Book Reviews

Physiological Function in Special Environments

Edited by Charles V. Paganelli and Leon E. Farhi
Satellite Symposium of the American Physiological Society Fall Meeting (1985)
Springer-Verlag New York Inc.
Price £45,50

This work is a compilation of papers delivered at the symposium on Environmental Physiology, held in honour of noted environmental physiologist Herman Rahn. Its publication is five years overdue, although references more recent than 1985 have been included in its update. The book is divided into four parts, with the first part devoted to physiology at altitude, the second part to diving and exposure to elevated pressure, the third to altered G-force, and the fourth to comparative physiology.

In his banquet speech dedicated to Herman Rahn, Ewald Weibel displays a perfect mixture of art and science: *from* ostrich eggs being more economical to take than smaller hummingbird eggs, if one were to prepare for an expedition on a flying saucer, *through* the astonishing likeness of the distribution of the eyes on a peacock's tail fan to some of the curves derived with the O_2–CO_2 diagram, *to* the gill fan of the Indian air-breathing catfish *Heteropneustes fossilis,* whose design compares remarkably with Botticelli's scallop. In Part I, Lahiri (Chapter 1) paints a convincing picture of carotid body manifesting structural, biochemical and functional responses to chronic hypoxia; responses, which affirm that carotid body is truly an oxygen-sensitive organ. While early work on the role of chemoreceptors in ventilatory acclimatization to hypoxia included suggestions of near-perfect regulation of the ionic composition of the ECF environment of the medullary chemoreceptor, additive effects of peripheral and central chemoreception on ventilatory output, and the view of alveolar ventilation as a single function of changes in chemoreceptor ISF $[H^+]$, Dempsey & Smith present evidence in Chapter 2 which challenges some of these ideas. These authors contend that ventilatory acclimatization proceeds either in spite of or indifferently to changes in cerebral fluid $[H^+]$. Further, in these high altitude studies, Stenmark *et al.* (Chapter 3) demonstrate physiological and morphological similarities between the newborn calf at high altitude and the neonate with pulmonary hypertension, and provide a useful animal model for future investigations into the aetiology and treatment of neonatal pulmonary hypertension. In Chapter 4, Cerretelli *et al.* provide further experimental evidence that both aerobic and anaerobic energetic mechanisms, particularly those of the skeletal muscle, are affected negatively by prolonged exposure to high altitude.

Van Liew starts Part II of this book with a computer simulation study and suggests that accelerative pressure does not constitute an important fraction of total pressure for breathing in a dense gas environment. Next, Ohta & Farhi (Chapter 6) provide experimental evidence for diffusion in the gas phase being a limiting factor in alveolar gas exchange at depth. In Chapter 7, Hong & Paganelli examine the physiology underlying the diuresis accompanying hyperbaric exposure (evident even in the complete absence of cold stress). Their fluid balance studies show that a significant reduction of insensible water loss in hyperbaria is primarily responsible for the diuresis. Using certain assumptions, Yount & Hoffman (Chapter 8) determine that a reasonable set of diving tables can be computed from a bubble nucleation model. At the end of this section of the book, Zapol *et al.* show up to 60% increases in arterial haemoglobin values in the free-diving antarctic Weddel seal; with the spleen being suggested as the source of the influx of oxygenated red blood cells.

In Part III, Burton presents data which show that pilot fatigue is a limiting factor in tolerance to sustained low and high G as well as the simulated aerial combat manoeuvre (SACM). And, Leach & Johnson (Chapter 11) review studies of fluid and electrolyte balance consequential to weightlessness, specifically in space travel.

In Part IV, Dejours (Chapter 12) presents such exciting excursions between the physiology of sea-dwellers and that of land inhabitants, that in addition to being informative, it forms an interesting backdrop to the earlier forays into such hinterlands as great altitude (Part I), many fathoms under the sea (Part II), or space (Part III). In examining the efficiency of gas-exchange organs, Piiper (Chapter 13) notes that enhanced efficiency (marked by arterial P_{O2} higher than expired P_{O2} and/or arterial P_{CO2} lower than expired P_{CO2}), has been observed in both fish and birds. But in many cases, the expected high efficiency of the countercurrent (fish gills) and crosscurrent system (bad lungs) is apparently not utilized. Further, in the study of comparative physiology, Ar & Zachs (Chapter 14) determine the rate of O_2 consumption, the rate of CO_2 production, and ventilation of the African catfish *Clariaq lazera* in water and air at preferred temperature and in different oxygen pressures in the water. In Chapter 15, Hammel presents an interesting comparison between the time-dependent, thermoregulatory responses of a dog to thermal stress and the time-dependent responses of a Pekin duck to salt stress. He notes the phenomenon of *homeostasis-embracing negative feedback* in the two responses, and introduces another concept, viz. that such feedback may be enhanced and sustained by positive feedback in the Pekin duck.

It is appropriate that Herman Rahn whom this symposium honours, be allowed the final say in the closing chapter (Chapter 16). Here Rahn invokes Max Rubners' bold 1908 assertions that during the life-span of mammals (whatever their size), their total basal energy

expenditure per kg body mass is similar. He notes that today's evidence still fits this model and can be extended to adult passerine birds; and further that energy expenditure per unit mass of developing avian eggs also fits Rubner's law.

Although this work is specific, it is relevant and of value to researchers in the respective fields. While the editors make no claim to all-inclusiveness, notable in its absence is physiological function in high and low temperature environments; for these, too, form 'special environments' for which this work is titled.

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Parasitic Diseases

M. Katz, D.D. Despommier & R. Gwadz
Second edition, Springer-Verlag, 1988
301 pages
Price DM 128,00

This well-produced book is a revision of the first edition published in 1982 and is aimed at medical students and undergraduate students of human parasitology. It covers the spectrum of parasites associated with man in the different geographical regions of the world. There are five chapters which are arranged not in the expected systematic order, but as follows: Nematodes, Cestodes, Trematodes, Protozoa and Arthropods. Chapter 1 deals with the common nematode parasites of man (53 pp.) plus a further 12 pages on aberrant infections and those of minor importance. This format is repeated in the other chapters which comprise 29, 29, 81 and 52 pages respectively. There are three appendices, I on the examination of clinical specimens (2 pages), II on drug dosages (4 pages) and III on laboratory diagnostic methods (7 pages + 14 more of black and white pbotographs of eggs, larvae, cysts and trophozoites that are likely to be found in samples of faeces, urine, sputum, blood etc.). These illustrations are particularly useful as they include a number of uncommon and spurious infections. The whole book contains 301 pages.

There are several other features which deserve mention: the life-cycle illustrations are skilful wash-drawings and are unusually explicit, the four plates of colour paintings of the erythrocytic stages of the four *Plasmodium* species are also of high quality, the useful inclusion of a section on *Cryptosporidium* because of its involvement in AIDS infections, discussions of the 'new' Lyme disease, chloroquine resistance in malaria and alternative treatment. These are all pertinent to recent developments in human parasitology in South Africa where AIDS and malaria are very real problems and Lyme disease has recently been detected. Reference lists are provided at the end of each chapter and have been updated (from the first edition which I have not seen) so that 50% of citations are post-1975 and 23% post-1982, the year of publication of the first edition.

Inaccuracies have, however, crept into the text. Examples from two sections, those on the schistosomes and mosquitoes, will suffice. The authors draw attention to the incorporation in many of the life-cycle diagrams of reservoir hosts but in some cases, such as the schistosomes, this is misleading. Monkeys are shown as reservoir hosts for both *Schistosoma haematobium* and *S. mansoni*. This indicates, following my understanding of the term 'reservoir host', and those of Bailliere's Comprehensive Veterinary Dictionary (1988) and the International Dictionary of Medicine and Biology (1986), that the human bilharzias of Africa are zoonoses or at least capable of maintaining a focus of infection in non-human primates and so facilitating transmission to man. In fact, *S. haematobium* has seldom been reported from any host other than man and, although *S. mansoni* does infect monkeys and baboons naturally, their ability to maintain foci of transmission is certainly not proven. Also, the snail intermediate host of *S. haematobium* is shown as having a dextral shell whereas it should have been sinistral. Cercarial penetration of human skin is not solely via hair follicles as both the text and drawings suggest.

In the section on mosquitoes, the statement that egg morphology is characteristic for a given species does not apply within the *Anopheles gambiae* complex — a point of practical importance in Africa. The longevity of larval instars is given as up to three weeks but these may last up to six — similar inaccuracies appear in the paragraph on culicines.

Few typographical and spelling mistakes were found but an erratum leaflet included with the book corrects eleven errors and omissions. The text is well written and the quality of the many black-and-white photographs is generally good. One irritating aspect of the authors' style is the apparently arbitrary use of italics for generic and specific names and capital letters for the former.

Notwithstanding these criticisms, many of which are minor and even semantic, this book is a useful reference work and is in several ways a refreshing departure from the hitherto standard accounts of the subject.

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References

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The Unheeded Cry — Animal Consciousness, Animal Pain, and Science

Bernard E. Rollin
Published by the OUP
308 pages
Price: R108,95

This book forms part of a series published by the OUP called 'Studies in Bioethics'. In general, books in this series (for example Kuhse and Singer's 'Should the baby live') have been well received. They represent the growing awareness in society of the moral dilemmas created by knowledge, especially growth of knowledge in the life sciences.

Rollin's book is the first in the series to deal with the ethics surrounding animal experimentation and I must say that it is disappointing. This is not to say that the book is badly written, or that the philosophical discussions are superficial, or that he does not have extensive knowledge of the issue, or that he has not done enough research. On the contrary, all these aspects of the book are impressive. What is not impressive is his approach to the subject. The over-riding impression I got was that Rollin had to create an argument on which to hang the book rather than use the book to highlight important deficits in our current thinking about animal experiments. It is quite simply an absurd notion to suppose that animals do not feel pain or have consciousness, and these ideas are certainly not central to a discussion about animal ethics.

Moreover, Rollin creates his argument using quite unforgiveable techniques, namely the use of anecdotes, sweeping generalizations, 'gee whiz' comments and statements which are simply unbelievable, all compounded by an irritating habit of quoting without referring. In addition the few identifiable references more often than not have nineteenth century dates attached to them. I can safely say that he presents no data whatsoever to support his claims. Consequently only uncritical readers will find solace in this book.

These comments are of special importance for a book on animal experiments. Anecdotes more than any other single factor have brought animal research into the spotlight. His attempt to justify the use of anecdotes — which takes 18 pages of the book — is unconvincing. Moreover, making highly questionable statements as if they are the accepted, conventional wisdom is unlikely to impress the scientists who might have read this book: anti-vivisectionists will no doubt seize them eagerly.

Examples are legion. Can he really expect us to believe his anecdote that many American university students cannot understand why Australians don't fall off the earth, and if that is the case, therefore all American University students lack common sense (p.4). Another trick he uses is to quote always anonymous 'senior' academics. Thus we hear from a 'senior veterinary scientist' (p.7), a 'famous dairy scientist' (p.7) and a 'sophisticated senior scientist' (p.31), or hear about a 'famous incident' (p.126) all of which at least from the comments attributed to them, are none of these. For example can he really expect us to believe that a 'famous incident' in which a 'well-funded researcher' said, 'At what stage do white mice grow up to be rats,' is true, or if specifically true, is generally true of the state of knowledge of all other well-funded researchers? I think not. And can we possibly be expected to believe that a 'chief of veterinary surgery' is not aware that post-operative pain is a consequence of major surgery. If this is the case it is surely a dreadful indictment of the state of veterinary training in America rather than an indictment of animal use. His tactic of using sweeping generalizations is even more ubiquitous. For example we are told that few biomedical scientists know or care much about the animals they use while auto-mechanics, construction workers and salesman know more (p.8). And 'Quite often I run across researchers and veterinarians who deny that animals feel pain'! And 'Toxicologists have no acquaintance with planaria'. And, he 'regularly finds lurid tales of senior researchers caught in acts of fraud'!

I was also concerned to find several erroneous statements. For example he uses the words 'severity of tail flicks' for assessing pain in rats, (presumably to extract the maximum emotional response) when 'latency' is the actual measure used. Also, Descartes features prominently even though his notions of animal pain and behaviour are thoroughly discredited. And 'no amount of data forces the conclusion that a person or animal is healthy or sick'. If this is so then establishment of normal values for, say, physiological and biochemical variables or diagnostic tests, values recognized to be the basis of modern veterinary and human medicine, is a worthless exercise. He also says that glucose tolerance tests are used to assess hypoglycaemia when surely he means hyperglycaemia. He also says (p.154) that the presence of (opiate) receptors implies a function for them. This statement is plainly wrong: human males have oxytocin receptors, but no oxytocin!

But enough. Disappointment is my residual emotion. Here, surely, was an opportunity missed. Here, surely, is a set-back for current efforts aimed at managing the moral dilemma posed by animal experimentation. Read the book for its prose, not its contents.

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