Kingdom, has been profound. Moreover, their occurrence is now threatening the normal operation of blood-transfusion services worldwide. Hence the need for such an authoritative book.

The prion field has been dogged by controversy, apparently the result of the long time it takes to generate reproducible scientific data, given incubation periods that can exceed 40 years. The discovery of the prion protein (designated PrP<sup>Sc</sup>) in 1982 as the principal component of the infectious particle revolutionized and galvanized investigators. Prusiner recounts the background to this, and takes us through the following critical decade in which the surrogate properties of PrP<sup>Sc</sup> (insolubility, resistance to proteolysis, increased  $\beta$ -sheet content, polymerization into amyloid fibrils) are elucidated. A certain obfuscation remains over the issue of prion rods and amyloid filaments; since the minimal infectious unit has still not been defined, and because it appears that neither rods nor filaments are required for infectivity, this issue seems to be related to attribution of discovery.

While Prusiner and his collaborators have driven the research agenda of the molecular basis of PrP infectivity, other independent groups have complemented his efforts. The nature of infectivity has been uncovered largely through the application of transgenesis to mice, including ablation studies that prove beyond reasonable doubt that PrP plays the central role in prionogenesis. Interestingly, the recent discovery of a duplicated homologue of PrP may necessitate some re-interpretation of these knockout studies, although leaving the central hypothesis intact. Studies in yeast by Reed Wickner and colleagues show that accessory chaperones (possibly the postulated 'protein X' of mammalian prions) may facilitate the conversion of a normal host-cell protein into a pathogen. Many enigmas remain: the topology of PrP in the cell membrane, the mechanisms underlying nerve-cell degeneration, the partial creation of *de novo* infectivity in overexpressing mutant PrP in mice, and the failure yet to create infectivity *in vitro*.

The emergence of BSE and then the threat of an epidemic in humans caused by contamination of the food chain has assured the future of intensive research of these diseases. The book closes with several helpful practi-

cal chapters on methodologies (including insights into future therapeutic strategies), antibody probes (which may prove essential for future clinical tests) and biosafety issues. The latter area is now of immediate concern, since the general levels of ignorance about the spread of CJD and BSE cause regulatory authorities to respond by containing the worst-case scenario, often with drastic financial implications.

Overall, the volume is virtually a monograph by Prusiner, and as such presents a

very unified picture of the current state of research. It is the best comprehensive overview of this field and is an ideal introduction for anyone wishing to launch a career in prionology. Perhaps the major message would be that Prusiner achieved his successes through outstanding collaborators, most of whom are represented in the book. ■

Colin L. Masters is in the Department of Pathology, University of Melbourne, Parkville, Victoria 3052, Australia.

## Science in culture

### The Brain

A theatre show from Forkbeard Fantasy which will be touring Britain from 6 December and throughout much of next year

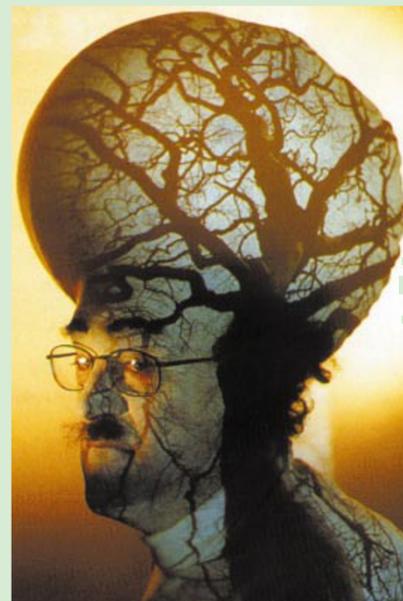
Bonnie Hurren & Robert Meech

Making sense of *The Brain*, an experimental performance from Forkbeard Fantasy, is like trying to make sense of the brain itself. Ronald C. James's well-known photograph of a Dalmatian dog against a dappled background reminds us just how easily the brain finds order in a random world. In the world of Forkbeard Fantasy, on the other hand, anarchy is created effortlessly out of a high degree of order. The technical skill required to mount this mixed-media performance is immense. Video machines, film projectors, neon lights, music, an 'intelligent' lighting system, automated smoke machines (to create a sensation of smell) all work seamlessly to give the illusion of chaos.

*The Brain* was funded in part by an award from the Wellcome Trust's Science on Stage and Screen competition. The nine winners of this, the first year of the competition, each received up to £36,000 (US\$56,500) to develop a production illuminating some aspect of medical science. *The Brain* was written and directed by Paul B. Davies, who has had considerable success on the Edinburgh Fringe — the offbeat offshoot of Britain's major arts festival — as well as on radio.

"Logical thought has no vantage point from which to observe its own workings," according to Davies in his programme notes, "but the imagination can propel the mind outside itself. ... *The Brain* is one such acrobatic enterprise and although we can't pretend that it contains much real science, ... modern scientific knowledge about the brain is the springboard from which we have launched it."

The one cerebral moment in all the confusion is when Emil Toescu of Birmingham University (billed as neuroscience adviser to Forkbeard Fantasy) appears on screen as a talking head to explain the neurophysiological basis of the sense of smell. He ends with a good joke, one of many good jokes during this 90-minute production. Look out for the one about that Dalmatian dog.



But for all the chaos, there are themes. Smell is important in the narrative, as are bees and phantom limbs. And behind all the fantasy there are important points about common oversimplifications made in the name of making science entertaining. Forkbeard use ridicule as a powerful weapon: how do you cure someone with a phantom limb? Answer: cut his head off.

Much intelligence and wit have gone into the production. Most of the ideas are well integrated but a few seem shoehorned into place, which makes for a disjointed narrative. But then narrative is the last thing on Forkbeard's mind.

Forkbeard acknowledge works by Richard Gregory, Rita Carter, Susan Greenfield, V. S. Ramachandran, Sandra Blakeslee, Marcel Proust and the children's comic *The Beezer*. ■  
Bonnie Hurren is a freelance actor and director, c/o Bristol Old Vic Theatre School, 2 Downside Road, Clifton, Bristol BS8 2XF, UK. Robert Meech is in the Department of Physiology, University of Bristol, University Walk, Bristol BS8 1TD, UK. *The Brain* will have its final venue at the Natural History Museum, London, between 16 and 30 September 2000. For performance details write to Forkbeard, PO Box 1241, Bristol BS99 2TG, UK. It is suitable for sophisticates seeking to nourish their inner child.