The Editor’s offering

My grasp of the physiology of breath-hold diving has been inadequate to understand how divers have achieved the depths of recent years. The present depth record for the variable ballast category in which the diver descends and ascends a shotline assisted by a sled and a buoyancy aid is now over 160 msw. The contraction from vital capacity of the gas volume in the lungs with compression, some collapse of the rib cage and fluid and blood shifts into the thoracic cavity seemed insufficient to explain why pulmonary haemorrhage did not occur. I was, as I suspect many readers are, unaware of the technique of ‘lung packing’ as described by Simpson and his colleagues in the first paper. This and the other mechanisms described now provide a new basis on which to calculate the limits to free diving. For instance, their subject could theoretically reach over 180 msw depth.

Aural barotrauma is the commonest injury associated with changes in ambient pressure. Whilst generally mild and overcome by good training in ear clearing techniques, severe permanent injury may result. When treating patients in a recompression chamber it is important to minimise harm. Symptomatic aural barotrauma, mainly of a minor degree, occurs in approximately 15% of patients in the facility at which the Editor is employed, whilst Lehmann and Bennett report that, if you look hard enough, nearly half of all patients will show some degree of injury following their first hyperbaric exposure. Their risk assessment confirms and expands on previous work that now allows us to identify with some confidence those patients who are likely to run into problems, combining clinical examination and modified tympanometry using portable equipment.

The move from prescriptive to discretionary medical assessment of ‘fitness’ for diving in recent years has not occurred generally where occupational diving is concerned. It is also not liked by the recreational diving industry for obvious reasons. The inherent problems of existing systems for employed divers based on healthcare-oriented rather than occupational health surveillance are discussed in the review article by Des Gorman. This is an important discussion paper that should be read by all doctors who perform diving medicals for working divers. Whilst much of the evidence to support his arguments has yet to be published, the rationale behind them is compelling. Time and good epidemiological research, of which there is little in the diving industry, will determine the validity or otherwise of this approach. This is a fundamental shift in philosophy to one of risk assessment and management shared by all parties concerned, doctor, diver and employer or diver training agency.

Understanding of the mechanisms of action of hyperbaric oxygen (HBO2) at the organ or tissue level has been a slow process. Simplistic explanations in much of the literature do little to enhance this. The interaction of physics and physiology is exemplified in two interesting theoretical papers previously published by Hills and Flook. Gas-induced osmosis was a concept first proposed to explain some of the phenomena occurring as a result of inert gas switching during a series of deep experimental saturation dives at the University of Pennsylvania in the 1970s. It is here invoked to explain the oedema-reducing action of HBO2. Hills also points out that there is minimal increase in tissue oxygen tension (P tissueO2) in metabolically active tissues.

Valerie Flook expands on this in her modelling of the theoretical changes in P tissueO2 for three tissues representing cardiac muscle, skeletal muscle and skin. Her calculations demonstrate clearly that P tissueO2 changes very little in highly metabolically active tissues such as the myocardium. However, even such small changes may be important for cell survival or function. This does not conflict with evidence that high oxygen tension gradients across the boundaries of hypoxic wounds are critical for fibroblast and other cell activation and migration. Neither is it likely to have relevance to the actions of HBO2 on white cell function that are now believed to be important in treating the vascular endothelial injury caused by intravascular gas.

Trish Batchelor completes her fact-filled ‘travel medicine’ series with an update on vaccination. Many positive comments on her articles have been received from members, and her support of the Journal has been much appreciated.

Those who attended the Madang ASM in 2001 may be surprised that something readable has come out of the entertaining ‘Pugwash’ role-play session. Michael Bennett has created a complex scenario, the critical component of which is ‘shopping around’ behaviour for a diving medical clearance. One of the victims of a multiple diving fatality in New Zealand a few years ago may well have died at least in part as a result of such behaviour, so the story he paints is not implausible. Stephen Grant provides a legal insight into some of the issues raised by this story.

Tony Slark provides us with another entertaining autobiographical snapshot of a diving doctor’s career, whilst Bill Douglas in a letter ‘nails his colours to the mast’ over children and diving. The items on children in the previous issue, including the Editor’s offering, have generated a wide range of responses. This subject will appear again in the December issue, once the contributing authors have had an opportunity to respond. If you wish to contribute to this debate then please write to the Editor.

Michael Davis

Cover page photos:
Left – A common fur seal, Arctocephalinae forsteri, descending in Bligh Sound, Fiordland, New Zealand courtesy of the Editor.
Right – Yasemin Dalkilic ascending after a 120 msw breath-hold dive courtesy of Ideas in Blue/Gido Braase. We seek photographs from members for the front page.