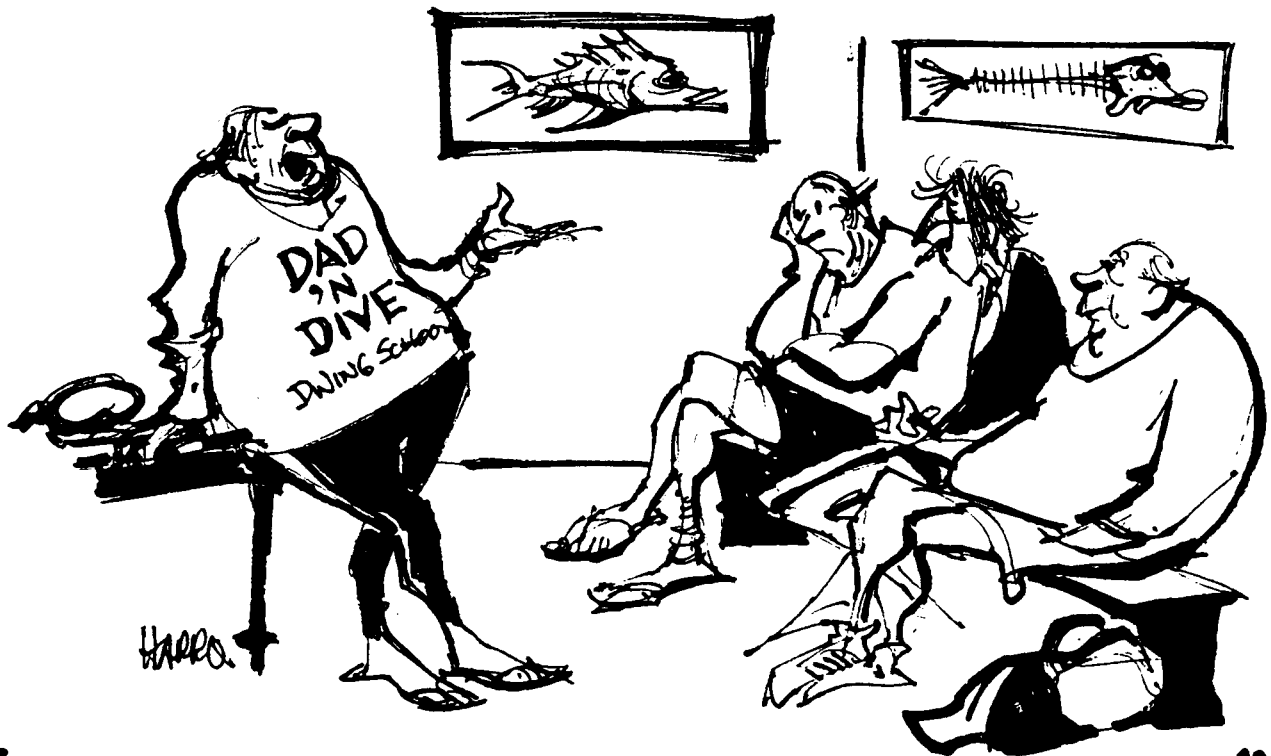


# SPUMS

# JOURNAL

South Pacific Underwater Medicine Society

JULY TO SEPTEMBER 1981



“ IF AT FIRST YOU FAIL YOUR MEDICAL, GET ANOTHER DOCTOR! ”

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## DISCLAIMER

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EDITORIAL

Children are forever being asked "What are you going to be when you grow up?" and however much they may dislike facing the prospect of change they ultimately have to accept its inevitability. The SPUMS Scientific Meeting (1980), the last report of which appears in this issue, found itself raising such matters at the session of The Development of a National Plan. While we are still a "mere" Medical Society rather than a cadet member of the elite group of Royal Societies of Medical Matters, we can still discuss the objectives most desired by members. Should the SPUMS Committee seek to organise Regional Groups, or should members of each region be encouraged to undertake local initiatives, naturally with any requested back-up from the Committee members? Should SPUMS strive to organise Diplomas and lists of these to be accepted as being Approved to undertake Diving Fitness Assessment of Professional Divers, or should some other Authority be responsible for such matters? These and other questions deserve discussion. Are we to be forced into increasing involvement in the regulatory side of diving medicine or can we justify standing aside and by our inaction meekly allow others, with special interests to further, to seize the commanding heights of office. Perhaps it is time to decide whether we are the phyto or zoo-plankton and start the next phase of our existence!

Time of change is indicated also by the approaches made to SPUMS by the Undersea Medical Society and the Australian Sports Medicine Foundation. There are overlaps between the interests of the three groups are differences. Interaction could stimulate members to reassess their ways of thinking and increase the opportunities for exposure to fresh viewpoints.

Diving Fitness receives attention in both the medical and diving training aspects from the

UK Department of Energy. There is now a more flexible, less dogmatic, approach to medical fitness and it is hoped that readers will give thought to the collection of information about those present day divers who dive despite apparent medical contraindications. We have much to learn from their histories, having due regard to the fact that where the exceptional man leads, others may not necessarily follow in safety. In seeking to allow the disabled every opportunity to try anything (in reason) we must not encourage stupid risk taking. Nobody really knows: they may be no more than throwing your baby into the pool!

The paper from Dr Hempelman and his colleagues reminds us of the cautious approach necessary when seeking to advance our understanding of avoiding morbidity associated with great depths, a useful balance to the usual publicity-angled reporting of "New Deep Dive Record". The tensions and responsibilities experienced by those involved whenever any symptom develops must be intense.

The correspondence is welcome as an indication that some people pay the various authors the compliment of reading them critically. It is only by submitting one's experience and opinions to the scrutiny of others that new ideas we have can be critically examined and, if necessary, modified. Please feel free to write to dispute with, or to support, our contributors even if you disagree with the Editor himself.

The next issue will contain the provisional "Project Stickybeak" report for 1980, medical standards for commercial divers in the United Kingdom and Australia, and the medical requirements for sports divers laid down by CMAS (the World Underwater Federation) and the British Sub-Aqua Club. So keep this issue and produce your ideas for the Annual Scientific Conference in Madang in June 1982.

MINUTES OF THE COMMITTEE MEETING OF SPUMS

Held At

Sydney Airport on June 15th, 1981 at 0800

1. Present: John Knight (President), Bill Hurst (Treasurer), Victor Brand, John Doncaster, John McKee.
2. Apologies: Chris Lourey (Secretary), Douglas Walker (Editor).
3. The Minutes of the previous meeting were confirmed; these have been published in the SPUMS Journal.
4. The Secretary's Report and the Treasurer's Report were as recorded at the AGM.
5. Correspondence

A letter from the Australian Sports Medicine Foundation's Secretary, Dr FW Webb, dated 4th March, 1981, enquiring whether SPUMS would co-operate in jointly promoting appropriate courses in instruction to selected groups from sporting and recreational organisations and/or the health professions. A reply had been sent on 17th March, 1981 by the Secretary stating that the request for co-operation would be referred to the next Executive Committee Meeting. After discussion, the following points were decided upon.

1. The Committee was happy to assist the Sports Medicine Foundation.
2. That SPUMS is already doing something for sports divers in organising meetings and the instructional lectures given by individual members and that this should be brought to the attention of the Australian Sports Medicine Foundation.
3. That SPUMS should enquire about affiliation with the Australian Sports Medicine Foundation. The Committee resolved that the Secretary write to the Australian Sports Medicine Foundation along these lines.

A copy of the letter from the Secretary to the National Health and Medical Research Council, enclosing a copy of the Health and Safety at Work (Diving Operations) Regulations was tabled. A similar letter had been sent to the Secretary of the Divers' Association of Australasia.

6. Future Meetings

It was considered necessary that the Society has a meeting in Sydney and Melbourne every twelve months. It would be preferable to have the next meeting in Sydney. The President had asked Dr David Davies of Western Australia to see whether he could organise a SPUMS meeting there on the lines of showing educational films, followed by some lectures.

It was decided that meetings in Australia should be widely advertised using "Impulse" and various AMA outlets as well as writing direct to all members.

Dr Slark has volunteered to organise a meeting in New Zealand in association with that of the Royal College of Surgeons, to be held in

Christchurch from Monday 25th January, to Friday 29th January. Dr Slark would like to have a meeting to which diving instructors and other divers, as well as doctors, are invited. He is also willing to arrange diving for anyone who is interested in diving the Haraki Gulf just outside Auckland. He says that the diving is excellent and because of the numerous islands, can be done whatever the direction of the wind. The Committee agreed as there are a large number of anaesthetists and surgeons in the Society, this would be an excellent way of arranging a New Zealand meeting.

7. The Annual General Meeting for 1982

Guidelines for the selection of the Resort were laid down by the Committee:

1. That there should be adequate conference facilities close to the accommodation.
2. That there should be an adequate number of sea-worthy boats.

The venues to be considered were Madang (PNG) and Fiji. After considerable discussion, it was decided that as a first choice, Madang should be investigated.

It was decided to build the scientific programme around the topic "Fitness to Dive". Dr AA Bove was first choice as guest lecturer.

It was decided that the Annual General Meeting should be advertised, in perhaps such organs as the publication "Impulse", but only some month or two after the brochure had been sent to all members. It is considered that this would be a good way of enlarging the Scientific outreach of the Society.

8. New Members were accepted as detailed on the attached list (not printed).

9. The filing cabinet requested by the Secretary was discussed and the Treasurer was instructed to liaise with the Secretary and spend enough money to buy a filing cabinet.

10. The Australian Resuscitation Council will have a meeting on 18th July, 1981. The President was instructed to ring Dr Douglas Leslie and arrange to attend the meeting to delineate the function of SPUMS and how it fits in to the Australian Resuscitation Council as an Associate.

11. There was discussion on the Diving Emergency Notice. Drs Knight and Brand were to revise the wording slightly and this would involve inserting the word "include" after "diving emergency" and making it clear that when ringing the Diving School at HMAS PENGUIN on the emergency number, the caller must leave a telephone number so that the Diving Medical Officer can ring back. To ensure that it was different from the great majority of notices that go on hospital notice boards, it should be printed in white lettering on a blue background, or even run across a diving flag. The attribution to SPUMS should appear on the poster.

There being no further business the meeting was closed shortly before 0900.

SPUMS SCIENTIFIC MEETING 1980  
SATURDAY JUNE 28th

THE DEVELOPMENT OF A NATIONAL PLAN

Chairman: Dr Victor Brand

This is our final meeting for the week. We have got a very important subject, which is the national plan. This means different things to different people, I think, but to me it means the duty that an association like ours has to the country we live in to provide the benefit of our know-how and expertise to the various people who are engaged in underwater activities. It may sound simple, but it really is a very complicated problem and that is possibly why we have not really done anything about it in the 8 years that SPUMS has been going. Certainly individual members have done their bit by giving talks to dive clubs and so on. But we do need to do more than that, and in order to help us we have gathered four people from widely separated countries who are going to describe their problems in their countries and how they have solved them. Our first speaker is Dr Chris Lourey of Australia.

Dr Chris Lourey

SPUMS is not a single country society, although the executive at the moment happen to reside predominantly in Sydney and Melbourne. Our membership is approximately 350 and is growing at a rate of about 20% per annum. Like any organism in rapid growth we have got to ask ourselves some questions. What are we all about? Where are we going? Where are our responsibilities?

I think our responsibilities lie in the nations in which we are resident. I think there are society responsibilities and also individual responsibilities.

I will outline the picture as it has been presented to the executive, both as a response to requests put to it and as we try to see where we should be going. We have had requests from the various sports diving federations around Australia to provide them with a list of medical personnel who are willing to assist the various sports diving clubs and/or individuals should they be diving in localities outside their own particular town or state. In other words, a regional network, so that if problems do occur they can have an immediate reference to someone. This is going to involve willingness on the part of the members. No member will be quoted, published or printed without his or her express approval. A resume of this activity will be published in the Journal. Everyone will be asked if they are willing to submit their names to the executive. The names will then be promulgated to the respective organizations.

Education in underwater medicine is another area which I think SPUMS is probably going to be involved in to a greater degree in the not too distant future. In what form and associated with whom, we do not know at this stage. We have been fortunate in the past few years to have approximately 10 civilian doctors each year doing the underwater medicine course at HMAS PENGUIN. The Navy has now reduced the number to their initial quota of 5 per course. I think that it is likely that

in the near future, when military requirements place pressure on the facilities of the school, the civilians will be told that there are no further places available. That is if the Australian experience is going to be anything like the Hawaiian experience.

Another area is exposure of undergraduates at some stage in their curriculum, to underwater medicine. Most of Australia's population lives close to the sea and diving is one of the most rapidly growing sports in Australia.

Another area which I think is a long term plan and I am sure John Miller will explain the problems of trying to achieve this even when you have a large population and you have sophisticated facilities available, is to try and coordinate and standardize aspects of treatment throughout the country.

So in summary, SPUMS is growing very rapidly by any society's standards. I think we have to ask ourselves a lot of questions. Concomitant with this rapid growth, a lot of demands are being put on the society for expert opinion. To give you an example. A letter was sent to us asking for comments on recommendations by the Flying Doctor Service on the air transport and handling of diving accidents. These were written by a nurse indirectly associated with the Flying Doctor Service. I doubt that girl has had any experience of transporting diving accidents, let alone that she fully understands the problems involved. Another example, in one of Australia's armed forces, non-medical members of that force are writing a booklet on underwater medicine for the use of their service. Various hornets' nests are raising themselves, and various calls are being made on our society. We, as a group, and your executive in particular, have to ask ourselves what we can do and contribute as much as we can. Like any growing individual we hope our growing pains will not retard our maturity.

Chairman: Dr Victor Brand

I would like to make a few comments. We are a South Pacific Underwater Medicine Society. Nevertheless, we must make an effort on a regional basis. We, in Victoria, will not be able to run what they do in New South Wales or in Western Australia. I think we have got to start at the beach where the patient turns up. It appears to me that we have got to inform people of first contact, which I think will be the local hospital. I visualise a kind of protocol that we could send to every hospital detailing the active first-aid treatment which is pretty simple, the administration of oxygen and fluids, and give them the phone numbers of where they can get further help. We have been going for 8 years now and we have not done anything about this and I think we have been rather dilatory in this regard. Now Tony Slark will tell us what he does in New Zealand.

Dr Tony Slark

I have some worries about national plans because plans always go awry even simple ones like putting a piece of paper on a view-graph. This has been my experience with planning ever since I have had anything to do with it. This is the sort of situation we have ended up in medicine where our planners have got to the

stage where they are busy doubling the number of doctors in the country in both Australia and New Zealand and we cannot really cope with it. This has been a result of national plans. National plans, although they sound very good, smack to me rather of the Soviet system of 5 year plans and getting everything organized. I feel that everybody really rather views these with a certain amount of alarm.

Viewing the matter of requirements for a national plan, I started to think about how we did things in New Zealand. How would I arrange things if I got a country to organize? We have got commercial divers and they should properly be under the care and concern of our beneficent government who should look after their health, safety and welfare. Indeed I think this is the case in most countries where there is any extensive commercial diving.

Then we have got our amateur side, which we are all concerned with ourselves. This, hopefully, is going to be voluntary and not in any way controlled at any stage by government. I hope that we will always manage, if at all possible, to keep the government out of our activities. We have seen what happened when in California, when the Government became unduly concerned about amateur diving and there were all sorts of restrictions suddenly placed upon amateur divers. I would very much regret to see this sort of thing happening in Australia or New Zealand. Now, if one considers that the amateur organization has to be voluntary, and hopefully it will remain so, what should it consist of? There has to be an administration. We have always got to have administrators. They are always with us, like the poor, but never are they poor. Then one has got to have instructors. One has got to have, in most sporting amateur activities, some elements of competition. We have found this to be an extremely valuable way of improving standards of activity in New Zealand. Not merely from spear fishing and the more lethal side of going under water but also from the skills that may be displayed in a competitive fashion such as breathhold diving skills in underwater hockey, for instance. More so perhaps with management of projects that I have set people to work out underwater which have proved to be very popular.

So that there are these two sides to this activity of ours. One commercial, controlled by the government, and the second amateur, which I trust will always be in the realm of voluntary administration. However, diving is somewhat different from other sports in that there is a tremendous interface between what is commercial and what is amateur because of the extent of the mechanical input required to act in our marine environment. You have got to have a load of expensive gear, and it gets more expensive all the time. As it does so does the commercial interest in the amateur activity become more significant. It also does in instruction. Although administration and competition may remain a local activity, it is likely that commercial influences will become stronger, particularly in instruction.

In New Zealand we have got in the Government side of our overall national plan, various Government agencies concerned with commercial diving. The Department of Labour, and the Department of Health in New Zealand

stand together to provide a list of designated medical officers for commercial diving operations all of which must employ somebody who is on the list of designated medical officers. This list of designated medical officers is vetted and those who wish to become members of this list must show their interest by becoming a member of the Undersea Medical Society. We hope that we have increased the membership of that society because of this requirement. After all it seems reasonable to suggest that people who wish to be concerned with diving activities display some specific concern with it and the scientific side of it. Now we will certainly try to ensure that, because of the advice of SPUMS in the last two or three years, membership of SPUMS will also permit somebody to be on the list of designated medical officers. Other departments are concerned with divers. The Department of Energy is concerned with those that are diving offshore on the rigs. They have a medical adviser. The Department of Agriculture and Fisheries also have a medical adviser. There is some military and naval direction of divers also.

Going on to the voluntary side of things, there is a national body. We have in New Zealand an underwater association which is the only administrative body of divers in New Zealand. We are lucky. I think it is impossible to imagine that there could be a national body in a larger country than ours. I think New Zealand is fortunate in its geography and population that it permits of a national body. It thus possibly permits a national plan also. We have a population of just over two million and I think it is because of this that we can sustain and manage properly a national body. I am inclined to think that Australia, with its many states, the United States with its many, many more states could not ever have a national amateur association. I suppose it is not impossible but I just get the impression that historically it is too late. We are lucky that we do have a national body. Now the national body controls the instructors, it has a sporting committee, it has a scientific committee. There is also a place, I think, for specific interest bodies. For instance the Underwater Association in the UK caters for many of the things that are not really covered by the British Sub-Aqua Club which acts as a sort of fatherly overlord in Britain and elsewhere to diving activities, and in much the same way as the NZUA. In Victoria, I believe, you have a cave diving association which vets peoples' ability to dive in caves.

We get to a stage where we have all these bodies requiring various advisers. The National amateur body requires a medical adviser or advisers. It would be better I think perhaps if it had a medical advisory committee like the Surf Lifesaving Association. That has a very active medical advisory sport committee which has been given a great deal of significance by the Surf Lifesaving authorities. Our NZUA has a medical adviser. The Navy requires a director of its medical services. This is an ongoing position which regardless of personalities will continue to exist directing much of the naval and military side of diving. The Department of Health requires

a consultant, the Department of Labour requires a consultant and the other government departments also require a consultant. These people I see as a basic requirement for national plans. Then I realized that I was medical adviser of the NZUA, Director of Naval Medical Services, Consultant to the Department of Health and Consultant to the Department of Labour, and I realized that if there was a national plan in New Zealand, regrettably I was it, and the extent to which it fails is my responsibility entirely. I am willing to receive all the bricks that you may throw at me, because I reckon they are my fault and deservedly cast in my direction, for which I now apologise.

Chairman: Dr Victor Brand

Our next speaker will be John Miller who will describe how things are done in North Carolina.

Dr John Miller

I will be talking about the whole of the United States as a broad overall sort of picture. You will appreciate that the United States consists of some semi-autonomous states that muddle along according to their own individual constitutions. Consequently, there is no possibility of having a well conceived, well executed national plan for all aspects of diving. In fact the aspects of diving in the United States are so diverse and represent such a wide spectrum of views and concepts that there is no way of getting any of these coordinated or put together in any shape or form.

Some years ago I was Chairman of the Diving Safety Advisory Committee of the University of Washington. Mike Davis followed me as Chairman of that committee for a short while before he left the United States. We had a difficult time getting the thing put together in some way that would allow diving associated with university research, in our university system, to interact and integrate in an equitable fashion with the university system, for instance in California. It was fortunate that at the time Glen Egstrom was the Chairman of the University of California's Diving Safety Advisory Committee and we were able to work out some sort of commonality of approach. Even then there were all sorts of differences in state legislation that made it very difficult for the different university groups to get together to work in the same areas. That situation has not changed.

In terms of diving and medical affairs and scientific affairs, there was several years ago, an attempt to put together a national plan of sorts. This was about 1975 or 1976. The national plan was totally oriented towards scientific aspects. Questions such as where diving and hyperbaric research were going? What were the key areas for future research? Things like that. There was no accent at all within the national plan upon caring for diving accidents and the co-ordination of their management. Through its activities, and in particular due to the efforts of the Executive Secretary, Dr Charles Shilling, the Undersea Medical Society has become the only national group with significant

underwater interests in the United States. It has become a sort of referral centre for a whole spectrum of things. The Undersea Medical Society is an international organisation like SPUMS and the differences between catering for national requirements and the international aspects cause a certain number of problems. Most of the members of the Undersea Medical Society are, however, resident in the United States. About half our membership now consists of physicians with practices in a whole variety of medical subjects and who do have an interest in diving medicine, like most of the members of SPUMS. The other half consists of people involved actively either in research or looking after patients who have diving accidents, or involved with naval or commercial affairs.

The Undersea Medical Society has a number of roles to play in diving medical affairs and diving medical research and one of the most important roles has been to form a focal point for Government sponsored contracts. One of the most recent contracts which it has undertaken is to be involved in the development of a co-ordinated network for the treatment of diving accidents. What they have done so far is to ensure that facilities around the country that are available for the treatment of diving accidents are in fact present, are adequate for the treatment of diving accidents, are adequately staffed and have adequately trained medical coverage. With that basis they have reported back to the variety of Government agencies particularly the National Oceanographic and Atmospheric Administration who are in the process of writing up a contract to establish a permanent national diving accident network. We at Duke have been invited to be the recipients of that contract, with myself as the Director of it, with the idea of establishing a central registry of trained medical specialists, a list of chamber facilities and their staffing arrangements, and to have advice available on the telephone 24 hours a day.

Within the Bell telephone system one can jump into the nearest call box, put in 20 cents and dial a given number code which gives access to a particular arrangement. In this case it would be the National Diving Accident Network wherever it may be in the country. For these purposes the United States has been divided up into seven regional areas, each with a major regional centre active in diving research and active in treating severe injuries. These people can be a regional resource and they also will know where the nearest facilities are for any diving accident. The central registry will be available on a consultative basis and to provide details of information about the regional centres. This whole thing is in the process of being set up. In fact while I am away the contracts will be written so I do not yet know how it is going to work. The upshot of this all is that in fact the United States is in a far worse position, from the point of view of looking after diving accidents, than many other countries in this area.

For example, for the last 5 years I have been involved with the facility at Duke. At the same time I have been providing primary medical coverage from 3,500 miles away to the

hyperbaric facilities in Seattle. The same sort of thing is true for the sort of thing that Jefferson Davis was doing, when he was at Brooks Air Force Base, providing all sorts of coverage and consultative coverage for a wide spectrum of places throughout the United States. It is time that we got all that together and started doing things in a more coordinated fashion, which is what we are attempting to do now. When we try and do something like this we run into a wide spectrum of problems. For example, the Food and Drug Administration in the United States exists primarily to prevent people like pregnant women receiving drugs like Thalidomide. However, the nature of bureaucracy is such that even things like high pressure chambers are now regarded as medical devices. Each chamber may now have to be demonstrated to the Food and Drug Administration to be a safe device, presumably even for pregnant ladies. That means that all the equipment that is used may have to receive some extra Government stamp, which is going to cost a lot of money. We have burgeoning bureaucracy that attempts to get into every aspect of our lives. This tends to complicate the issue particularly when the Government organisations are at a national level, a state level, a county level and a municipal level and all of them vie with one another to make life as complicated and as difficult as possible. So you will understand in that sense why we are necessarily going to lag behind countries like Britain and New Zealand and perhaps Australia. But I suspect that the Australian scene is going to end up like our own, except a little less complicated. However, I guess within a year or so whoever sits where I am sitting now will be able to report to you on how our national plan is going for looking after diving emergencies.

Chairman: Dr Victor Brand

That was a fascinating description of frustrations in a huge country. I think it is a lesson to us that we should keep our contribution to our Australian states simple and as free from other organisations as possible. Now I will ask Jimmy How to let us know how things are in Singapore.

Dr Jimmy How

In Singapore we are now looking at a mass transit system. As well as a surface train system, we intend to dig tunnels throughout the island, so it will have to be partially a tube system.

For the first time the Government is looking into separate regulations for controlling caisson disease and the safety of all people working in compressed air. It is interesting why we are only now starting to look at regulations.

When we finished our training in diving medicine we returned to Singapore and we wanted to start writing safety regulations. But in Singapore the control of diving has a very strange problem. Singapore supports all the diving companies and provides the infrastructure. We have huge factories. Diving companies build chambers in Singapore. You can see all sorts of chambers in Singapore from the cylinder to the completed article.

They bring them to Singapore, they plumb them in Singapore. Singapore is the centre for all the divers throughout Asia. Divers fly to Taiwan, to the Philippines or Indonesia, and back to Singapore for R and R. The strange problem is that the diving is not in Singapore waters. Therefore it is irrelevant for the Singapore government to say that they must have a chamber, that they must do this or do that for the diving is not in Singapore. So that point was shut in terms of safety and we were left wondering whether it is necessary to create a plan for them. After all they must do medicals, they must be physically fit. But then again regulation is not necessary. All the divers are covered by insurance and they would rush to have their medical every year. They want to keep in date since they are covered by insurance only when medically in date. So from the government point of view, that particular control was not needed. We did not come up with a national plan to control the diving scene.

Now amateur diving is where we run into a problem. Some of you might have noticed me wearing a crest - it is that of the underwater federation. We have tried for a long time to persuade all these clubs to come together in a federation and then have some form of control over them. We have never been successful. There is so much politics within the underwater federation that it is really ridiculous. People who sell things, the dive shops, tried to come in, tried to control the federation. People want to push sales, to push the retail side or to push the instructional side. They could not come together. I would say that, much like in Australia, sports diving is really increasing. More and more people are taking up the sport. And we would like to popularise it for the time being. Even now we still cannot find out exactly how many diving clubs there are. We have not been able to set up formally anything to give encouragement. I would agree with Tony Slark that the moment we push too hard for governmental control then you are going to find the diving scene fragmenting.

So that is basically the two scenes that you are looking at, the governmental side and the amateur. On the governmental side, once we have formulated working regulations for the fishermen divers I think we will advance to a very simple plan to develop some kind of low key control. Why low key? Because I do not want to push all the divers away from Singapore. The only dangerous people are the Japanese. I do not know why they do not have a chamber when they have so much money. They are queer people. They work around South East Asia but they do not bring a chamber. I have treated at least 8 cases of Japanese divers coming in screaming with pain in their joints because they do not bring their chambers with them to the dive sites. They also use strange decompression tables.

Now to look at the basic problems we are discussing tonight. In 1972 I was down in Australia. The idea of SPUMS actually started when we had the Asian doctors coming down to HMAS PENGUIN for training. Why did we push the idea of SPUMS? Because we feel that in South East Asia, using that to cover right up to Singapore and Malaysia, we have a lot of divers

going down to learn from the Navy in Australia. We thought it would be a good idea to have an Underwater Medicine Society. Some of you may remember we do have regional representatives. We do have them and I was supposed to be the regional representative for Singapore. Every year since we got started the convention has been held down South. Because of the costs of getting there we from South East Asia have not been able to come to the meetings. I do not know why, but the regional representatives have been chopped off. Now so we disappear from the scene, from the South Pacific Underwater Medicine Society, but I assure you we want to live.

Another reason I push the idea of regional things is because we wanted Australia to start the first diploma and certificate of competence. We looked around and saw there was nowhere else in the world that could provide the training. In fact, frankly and truly, Australia so far provides the best training in Diving Medicine. I have looked through the American syllabus. I have looked through some other syllabuses in England. I think the Australian syllabus is very comprehensive. We have a good syllabus down in the School of Underwater Medicine in HMAS PENGUIN and we get hyperbaric knowledge from Prince Henry Hospital. I think the school is excellent, first class as far as we are concerned. We go down there for the advanced course and we talk about saturation diving and this is excellent. And we like to push that training at home. That we do have somewhere in the world that is really good, some really good teaching. So finally we disappear from the scene.

Now I am speaking for another country. We are trying to tell you our problems and see whether you can feel them and restart the original idea again. We need standardization. Standardization in the way we examine divers. We need standardization in the way we develop chambers. You would be surprised at the different technologies of creating chambers, at the differences between lock on facilities. We need standardization so that, for instance, somebody in Singapore can be moved under pressure to another locality if our chamber is not working. So that a patient can be locked into any chamber from any transportable chamber. We need standardization of that nature. Then also standardization of the training of divers.

Now a body like SPUMS if we are big enough and strong enough can influence our governmental bodies. Although we cannot do much to push within government we can influence by standardizing all this medical approach. We can move around in terms of international conferences, around each country every year. Certainly from these conventions we can consolidate and have such a common approach that it would benefit the region as a whole. I feel very strongly that a strong body such as SPUMS with enough membership, could fly the executive members of SPUMS to South East Asia to meet with the regional representatives. And fly the regional representatives to meet the executive members for the AGM and good

discussions. I do not think that it is so difficult to solve that. For instance, in the United Kingdom they have their meetings throughout the world. The United Kingdom had a meeting in DCIEM (Defence and Civilian Institute of Environmental Medicine) in Canada. I attended that meeting. All the tickets to fly there were paid for by the general membership. So we can meet together throughout the world. I cannot see why SPUMS cannot extend this to the region around here. We have regional representatives and within the region we will have our own committee. This committee can then take direction from the main body. Maybe I am just saying a wild idea, perhaps anyone of you can pass some comment here.

Dr John Knight (President SPUMS)

The demise of the regional representatives was my fault. When I took over as Secretary, there was no paperwork handed to me at all. Nowhere in the constitution was anything written about regional representatives and you, Jimmy, were the only one who ever bothered to write and say that he was interested. So, I just let regional representatives die quietly. We can easily resurrect them. It is a two-way business. The regional representative has got to be active as well as the Society appointing a regional representative. It was the inactivity of the other regional representatives that led me to fail to notify them that they still existed.

Dr Chris Lourey (Secretary SPUMS)

A further comment. I have alluded before to what was a bandaid era. In the middle seventies there were problems in SPUMS and due to the efforts of the people on the executive like John Knight and Victor Brand, the society was held together to a stage now where we are growing rapidly and are mindful of the responsibilities which Victor has mentioned, Tony has mentioned and Jimmy has mentioned. One of the reasons of having a panel such as this was to resurrect the whole concept of having regional representation into the society and into the executive. This not only assists those regions, but I think it is assisting the Society in general.

Dr John Miller

One of the most fruitful elements of the Undersea Medical Society in recent years has been its utilization of workshops to look at very specific problems. This is where a group of something like 10 to 12 people, it gets unmanageable if you have more than that, from if necessary different places in the world, meet under a chairman to work out the details of a specific problem. It may be a regional problem, it may be a research problem, it may be a technical problem, it may be a physiological problem. We have found in the Undersea Medical Society that money has become available from a wide variety of sources for this work. One workshop recently was on when a commercial diver should return to work after a diving accident. That was partially funded by the Unions, as they are involved with the divers,



and partially funded by the National Institute of Occupational Safety and Health. Another workshop I was involved in was on the treatment of serious decompression sickness. Fructus, who provided the treatment data that I mentioned, was brought over for this workshop. It was funded by the National Institute of Occupational Safety and Health, the Navy and the National Oceanographic and Atmospheric Administration. So different groups are likely to have money for specific problems. Nobody puts up any money for dilute broad based things. But I would suggest to you that you might consider that among the membership of SPUMS, and internationally beyond SPUMS, perhaps there are people who can help a small group with a particular problem. A problem like the standardization of chambers, which is one of the most important elements, but none of us seem to be able to agree and yet all of us agree that we should have standardization. All these things lend themselves to that sort of provision.

Chairman: Dr Victor Brand

This has turned out to be a very interesting meeting indeed. Besides discussing the provision of our knowledge and expertise to the public, it has also turned out to be a survey of the Society and what our basis is and what our aims might be. I thought Jimmy How's talk was most inspiring. Are there any comments or questions from the body of the hall?

Dr Darrell Wallner

I would just like to reiterate. I think we certainly should take an educative role upon ourselves. I think we should certainly outline first aid treatment which is simple and effective. We should publish it in the right areas, such as sending it to all public hospitals. I think also it should go to all professional dive schools. I think the other group we should approach should be medical graduates. As we know there is little knowledge of diving medicine. It is badly neglected in University education. Unless you have got an interest you are totally out of your depth both with diving accidents and the examination of increasing numbers of pupils appearing with the blue forms that John Knight mentioned the other day. He has done the basic work here on simplifying that form for doctors, and I think that should be promulgated too.

We should publish what is really necessary for the examination of sports diving. And much more so what is important, for the average GP would not know what is important, whether ears, eyes, nose or throat.

I think that sort of information ought to be promulgated but how do you get it to the majority of GP's in our country? Margaret feels that the way this could be done effectively for a wide number is through the Australian Family Physician, which is sent to every doctor. Its distribution includes undergraduates. There are two possibilities. One is an insert type simple first aid protocol and an explanation outlining the important points for a physical examination form. Now that could be done through the Family Physician

through Margaret's own contacts with the Faculty Medicine Programme. The other viewpoint is that an actual edition on diving medicine would be done through the Family Physician. That needs twelve months' preparation. In other words, if you ask them 12 months ahead they will do a specific issue for you. Margaret did have an issue in which she wrote about adolescents. They would quite possibly have an issue on diving medicine for us. A special edition would require a fair amount of work. But an insert would be more instantaneous and could be put in. I think it would be worthwhile because you have got to reach a lot of people immediately. This is the only way I can see to do it.

Dr Jimmy How

Can I just come back to the Australian scene? I think it is important from now on to be ready. As we see it from the outside you have three recognised bodies who could set up to speak for diving medicine in Australia

1. SPUMS
2. The School of Underwater Medicine, HMAS PENGUIN, with the research going on and the authority there and all the back-up for what they do.
3. The Diving Medicine Centre in Sydney. They are people who are very well known - Carl Edmonds, Bob Thomas and Chris Lowry.

I wonder whether there could be in any way some kind of fusion - some kind of tie up that could come up with something. I can see confusion if somebody is going to publish and another body is going to disagree. Let us see if we can have a fusion and get on with a national view from Australia.

Dr John Knight (President SPUMS)

The situation is rather like Jimmy's diving clubs. There are personalities involved in this exercise. All the people you have mentioned are members of SPUMS, but we do have problems in getting them to write to us and when we ask them to do something. Naturally enough the Diving Medical Centre is busy earning its living in private practice. The School of Underwater Medicine has too much work on its plate. It has been understaffed for the last 5 years, and it has a large research programme that they cannot keep up with. It has a large number of divers to look after. Then on top of that, as emergencies, it treats diving accidents. The members of the SPUMS executive are all in private practice and have to earn their livings. I agree with you that it would be absolutely ideal if we could everybody to agree. But even with Bob Thomas and Carl Edmonds talking about diving problems, they disagree. As one trained the other, how are we going to get a perfect result? I think we are going to have to settle for a near-enough consensus. If we follow the principle of drawing from worldwide experience and adding an Australian flavour, we should be able to come up with something that is acceptable in Singapore.

Dr Chris Loury (Secretary SPUMS)

The new member of the executive this year is Beryl Turner. She is the Officer in Charge of the School of Underwater Medicine. We hope that with Beryl on the executive and with dialogue between SPUMS and the Department of the Navy there can be very close liaison but certainly there is no direct linkage. I think that if we cannot get all three of the people you mentioned to take an active role we should probably be able to get two out of three, which will be better than one out of three, which is better than none out of three.

Chairman: Dr Victor Brand

Before I close the meeting I would like to say that my opinion is first things first. We ought to make up a protocol on the lines of what John Miller has told us. A very simple thing, the provision of fluids and the administration of oxygen and aspirin. If we circularise notices to all casualty wards in all hospitals with the telephone numbers of a certain number of knowledgeable doctors we will have at least started to carry out our responsibilities.

*The Executive has carried out Dr Brand's suggestion and prepared a simple protocol in the form of a poster for Hospitals and diving clubs. The proposed design is printed opposite. There is a space provided for local contact instructions so that places where there is already a diving accident network, such as Western Australia, can put the appropriate instructions.*

*The April 1981 issue of "Undercurrent" carried an announcement headed "Diving Emergency Dial 919/684-8111". By dialling this number at any time of the day or night and asking for DAN (Diving Accident Network) anyone in the USA can get immediate help for the treatment of any diving accident.*

*The National Oceanic and Atmospheric Administration (NOAA) has given a two year, \$270,000 grant to Duke University to establish and run the network which, as Dr Miller mentioned at the SPUMS conference last year, advises and puts the patient in touch with the nearest hyperbaric facility.*

#### REPRINTING OF ARTICLES

Permission to reprint articles from this journal will be granted on application to the Editor in the case of original contributions. Papers that are here reprinted from another (stated) source require direct application to the original publisher, this being the condition of publication in the SPUMS Journal.

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Editor, SPUMS,  
PO Box 120  
NARRABEEN NSW 2101

#### MANAGEMENT OF DIVING ASSOCIATED PROBLEMS IN WESTERN AUSTRALIA

Harry Oxer

The management of diving associated problems in Western Australia is complicated by the large size of the State, almost one-third of the Australian land mass, very long coastline and the distances involved in communication and transport. In addition the total population is relatively small, though divers operate both for commercial reasons and as sports divers in all areas of the coastline of the State.

Sport diving is, as elsewhere, a rapidly growing leisure activity and divers are becoming more adventuresome. This leads to diving in out-of-the-way areas, where transport and communications are particularly difficult should there be a problem.

Commercial diving is increasing rapidly in association with the off-shore oil and gas exploration but is catered for separately, mainly by the provision of recompression facilities in association with exploration and production platforms.

Other commercial diving involves the pearl divers in the North West of the State around Broome and abalone divers who currently operate mainly in the extreme south and along the coast near Esperance, as well as in many other areas around the coast. By their nature the latter tend to operate in small groups and away from support facilities.

For a long time there were only loose arrangements for the management of diving associated problems. Most divers were aware that a two-compartment naval recompression chamber existed at the RAN base at HMAS LEEUWIN in Fremantle. As a result sufferers would arrive there at any hour of the day or night and hammer on the door!

HMAS LEEUWIN is a training establishment for young sailors and has no requirement to provide a 24 hour capability. As a result, on a number of occasions, patients would arrive when there were no staff or facilities at the base.

In 1978, as a result of this, simple protocols were written based on Fremantle Hospital. This hospital is the teaching hospital closest to HMAS LEEUWIN and the protocols were developed in association with the Commanding Officer and Royal Australian Navy authorities and the West Australian Medical Department.

They consist of simple instructions to diving clubs and divers of who to contact, what information to give, and how they could obtain advice and transport. Other protocols were arranged at the receiving end, in the hospital, for the telephonists receiving the message, the emergency department staff who would be receiving the phone call and the procedure was laid down for identifying and contacting expert advice.

# SCUBA DIVING ACCIDENTS

*can include:*

*• decompression sickness*  
*• pulmonary barotrauma*

## FIRST AID FOR BOTH OF THESE:

1. OXYGEN
2. FLUIDS
3. ASPIRIN
4. OBTAIN EXPERT ADVICE

### CONSCIOUS PATIENT

- 100% O<sub>2</sub> mask. High flow
- Fluids — salted and sweetened 1 litre/hour
- Two tablets of aspirin

### UNCONSCIOUS PATIENT

- Intubate O<sub>2</sub> 100% High flow
- I.V. fluids (saline or Hartmann's Solution) 1 litre/hour

### LOCAL CONTACTS

Duty Diving Medical Officer  
R.A.N. School of Underwater Medicine  
02-960 0444 (0800-1600 hrs)  
02-960 0321 (after hours)  
Please state:  
— The diving medical emergency  
— Ask for the Duty Diving M.O. to be contacted  
— Give your telephone number

Other protocols outlined initial management of a diving casualty arriving at the hospital. They emphasised the need for a full neurological assessment, provision of oxygen, intravenous infusion, and simultaneous activation of an agreed call-out system for the operators of the RAN chamber facility at HMAS LEEUWIN.

When the chamber is ready, the evaluated patient is transferred for recompression therapy in the Naval chamber. Following completion of recompression he is transferred back to Fremantle Hospital for observation or continued care, either in the intensive care unit or ward facility.

This system has worked well in most instances though, due to the relative infrequency of such accidents, by Murphy's Law it is always possible for everyone to be in the wrong place when such an accident happens. Murphy's second law of diving states that "All diving accidents happen on a holiday weekend, away from all forms of communications, when almost all the people involved in possible management are away on holiday or conference visits".

Patients have however entered into the system and been managed in accordance with the protocols on many occasions. Delays in getting the patient to the treatment facility are normally due to the distance involved rather than failure of the protocols.

The protocols have recently been revised and re-issued. The Royal Flying Doctor Service (WA Division) has two pressurised aircraft which are preferentially used for transporting patients by air if this is necessary. Because of the lack of high terrain in much of Western Australia, unpressurised aircraft may be used successfully without incurring a significant altitude penalty.

A number of initiatives are under discussion or in progress including replacement of the ageing RAN recompression chamber and the possibility of a civil recompression facility being established. Other recompression facilities may be established in the North-West of the State in association with the developing off-shore industry and could be available for use in an emergency for civil diving casualties. It is planned to increase the number of doctors in Western Australia with expertise in this field by the provision of training programmes.

#### WATER BABIES

Human adaptability, demonstrated everywhere by the many cultures and sub-cultures existing even within any single country, is well exemplified by the successful expectation some parents have that their babies will swim. According to a press report, unfortunately not confirmable, a Moscow centre has taken the process to its "logical" conclusion and delivered babies underwater. This is held to increase their brain power and all round physical abilities.

Mr Igor Charkovsky, leading the project at Moscow's Scientific Research Institute for Physical Culture, has said that twenty volunteers have given birth under water in experiments over the last two decades. In the mid 1970's four women wearing aqualungs were delivered at a depth of about 6 metres in a specially sealed-off section at one of Moscow's swimming pools. The other deliveries were undertaken in glass tanks in clinical surroundings. All the babies were said to be thriving. It is said that lack of funds, and lack of full-hearted support for the undertaking on the part of the medical establishment, have hampered the experiment. Such medical caution is completely understandable. The sub-specialty of Underwater Obstetrics is likely to remain an esoteric calling for a considerable time to come.

On what may be, in comparison, a more conventional introduction of the young to water activities most readers will be aware of the activities of groups seeking to train babies to swim. The age of such pupils may be as low as four months, as was the case of the Timmermans in the mid 1960's, but is more frequently over twelve months. It is now revealed that Igor Charkovsky had a daughter while he was still a student at Moscow's Institute for Physical Education. She was 1,600 gm at birth and he gave her special attention. This was about twenty years ago. He made a bed for her in a bath filled with warm water, in which she was taught to swim and dive. At six months she swam and dived quite freely and seemed much better physically developed than her age-mates.

There are now seventy one swimming and body-hardening schools functioning in Moscow alone and twenty five swimming centres in other cities. Any baby can be admitted, the only condition being that the baby should be under three and a half months of age, as at an older age the baby's swimming reflexes have faded and are hard to recover.

Depending on their capabilities, newly borns are initially trained in ordinary baths, later passing on to a swimming pool. It is claimed that such babies are less liable to illness, start walking earlier and are hearty eaters. It is held that this super-early training retains the newborn's ability to breathhold and to utilise anaerobic metabolism. So far as is known, such early training is not practised in other countries.

*We are indebted to the Press Attache, USSR Embassy, Canberra, for much of the above information.*

#### SUBSCRIPTIONS

Members pay \$20.00 yearly and Associate Members \$15.00. Associate Membership is available to those neither medically qualified nor engaged in hyperbaric or underwater related research. Membership entitles attendance at meetings and the Annual Scientific Conference and receipt of the Journal/Newsletter. Anyone interested in joining SPUMS should write to the Secretary of SPUMS, Dr Christopher J Lourey, 43 Canadian Bay Road, Mount Eliza, Victoria, 3930.

SPUMS 1981 ANNUAL GENERAL MEETING

The SPUMS Annual Scientific Meeting was held at the Argao Beach Club, Cebu Island, Philippines, from 4th to 12th June.

On Wednesday 3rd June, the SPUMS members left Melbourne and Sydney, flying by Philippine airlines to Manila. Manila airport was hot, very different from Melbourne. We were driven in the dark to the Manila Hotel. Occasional flashes of lightning sometimes illuminated buildings pointed out by an overoptimistic guide who must have expected cat quality night vision from his sightseers. The Manila Hotel, which originally built in 1912, has been extensively modernised and updated in 1976. The result is quite enough to make one's eyes stand out on stalks. The main foyer of the Manila Hotel is about 200 feet long and 75 feet wide. Huge crystal chandeliers hang high above the numerous tables and armchairs. One wall is glass doors, another is mirrors and the other two are ornately carved wood. All in all an international class hotel which makes the Melbourne Hilton look dowdy.

The next morning was free for a bit of shopping and then at mid-day we flew to Cebu City and then by bus for two hours to Argao. The Argao Beach Club is a newly opened resort. The accommodation faces a sandy beach, behind this rows of rooms climb up the hill. The restaurant is open all round, which allows it to stay reasonably cool. The day temperatures were in the upper 80's and the water temperature in the sea was well over 80°F. The fresh water swimming pool, enjoyable early in the day, reached a temperature later in the day that meant that you had to get out after you had been swimming, to cool off.

This year's visitor and keynote speaker was Dr David Elliott OBE, the President of the European Undersea Biomedical Society. Dr Elliott served for 17 years in the Royal Navy and was one of their underwater medicine experts. He is co-editor of "Bennett and Elliott" the standard text book for advanced diving medicine and physiology. The full title is "The Physiology and Medicine of Diving and Compressed Air Work". Since retiring from the Royal Navy, Dr Elliott has been employed by Shell International as their Diving Safety Expert. He is a trained Royal Navy Clearance Diver (closed circuit equipment) and it was his diving experience as well as his knowledge of physiology and medicine which made him so valuable to Shell. Shell does not employ divers directly, but Dr Elliott's job is to make sure that the diving contractors employed by Shell dive safely and this means that they stick to the rules laid down for safe diving in the North Sea.

The scientific meeting followed the usual pattern with the guest speaker contributing most to the sessions. Dr Elliott spoke of the patho-physiology of decompression sickness, with special attention to spinal cord decompression sickness, and of air embolism. He discussed the treatment of these two conditions. These topics covered two sessions. A session was devoted to diving illnesses and injuries and their prevention and treatment.

With this there was a discussion about

the physical fitness requirements for sports divers. The opinions voiced ranged from the paternalistic, forbidding everyone who was not as fit as an Olympic athlete from diving, to the laissezfaire, giving the prospective diver a certificate with his restrictions written on it. A session on dysbaric osteonecrosis reminded the meeting that although X-ray changes are fairly common, dangerous lesions are rare.

A session of medical support for diving operations covered the situations in New Zealand (Dr Tony Slark), Australia (Dr John Knight) and the commercial diving industry. Dr Elliott introduced earlier in the week what he called the 5 pm game. It goes like this. *You are staying in a small fishing village on the North Atlantic. The local doctor calls you to help him with a problem. He has had a message that there has been a scuba diving accident on a nearby island and that there is one unconscious diver. There is no way of contacting the island except by boat and in 15 minutes there will not be enough water over the bar at the harbour mouth for the fishing boat that is standing by to get to sea. What 15 items do you collect from the local hospital to take with you?* He organised the audience into groups of six to compare their items and settle on 10 in order of importance. Then the group's choices were compared with Dr Elliott's list from an earlier course. As he pointed out, there is no absolutely right list.

The last session was devoted to the problems of oxy-helium diving and to the physiological adaptations to immersion and breathhold diving with emphasis on the specialised aquatic mammals (Dr John Knight).

The diving at Argao was run in an extremely efficient manner. The establishment had purchased 100 new tanks and had three boats at our disposal, one of which was only finished on the day of our arrival. One was the sort of catamaran which is used for diving in the Caribbean. The other two were versions of the local Cebu boats, which are narrow hulled, with outriggers on both sides. The smaller one owned by the resort was about 35 feet long. The larger one was over 60 feet and was a little unstable, as the outriggers did not reach out far enough, and the decking extended out on both sides of the narrow hull. On more than one occasion there were cries of "Balance" from the crew as brown bodies shot precipitately onto the rapidly rising outrigger. It is quite easy to see how these can turn turtle.

Diving was coral reef diving and drop-off diving. Unfortunately, the best dives and the best coral drop-offs were not on the island of Cebu, but across the strait, a trip which took about 20 minutes, in a fast speed boat in good weather. Murphy's Law was in operation as usual. The catamaran got itself across the strait only to have one engine malfunction. The wind got up a little bit, and with only one propeller it could not cope with the sea. So local fishermen were approached and they took the divers back to Argao. Instead of the hour or so it had taken to cross, it took 2 1/2 hours to come back in the rising seas, largely because the fishing boats are propelled by one cylinder four-stroke motors, rather similar to those on a lawn mower.

After a few days we had a workable routine which allowed divers to be back in time for the evening lectures. As always, there were problems when going to the less developed parts of the world. There were regular electrical failures from the main supply but the hotel was provided with an emergency standby generator which allowed us lighting to eat by even if there was not enough power to work the slide projectors.

A word of warning to those intending to visit the Philippines, spirits and wine are expensive. In the most expensive of the restaurants at the Manila Hotel a magnificent buffet lunch cost 98 pesos. The cheapest bottle of wine cost 200 pesos. That translates into about \$11.00 and \$23.00.

Once again, the Society owes a debt of gratitude to Anthony Newly and Allways Travel for a smooth and painless journey, excellent accommodation and first class diving. It was not his fault that the monsoon came early. Even so the rain only fell at night in Argao!

Once again the proceedings were recorded and will eventually appear in the journal.

#### SPUMS ANNUAL SCIENTIFIC MEETING 1982

Dr AA (Fred) Bove, MD, PhD, Chairman of the Education Committee of the Undersea Medical Society will be the guest speaker in 1982. Dr Bove with David Elliott, the 1981 guest speaker, and Dr John Hallenbeck did the work which showed that venous stasis in the vertebral canal was a major cause of spinal decompression sickness.

Dr Bove is a cardiologist at the Mayo Clinic. He is also a diving instructor.

DrBove has agreed to give lectures on the following topics:-

#### A BASIS FOR DRUG THERAPY IN DECOMPRESSION SICKNESS

A discussion of the pathophysiology of DCS with the rationale for use of drugs in therapy.

#### STRATEGIES FOR TREATMENT OF DCS WHEN NO CHAMBER IS AVAILABLE

An application of the principles presented in the first lecture to the real world.

#### EXERCISE PHYSIOLOGY

This includes the normal responses to physical exercise and the effects of illness on exercise capacity.

#### FITNESS FOR DIVING

How general health and physical conditioning interact with the diving environment. How to assess physical conditioning.

#### CARDIOVASCULAR DISORDERS AND DIVING

The problems of diver candidates with congenital, valvular, or coronary heart disease, arrhythmias, or pacemakers.

#### PULMONARY DISORDERS AND DIVING

Dealing with asthma, pneumothorax, chronic bronchitis, emphysema, lung surgery and hyperventilation.

#### OTHER MEDICAL PROBLEMS

These include epilepsy and other neurological disorders, diabetes, thyroid and adrenal disease, anticoagulants and hemophilia, renal disease, musculoskeletal disorders, amputations.

To make the 1982 SPUMS Scientific Meeting a success there must be papers from members. It is hoped that many people will want to contribute to one or more sessions and prepare papers.

The meeting will be held at the Madang Resort Hotel, Madang, Papua New Guinea from June 26th to July 5th. There is excellent diving around Madang, which has a tropical climate.

Allways Travel, 168 High Street, Ashburton 3147 will soon be sending out brochures. As accommodation in the conference hotel is limited to 45 rooms those making late bookings may have to be accommodated at the Smugglers' Inn and commute.

#### IN MEMORIAM

The tragic accidental death of Dr "Charlie" Brown, the noted and very highly respected diving medicine writer and practitioner, has come as a shock to both lay and medical divers around the world. He has been greatly involved for many years in spreading information concerning safety and diving medicine facts to divers, not only through articles in Skindiver Magazine and NAUI and PADI publications, but also through the UMS newsletter "Pressure". We have been honoured to have had him as a member of SPUMS and have been pleased to publish some of his papers. His death is a loss to diving, not only in the USA, but his life has been full and useful. Outside diving, he gave considerable time to helping the underprivileged. Our sympathy goes to those now deprived of his presence, his family and many friends.

SECRETARY'S REPORT 1980-81

It is with much regret that this report is presented in my absence.

The 1980-81 SPUMS year commenced with the combined Scientific Meeting in Singapore jointly hosted by SPUMS and the Singapore Navy, Diving Medical Centre.

This meeting was not only a great success, but has resulted in considerable involvement and growth of the Society and the ASEAN region.

The proceedings of this meeting are shortly to be published in a book form.

The year has witnessed a further growth both in the Society's numbers and its involvement in the various areas of underwater medicine. Significantly, the Government Departments of Minerals and Energy, Health and the CSIRO, concomitantly with the growth in the Society's responsibilities, the Diploma sub-committee, have held discussions with the Post-graduate Medical Foundation, Royal Australian Navy, and the Commonwealth Institute of Tropical Medicine and Industrial Health, with the view to formalizing Underwater Medical Education and providing a means of accreditation of medical practitioners for the benefit of all involved in the underwater environment.

The preliminary discussion paper was published in the January to March 1981 issue of the SPUMS Journal.

The Society is fortunate to have Dr David Elliott, OBE as this year's Guest Speaker/Keynote Lecturer. As one of the world's giants in the field of underwater medicine, his presence and knowledge can only enlighten those attending the AGM and aid the maturation of SPUMS.

In conclusion, I would like to thank my fellow committee members for their assistance during my term of office.

CJ Lourey  
Secretary SPUMS

EUROPEAN UNDERSEA MEDICAL SOCIETY

The 1982 Annual Meeting of EUBS is due to be held in Lubeck, West Germany on 6th and 7th October. Additional days are to be arranged for visits to GKSS (1000 m wet chamber) and to the Institute of Naval Medicine at Kiel (celebrating its 50th Anniversary).

The local organiser is Captain Klaus Seeman (Past President - EUBS) but if any SPUMS members would like details, please write now to Dr David Elliott (President EUBS) Rockdale, 40 Petworth Road, Haslemere, Surrey, GU27 2 HX, England.

SPUMSSTATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 30th APRIL, 1981

<u>Opening Balance 1/5/80</u>			
Investment Accounts -			
CBC Savings Bank Ltd	2047.64		
Investment Accounts -			
Mutual Acceptance Ltd			
(9.75%)	1000.00		
Cash at Bank -			
ANZ Banking Group Ltd	3682.07		
Cash on Hand	2.00		<u>6731.71</u>
<u>Add Income</u>			
Subscriptions	5893.07		
Interest -			
Mutual Acceptance Ltd	111.24		
Interest -			
CBC Savings Bank Ltd	<u>186.72</u>		<u>6191.03</u>
			12922.74
<u>Less Expenditure</u>			
Secretarial Service	1607.97		
Post	988.73		
Meal Allowance	240.00		
Newsletter	2479.10		
Travel	1435.25		
Bank Charges	<u>78.90</u>		<u>6829.95</u>
			6092.79

TOTAL FUNDS 30/4/1981

Represented by:

Investment Account -			
CBC Savings Bank Ltd	2234.36		
Investment Account -			
Mutual Acceptance Ltd			
(11.75%)	1000.00		
Cash at Bank -			
ANZ Banking Group Ltd	2856.43		
Cash on Hand	2.00		<u>6092.79</u>

AUDITORS REPORT

I have examined the above statement of receipts and payments for the South Pacific Underwater Medical Society and state that the Statement gives a true and fair view of the financial transactions of the Society.

Robert G Goddard  
ARMIT (Com), FASA

NOTES TO CORRESPONDENTS AND AUTHORS

Please type all correspondence, in double spacing and only on one side of the paper, and be certain to give your name and address even though they may not be for publication.

Authors are requested to be considerate of the limited facilities for the redrawing of tables, graphs or illustrations and should provide these in a presentation suitable for photo-reduction direct. Books, journals, notices of symposia etc., will be given consideration for notice in this Journal.

TOWARDS 43 BAR - HUMAN PHYSIOLOGICAL  
STUDIES

A REVIEW OF THE FIRST EIGHT DIVES IN THE  
SERIES

HV Hempleman and others

Admiralty Marine Technology Establishment,  
Physiological Laboratory, Alverstoke.

INTRODUCTION

During the course of a prolonged and complicated series of experiments it is necessary, from time to time, to attempt an overview of the current situation. Otherwise the research effort tends to fragment and lead to the collection of a vast amount of data in various specialised areas of activity, with little or no appreciation of how the findings inter-relate. With this in mind, the principal findings and lessons learned during the course of the first six dives in the present series will now be given.

Dive 1 employed air as the breathing medium, Dives 2 and 3 used oxy-helium, and all these first three dives were at the low pressure of 3m and of 9 days' duration. These were valuable and necessary control dives and served to show that there was no measurable psychological or physiological effects from living in the somewhat cramped conditions of the experimental pressure chambers. Dive 4 consisted of 2 days' control period, breathing oxy-helium at atmospheric pressure, followed by compression at 1 m/min. to a depth of 200m. The breathing gas consisted of 0.4 bar oxygen, remainder helium. This dive also served to some extent as a control experiment with minimal signs and symptoms characteristic of the high pressure nervous syndrome, and once again there were no physiological or psychological changes of any consequence throughout the 16 day sojourn in the pressure chamber. Dive 5 was to have been an extension of the same compression profile as the previous Dive 4, but reaching 300m. The 2 day control period at atmospheric pressure in oxy-helium and the 1m/min compression with the standard breathing mixture of 0.4 bar oxygen, remainder helium, was completed uneventfully until a depth of about 190m had been reached. From then on, the effects of HPNS became increasingly evident and compression was halted at 255m. Compression recommenced approximately one hour later at the previous rate of 1m/min. and the target depth of 300m was reached without further need of a halt for recovery, but both divers were clearly suffering quite markedly from the effects of HPNS. Despite the quite severe nausea and vertigo experienced by both subjects, there were no gross or unexpected abnormalities in the heart rate, EGG or EEG, nor were the intentional and postural tremor studies unusually affected. A further one and half days were spent at 300m before both subjects reported feeling well and free from all except trivial symptoms. The severity and duration of the ill-effects caused by compression at the rate of 1m/min were unexpected and it was thought that

perhaps the 2 day control period spent at atmospheric pressure prior to the commencement of pressurisation, was eliminating the entire dissolved gas content of the tissues of the body, thus removing its well-known protective effect against some of the manifestations of HPNS. Accordingly, for Dive 6 the control period in oxy-helium at atmospheric pressure was abandoned but the pressurisation rate of 1m/min, using the standard breathing gas mixture, was retained. Once again, the subjects began to notice the onset of HPNS at a depth of about 190m. On reaching 225m it was quite apparent that the two experimental subjects, who were incidentally not the same men as on Dive 5, were becoming increasingly distressed by the compression procedure and consequently compression was halted at this depth for a period of twenty four hours in order to ensure a complete return to well-being before commencement of the 1m/min. compression to the target depth of 300m. This dive confirmed the view gained from previous experience, namely that compression on oxyhelium can be extremely rapid to depths of the order of 180m but that thereafter the compression rate moves into a very sensitive area. Although adding nitrogen is demonstrably beneficial at dive pressures greater than 180m, the relatively small partial pressures of nitrogen involved in Dive 6 of this series were clearly having no practical effect.

Apart from the gross observations mentioned above, a number of carefully controlled investigations were pursued into several physiological systems to ascertain whether there were any signs of breakdown in the normal homeostatic mechanisms. Strong evidence had accumulated to suggest that there is a change in the utilisation of dietary constituents, most particularly with regard to energy exchange. Accordingly, uncontrolled food intake by the subjects was analysed indirectly by the use of standard food composition tables and numerous chemical and physical measurements were made. Several indicative findings were reported, but the main conclusion of this area of work can be summarised by a quotation from one of the investigators - "It is obvious from study of the above data and the results discussed elsewhere that in order to analyse more usefully such factors as energy balance, nitrogen balance, mineral balance, and amino acid metabolism in relation to bone necrosis and HPNS, and a host of other biochemical variables, a completely fixed dietary intake is essential so that classical metabolic balance techniques may be used. This procedure is planned for subsequent dives in this series".

In the thermal balance studies, partitioned calorimetry techniques as well as direct measurement of skin heat flux reveal the precarious nature of the thermal homeostatic condition in high partial pressures of helium. The reduced effectiveness of the evaporative heat loss mechanism at increased depths was also noted.

In general, the respiratory physiology results agreed with those given in the established literature. For example, the change in maximum voluntary ventilation with



gas density harmonised quite well with data obtained from other laboratories and indicated for instance that at 600m the diver should be able to achieve 42% of his surface value. A measurement unique to this laboratory is the pulmonary tissue volume. There were strong indications that the pulmonary tissue volume had increased at pressures as low as 200m. The implications are numerous. Is the pulmonary membrane unique in its response, and is there a significantly increased diffusion pathway? These and other pertinent questions, were left open to be investigated in subsequent experiments.

There were three separate approaches to the neural problems of these dives. Firstly, there was a neurochemical investigation into the metabolism of dopamine and noradrenaline, measuring urinary outputs of metabolites. It was shown that there was no sustained differential effect of pressure on the metabolism of these transmitter substances and no obvious correlation between the metabolite output and the severity of HPNS experienced during the compression phases of Dives 5 and 6, but it must be borne in mind that a small vital change in a particular mechanism may not significantly affect these measurements of whole body turnover. Secondly, control observations were completed on the knee-jerk reflex during Dive 6, which indicated, in agreement with work from other laboratories, that changes leading to the increased excitability of the mechanically-elicited reflex response are occurring at some higher level than the reflex loop itself. Thirdly, a set of neurological tests, limited in scope by the somewhat cramped conditions and inaccessibility for direct examination, were given. It was concluded that there were no gross neurological changes, of even a temporary nature, at depth. Despite the presence of vertigo and visual disturbances provoked by head or eye movements, particularly marked during the later stages of the compression phase, there was no evidence of gross endorgan type vestibular or vestibulo-cerebellar interference. As mentioned previously, the EEG results, and the recordings of intentional and postural tremor, were also remarkably indifferent to the obviously distressing symptoms suffered by the experimental subjects.

A wide selection of psychological and behavioural tests were given, but as might be expected with such small numbers of subjects involved, it is difficult to draw firm conclusions. Not surprisingly sleep quality was poorer in the chamber under all conditions but there was evidence of adaptation and a recovery of sleep quality, even at 300m. Two further points can be made from the observations at 300m, namely that decision-making is slowed down at this depth and there is impairment of short-term memory.

Haematological investigations were pursued in Dives 5 and 6. No significant changes were noted in packed cell volume or haemoglobin, and the usual platelet changes seen upon decompression were observed. These findings tend to accord with those previously reported from this laboratory and elsewhere. However, two highly significant further

observations were made during the course of Dive 6. A very pronounced rise in the erythrocyte sedimentation rate was noted during the later stages of the decompression which persisted for some weeks afterwards and a large percentage of erythrocytes, in excess of 10% in all four cases, presented what was termed a "ball race" appearance under the light microscope, and these too persisted for many days after completion of the decompression.

The above paragraphs contain a very condensed volume of experimental evidence, and hopefully, no major points have been overlooked.

Clearly, before proceeding to any greater depths it was necessary to change the compression profile. Severe symptoms of HPNS were manifesting themselves at depths in excess of about 200m and it was becoming impossible to distinguish between effects caused by the compression profile and those due to pressure per se. In the next two dives of the series to 420m it was decided to attempt to separate these effects. It was realised that no symptoms of note appeared at depths less than about 150m, but it was far from clear whether the relatively rapid compression to depths of this order was precipitating subsequent problems and the decision was made to proceed very slowly to depth both in the early and later stages of the compression phase. In other words, the compression would still remain linear with time but the rate of change of pressure would be slowed down very considerably. It was supposed that if 60m of depth were accomplished in each twenty-four hour period then this represented a sufficient departure from the earlier experiments to enable a proper test of the hypothesis.

It was also realised as a result of the earlier dives and from a scrutiny of the literature that no saturation dives had been undertaken using rigidly controlled dietary procedures, and that without such controls it was impossible to make reasonably accurate and meaningful statements on such matters as weight loss, energy balance, mineral exchange to name but a few. It is salutary to note that exactly one hundred years ago, P Bert had realised the impossibility of studying metabolic processes in diving without strictly controlled dietary procedures. There are of course numerous measurements which must accompany the strict dietary control, such as the deuterium oxide body water estimations and the skin calliper fat measurements, and these are described in detail later in this report.

A greatly increased volume of data was collected during the course of Dives 7 and 8, as most investigators were now in possession of thoroughly validated techniques applied to very experienced, highly cooperative, experimental subjects in a familiar and standardised chamber environment. The enormous advantage of having a team of investigators and experimental subjects together for an uninterrupted period of three and a half years was amply demonstrated in the conduct of these dives and particularly Dive 8, which yielded a quality and quantity of information that it is impossible to view without a sense of satisfaction being shared by all concerned.

TABLE I

## SATURATION DIVING, AMTE PHYSIOLOGICAL LABORATORY

Dates	Dive No	Subjects	Compression Time		Maximum Depth Gas	Time at Maximum Depth		Decompression Time		Total Dive Time	
			Days:	Hrs: Mins:		Days:	Hrs: Mins:	Days:	Hrs: Mins:	Days:	Hrs: Mins:
3 Sept 75 to 12 Sept 75	1	D M	<u>Direct</u>	.5	3 msw Air	8: 23:	49.5	<u>Direct</u>	.5	8: 23:	50.5
12 Nov 75 to 21 Nov 75	2	P R	<u>Flush/Direct</u>	7	3 msw O <sub>2</sub> /He	8: 22:	42	<u>Direct</u>	1	8: 22:	50
21 Jan 76 to 30 Jan 76	3	D M	<u>Flush/Direct</u>	33	3 msw O <sub>2</sub> /He			<u>Direct</u>	1	8: 22:	57
12 May 76 to 28 May 76	4	P R	<u>Staged/Direct</u>		200 msw O <sub>2</sub> /He	6: 22:	48	<u>Staged/Drops</u>	7: 18: 30	15: 23:	50
22 Sep 76 to 12 Oct 76	5	D M	<u>Staged/Direct</u>		300 msw O <sub>2</sub> /He	7: 13:	25	<u>Staged/Drops</u>	10: 6: 25	20: 2:	15
11 Feb 76 to 1 Mar 76	6	P R	<u>Direct/Staged/Direct</u>		300 msw O <sub>2</sub> /He	6: 19:	15	<u>Staged/Drops</u>	10: 6: 6	18: 1:	48
21 Sep 76 to 17 Oct 76	7	P P	<u>Staged</u>		420 msw O <sub>2</sub> /He	2: 0:	55	<u>Staged/Drops</u>	15: 15: 28	26: 2:	17
1 Feb 78 to 26 Feb 78	8	D R	<u>Staged</u>	3	420 msw O <sub>2</sub> /He	3: 9:	55	<u>Staged/Bleeds</u>	15: 12: 55	25: 9:	15

## SUMMARY OF EVIDENCE FROM THE FIRST EIGHT DIVES

1. Following three 9 day exposures to 3m pressure of air or oxy-helium it has been shown that there are no 'caging' effects from living in the somewhat cramped conditions.
  2. There is a threshold pressure of  $180 \pm 20$ m for the onset of a variety of characteristic signs and symptoms. These symptoms are described variously as light-headedness, giddiness, clumsiness, 'nervy' feeling. Signs noted are the onset of 'helium tremors' some evidence of nystagmus, and knee-jerk reflex changes (see 14).
  3. The effects described in 2 occur whether there is a very fast (6 min) or very slow (2 days) compression to the threshold pressure.
  4. If the compression rate is 1m/min or faster severe ill-effects are experienced by some subjects at depths just greater than the threshold pressure range. These manifest as distressing nausea, vertigo, pallor and a form of drowsiness (sometimes termed micro-sleep). Although the subjects are clearly quite distressed this is not reflected in the neurological and performance tests.
  5. There is a threshold pressure of 300m, or thereabouts, for the onset of occasional involuntary gross twitches of the skeletal muscles. A variety of compression profiles has failed to eliminate or ameliorate this condition.
  6. A wide spread of neurological tests supports the view that the hyperbaric oxygen-helium environment causes numerous small disturbances throughout the nervous system, but cerebellum and brain stem are mainly implicated. There are also significant contributions arising from a dysbalance between the responses of the left and right vestibular sensory mechanisms.
  7. Pressure arthralgia cannot be completely eliminated by the slow compression used in these dives.
  8. Psychological testing revealed no drop in subjective alertness before, during, or after the 420m exposures. Sleep quality seemed to deteriorate with increase in pressure but there is a great variability in subject tolerance to the conditions. Visual search tasks are also adversely affected at 420m.
  9. The mean weight change of the ten subjects who went to 21 bar, or deeper, was +0.6 kg, with a mean 24 hour energy intake of 14.14 MJ.
  10. Rigorously controlled fixed dietary intake studies on dives at 420msw revealed that mineral balance, as represented by calcium, magnesium and phosphate, remains undisturbed, but the total nitrogen balance of the body is not maintained, and a steady loss of nitrogen, mainly as urea, occurs. Relevant to bone metabolism it has been established that the level of hydroxy-proline and collagenase activity are unaffected at depth.
- The expected decrease of Vitamin D content occurred and this is an example of an observation that is potentially very important but requires further experimentation.
- Numerous hormonal, enzymatic, and neurochemical measurements have been made but, here again, further confirmatory work is needed. All changes seen are reversible, during, or shortly after decompression.
11. The haematological investigations yielded three major new findings. Firstly, a large percentage of the erythrocyte's carbonic anhydrase migrates to the membrane during exposure to 420m pressure. This change follows the compression profile quite closely and stays constant at constant pressure, but decompression does not reproduce the compression response in reverse, and it takes two or three weeks after the dive for complete return to normal carbonic anhydrase distribution. Secondly, during the decompression, aside from the usual platelet changes, there are marked changes in red cell morphology. These changes can occur in as many as 3-12% of the cells. Once again it takes two or three weeks before the red cell fields regain their normal appearance. Thirdly, the erythrocyte sedimentation rate (ESR) increases greatly during the decompression, and extremely high values have been encountered. These ESR values reach their greatest level at the end of decompression, or shortly afterwards, and take one or two weeks to return to normal. No changes are seen in packed cell volumes, or haemoglobin content or red cell counts, but these measurements are sometimes being made when the red cell morphology has undergone quite marked change, as noted above, and therefore small changes in such gross measurements as PCV, would probably be masked.
  12. The expected changes in distribution of heat exchange by the body were seen, ie. marked increase in respiratory and convective heat loss with an equally marked decrease in evaporative and radiation heat loss. A new finding concerned changes in thermoperception at 420m that took approximately two weeks to return to normal following decompression.
  13. The rate of recovery of the fatigued adductor pollicis muscle was unimpaired at all pressures but it was observed that there was a substantial increase in the level of fatigue for a given work load at 420m.
  14. The knee jerk reflex showed onset of changes at  $200 \pm 20$ m, ie. near enough to the threshold value mentioned in 2 above. At 420m the increases in excitability were quite marked and shown to be due to a central effect, most probably release of brain stem inhibitory function.
  15. Cardiac output falls slightly at 420m and is accompanied by a tachycardia.

16. Standard 150 W workloads can be completed at 420m but require not less than 60% of MVV and do not leave much ventilatory reserve.

17. There was a small increase in pulmonary tissue volume, and there is some evidence that a problem with the movement of the CO<sub>2</sub> across the alveolar-capillary barrier as compared with that of N<sub>2</sub>O is beginning to appear at 420m.

18. There is evidence that a suitable decompression profile can avoid the platelet and ESR changes seen during most saturation decompression procedures.

These summarised findings from the first eight dives can be examined from several standpoints. Firstly, the purely practical position is clear. At 420m it is possible for men to cope with quite hard sustained physical work (150W), exacting mental tests, and delicate manipulative tasks, for example, venepunctures. This reinforces previous findings at the laboratory during a series of dives in 1970 culminating in a 1500 feet (457 m) exposure and of course - any subsequent, and deeper hyperbaric exposures reported by Comex, USN and Predictive IV. The depth band of 450 ± 30m can be attained without any major subjective disturbances, provided care is taken with the compression procedures.

Despite this apparently optimistic finding, it is necessary to establish whether there are changes in homeostasis that are not being detected subjectively but which are nevertheless damaging. Accordingly, an extensive set of observations has been completed to measure the magnitude of any shifts in the principal physiological mechanisms. From these observations two gross statements can be made. Firstly, all changes that occur during the dive revert to normal, either during the decompression or perhaps as long as three weeks after completing the hyperbaric exposure. Secondly those changes that do occur at 420m are not a source of concern, given a suitable compression profile. Nevertheless, there are some haematological changes occurring during the decompression which are certainly not desirable and which, it is believed, can be avoided by adjustment of the decompression profile. There are also changes which, whilst not a source of worry at 420m, may well become more serious at deeper depths.

The changes which must be regarded seriously are at a very basic level. As stated in 11. above, it has been found that at pressure the enzyme carbonic anhydrase is redistributed within the red cells and attaches itself to the erythrocyte membrane. This must result in a functional change in the membrane and adds a further complication.

The membrane is just not responding to pressure and dissolved gas as a particular structure, but is undergoing structural changes which are themselves dependent upon the dive conditions. Clearly it is most unlikely that the erythrocyte membrane is the only membrane

in the body which will be affected in a similar manner and, of course, the role of neural membranes in the reversal of anaesthesia by hydrostatic pressure is well established; but the erythrocyte membrane phenomenon, by contrast, may even occur, albeit minimally, at 15m when breathing air, and this points to a very sensitive response to a physical phenomenon, independent of gas composition, perhaps a colligative property or pressure per se. Indeed, there may be, as with the anaesthesia reversal, an effect of increased hydrostatic pressure that interacts with some other physical property of dissolved gas thus giving a far from simple set of responses. This can only be ascertained by further careful human experimentation over a wide range of pressure.

It seems reasonably definite that rapid compression to the threshold level will start minor ill-effects at 150m in some men, who will be noticeably affected at 200m, whereas some resistant men will hardly notice any problems until 200m. Furthermore, once this individual threshold is reached it is necessary to retard the compression rate very considerably, or to give a rest period before proceeding deeper. The latter procedure was successfully employed in the 1500 feet (457m) dive and during the Predictive IV series. For the 9th and 10th dives in the current series, this stage compression will be used, with the stages being placed at 180m, 300m and 540m. Data for comparison purposes is available at 300m and 420m from the first eight dives and this will strengthen the value of any new or modified findings at the deeper depths.

It is not yet possible to reach a set of concepts for guiding future research, except in a somewhat vague and very general terms. There are two principal physical factors influencing the physiological mechanisms. Firstly there are the purely mechanical effects of raised pressures of helium, which may cause compression of existing gas nuclei inside the body or produce shearing stresses due to the different compressibilities of adjacent tissues. Then there is the influence of pressure on those biochemical reactions that are associated with volume changes, which would seem not of much physiological significance until the pressure is in excess of 100 bar. Of more moment at diving pressures would be the biophysical effects, such as shifts in the sol-gel equilibria.

Secondly there are effects due to the use of helium gas as the compressing medium. The respiratory system is faced with a dense gas of altered viscosity and heat exchange is markedly altered. These direct physical effects are accompanied by the physico-chemical consequences of the presence of large concentrations of dissolved gas.

At present the various physical factors involved in breathing hyperbaric oxygen-helium mixtures cannot be directly implicated as causing any of the ill-effects seen. It is always possible to propose any of several views. For example, the arthralgia can be regarded as either due to crushing of the gas

nuclei, or dissolved gas gradients, or differential compressibility. All these mechanisms can be made to fit the experimental facts. Too little is known about whether sustained dissolved helium gas gradients are attainable, or of sufficient magnitude, or can cause the pain of arthralgia. Also, no satisfactory data are available on the compressibility of different tissue types around joint structures, and whether these various compressibilities might be complicated by being dependent on the absolute pressure; or, again, although undoubtedly gas nuclei are present in tissues, whether they are present in sufficient numbers that crushing them will cause pain, is totally speculative.

Given these basic uncertainties it is necessary to collect more data to clarify the various possibilities. In this search for an understanding of the mechanisms involved the prime consideration is to ensure that the experimental subjects are not adversely affected. It is clear from the carefully controlled measurements made in this present dive series that this is true to depths as great as 420m and a cautious approach to even greater depths is the next step. Animal experiments are unfortunately not yet directly helpful to the human situation. It is now known that some mammals (sperm whales) can descend to 2250m depth in about 15 minutes. Experience indicates that this would be lethal for most mammals, including human beings. In contradistinction some varieties of laboratory mammals (rats) are unable to survive for a few days at 300m which is quite an uneventful exposure for most mammals. In these circumstances an old philosophical saying is very apt, "The proper study of mankind is man".

*The first six dives are covered by report AMTE(E) R 78-401. The last two dives by AMTE(E) R 80-402*

#### UNUSUAL FISH BONE INJURY

IR Gibbs

I wish to report a further hazard associated with the consumption of North Queensland reef fish. The patient was a previously healthy 65 year old male who presented with a complaint of throbbing anal pain, not associated with defaecation and not similar to the pain of piles from which he had previously suffered. His bowel actions were normal and he had passed no blood or mucous.

External examination was normal. Rectal examination revealed the presence of an elongated foreign body which felt like a pin or a needle with both ends embedded in the mucosa, its long axis being in the axis of the rectum.

Excruciating pain made manipulation with the proctoscope impossible. By digital manipulation the upper pole of the foreign body was released from the mucosa and it was then

rotated about its lower pole. Further manipulation resulted in the delivery of a large coarse fish bone approximately 4 cms in length.

This hazard could have been avoided by selecting less bony fish, and by limiting libations to a fishing success until filleting has been completed.

#### TURNING TURTLES?

Question:

When a turtle is brought up in a net is there anything that commercial fishermen can do to help the animal?

Answer:

Fisherman should elevate the turtle's hindquarters for several hours to permit water to drain from the lungs, according to NOAA regulations. Afterwards the animal should be released over the stern with the engine in neutral. This should be done in an area where the turtle is unlikely to be recaptured or injured by vessels. Many turtles that appear dead or comatose can be saved by proper resuscitation procedures and careful return to the sea.

In the summer of 1980 about 1,850 sea turtle carcasses washed up on beaches of southeastern United States. IOF members who find a turtle stranded on a beach from Virginia to Texas are asked to report this information.

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#### CORRECTIONS

We are grateful to an overseas reader for drawing attention to several proof-reading errors which crept into the January-March issue of the Journal. Please correct your copies in the following matters:-

Page 17

Left column INNER EAR BAROTRAUMA  
First paragraph Line 3. "decompression" should read "compression".  
Line 12. "ascent" should read "descent".

Page 19

Right column, third paragraph.  
Line 3. "decompression" should read "decompression sickness".  
Line 6. "(n-63)" should read "(n=36)" for the numbers to add up correctly (this error appears in the Abstracts of the Seventh Symposium on Underwater Physiology).

Page 24.

Left column, fourth paragraph. Line 4. "minus 10°C" should read "minus 1°C"

USHERS IN THE SERVICE OF AESCULAPIUS

In May this year Drs Stephen Lock and Bill Whimster, both from the BMJ, were brought to Sydney and Melbourne through the joint sponsorship of the AMA, the RACP and GeigyCiba, to whom thanks are due. Whether they came to conduct Writers' Workshops in the two cities and took the opportunity to try to educate editors of medical Journals at the same time, or the reverse was the priority, both groups benefited from the exposure to these wielders of great print power. It soon became evident that there are in the Medical Fourth Estate, like ancient Gaul, three main parts. In the top division there are the Journals with international reputations and circulation, such as the New England Medical Journal and the BMJ, then the middle ground is occupied by the specialist Journals, often published by the respective Royal Colleges, and the majority of national medical societies. In the last group come the multitude of smaller Journals, ranging from those based on individual hospitals to those representing the Third World countries. SPUMS must be considered as a member of this group. To each group its advantages, to each its particular troubles.

Cost is the fatal disease effecting most publications, and it was said that 20,000 scientific journals have died in the past 25 years. As readers of Modern Medicine will know, there are over 7,000 medical Journals published throughout the world annually. Mercifully, it is possible to remain in good standing concerning present day treatment while restricting oneself to only a select few. There is a struggle, naturally, by journals to be included in such select lists. A major problem for many is to ensure that librarians include one's own publication in their buying brief even at the (lamented) exclusion of some similar publication. The first two groups have become dependent on income from advertising and have been hurt by the increase in the number and professionalism of free medical publications, as also the increasing incursion of purely commercial interest into their publication and distribution. Such changes, apparently, have recently caused the drastic step of resignation to be taken by the Editor and two assistant Editors of the Medical Journal of Australia. The rising cost of printing worries all groups, many responding by utilising cheaper (and sometimes more efficient) facilities in Hong Kong.

Some Editors have an excess of papers offered, some have to encourage and rewrite contributions. One problem increasingly recognised by the major journals is the inclination of some contributors to steal the work of others, another problem is the imperfect standards of accuracy of the references which are provided. The assessment by referees, sometimes including statisticians of papers presented to major journals, is a serious work load problem. While only the important should be published, few journals and fewer authors could hope to survive with

such high standards. Compromise is necessary, though nobody said so directly! One indirect problem noted was the ease with which poor work could become written into the system through being included in the references and thenceforth being accepted by readers as being de facto reputable.

The BMJ, which has the problem of seeking to keep two main groups of readers satisfied, has taken the unusual step of setting aside a few pages for printing in ultra fine print. The contents, corresponding to the intended distribution, relate either to specialist or GP matters. The sales of magnifying glasses have been excellent, an unexpected trade bonus to the BMA!

The future was thought to be dominated by floppy discs, word processors and home terminal display screens on which the reader could obtain anything from the article titles to the full printout. Whether this would be a good thing was not discussed, if only because commercial rather than medical interests would govern such "progress".

If there was a touch of evangelical fervour about our distinguished visitors, it related to the Vancouver agreement, the attempt to make uniform the form of presentation for papers for publication. As this agreement was not spelt out, all being presumed to know it by heart, it was only later that your Editor realised that this Journal (in general) practised its precepts. He felt a little like the man who found that he had been talking prose all his life without realising it!

ADVICE TO AUTHORS

W Saline

Remember to never split an infinitive. The passive voice should never be used. Do not put statements in the negative form. Verbs has to agree with their subjects. Proff-read carefully to see if you any words out. If you re-read your work you will find on re-reading that a great deal of repetition can be avoided by rereading and editing. A writer must not shift your point of view. And don't start a sentence with a conjunction. Don't over-use exclamation marks!!! Place pronouns as close as possible, especially in long sentences, as of ten or more words, to their antecedents. Writing carefully, dangling participles must be avoided. If any word is improper at the end of a sentence, a linking verb is. Take the bull by the hand and avoid mixing metaphors. Avoid trendy locutions that sound flaky. Everyone should be careful to use a singular pronoun with singular nouns in their writing. Always pick on the correct idiom. The adverb always follows the verb. Last but not least avoid cliches like the plague, seek viable alternatives.

*Originally published in New York Times Magazine, May 1979.*

DISCUSSION PAPER  
IS "FIT ENOUGH" GOOD ENOUGH?

Douglas Walker

Medically certified Fitness is so obviously a GOOD THING that it may seem to be both churlish and deliberately contrary to suggest anything less than the highest possible standards if asked to state the physical requirements for some particular activity. But living creatures are rarely if ever completely identical so an allowance for some variation must be included, which is an indirect admission that there will inevitably develop a "grey area", a frontier zone where the law of whim (or "in my opinion") will hold sway. Guidelines rather than benchmarks are the "standards" for practical people in most day to day situations, and such must include assessments of fitness or otherwise.

The first question to be faced is the purpose proposed for any standard, whether it is seeking to identify and exclude all without perfection (as it so defines perfection), or to exclude only those with gross defects (with a high risk value to the applicant), or whether it is to assess the balance between discovered morbidity and the positive factors, such as intelligence, training, experience and use of correct equipment. Only the first two approaches lend themselves to legislation, the third requiring knowledge, judgement and a willingness to risk professional censure should a wrong decision be revealed by events. Such a risk is, obviously, what almost every practicing doctor does every time he treats a patient, though he may believe the contrary. The better the information available, the more likely is the decision to be correct, which is the real reason for the collection and publication of information in journals such as this one.

When Mr Herbert Spencer coined the phrase "The Survival of the Fittest" he meant those best adapted to their environment rather than those in perfect physical condition, though the sick and imperfect are soon removed from the struggle to exist in a like manner the early divers required brute strength and endurance to survive, there being a lack of understanding of the risks peculiar to their occupation. Natural selection rather than medical assessment worked well for such exacting times. Nowadays not only is our understanding greater but our methods of reducing the impact of the adverse environment are more effective. The physical requirements for survival in a 1 ATA suit are very different from those of a Standard Rig diver at the same depth.

Medical Standards were introduced initially by the various armed forces, a pedigree still heavily evident in present criteria of fitness. Naturally was not because the Naval authorities were tender hearted towards their members but rather because the fall-out rate from courses was reducing the efficiency of diver/charioteer production. As very little was understood at

that time (WW II) about underwater problems, nor was it recognised that they even existed as a limiting factor effecting everyone to some degree, it was through stricter selection rather than through changes in diving practices that in-training losses were reduced.

However in the gentler days of peace, a less Draconian approach is thought to be proper. At first, when sports diving started to become popular, there was a total *laisse faire* attitude to questions of medical fitness for diving. After all the only doctors who knew much about diving were in the armed services and there was no expertise available to civilians. Since those distant days there has been a partial return swing of the pendulum of fashion. Now many aspiring sports divers are expected to produce a certificate saying that they meet the fitness standards of Australian standard CZ18, a standard suitable for commercial divers but not necessarily suitable for sports divers.

The great advances of equipment available to sports divers have made it possible for the meek to inherit the underwater world, or attempt to do so, without the selection process imposed formerly by heavy equipment, poor heat insulation and a public belief that only the tough guys should attempt to dive. There will inevitably be some clash of opinion between those who, for a variety of reasons, propose High Standards and those who would allow the disadvantaged to Do Their Own Thing even if this carried a high risk (but not certainty) of morbidity or mortality.

While it is agreed that Procrustes carried the application of standard measurements too far, freedom to treat diving as a Russian Roulette exercise is hardly more acceptable. There must be some standards of medical and physical fitness because the environment is demanding, but there is no single environment situation faced by every "diver" so a flexibility of decision making is necessary. It must never be forgotten that the most critical factor in survival is training and the use of the appropriate equipment. Many a Coroner has been told "he was a keen athlete, a champion swimmer" when listening to the details of the demise of someone crying-out diving.

Fitness assessment should take into consideration the circumstances of the diving which is proposed, ignoring the factor of whether the person is an amateur or professional at the time, though consideration of Insurance and Legal Liability effect the employability of some otherwise symptom free divers, eg. the bones which show changes and the back X-ray showing deviation from perfection, or a history of unexpected sensitivity to the hyperbaria of diving situation (eg. DCS, Cold, Nitrogen or Oxygen over sensitivity).

The degree of "Nelson's Eye" to be afforded to experienced divers who fall below generally accepted fitness levels can only be related to specific cases, considerations of safety being the decisive factor at all times.

A flexible approach requires good faith by all parties, that the entire truth be revealed by the applicant and that any conditional approval be strictly honoured. The recent fail-safe decision by the BSAC to withdraw permission to dive from all diabetic divers was an example of panic action best regarded as a reflex reaction rather than cortically induced, for those involved had already proved their actual safety and were experienced, careful divers. Nowadays epileptics and diabetics are often in legal possession of driving licences, so that day may yet dawn when carefully selected divers with such troubles will be able openly to attend for diving instruction. Our standards must be self evidently for the good of the person involved if we are to avoid a developing "sly diving" fraternity.

What guidelines should there be for the different grades of diving being undertaken now and in the future? Surely they can be divided into Absolute NO; You'd better not; There are better choices than diving for you; and Go to it Chum! Undoubtedly an uninspiring Grade notation would replace such descriptive terms, but the intention would be the same.

The absolutes would be either Psychological or Physical in nature. At present the diving Instructors de facto try to eliminate the first group, while the training itself seeks to upgrade purely physical deficits. The Medical Conditions are those where loss of clear consciousness may occur, barotrauma of upper or lower respiratory tract is likely to occur and be serious, or dyspnoea of effort can cripple the diver in a stress situation (eg. Cardiac and Asthma cases). The relative contraindications are non persistent infections and remediable ENT problems: in the future some may include Asthma, Epilepsy and Diabetes. The significance afforded to a perforated ear drum in a Hard Hat or 1 ATA rig diver will be less than should be a scuba diver. However the discovery in an experienced diver of a perforated drum of long standing should greatly reduce the adverse rating it attracts, supposing such a situation does exist. One the principle of "horses for courses" there will be some cases where Audiometry, Vitalograph, Long Bone X-ray Surveys, Oxygen Sensitivity, ECG, EEG, or full blood check will be essential elements on which assessment will be based.

The decision concerning which special tests, if any, are required by sports divers is a vexed one now receiving overdue consideration by non-medical bodies. There is the need to face this problem openly, to demonstrate to a somewhat sceptical diving population that it is their interest, to reduce morbidity, to have a "medical" and that one from a doctor well versed in the problems facing divers makes more sense than a "quickie" from an obliging cove down the road who equates fitness with footy toughness. With the present trend for the disabled to attempt everything, however inappropriate, it is necessary to be certain of our reasons for saying NO to anyone.

The provision of a graded system of diving fitness, a seemingly revolutionary concept which may soon be regarded as the obvious solution, would make it easier to make a logical defence of special tests. It should be remembered at all times that an experienced, trained diver of uncertain health, diving with full observances of advised diving procedures, is a better life risk than an Olympic swimmer who thinks anyone can dive without instruction.

It is suggested that discussion centre on the following points:

- a. Is a Medical Examination necessary or only a good idea for divers.
- b. Can all doctors give an adequate service or should there be a need to demonstrate a special interest in Diving Medicine.
- c. Should there be one, or several, Fitness grades.
- d. Suggest absolute, relative and debatable contraindications to diving.
- e. Can it be left to the diver and/or the diving Instructor to decide, after reading a Check List, whether to submit to a "Medical".
- f. Consider the information sources available to decide on the above questions. Are they adequate for a definitive decision?

A LEECH TO REMEMBER

Brian Wagstaff

On a recent course of basic scuba instruction conducted in the Mount Gambler area, I utilised Ewens Ponds for some of the dives. During one training session I encountered the nemesis of all diving instructors - ear problem in a student.

The student had had problems with ear clearing in the first Pond at Ewens and after leaving the water complained of a "fuzziness" and partial deafness in one ear. I asked her to cover her good ear and then listen - poor hearing confirmed her stated symptoms. To my consternation she then told me that the ear was bleeding also! A classic case of ear barotrauma thought I, feeling very worried indeed.

Wrong! Though you would also be forgiven for thinking so.

On closer examination (of the ear) I encountered a leech, engorged with blood, happily on its way out. No wonder the unfortunate student felt a bit deaf. It seems that the leech crawled inside her hood and latched onto the wall of her outer ear canal, causing the problem.

The moral of this story is to stay off the bottom and in clear water. Incidentally, it was a case for immediate hospitalisation; the bleeding took two days to stop even with packing and treatment.

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CORRESPONDENCE

The Editor,

I write on behalf of the National Executive of the Federation of Australian Underwater Instructors which, at a recent meeting in Sydney, gave a great deal of discussion to the matter of divers requiring the ASA CZ18 1972 Medical. A letter from FAUI Instructor Keith Cook of the Physical Education Branch of the Western Australia Education Department was before the Executive and seemed to summarise the general feelings on this matter. This letter is quoted in full.

*"The medical form adopted for the National Qualification Scheme is based on the ASA CZ18 medical for professional divers. This form is very comprehensive, perhaps excessively so for sports divers, and the medical examination is very costly. Few, if any clubs or instructors actually insist on divers undergoing this test. In fact, most only require a doctor's statement that the person is fit to dive.*

*"It is time FAUI addressed this problem instead of ignoring the true situation.*

*"Most sports are strenuous yet participants are not required to obtain medical clearance.*

*"I believe that doctors are unable to detect potential medical problems related to diving in their consulting rooms. Also skeletal X-rays are irrelevant to new divers and divers educated in the NQS standard are sufficiently informed to make their own decisions on the necessity of a medical.*

*"I would therefore suggest that the following be considered at the next FAUI National Executive meeting:*

*"1. That FAUI canvass the opinions of suitably experienced medical practitioners and researchers in human movement at universities as to the validity of a medical certificate for diving.*

*"2. That FAUI canvass opinions from suitably experienced Law practitioners as to the position of an instructor when a student develops a medical problem not accident related.*

*"3. If, after investigation, it is still deemed that a medical certificate is necessary, that a committee be formed to produce a medical certificate relevant to sport diving."*

Does The South Pacific Underwater Medicine Society think that there is justification for all sports divers (ten to twenty thousand each year) undergoing the full CZ18 medical? One must bear in mind that at present very few actually do have a complete CZ18 anyway, with the majority gaining a somewhat briefer examination, depending on the medical practitioner's knowledge of the diver's medical history and the availability of more specialised equipment required eg. for respiratory function tests. It would seem appropriate that there should be a uniformity in specified

requirements, yet the present CZ18 goes beyond the realms of sport diving, we believe.

In the light of these comments, would SPUMS be prepared to offer comments on areas of the CZ18 medical that deserve either alteration or elimination?

We look forward with anticipation to your reply.

Yours... AK Denny  
for FAUI National Executive.

The Editor,

Mr Denny's letter raises important points. Printed below is a letter on the subject of medicals for sports divers that I sent Mr Phil Straw, then the National Director of FAUI in May 1980. No action was taken by FAUI at that time.

Also printed below is my reply to Mr Denny's letter. Reading it again, I realise that I did not make the point forcefully enough that a doctor, properly trained in diving medicine, can detect all the potential medical problems of diving with scuba.

Yours,  
John Knight  
President SPUMS

Dear Mr Straw,

I thoroughly approve of the current effort by FAUI to try to ensure that all candidates for sport diver training are free from medical conditions which can be dangerous to divers. However, insistence on meeting the standards of CZ18 (is now AS2299) which is for professional divers, may not be the best way to achieve this, as application of these standards exclude many who can dive quite safely.

It is a step in the right direction that FAUI prints and distributes to its members the blue medical application form. Unfortunately the possession of this form encourages the embryo divers to attend their usual medico, who often has no knowledge of diving medicine or of the hazards of changing pressures. Furthermore the form includes examinations that are not necessary for sports divers, eg. colour vision, long bone survey, ECG and exercise ECG, except in rare cases. It has come to my notice that some FAUI members are insisting that every box on the blue form be filled in before they accept the trainee. This merely increases the cost of the medical examination with no benefit to the person being examined.

In each state there are doctors who have a knowledge of diving medicine who carry out diving medicals. There are also doctors with little knowledge of diving medicine who carry out diving medicals. If these latter have

asked for guidance from the first group they may be able to advise their patients properly. Later this year it is proposed that SPUMS will publish a list of the first category of doctors.

The problem with the FAUI blue form is that there are no instructions issued with it for the guidance of doctors ignorant of diving medicine.

I enclose a sample set of instructions. I hope that FAUI will act on my suggestion and print the instructions and distribute them to holders of stocks of blue forms and issue one with each blue form in the future. When the blue forms are reprinted the instructions should be printed on the back page, with a note on the front drawing the doctor's attention to the back page.

Another point. FAUI members are instructing trainees that they must have a medical every year. This is unnecessary. Six-monthly examinations of professional divers is required by law, but beyond establishing a man's normality, or otherwise, as a basis for future compensation claims it has little value. Routine medical examinations of healthy people have a very poor cost benefit ratio and cannot be justified in the majority of cases.

If the diver has no illnesses, other than the common cold, there is no need for a medical at intervals of less than 3 years. However, if he or she has had a serious illness they should have a physical examination before recommencing diving. The initial chest X-ray need only be repeated if the diver had had a major chest infection or an injury to his chest.

I would like to emphasize that divers will get better advice and more effective examinations from doctors who know about diving medicine than from those who don't.

Sincerely,  
Dr RJ Knight  
President SPUMS

#### MEDICAL EXAMINATION OF PROSPECTIVE DIVERS

##### Advice to the examining physician

Diving is a sport carried on in a non-respirable environment, the sea, using breathing apparatus. Sudden unconsciousness under water is usually fatal when using Scuba equipment as the relaxation of muscle tone accompanying unconsciousness results in the regulator falling out of the victim's mouth. The diver's next breath will then be water. This makes any condition which can cause sudden unconsciousness an absolute bar to diving. Such conditions include epilepsy, and diabetics on insulin.

A further problem with the water environment is that pressure increases very rapidly with descent. One atmosphere extra pressure for every 10 m of depth in the sea.

The use of breathing apparatus providing gas at ambient pressure prevents problems of pressure-volume imbalance in the lungs during descent. However the middle ears and sinuses will develop problems on descent unless the pressure in these spaces equals ambient. There is no way of establishing the patency of sinus ostia by clinical examination. However patency of the Eustachian tubes, and so the ability to equalise the middle ear pressures, can be established easily. Observation of the tympanic membrane while the patient holds his (or her) nose, shuts the mouth and blows (Valsalva manoeuvre) will reveal the ingress, of air to the middle ear by movement of the drum. The Eustachian tube opening in the nasopharynx is normally closed. Swallowing opens the ostium. So a combination of a Valsalva and swallowing during the manoeuvre will give the best chance for air to travel up the Eustachian tube. Another way of opening the Eustachian tube is to protrude the jaw and wriggle from side to side while performing a Valsalva manoeuvre. Failure to autoinflate a middle ear is an absolute bar to diving until the person can auto-inflate.

A further set of pressure related problems also occur in diving - these are related to decreasing ambient pressure ie. the ascent phase of the dive.

If an air-containing space cannot vent when the surrounding pressure is reduced two things can happen. If the space has elastic sides it can expand. If the space has rigid walls the pressure in the space, remaining at the original pressure, becomes higher than ambient. The chest wall is elastic, but after a certain expansion the stretching of the lungs results in tears of the lung substance. Air can then enter the pulmonary venous drainage, pass through the left heart and be carried to the brain as air emboli. Unconsciousness and death can result. Thus any condition preventing normal emptying of the lungs is an absolute bar to diving.

Lung cysts, bullae and other areas that empty slowly or not at all are an absolute bar to using compressed air under pressure. These conditions are best detected by taking an X-ray of the chest in full inspiration and another in full expiration. Asthma is another such condition. It is in order to detect expiratory airway obstruction that a Vitalograph (or similar) test is required. Experience in the Navies of the world, whose experience with submarine escape training in many thousands, has shown that a disproportionate number of those suffering burst lungs have FEV'/VC ratios of below 75%. Such people do not need to hold their breath on ascent to damage their lungs, all they have to do is rise too rapidly. People with a FEV'/VC ratio below 75% cannot be considered fit for diving.

A normal FEV'/VC% but clinical signs of bronchospasm, especially a forced deep, rapid ventilation, is an indication of unfitness to dive.

Treatment with drugs is not suitable as:

- a) the effects can wear off underwater
- b) the effects of pressure on bronchodilator drugs are uncertain.

It is hoped that the foregoing makes a list of

absolute and relative contraindications to diving logical and comprehensible.

Absolute contraindications  
 Conditions causing unconsciousness  
 Epilepsy  
 Diabetics on insulin

Lung conditions  
 Asthma  
 Lung cysts  
 Previous spontaneous pneumothorax  
 Obstructive lung disease  
 Lungs which empty unevenly  
 (X-ray appearance)  
 Previous Thoracotomy

ENT Conditions  
 Inability to auto-inflate the middle ears  
 Perforated ear drum  
 Previous middle ear surgery with insertion of prosthesis to replace any of the ossicles.

Relative contraindications  
 FEV'/VC ration less than 75%  
 Poor physical condition  
 Previous myocardial infarction  
 Pregnancy

*If in doubt about a candidate's fitness it is safer for the candidate to be classed as unfit than fit to dive. Difficult decisions should be referred to a doctor experienced in Diving Medicine. These are to be found in each State.*

#### RECOMMENDED READING

Edmonds C and Thomas RL. Medical Aspects of Diving Parts 1,2,3,4,5 and 6. *Med J.Aust.* 1972: 1199-1201; 1256-1260; 1300-1304; 1367-1370; 1416-1419; 1458-1460.

Edmonds C, Lowry C and Pennefather J. Diving and Subaquatic Medicine. Sydney, Diving Medical Centre, 1976.

The South Pacific Underwater Medicine Society exists:

- a) to promote and facilitate the study of all aspects of underwater and hyperbaric medicine
- b) to provide information on underwater and hyperbaric medicine.

Enquiries should be addressed to the Secretary, SPUMS,

Dr CJ Lourey  
 43 Canadian Bay Road  
 Mt Eliza VIC 3930

Dear Mr Denny,

Dr Douglas Walker has forwarded a copy of your letter of 22 July 1981 to me. I will be placing it before the Executive at the next committee meeting. However as this may not be for some time I am replying immediately.

As you can see from the enclosures I raised the matter of a suitable diving medical with Phil Straw in May 1980. I gather from your letter that he did not submit my letter to your Executive.

The reasons for a medical examination of prospective divers are:

1. To detect conditions that could be lethal with changing pressures. These include lung cysts (detectable only by chest X-rays), previous pneumothorax, asthma and obstructive airway disease.
2. To detect conditions that could be lethal with exertion, such as angina and heart failure. Asthma figures again as a cause of incapacitating breathlessness.
3. To detect conditions that can cause sudden unconsciousness, such as epilepsy or diabetes treated with insulin, which can, because of the equipment used by scuba divers, result in the unconscious person drowning.
4. To detect conditions which will damage parts of the body with changing pressure. For example a person who cannot clear his ears should not dive. Medical treatment may enable him to clear his ears and allow diving. A person who has had middle ear surgery and has an artificial replacement for part of the normal chain of small bones in the middle ear should not dive.
5. To detect conditions which will be adversely affected by immersion. An example is a perforation of the tympanic membrane (ear drum).
6. To detect conditions which may be adversely affected by accidents when diving. An example is someone who is completely deaf in one ear. If he loses the hearing in his good ear he will be very considerably handicapped and should be warned of the possibility.
7. To detect those who are over represented in the statistics of burst lung. Those whose Forced Respiratory Volume in One second (FEV') to Forced Vital Capacity (VC) ratio is less than 75% are in this category.
8. To establish a base line for future reference. The audiogram is an example. A number of divers damage their inner ears when diving. They are deaf and giddy and usually nauseated. But by the time they get to a doctor they may only be deaf. If their hearing was known to be normal it is more likely that they will be considered for operation and repair of the inner ear fistula (fluid leak) which is the only way to prevent further loss of hearing and which may restore their hearing to normal.
9. To educate the diver about his medical handicaps and to advise him on ways of coping with them. Also to teach the diver how to clear his ears and how often to do this to avoid barotrauma. This is an area where diving instructors, who must be able to clear easily to cope with their job, often fail to educate their students properly so that they present to the diving doctor part way through their course with avoidable barotrauma of the ears.

The main purpose of the medical examination of prospective divers is to detect those who should not dive and advise them. It is not at present possible for everyone wishing to learn to dive to be examined by a doctor with a good knowledge of diving medicine. It may never be possible. So any diving medical form should

include adequate instructions to the examining doctor so that he or she knows what are disqualifying conditions.

I know that some instructors still teach emergency-out-of-air ascents, some even as early as the second lesson. I would like to draw your attention to the USA National Underwater Accident Data Center reports for 1977 and 1978 when 32 deaths (15% of the total) occurred in training. A number of these were during emergency ascent training and were due to air embolism.

A medical examination is recommended for diving trainees to lessen as much as possible the fatalities and injuries associated with immersion and the consequent pressure changes. These changes are absent from all other sports which are moreover practiced in a respirable (breathable) medium (air). The scuba diver is entirely dependent for his life on his air supply and his intact lungs. A person can live his life fully and actively on the surface with a lung full of cysts and yet die from air embolism ascending to the surface after a dive. Only an X-ray can detect lung cysts.

A minimum diving medical should include:

1. A chest X-ray taken in full inspiration and full expiration as this shows up lung cysts and areas of uneven emptying best. The Chest Clinic free X-ray is only taken in full inspiration and the "normal" report only means that there is no evidence of tuberculosis or lung cancer, not that there are no cysts.
2. A careful history to exclude previous pneumothorax, asthma, obstructive airway disease, tuberculosis and other lung diseases epilepsy and diabetes, other conditions causing sudden loss of consciousness, previous middle ear surgery, deafness, angina and breathlessness.
3. A physical examination paying special attention to the ears and Eustachian tube patency (ability to clear the ears). Another area of special attention is the lungs which should be noise free even with rapid, deep respiration such as occurs with severe exercise. Many people develop wheezes and noises in their chest with exertion. They are at risk underwater if they ascend when wheezy, and this may be forced on them by running out of air.
4. Vitalograph or other method of assessing Vital Capacity and FEV'. Those with an FEV'/VC ratio of less than 75% should be advised not to dive.
5. Audiogram to provide a base line in case the diver later damages the inner ear.

The cost of this should be, at August 1981 Government prices for Victoria:

Chest X-ray	Item 2625	\$28.00
Standard Consultation	Item 14	10.40
Vitalography	Item 922	16.20
Audiogram	Item 863	10.20
Total Cost		\$64.80

When this cost is compared with the price of a decent regulator such as the Tekna the medical is less than one third of the cost of one piece of equipment. Hardly a high price to pay for safety.

It is our duty as instructors and doctors to make the underwater experience as safe as possible. Not many people should be excluded from diving but even one death that could have been avoided by an adequate medical is a tragedy.

At the recent Annual Scientific Meeting of the South Pacific Underwater Medical Society at Argao in the Philippines a session was devoted to the sports diver's medical. Next year when the Annual Scientific Meeting will be held in Madang, PNG, the central topic will be the fitness to dive requirements for sports divers.

The CZ18 medical is not suitable for sports divers. A new standard should be developed, which will take time. In the meantime the best course for FAUI members to take is to refer the pupils only to doctors with a knowledge of diving medicine for their medicals.

Yours sincerely,  
Dr John Knight  
President SPUMS

Israeli Naval Hyperbaric Institute  
PO Box 8040  
Haifa, ISRAEL

August 16, 1981

Dear Sir,

We would like to make a number of points regarding Dr Jones' reply to Dr Khan's letter (SPUMS Oct-Dec 1980).

We do not routinely administer Valium. Assuming this is done to prevent CNS O<sub>2</sub> toxicity, we believe it only obscures the signs of such toxicity, and find that this is a rare problem, easily controlled by taking off the oxygen mask.

We only administer steroids (Dexamethasone) in refractory cases and not routinely. The effect of steroids on oxygen toxicity is becoming well known and should be borne in mind.

Dextran has many known side-effects, chief among which are pulmonary oedema, renal failure and coagulation disturbances. The maximum dose we use is 500 ml twice daily, given as a slow infusion (over two hours) and started only after volume replacement has been initiated with Ringer's lactated solution.

Regarding the absolute contraindication to recompress an unconscious diver in a one compartment chamber: our experience with monoplace chambers is quite extensive (1), and the dangers of using this type of chamber are recognised. However, if we got an unconscious diver very soon (minutes) after surfacing, and he had no respiratory difficulty, we would recompress him in a monoplace chamber rather than wait for his arrival at a two-compartment facility, if this entailed a delay of more than

say 30 minutes. We do this in the belief that it is more dangerous to delay recompression in this case than to undertake the risk of cardiorespiratory arrest in the chamber. The patient is placed on his side in the usual anti-aspiration position. The chamber is quickly transported to a multiplace facility, and transfer under pressure into the larger chamber accomplished as soon as possible.

The indication to recompress is especially acute when the circumstances of the accident make it likely that it is a case of pulmonary barotrauma with air embolism. The critical effect of delay in recompression on the outcome of cerebral air embolism needs no elaboration.

Yours sincerely,

Dr P Halpert, physician  
Dr A Greenstein, physician  
Dr Y Melamed, Director

#### REFERENCES

Melamed Y, Sherman D, Weiler-Ravell D and Kerem D. The Transportable Recompression Rescue Chamber (TRRC) as an alternative to Delayed Treatment in Serious Diving Accidents. Presented at the International Diving Symposium 1980. New Orleans. 6 February 1980. Accepted for publication by Aviat Space Environ Med.

#### UNDERSEA MEDICAL SOCIETY

The Undersea Medical Society has changed its by-laws to permit EUBS, SPUMS and other similar regional societies to become affiliates of the UMS if 10% of the membership belong to the UMS. This means also that each organisation will be able to send one representative to each executive committee meeting of the UMS and that that member will have a vote.

Dr C Lourey, the Secretary of SPUMS, has been appointed co-chairman, with Sir John Rawlins, of the International Affairs Committee of the UMS.

#### UNDERSEA MEDICAL SOCIETY 1982 ANNUAL MEETING

This will be held in Norfolk, Virginia, from June 4th to 6th, 1982. The programme will consist of a Symposium on Diving Safety, some tutorials, oral sessions, posters and a poster symposium. Dr John Miller, the SPUMS guest speaker in 1980, is once again the programme Committee Chairman. The last time he had this position was for the 1979 meeting in Miami which was a great success. He is hoping to involve the Cousteau Society and the South East Consortium for Undersea Research with their research ship.

Dr Miller also hopes to have a special section for associate members covering technical aspects of chamber and diving systems, hyperbaric nurses and off-shore communications.

#### IS IT SAFE TO DIVE WITH A PACEMAKER?

The real question is whether an individual wearing a cardiac pacemaker should be scuba diving in the first place, because of his or her heart condition. All victims of heart disease should consult their physicians before undertaking any scuba-diving activities.

If a person wearing a pacemaker has been cleared to dive, a final test is mandatory prior to the first dive. While being monitored with an electro-cardiogram, the diver should don his gear and go through the full range of motions encompassed in swimming and diving. This would ensure that the pacer would not be inadvertently "turned off" by muscular activity while underwater.

Another problem that divers wearing pacemakers may experience is irritation of the skin overlying the pacer, due to the chafing of the scuba-tank straps over this area. This condition could lead to substantial erosion of the skin, as a result of rubbing between the metal of the pacemaker and the tank straps.

There would be no interference, due to pressure changes, on the function of a cardiac pacemaker worn by a scuba diver, because there are no compressible areas within the instrument. Certain models of pacemakers have, in fact, been tested for deficits under rapid compression and have been found to exhibit no alteration of function under such conditions.

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#### FUTURE MEETINGS

There will be a SPUMS meeting held at the Mount Lawley College of Advanced Education, (WA) on Saturday, 12 December 1981, commencing at 1400.

The programme is expected to be:

Film - "Requiem for a Diver"  
Dr John Knight - First Aid for Diving Emergencies.  
Dr Nigel McKie - Diving experiences in North Sea and Europe.  
Dr John Knight - Fitness Standards for Sports Divers.  
Dr Nigel McKie - Saturation Diving and its problems.

After a break for tea the meeting will continue at 1930.

"Decompression Sickness" - Film  
Dr John Knight - The Edmond's Underwater Oxygen Equipment.  
Dr Nigel McKie - Woodside's role in the North-west Shelf.

REVISED DIVING SAFETY MEMORANDUM NO. 6/1981  
DIVING TRAINING STANDARDS

Department of Energy,  
 Petroleum Engineering Directorate, Thames  
 House South,  
 Millbank, London SW1P 4 QJ

Since the issue of Diving Safety Memo No. 6/1981 considerable interest has been shown from all over the world. It has therefore been decided to re-issue a "revised" version.

With the introduction of the new Health and Safety Diving Operations at Work Regulations (S1/1981/399) from 1 July, all divers taking part in any diving operation as a diver in the UK or UK designated areas must have a valid certificate of training.

There are four standards of competence, a Part I, Part II, Part III and Part IV training requirements in Schedule 4 to the regulations.

Parts I and II cover the "Basic Air Diving" and "Bell Diving" Standards. (Published by the Manpower Services Commission, both of which have been revised, the new "Bell" Standard was published in November 1980 and the new "Basic Air Diving" Standard will be available shortly). These two standards are the only ones acceptable in diving operations connected with the exploration for and exploitation of mineral resources (offshore oil and gas) both in territorial waters and on the United Kingdom's Continental Shelf.

Parts III and IV are different from Part I, in a number of respects but mainly relating to physical limitations on depths and duration. Parts III and IV apply only to air diving where a surface compression chamber is not required to be on site.

Part III covers air diving using either surface supply diving equipment or self contained diving equipment and Part IV covers diving using self contained diving equipment only.

It should be noted that all diving operations involved in the exploration for and exploitation of mineral resources require a two compartment chamber on site, and therefore Parts III or IV certificates cannot be used in this context.

It is also important to note that a person taking part in any diving operation as a diver must have in addition to a valid certificate of training a valid certificate of medical fitness and is competent to carry out safely the work he is called upon to perform in the operation.

The regulations do not require that a diver must progress to a higher standard by a particular means. The regulations simply require that a person issuing a new certificate of training (the HSE) with effect from 1 July has to be satisfied as to the competence of the diver as a result of that training. For example, a Part III diver wishing to progress to Part I could do so by:-

- (a) doing a full-time Part I course or
- (b) doing a special module (which could

be part of a Part I course) covering the depths, compression chamber and tool training elements required by Part I, and in which he is deficient as a Part III diver.

The enforcing authorities do not see this however as opening the door to some magical route to Part I. Those claiming a Part I certificate will have to satisfy HSE that they have achieved the standard required.

With effect from 1 July 1981, all new divers, without adequate practical experience will have to satisfactorily complete an approved course of training to the Part I, Part III, Part III or IV standard, as appropriate. Approval of all courses from 1 July will have to be sought from the HSE.

Any course or training module therefore designed to progress a diver from one part to another must have the prior approval of HSE, and in the case of inquiries in connection with training for offshore diving these should be directed to the Diving Inspectorate of the Department of Energy who are acting as agents for the HSE in this matter.

The training period (from 1 July to 31 December 1981) is not a period designed to permit divers to "top-up" their diving times and depths to progress to a higher standard or to obtain a standard. The transitional provisions are designed to cater for the diver who has been operating for a long time, who has not necessarily completed a recognised course of training but is qualified by experience. During the first six months immediately after coming into operation of the Diving At Work Regulations 1981, a diving contractor may issue a certificate of training for the appropriate part or standard providing he is satisfied that the divers' experience during the two years immediately preceding the issue of the certificate is such that he is competent to take part in diving operations of the category stated ("The diving contractor" means the first relevant diving contractor after these regulations come into operation). (Diving contractors can purchase transitional certificates from the Association of Offshore Diving Contractors).

After July 1981 there will be only two types of professional diver:- those with certificates and those carrying out approved training. Thus for example, for a diver to progress from Part III to Part I it will mean that he will have to undertake a course of training which has been approved.

It is unlikely that any diver who has only worked in docks and harbours or on civil engineering sites will qualify for the Part I standard without further training simply because they would not have had exposure and experience to the necessary depths, surface decompression routines, chamber operations and exposure to the offshore environment. However, a diver with considerable experience in the Southern North Sea gas fields, where water depths are rarely deeper than 35 metres, would qualify as a Part I diver.

Sport diving and experience does not count towards professional standards.

Experienced divers who may be working outside the United Kingdom should, in the first instance, contact the Diving Inspectorate at the Department of Energy on their return to the UK after 1 January so that the necessary certification procedure may be initiated.

Yours faithfully,

COMMANDER SA WARNER  
Chief Inspector of Diving

APPENDIX I TO DIVING SAFETY MEMORANDUM  
NO. 6/1981

GUIDANCE ON QUALIFICATION BY EXPERIENCE FOR  
PART I AND PART II DIVERS

The Part I and Part II diver qualifications are the only ones acceptable for divers working in operations involved in the exploration and exploitation of mineral resources. (Anything to do with offshore oil and gas).

Part I is based on the standards established by the Manpower Services Commission for the basic air diver.

Part II is based on the standards established by the Manpower Services Commission for the bell diver.

The six months transitional period is often referred to as a "grandfather clause" which permits the certification of those divers who have a vast background of experience. It is not a period for "topping up" on experience or exposure to depth.

Any certificates issued by employers during the transitional period should be based on:-

- (a) possession of a Norwegian certificate
- (b) properly documented previous experience
- (c) divers with the appropriate Department of Energy's Diving Inspectorate's stamp.

All certificates issued prior to 1 July under the Manpower Services scheme are still valid.

From 1 January 1982 only the following certificates will be accepted:-

- (a) certificates issued by the HSE/ Department of Energy
- (b) certificates issued by approved schools in UK, Norway and France
- (c) transitional certificates.

Any doubtful cases or divers who may wish to appeal against a decision should in the first instance be referred to the Diving Inspectorate of the Department of Energy who may further refer it to the HSE's certification board.

The following is produced as guidance:-

Part I Diver (Basic Air Diver)

Requirements (All of which must have been achieved before 1 July 1981)

1. Must be at least 18 years of age
2. Must hold a in date medical certificate valid in the UK.
3. Must achieve standard of competence by training experience or a combination of training and experience in accordance with the aims and terminal objectives for the basic air diving and underwater working issued by the Manpower Services Commission.
4. Must be a competent commercial air diver and underwater worker with experience over the range of depths to 50 metres.
5. The absolute minimum of working time underwater is a total of 2000 minutes with at least 1600 at 0 to 19 metres, at least 250 at 19 to 39 metres, and at least 150 at 39 to 50 metres.

It is unlikely that any diver who has only worked in docks and harbours or on civil engineering sites will qualify for the Part I standard without further training simply because they would not have had exposure and experience to 50 metres.

Sport diving training and experience is not acceptable.

Part II (Bell Diver)

Requirements (All of which must have achieved before 1 July 1981).

1. Must be at least 19 years of age.
2. Must hold an in date medical certificate valid in the UK.
3. Must be a competent air and bell diver and underwater worker with experience of working over representative ranges to 100 metres and deeper with experience of both saturation and bounce diving.
4. Must have achieved the standard of competence by experience or a combination of training and experience in accordance with the aims and terminal objectives for "bell diving" issued by the Manpower Services Commission.
5. The absolute minimum exposure as a bell diver is:-

25 bell lock-outs.  
25 bell runs acting as a bellman.  
At least 5 exercises for recovering an incapacitated diver.  
Successful completion of at least 4 bounce dives in varying depths between 50 and 100 metres and at least one exposure under saturation conditions with a lock out.

NOTE:

The only training schools that have achieved the requisite standard for Part I and Part II divers are the appropriate UK approved schools, the Norwegian Diving Training Centre and Cetravim in Marseille.

UNDERSEA MEDICAL SOCIETY, INC.

9650 Rockville Pike  
Bethesda, Maryland 20014, USA.

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