South pacific underwater medicine society

Newsletter

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NEWSLETTER REPORT

This *Newsletter* is scheduled to be the last one compiled by these old and tremulous hands. It has never been my intention to utilise the Newsletter as an official voice for South Pacific Underwater Medicine Society - and nor can it be, with only one editor. I look upon it more as a forum for discussion, a vehicle for individual viewpoints, and a way of keeping in touch with old friends. This must at last come to a protracted end, and I pass over the tiller to Douglas Walker, for the next and subsequent issues. SPUMS is changing, and so must its decision makers. Perhaps the newsletter should cease its informal presentation and emulate the newly launched *Undersea Biomedical Research*. The latter receives my unqualified praise - but if I were faced with a choice I would personally prefer to continue receiving its humble predecessor, Harry Alvis' *Hyperbaric Newsletter*. Times change, and so do editors, and it is usually for the best. I implore you to give Doug Walker the same tremendous support you gave me. In the recent Annual General Meeting, a decision had to be made whether to maintain our high subscription rates or reduce the cost of the Newsletter. I voted for the latter - and this *Newsletter* is published at approximately half the cost of the previous one. It is also subsidised by a drug company. Perhaps our members could assist the editor in obtaining similar "one time only" support. This particular subsidy was arranged by David Sutherland, whose effort we acknowledge with gratitude.

The *Newsletter* cost is limited to $150 per issue, and I believe this to be more than generous, and not a burden on the members.

CARL EDMONDS

EDITORIAL

Times are changing, and I hope my fellow members shall forgive my nostalgic meandering in my final role as editor of the Newsletter. Old faces are fading away. Ian Unsworth, who has guided the Society through many troubled times since its inception has resigned his position as secretary. His devotion to the Society, and his wisdom during those early years, deserves our unqualified admiration. The Society has finally evicted me as editor, a belated change for the better. New and enthusiastic faces are popping up on sub-committees, and it looks as if one powerful state group are now to relinquish the constitutional control they have on the Society. With the exception of Ian's resignation, this all meets with your editor's complete approval.

The divers in the Indo-Pacific area have also changed. Nowadays one can see buddy lines, pressure gauges on tanks, air inflatable buoyancy vests and well organised dives for well trained divers. It is not always so Utopian, but it is a far cry from five years ago, when such common sense safety precautions were virtually non existent. SPUMS can take some credit for this mature approach to an exciting and safe sport. Many of the SPUMS members have made themselves available to lecture at Diving Conferences and Diving Clubs. This *Newsletter* pays homage to those who have contributed in this way. This year has seen three major diving conferences, *Oceans 74 i*n Melbourne, the *Man and the Sea* in Brisbane, and the *Underwater Film Festival* in Sydney. All have invited medical practitioners to lecture, to give demonstrations on safety or the medical aspects of diving, and have acknowledged the importance of these.

Unfortunately the diving administrators have not yet learnt the value of unity. Each of the "national" groups has certainly improved the standard of instructing and instructors, and is insisting on a responsible attitude from its members. It should not be too long before the competing groups improve to such a degree that they amalgamate and speak with one voice. Professional diving is also bedevilled by the commercial and competitive spirit. Nevertheless there is some suggestion that the number of companies may be lessening, and also that they are giving more support to the Government attempt to standardise and rationalise diving procedures. The publication of the Australian Standards Association, Medical Standards for Compressed Air Workers, was a landmark this area.

Hyperbaric chambers are now dotted around Australia. The Royal Australian Navy concept of having 2 man chambers able to be interlocked to each other and to two major chambers - one in Perth and one in Sydney - is progressing slowly. Both Melbourne and Adelaide have low pressure oxygen chambers available for treatment of civilian divers. The Prince Henry Hospital in Sydney has a single lock high pressure chamber. Royal Hobart Hospital have acquired a two lock high pressure chamber for Oceaneering, and should now be able to treat the Tasmanian diving accidents. Most of the diving companies have adequate numbers of chambers on the shore and on the oil rigs. Most the chambers now designed are fitted with the capability to transfer under pressure to the main high pressure Navy chambers. This is all a vastly different scene to that of 5 years ago, when only Sydney and Perth had functioning chambers.

Last but not least, according to the figures available to us, there appears to be no increase in diving deaths or morbidity despite an explosive acceleration in the number of divers being trained. It is a very promising and rewarding situation, and one that brings tears to the smiling eyes of us oldies. The young kid starting up his diving in 1974 will be taught by competent instructors how to avoid accidents and also how to treat them. In the event of a problem arising during the dive, he will be able to contact his buddy without using telepathy, will be able to ensure he has an adequate gas supply for any procedure he carries out, and will be able to use buoyancy for both himself and any injured diver who floats by. He understands first aid and in the event of a decompression or barotrauma accident, recompression facilities would be available to him. Under these conditions, I am delighted that my children are taking up diving, and I do not begrudge them missing out on the Russian Roulette "good old days".

PERSONALITY PROFILE
DANGEROUS MARINE ANIMALS THAT I HAVE MET

Dan Quick, born to a Cornish fishing family some 20-40 years ago. Did the usual rounds of Borstals and remand homes. Won a scholarship as a boy slave to a Government Research Unit and was allowed to study at London University in his spare time, but not being able to speak English proved to be a big disadvantage. Eventually got a Diploma in Electrical Engineering. At around this time a personal invitation was presented to him to join Her Majestys Royal Navy for 2 years National Service, which was spent plotting mutiny and rebellion (which proved good training for later life). On demob (dismissal) followed a period of several years of no official record, there were stories of course, like when, the French Security Police interviewed him and the whole affair setting back Anglo-French relationships 20 years; or a certain Bar Owner in Algeria that goes quite pale when his name is mentioned. In 1959 he decided to emigrate (deported) to Australia. Worked for several years as a research assistant at RPAH. Dan joined the SUM at its birth at HMAS RUSHCUTTER in 1965, originally being the one man band, he went on to specialize in diving equipment. He was involved in many of the medical breakthroughs of the SUM over the last 8 years, including the work on unconsciousness in divers, diver selection procedures and physical fitness requirements. He is the joint author of many SUM diving equipment reports and the instigator of an excellent history of the development of oxygen diving equipment. Recently he made available a very professional assessment (mainly thumbs down) on the SOS decompression meters.

The Quicks, Dan and Laurie his wife live in a Paddington Terrace overrun with dogs, cats, birds and building material.

Dan leaves the SUM this month to join another RAN Unit involved with guided missiles and on his past record it is unlikely we have heard the last of him.

MAN IN THE SEA: A SHORT HISTORY
Rex A Benson, Royal Australian Naval College, 1974

“The origins of free diving probably date back to the time man first entered the water”. This is the opening sentence of a treatise on diving, but one could well add “whence he came”, and immediately we are presented with a paradox. Life did originate in the oceans, and although man has evolved as a land animal, that he can adapt himself to living in a sea environment, albeit for only short periods, should be a natural consequence.

It is only in recent decades however that there have been serious attempts to bring about this adaptation. In the days of sail, most seamen could not swim, and did not think that this was a handicap. They chose not to learn supposing that to be swept overboard meant that they were going to be lost anyway, and better a quick death by immediate drowning than a lingering one after hours of treading water and eventual exhaustion.

It is one of the inexplicable traits of man that he first sought to conquer the air and persisted in so doing despite the fate of Icarus, a tale told down through the ages to deter man from trying to fly like the birds; moreover, that he succeeded with a heavier than air machine that defied the Law of Archimedes, when all the time it was well known that the sea was a more buoyant medium. Nevertheless there were the intrepid who gave substance to the thought that existence in the sea was possible, and we can trace a history up to the present, when diving is commonplace, and even a means of recreation. As is so often the case with rapid advancement in a new field, war hastened the process.

I once met a Greek hawker near Piraeus, whose only words of intelligible English were “lufly sponges”, as he traded his wares to do business with me. Sponges had been taken from the nearby seabed from the time of the Greek Empire, when they we familiar household articles. The slowly shuffling throng, admiring the Crown Jewels the Tower of London cannot fall to notice the enormous matching pearl ear-drops of Good Queen Bess which flank the Imperial State Crown. These must have been recovered by pearl-divers centuries ago. With the exception of shallow diving to examine wrecks of vessels close to shore, there is little evidence in the past of other forms of diving and the two examples referred to, sponge-diving and pearl-diving, took place in relatively clear waters.

Early man could well brace himself to explore the depths of a mysterious cave, holding a blazing band that gave him sufficient light. There was no incentive to want to explore a subterranean one in the dark, even if its existence were known. Darkness was the main deterrent to exploring the waters below the surface of the sea.

The first record of a meaningful plunge into the dark world underwater, dismissing tales from mythology, informs us that in 1538, at Toledo, and in the presence of Charles V, two Greeks were lowered into the River Tagus in a rudimentary diving-bell, each carrying a lighted candle. Robert Boyle had not then expounded his familiar law and they were ignorant of any traumatic effects that could have resulted. They suffered none and were brought to the surface dry and unharmed. In effect they had taken down with them part of their normal environment, the air, which had automatically adjusted itself to the increased pressure, but this was the first occasion of using a device to stay underwater, as distinct from the free-diving that had been carried out for centuries to gather sponges and oysters.

In the same way that Benjamin Franklin, in blissful ignorance of the risk he was running, had avoided electrocution when using his kite to demonstrate the idea of lightning during a thunderstorm, so did some of the early experimenters escape an early demise when using diving-bells. Halley, the renowned astronomer, spent over an hour with four others in a diving-bell of his own construction at a depth of sixty feet. They too were brought up without incident, but had they chosen to stay down longer, tolerance level would have been exceeded and all would have died. Halley, who was later to suffer from ear trouble as a result of his underwater sojourns, modified the type of diving-bell which had been used earlier by supplying extra air, first by utilising weighted buckets, and then incorporating an air hose for the same purpose.

The need for decompression, or the very nature of it, was unknown until the construction of caissons on a wide scale, and many years were to pass before it was realised that there was more to descending into water at depth than a superficial knowledge of the elementary laws of physics. There are many diving neophytes who have not realised this yet.

It seemed a natural step to go one better than the diving-bell by enclosing only the head with a miniature closed bell, to wit, a helmet, with the added refinement of a glass window through which to see. That any credit can be ascribed to Leonardo da Vinci for this novelty can be disregarded, as any device constructed according to his specifications and sketch plans to supply air through a simple tube leading to the surface, would be doomed to failure.

In the film “Dr No”, James Bond, together with his two companions Quarrel and the delectable Honeychile, who appeared to be endowed with a generous lung capacity remained undetected in the waters of a swamp by breathing through long reeds. Anyone with a knowledge of pressure differential and dead space would realise the extreme difficulty of attempting this for any period of time.

It has generally been acknowledged that the diving-dress designed by Augustus Siebe in 1819 was the forerunner of the modern type. He was a German engineer who had settled in England, where he considered that his inventive genius was more recognised than in the Fatherland. His first suit, supplied with compressed air from the surface, was a jacket-type affair from which the expired air was allowed to escape through vents around the waist, by which it was known as an open diving suit. It had one obvious drawback: the user was obliged to remain upright to avoid the entry of water into the suit, and consequently the helmet, which was riveted to the waterproof flexible jacket. As an upright stance was the normal working position, this restriction was not as serious as would at first seem.

An improved version of this suit had its first real test in 1839, which could be termed the year in which the art of clearance diving, as we know it today, was founded. In August of 1782, the “Royal George”, then at anchor at Spithead, capsized and sank in only eleven fathoms of water, which caused the wreck, in such a busy anchorage, to be a navigational hazard. She was too heavy, being a first-rate ship of the line, to be raised, and demolition by surface parties proved impossible. She was to lie neglected for over fifty years before considering new means of trying to break her up. A diving bell was decided upon, and a team of Army divers, which must have upset the Nautics, arrived for the task. The bell proved unsatisfactory, but Siebe’s new modified diving outfit, the first closed type comprising a helmet sealed to a suit now watertight at both wrists and feet, and serviced by efficient hand-pumps, proved equal to the task. An escape-valve fitted to the helmet dispensed with the vents, giving the diver greater freedom of movement. Lead weights were attached to the chest, back, and boots, and the modern diving-suit differs in only minor details.

One problem remained. The helmet-and-hose diver required an attendant boat overhead to supply the compressed air, and hence he could work only in situ. Was there a way of using a portable air supply?

In 1680, Giovanni Borelli suggested that the expended air could be purified and rebreathed by being passed through a copper tube cooled by sea water, causing condensation designed to trap the impurities. In 1831, Charles Condert, an American, made the first self-contained outfit of compressed air, and he went for walks under the East River until the breaking of an inlet tube put a sudden stop to his peregrinations when he drowned. This set back further investigations into a self-contained set until an Englishman, Henry Fleuss, in 1868, patented the first workable fully self-contained apparatus using pure compressed oxygen. This was a breakthrough, as it allowed him to stay down for more than an hour, since he used caustic potash to remove the carbon dioxide from the exhaled gas, all of which hitherto had been allowed to escape.

Many inventions have languished for want of an occasion to show their worth. News headlines in 1910 were of the arrest of Dr Crippen, whereas those of 1912 dealt with the sinking of the “Titanic”. In both of these events, which caught the interest of the world, wireless, then a novelty, played the major role.

In 1880, while Fleuss was trying to instil interest in his new gear, the Severn Tunnel flooded. This was being built for the Great Western Railway by Brunel, to connect Bristol with South Wales, and was one of Brunel’s engineering wonders of the age. The flooded tunnel could not be pumped out from the Bristol side until a heavy iron door within the tunnel was closed. To reach the door entailed a descent of two hundred feet, followed by a further distance horizontally of one thousand feet - an impossibility for one diver using the Siebe set with its length o£ hose. The most famous diver in England at the time was Alexander Lambert, and Fleuss offered him the use of his new device. Using it, Lambert closed the door but only a man of his physique could have done so, after superman exertions that would have taxed a normal man accomplishing the same task on land.

“Send for Lambert” was the cry three years later when the tunnel flooded again, but on this occasion, using the Fleuss gear that had stood him in good stead previously, the redoubtable diver almost died before reaching the trouble spot, yet recovered and had sufficient courage to complete the job using his trusty Siebe helmet dress, assisted by other divers who paid out his lines.

Unknown to Fleuss, Paul Bert had by this time published a warning of the toxic effect of pure oxygen being breathed below twenty-five feet. As in the case of Halley, Fleuss had survived his experiments with the apparatus by pure chance, having limited his dives to shallow water.

Bert, a French physiologist, was the first man to study underwater medicine as a science, but at first had been more interested in the physiological effects resulting from the decreased pressure as one went up in a balloon, or climbed a high mountain. He could thus also be considered as the founder of aviation medicine. He discovered that pressure acted to change the proportions of oxygen in the blood, causing toxic symptoms which, in excess, could kill. This was a discovery of great importance, and having exposed this hazard, Bert then turned his attention to another, “the bends”, which had occurred among sponge divers for centuries, and had been accepted philosophically as occupational hazard, without any research having been undertaken into its possible cause. “The bends” was a simple term, descriptive of the twisting of the body by a sufferer seeking to relieve pain in the limbs and joints.

It was in 1840 that there came to the fore reports of strange illnesses among workers in caissons and tunnels. For subaqueous mining, and in particular for tunnels under rivers, it had been found necessary to use compressed air to cut down seepage of water into the workings. In 1854, after an explosion in a caisson under pressure, six workmen died, and a post-mortem revealed that one of the deaths was the result of decompression. In the same sort of occupation, hundreds of workmen had reported cramps over the years.

As post-mortems could be carried out only on the dead, it was difficult initially to relate the symptoms to the cause, but Thomas Littleton in 1855 recalled the phenomenon of “The Viper’s Eye” which sounds like the intriguing title of one of Sherlock Holmes celebrated cases. Boyle had been studying the effect of pressure on animals in an elementary decompression chamber, and in this case the subject was a viper, one of England’s few snakes that was poisonous. Scientists were wont to use as specimens animals such as snakes, lizards, and toads, to which most people had a natural revulsion and Harvey had used a lizard to study the circulation of blood. Boyle had noticed a tiny air bubble, or aeroembolism, in the pupil of the snake’s eye which, unknown to him had been a tiny bubble of nitrogen. Littleton correctly diagnosed that decompression symptoms might arise as the result of such a bubble pressing on the brain, and recommended gradual pressure changes.

Bert took over from where Littleton and others had left off, and in 1878 published his classic work “Barometric Pressure. Researches in Experimental Physiology”. The original investigations were prompted by a problem existing on land, but it also existed underwater, and at last was offered an explanation for the painful sufferings and deaths of the sponge divers.

After Bert had advanced the knowledge of the effects on the body of high pressure, it was realised that decompression symptoms might be prevented, or at least minimised, by gradual decompression. He himself died in Indo-China a few years later as a French Colonial official, but was to be followed on the scene by John Haldane, a Scot, who was a Doctor of Medicine.

As with his predecessor, Haldane was at first not interested in any way in diving, but concerned himself with air-fouling and mine safety, social problems of the day which, in his view, were being swept under the carpet. Many lives were being lost in mine disasters near the turn of the century as a result of fire-damp, and the stench of open sewers in slums was a menace to health.

His later research was into the effects of high altitude, so he went mountaineering abroad to discover his own reaction to ratified air. This led him to the important discovery of the influence of carbon dioxide upon human respiration, which to prove of great value in the practice of safe diving. He then investigated “caisson disease”, but, like Bert, found himself involved with the medical aspects of diving. After he had advised the Admiralty that there appeared to be no guide lines for safe diving, such was his standing that in 1906 they appointed a committee to report on the matter, making Haldane a senior member.

Decompression was the major problem that needed solving, and Haldane was able to call upon the experience of the few diving officers in the Navy. It had already been shown by Paul Bert that divers did not suffer “bends” when drawn quickly from thirty three feet up to the surface, being a pressure change from two to one atmosphere.

Possessed of this knowledge, and knowing from basic physics that relative pressure changes were greater the nearer one approached the surface, Haldane devised the method of halving the pressure in steps, thus developing the system of underwater stage decompression. He also improved the design and efficiency of the hand-pumps, and by this time Service divers were able to work at a depth of two hundred feet using a normal Siebe suit.

Although in 1915 a US Navy diver reached a submarine sunk at a depth of 340 feet, this proved the limit for compressed air diving, and a new breathing mixture needed to be developed for deeper dives. This was not because of the oxygen in the compressed air. Admittedly at this depth it was being breathed as though it were in a pure state, but oxygen toxicity is not acquired over a short period of time, and such dives were of short duration. The villain was again nitrogen, but acting in a different manner than in decompression sickness with its bubble formation.

Whereas Bert himself had observed that divers appeared to become intoxicated at depth, this had been put down, in part at least, to psychological reasons, the effect being more marked with some than with others. Were there not men who could drink a yard of ale, whereas others were known as “two-pot screamers”?

It was not until 1938 that Behnke, a US Navy doctor proposed the now generally accepted theory that this intoxication or narcosis was due to the increased partial pressure of the metabolically inert gas nitrogen. The narcosis had been accorded other names, such as “the narks”’ and “rapture of the deeps”. Although other gases can produce varying degrees of narcosis, (xenon at atmospheric pressure), these effects vary, and it was found that helium has a less narcotic effect. Unfortunately at that time the United States held a virtual monopoly on the supply of this rare gas, and adopted a dog in the manger attitude which directly contributed to the loss of the German airship “Hindenberg” which had to use hydrogen instead and caught fire. Little research therefore was able to be done using this gas other than the United States.

It is sufficient to say that helium gas, now readily available, containing only a small percentage of oxygen, is now used for deep dives, and has almost eradicated the narcosis originally experienced when nitrogen was the inert gas involved. That it causes distortion of the voice is a small price to pay as a side effect.

We should now go back to the beginning of the century to mention the contribution made by RH Davis. All diving then was being done by “hard-hat” divers in conventional dress. Fleuss, still active had given up developing his oxygen apparatus, and it was not in popular use. He was encouraged by Davis to join forces with him at Siebe Gorman and Company, Submarine Engineers, and this combination led to the development of several oxygen sets, which included the original submarine escape set designed in 1903-06 in which Admiralty took no interest until the sinking of the American submarine S4 with all hands, the usual fate of all who went down with a submarine. In 1927 he improved upon his original design and produced the Davis Submarine Escape Apparatus, which four years later saved six lives from HM Submarine “Poseidon” which had been rammed and sunk in the Sough China Seas. His name became a household word and the set a model for all navies. A similar set was also adopted by firefighters and rescue workers. It has since been superseded by free ascent and the use of a different service in the submarine itself before escaping.

The set was essentially regenerating, and took the name CCOUBA, Closed Circuit Oxygen Underwater Breathing apparatus. Its use played an important part during World War II, particularly during the later part, and included escapes from submarines, attacks on ships by human torpedoes, and the clearing of obstructions from enemy beaches prior to landing operations. They were later used for the clearing of mines and booby-traps from occupied ports. These operations, even without the meeting of enemy opposition, were fraught with danger, and required a degree of courage that could not be expected in peacetime. This, together with the post-war advent of the compressed-air aqualung saw the gradual fading out of CCOUBA from diving.

Since a self-contained set, with its absence of tell-tale bubbles, still had military applications, a review of the use of CCOUBA during the war should find in a history of diving.

A recall of names such as Bert, Fleuss, Haldane and Davis would lead on expect that Britain was to the fore in its use, but this was not so, and the honour undoubtedly fell to the Italian Navy, which was hardly in the same league, according to the Royal Navy whose thinking was, “The German Navy we know, the United States Navy we have heard of, who are you?”

The Davis Submarine Escape Apparatus was being made by Pirelli, the well-known Italian rubber company, before the war, under licence, and in 1935 two young Italian Navy officers, Tesei and Toschi proposed the use of a human torpedo, to be known later as “the pig”, since it did not endear itself to those working with it. The idea had been given to them by the exploits of two earlier Italians in 1918, who had sunk an Austrian warship in harbour, riding a “chariot”, but not using diving-sets, choosing instead to keep their heads just above water, a ploy hardly likely to meet with success with more modern means of detection. The Italian Navy pushed ahead at full speed with the project, in case war with Britain resulted, during the Abyssinian campaign in 1936. This was not to eventuate until the fall of France in 1940, and the Royal Navy would not have been so indifferent towards the new Axis partner had they known of the new “pigs” which had a range of ten miles, could submerge to one hundred feet, and travel at three knots. Unknown to Royal Navy, the first attempts to use them in action proved unsuccessful because of mischance, and not from failure of the suits, but on the 19th of September, 1941, three British ships were sunk at Gibraltar. Fortunately for the British, two of the sets were recovered from the harbour, and within days the Admiralty were in possession of them. The new menace was even more forcibly driven home a week before Christmas, when two capital ships of the Mediterranean Fleet, “Queen Elizabeth” and “Valiant”, were severely damaged in harbour at Alexandria by Italian Navy divers using “Pigs”.

Their Lordships wasted no time in ordering the development of human torpedoes modified to operate in colder northern waters, and called for volunteers, many of whom had little idea of what they had volunteered. There were fatalities during the early experiments, as not sufficient heed had been taken of Bert’s warning regarding the use of oxygen below thirty feet, but by September 1943, after the usual series of abortive attempts, the Royal Navy was able to carry out a successful attack on “Tirpitz” using midget submarines known as “X-Craft”, each manned by divers using special suits of closefitting rubber, which gave good protection from the sub-arctic conditions. Together with their goggle-eyes, and the later use of flippers, it is little wonder that the word “Frogmen” was coined by the Press, and survives to the present day.

Today, almost all CCOUBA sets are restricted to Service use, mainly because they give no indication to the enemy in the form of bubbles, but they offer no advantage to the civilian user, being costly, difficult to service, and with the risk of oxygen poisoning, limited to a shallow operating depth of thirty feet. They have been superseded by compressed-air, open-circuit system, the oxygen rebreather being considered too risky. Both are types of SCUBA, self-contained underwater breathing apparatus, but the term “SCUBA diving” today would tend to exclude oxygen breathers, and they are not sold commercially.

The set in popular use, and which has revolutionised diving to the extent millions of people use them for sport, was co-invented by the Frenchmen Jacques-Yves Cousteau, and Emile Gagnan, in June, 1943. Ten years before, a retired French Navy Commander, Yves Le Prieur, after earlier work, had brought out the prototype air-lung for diving. It utilised a compressed-air tank and a hand-operated breathing valve, with light face-mask and fins, which gave great mobility but suffered from the disadvantage that the air supply needed to be adjusted by hand which meant constant fiddling and loss of air, cutting down diving time.

What was needed was a regulator of the demand type, and this Cousteau and Gagnan supplied. It was the answer. As well as giving great mobility also, it enabled the diver to breathe normally. Gagnan had already developed several kinds of gas-flow regulators used on cars, and in operating theatres during the war, but it was Cousteau who figured that they could be adapted for underwater use. So the sport of SCUBA-diving was born in war-time, but not for war purposes. Cousteau thought only of exploring the mysteries of the sea.

The basic single-stage, double-hose regulator used commonly today is little different from the 1943 model that enabled Cousteau to produce the underwater film "Sunken Ships" in 1944.

Even the cold, which was a problem for the crews of the "X-craft", poems no discomfort to the modern SCUBA-diver, who can break a hole in the ice and go under, thanks to the wet-suit. Made of unicellular, neoprene rubber with a synthetic cloth packing to prevent tearing, it traps a thin layer of water against the skin, which is quickly brought to body temperature to act as an insulator.

Safe diving is now a sport within the reach of everyone physically able to dive, add observe the basic rules of safety.

What of the future? Experiments begun in 1961 lead some to suppose that man can flood his lungs with oxygenated water and "breathe" it, if such an expression is permitted. This would lead to dives to depths previously unknown, and a return to the surface without any need for decompression. Reading through this brief history, when pioneers risked, and sometimes lost their lives trying out a new technique, who knows but that this might not succeed? There will be someone willing to try it.

AQUATIC STATISTICS
BY TERRY MURPHY

A summary. The full text is available from the School of Underwater Medicine Library. This article is a collection of statistical data related to aquatic deaths.

Drowning is responsible for 6 fatalities per 100,000 people on a world wide basis and 4 per 100,000 in Australia.

The World Health Organisation classified drowning under five groupings for statistical purposes:

1. All accidental deaths by drowning where the cause is known except suicide and those associated with water transport (E.910)
2. Accidents to watercraft causing drowning (E.830)
3. Other drownings associated with watercraft (E.832)
4. Suicide by drowning (E.954)
5. Drowning where there is doubt as to whether this was due to suicide or purposely inflicted (E.984)

The 1-4 age group is responsible for far more drownings than any other. Yet this should be the group of drownings most amenable to prevention, as it is largely due to inadequate supervision of a child unable to swim - as seen in backyard swimming pool deaths.

Watercraft accidents tend to affect the middle age groups predominantly. Studies in Geelong[4] and overseas have incriminated alcohol as being associated with almost half of the drownings in this middle age group. Giertson in 1970 obtained figures of 50% of drowning accidents in Norwegian seamen and one third of those in Finland occurred with the deceased being under the influence of alcohol. The use of small boats inadequate for the conditions, inexperience of the users and the non-wearing of flotation vests were also major factors.

A comparison with the 1967 deaths by drowning and motor vehicle deaths in Australia according to age groups gives the following results.

1967 TABLE I

DROWNING DEATHS			MOTOR VEHICLE DEATHS		
Age	**Male**	**Female**	**Age**	**Male**	**Female**
0	4	4	0	9	9
1-4	46	23	1-4	56	49
5-9	35	3	5-9	63	52
10-14	18	2	10-14	58	30
15-19	30	6	15-19	378	115
20-24	26	3	20-24	418	84
25-29	24	0	25-29	213	42
30-34	13	1	30-34	124	27
35 & Over	132	29	35 & Over	1112	433
TOTAL	**328**	**71**	**TOTAL**	**2431**	**841**

DIVING FATALITIES

In the United States there were 94 diving fatalities in 1964 and 130 in 1970. Of these, 109 were associated with the use of SCUBA or Hookah apparatus and 21 were skin diving. The Australian fatalities also show an increase.

Of the 1972 Australian fatalities, five occurred while the diver was on the surface, four occurred while diving in caves, two were due to decompression sickness and two were learners.

Of the people snorkelling, two drowned as a result of waves when trying to come ashore, one apparently suffered from cramp and one died of a coronary while in the water.

Either ignorance or carelessness was a major factor in all of them except for the coronary death.

A study on civilian diving deaths in Australia by Bayliss[3] showed these causes of diving fatalities between 1957 and 1967.

Diving accidents resulting in Spinal Cord Injuries have become more frequent. A study by Burke[9] at the Geelong Hospital between 1964 and 1972 gave 52 people admitted to the hospital with spinal cord injuries and of these, all but 4 occurred from diving into shallow water.

YEAR	NO. ADMITTED	YEAR	NO. ADMITTED
64-65	2	68-69	7
65-66	4	69-70	5
66-67	4	70-71	13
67-68	7	71-72	10

DANGEROUS MARINE ANIMALS

Shark Attacks

Sharks are responsible for about 75 recorded attacks on humans per year and most of these tend to occur where there is a concentration of bathers less than 1,000 feet from shore.

Studies by Dr VM Coppleson indicate that most attacks occur between latitudes

42° North and 42° South - this area being known as the shark belt, and that most attacks are along the East coasts of the major continents. This latter observation appears to be related to the warmer water temperatures along this part of the coast.

Between 1901 and 1968 there have been 210 shark attacks recorded in Australian waters - 93 of these were fatal.

Beaches	90
Harbours	17
Rivers and Creeks	24
Bays and Estuaries	11
Lakes	4
Open Sea	4

173 of these attacks occurred on the North-Eastern coast between Sydney and the Torres strait Thus giving a very uneven distribution.

An analysis on the months in which shark attacks have occurred in Australia up to 1963 is given by GP WHITLEY in "Sharks and Survival" Chapter 10.

<u>TABLE 2</u>

	NSW	**QLD**	**OTHER STATES**		**NSW**	**QLD**	**OTHER STATES**
Jan	45	15	12	July	2	3	1
Feb	22	8	12	Aug	2	7	1
March	17	10	11	Sept	0	4	0
April	10	11	5	Oct	8	12	2
May	2	8	2	Nov	8	12	5
June	4	4	1	Dec	22	17	10

<u>TABLE 3</u>

STATE	PERSONS ATTACKED	PER CENT
Queensland	123	39
New South Wales	129	41
Victoria	15	5
Tasmania	6	2
South Australia	12	3
Western Australia	19	6
Northern Territory	7	3

These figures from GP Whitley show the heavy preponderance of attacks in NSW and Queensland.

The effect of meshing sharks in the Sydney area has been demonstrated by Dr V Coppleson. This method of catching sharks was commenced in 1937 in the Sydney area.

<u>TABLE 4</u>	ATTACKS BETWEEN 1919 AND 1937	ATTACKS SINCE MESHING
NEWCASTLE HARBOUR AND OCEAN BEACHES	12	2 since 1950
SYDNEY NORTHERN OCEAN BEACHES	5	None since 1937
SYDNEY HARBOUR	15	6 since 1942 (Entrance not meshed)
SYDNEY SOUTHERN OCEAN BEACHES	9	1 since 1937 till 1960

Since 1960 there have been at least five attacks in the Sydney Harbour area plus two attacks in the Manly Marineland. Two of the attacks occurred in Middle Harbour in 1960 and 1963 with these causing the death of the victim, but no attacks have occurred on netted beaches in the fourteen years since Coppleson's figures were published.

The Sea Wasp

The Chironex Fleckeri was first identified as a separate type of jellyfish 1955 by Dr. Flecker. It has been responsible for 30 recorded fatalities between Yeppoon and Cairns compared to about 20 shark fatalities in the same area.

The most often quoted figure is that about 90 fatalities in Australia have occurred this century due to this species of jellyfish.

The danger period is between November and March; the jellyfish being thought to possibly breed in the Timor Sea at the beginning of the summer season and then increase in size and virulence in the warm waters of the Northern Territory and upper Queensland coast.

They are incapable of effectively stinging through material as thin as pantyhose and this is becoming a popular method of protection by the Queensland surfing cult in summer months.

WATER SKIING

The increasing popularity of water sports is also causing a significant group of injuries.

The types of injuries suffered by people who water ski[10] can be classified as follows:

1. Death by trauma - for example, skiers who hit obstacles such as ski jumps.
2. Orthopaedic - cervical spine damage; ankle and knee injuries; lumbo-sacral ligament damage
3. ENT injuries - ear drum perforation. These are often large and slow healing.
4. Genito-Urinary - water enema; water entering the vagina and causing peritonitis or spontaneous abortion; prostatitis, torsion of the testis and haematocoeles.
5. Rope Burns.

WATER POLO

Water Polo player injuries have been studied by J ROUS and J NOVAK[10] with the following results.

YEAR	NO. INJURED	YEAR	NO. INJURED
1958	5	1963	4
1959	3	1964	13
1960	4	1965	17
1961	0	1966	12
1962	3	1967	12

SITE OF INJURY	NO.
Head	35
Chest	1
Abdomen	1
Upper Extremity	26
Combined Injuries	2
Eye	9
Ear	12
Nose	5
Mouth	4
Others	1

These figures show a dramatic increase in the number of people being injured; the most common injuries being those to the ear or eye.

SURFING ACCIDENTS[15]

One Sunday in September, 1902, Mr William Gocher at Manly Beach in Sydney, defied the law of the time (which permitted surf bathing before sunrise or after sunset) by bathing in the prohibited hours. His action forced the issue of daylight bathing and virtually founded the zestful pastime and sport of surf bathing as enjoyed today.

Surf bathing grew rapidly in popularity, but just as rapidly its dangers became apparent. Of necessity, small groups of experienced and regular surfers formed themselves into life-saving bodies to assist those who could not swim, and those who were not familiar with the dangers associated with surf bathing. These life-saving bodies gradually grew in size, numbers and importance and on 18th October, 1907, the New South Wales Surf Bathing Association (later changed to the Surf Life Saving Association of Australia) was formed.

Since then, the Association has developed into an organisation known throughout the world for its voluntary and humanitarian work which has resulted by the end of 1973, in the saving of 200,000 lives. In 1973 alone, 4,000 rescues on Australian beaches were made.

Surfing accidents range from the orthopaedic injuries of body surfers to the physical trauma of surf boards (especially with some of the sharpened fins now being employed). Tides, undertows and rips aggravate the likelihood of drownings, and marine animal injuries are common to both types of surfers.

Australia is fortunate in possessing the longest coastline of any country. The increased aquatic recreational activities and the commercial exploitation of the continental shelf, we are in the position of having available the largest and most varied group of aquatic accidents. There is every reason to be modest regarding the Commercial and Governmental backing given to the voluntary sports organisations, and individual enthusiasts who have made the above data available. It is hoped and anticipated that some future Australian Government shall see fit to assist and subsidise compilation of this data, and its promulgation to other countries.

MEDICAL STANDARDS FOR DIVING by Carl Edmonds

The imposition of medical standards for any occupational activity is, to a large extent, both presumptive and arbitrary. Although divers and hyperbaric personnel share some hazards, others are peculiar to one or the other. Even within the diving occupation there may be considerably different medical requirements for the occasional shallow water, sport diver and the professional deep and experimental diver. Some of these variations in standards will be discussed using the model of a medical history and examination format similar to those being used by most navies employing divers.

Reports of diver selection criteria are mainly anecdotal.[2, 6, 9] These infer that the diver should be a psychologically stable or even phlegmatic personality, able to endure much physical and emotional stress, free of all serious physical disease and also free of minor illnesses affecting the upper and lower respiratory tracts. A group of more objective reports[3,4,7,8] more clearly define the psychological assessments, physical fitness levels and medical disease limitations which are relevant to diving candidates. In appreciating the importance of these criteria, it is necessary to consider three aspects of diver training. One is the high failure rate of diving courses[3,4] and the characteristics necessary for success in these courses. The second is the hazardous nature of the marine environment and the sudden unexpected demands it is likely to make on the diver. The third is the occupational diseases to which the diver is subjected.

<u>Medical Standards Format</u>[1,9]

A copy of a typical diver medical examination form is shown in Tables 1-3. This was developed for the Australian Standards Association for use with compressed air divers. The reasons for the requirements are outlined below with an explanation of any permitted relaxations and cautions.

TABLE I - Medical history questionaries (MH items 1-60) is completed by the candidate.
TABLE II - Diving history questionnaire (DH items 1-24) is completed by the examining physician in consultation with the candidate.
TABLE III - Medical examination (ME items 1-42) is completed by the examining physician.

Identification and personal data is obtained (MH items 1,2,3,4,48,53; ME items 1,2,3,36) for medico legal reasons.

Age

The age range for diver training is between 16 and 30-35 years. Exceptions are usually made for specific circumstances in both military and civilian training centres. The maximum recommended age is extended to allow physically and medically fit individuals to undergo training. Annual medical examinations are required for all divers. For those still diving beyond the age of 40 years, annual electrocardiographic examinations are required.

Occupation

The candidate’s occupation may give some indication of his physical fitness, but may also be important in increasing the diving hazards, eg. aviators or air crew should be specifically advised of the flying restrictions imposed after diving. Sonar operators and musicians may not wish to be exposed to the otological complications of diving.

Medical treatment and Drugs

Physical treatments and meditation (MH item 8) may have an adverse effect on diving and vice versa. Any drug which influences the conscious state may also affect the susceptibility to nitrogen narcosis and oxygen toxicity, whereas others may affect the assessment of decompression sickness signs. Alcohol and hallucinatory drugs are absolutely contraindicated because of the effects on the diver’s psychological reaction to stress and the impaired judgment. Hallucinations and illusions will be enhanced in the insecure marine environment. Alcohol and Marijuana have the added disadvantage of blocking vasospastic reactions to cold, resulting in more rapid hypothermic complications.

Cardiovascular

The existence of serious cardiovascular disease disqualifies the candidate from diving. A history of cardiovascular disease (MH items 9-13) and the physical examination (ME 24, 25, 39-42) should make the examiner aware of this. Tolerance to physical exertion and the absence of factors predisposing to myocardial failure or infarction, are required. If in doubt, a resting and exercising ECG should be performed, and should not show any evidence of abnormal arrhythmias or ST depression. Blood pressure should not exceed 140mmHg systolic and 90mmHg diastolic. Weight should be within 20% of the average for age of the height and build. Obesity (ME items 2 and 3) is contraindicated because of the increased propensity for decompression sickness it produces, even though it may have a beneficial effect in reducing the likelihood of hypothermia. For civilian sport diving it is permissible to allow diving with degrees of obesity that would not normally be accepted in professional or military diving. This is achieved by imposing an added 50% safety margin in calculating the depth/duration dive profile, also by making an absolute depth limit of 20 metres and not permitting any dive that requires decompression staging.

Respiratory

The existence of respiratory disease disqualifies diving candidates. Divers must not only be able to tolerate severe physical exertion, which requires good respiratory reserve, but must also be able to tolerate rapid changes in lung volumes and pressures with equal compliance throughout the lung segments. Any local restrictions, fibrosis, cysts, etc. may result in pulmonary barotrauma with a tearing of lung tissue and subsequent complications, including air embolus. A history of asthma is particularly ominous, as a recurrence will result in increased pulmonary airway resistance, and also the use of adrenergic drugs. Neither are acceptable in any diving operations, sport or professional. The history of respiratory disorders (MH items 14-19, 57) is complimented by the physical examination (ME items 4, 23), chest x-ray and simple respiratory function (ME items 8,11). High pitched expiratory rhonchi, which may only be elicited during hyperventilations, indicate airway obstruction and preclude diving. To comply with the Australian Standards for Divers, vital capacity should be more than 4 litres in males, 3 litres in females, and the forced expiratory volume in 1 second must not be less than 75% of vital capacity. A more rational standard would be to accept a value of VC=(27.63 - 0.112 x age) x height in cm for males, (31.78 - 0.101 x age) x height in cm for females, and allow 20% below this value as the minimum standard. The full plate chest radiograph must be normal.

Upper Respiratory Tract

Disorders of this system comprise the largest cause of occupational morbidity in divers. History of chronic or recurrent allergies or infections (MH items 20-22) and evidence of these, or acute disorders of the ears, nose or throat (ME items 13-19), will disqualify the diving candidate. Chronic sinusitis, allergic rhinitis, dental caries, pharyngitis and tonsillitis, etc. will all have a detrimental effect on diving. Sinus and nasal polyps may produce obstructions during ascents or descents, resulting in barotrauma. A deviated nasal septum may also result in abnormal nasal mucosa, influencing patency of sinus ostia and the eustachian tube. Whenever obstruction or restriction of the upper respiratory tract airways occurs, barotrauma is likely. If infection is present, it is likely to be spread by the movement of gases during the changes in depth and pressure. Sinus x-rays should be obtained in doubtful cases. A break in the skin or mucosal lining of gas filled spaces is a danger in diving, allowing access of gas into the body tissues, resulting in barotrauma or surgical emphysema.

Otological[5]

The diver must have normal external ear canals, normal middle ears, and normal inner ears. In addition, he must have normally functioning eustachian tubes and this requires a normal, healthy nose.

EXTERNAL EAR

Cerumen - The external ear should be free of cerumen. Occlusion of the external ear by cerumen may lead to vertigo or external ear barotrauma.

Exostoses - These should not be of such size as to occlude the external auditory meatus or to lead to occlusion by ecrumen being washed into the narrowed area when swimming.

Otitis Externa - A diver is rendered unfit by the presence of acute or chronic otitis externa.

MIDDLE EAR

Tympanic Membrane - A healthy tympanic membrane, intact and mobile, is a prerequisite for diving. The following conditions should render the individual unfit for diving. Any evidence of otitis media, however mild, a perforation of the tympanic membrane, or a thin atrophic scar. Obviously it would be unwise to submit a tympanic membrane which had been weakened by a thin scar, to the pressure changes involved in diving. On the other hand, a healed perforation which left the tympanic membrane normal in strength and mobility would be quite acceptable. A retracted and immobile tympanic membrane is unacceptable.

Middle-Ear Cavity - This should be free of fluid and be aerated. This is shown by the appearances of the tympanic membrane and its mobility on auto-inflation.

Eustachian Tube - This must function normally, ie. auto-inflation must be accomplished without excessive force. It should be noted that the ability to autoinflate at any one point in time does not preclude the possibility of intermittent Eustachian tubal obstruction at another time. The function of the Eustachian tube is dependent upon normal nasal function, and this requires careful assessment.

INNER EAR

Cochlear Function - Ideally, divers should have normal cochlear function, but minor changes in auditory acuity may be acceptable.

The Australian Standards Association has stipulated minimum ISO standards of hearing for divers and compressed-air workers as follows:

Hz	500	1000	2000	4000	6000	8000	Hz
db loss	40	35	35	45	50	50	

These standards now seem inadequate and inappropriate in many cases, at least without considerable qualification.

It should be borne in mind that loss of cochlear function may be associated with loss of vestibular function. If the vestibular proportions of the inner ears respond to stimuli unequally, then vertigo might result, more especially when visual fixation is poor, as frequently occurs in diving. This could constitute an appreciable hazard for the individual diver. The whole question of vertigo occurring amongst divers is attracting considerable attention, and much investigation is under way. Until more is known about the part which an abnormal inner ear may play in inducing vertigo it seems reasonable and safe to expect that the hearing of the diver should be near normal.

Threshhold hearing for divers should be 15 decibels at the frequencies of 500, 1000, 2000 and 4000 cps, using audiometers calibrated to ISO standard. This is the level classified as "Standard I" in most armed forces and it would seem to be appropriate to expect this standard to be reached by individuals who wish to participate in professional diving. Nevertheless, it is an insufficient range for divers, as it does not tend to 6000 and 8000 cps, which should be tested in both initial and annual examinations.

It is appreciated that this may be thought to be too harsh a standard, but it must be pointed out that this is a "safe" standard. Some individuals may have normal ears, which do not withstand stresses as well as other individuals, but once it has been shown that there is depression of inner ear function, an extra element of risk comes into diving. This will increase as the inner ear function deviates from normal.

Noise as a Hazard for Hearing - Attention has been drawn to the noise levels experienced by divers in helmets and compression chambers, and temporary threshold shift in the hearing of divers have been demonstrated. The possibility of noise-induced deafness resulting from exposure to loud noise should be borne in mind, and all diversshould have an annual audiogram as part of a hearing conservation programme. The permissible duration of exposure to loud noise of different intensities is well documented,and should be adhered to when exposing divers to such noise levels.

Vestibular Function - It has been shown that vertigo can be induced by cold water entering one ear but not the other ear, owing to the latter;'s external auditory meatus being occluded by cerumen. Similarly, vertigo can be expected to occur when diving if one labyrinth is not functioning, and the other ear is stimulated by the caloric effect of cold water in the normal ear.

The significance or importance of less marked changes in vestibular function is not fully understood as far as diving is concerned, but there is ample evidence to suggest that abnormal vestibular function will play a part in disorientation. It may prove to be wise in the future to exclude from diving those individuals whose vestibular function is not perfectly normal and equal on each side. In the meantime, it is safe to say that a diver should have normal inner ear function in both cochlear and vestibular portions.

Visual

Good vision (MH item 24) is needed both underwater, to avoid dangerous situations, and after surfacing, when the diver may have to identify landmarks, floats, boats etc. The problems resulting from an incorrect visual bearing are obvious. The use of corrected lens in the face mask is of value in reducing this danger, but the technique of buddy diving (diving while attached by a line to a visually fit diver) is even more important. Distant vision should not be less than 6/12 both eyes, or 6/24 for the worse eye (ME items 5,6). Hypermetropia should not exceed 5.0 dioptres, but colour vision, unless grossly abnormal or required for ships watch keeping duties, is not of great importance.

Neurological

Any neurological abnormality (MH items 25-27,42,45,47 and ME items 20-22, 28-31,33,42) will add danger to the diver, as well as complicating the various neurological disorders due to diving, such as cerebral or spinal decompression sickness, air embolus from pulmonary barotrauma, oxygen toxicity, etc. Migraine is often exacerbated by diving. Sleepwalking is of importance when the diver intends to live on board the diving boats. Epilepsy and epileptogenic drugs are contraindicated in diving.

Freedom from psychiatric disorders (MH items 26,29,54 and ME items 34 and 35) is also of importance. There should be no increased susceptibility to neuroticism, anxiety states, depression, claustrophobia or agorophobia, psychoses, or any organic cerebral syndrome.

General

The presence of severe gastrointestinal, renal (MH items 30-38 and 7, 26, 27), endocrine and systemic diseases has the same harmful sequelae as neurological disorders - making the diver a potential invalid in an environment that does not lend itself to first aid or medical support.

Hernia (MH item 39) may cause problems with the variation in gas volumes during changes of depth, as well as reflecting poorly on the diver's physical capabilities.

Musculo skeletal (MH items 43, 44, 45 and ME items 28-31) problems of any severity will limit the diver's physical capabilities, and complicate decompression sickness assessment. For divers (ME item 9) who were employed professionally, or who underwent many decompressions, or any recompression treatments, or who are exposed to experimental diving, annual long bone x-rays for dysbaric osteonecrosis are indicated.

Motion sickness (MH item 49) is a dangerous disorder to have if any diving from boats or in rough water is contemplated. Vomiting underwater is a problem especially if the diver vomits into his diving equipment or air supply. The psychological manifestations of motion sickness also may result in injudicious decisions, eg. to return without completing adequate decompression stops.

Smoking of cigarettes (MH items 50-51) is contraindicated, but not only because of its effects on general health, but also because of its specific effect on respiratory and cardiac fitness.

Pregnancy (MH item 59) is a contraindication to diving. This is based more on the woman's systemic physiological reactions to the pregnancy (vomiting with morning sickness, reduced tolerance to exertion, reduction in respiratory function measurements, etc.) than the specific obstetric complications. (She may be exposed to difficulty with diving harness and equipment fitting, abdominal pressure gradients with depth changes, effect of high oxygen tensions and "silent" bubbles on the foetus, hypoxia subsequent to salt water aspiration, etc.) These may eventually be shown to be of serious import.

Diving History

A knowledge of previous hypobaric, hyperbaric and aquatic accidents (MH item 60 and DH items 1-24) may be invaluable as an assessment of future problems.

Diver selection[4]

In the above discussion, we have dealt mainly with what medical standards are required for diving. A much more complex situation exists when we attempt to define what standards are optimal or ideal. These standards will vary for each type of diving activity, but in the one large navy series available on diver selection, the diver was found to be a psychologically, stable, medically and physically fit individual, who is not overtly worried by diving hazards and has both a capability and a desire to function in a hyperbaric aquatic environment. In comparison to the unsuccessful candidate, he is usually more mature, motivated by an affinity for water sports, very capable at swimming and breathholding. He is not motivated by adventure or comradeship. He is a thick set individual with a low Cotton's Index of build, a non-smoker, and based on psychometric assessment, he is an intelligent, non-neurotic, self-sufficient and practical person.

Results of Medical Examination

In the one large survey of sport divers, it was found that 33.3% were classified as medically unfit on the first examination. This fell to 20.1% after subsequent treatment and examinations. The failure rate increased with age, and reached 45.5% over the age of 35 years. Of those who were permitted to dive, 10% received some operational diving limitation imposed by the examining medical practitioner.

REFERENCES

1. Australian Standards Association CZ18 and 267, of 1972. Underwater Air Breathing. Published by ASA, 80 Arthur Street, Sydney.
2. BOVE, AA (1969). Physiological Fitness of Sport Divers. Physiological Problem of Man-in-the-Sea. J. Occup. Med. 2:281-284.
3. CAILLE, EJ (1969). Psychology and Physiology of Diving. Nautilus 6 Documenta Geigy.
4. EDMONDS, C The Diver. Royal Australian Navy School of Underwater Medicine Project Report 2/72.

DIVING MEDICAL CENTRE, 6 Hale Road, MOSMAN. 2088 Tele.No. 905422

	YES	NO	NOTES ON HISTORY
52. HAVE YOU EVER BEEN UNABLE TO HOLD A JOB FOR MEDICAL REASONS			
53. HAVE YOU HAD ANY OPERATIONS			
54. HAVE YOU BEEN A PATIENT IN A HOSPITAL OR MENTAL INSTITUTION			
55. HAVE YOU BEEN REJECTED FOR INSURANCE			
56. HAVE YOU EVER BEEN ON A PENSION ..			
57. HAVE YOU EVER LIVED IN CLOSE PROXIMITY TO A PERSON WITH T.B.			
58. HAS ANY MEMBER OF YOUR FAMILY (A) HAD T.B. (B) FITS, EPILEPSY (C) ATTEMPTED SUICIDE (D) MENTAL ILLNESS			
59. FEMALES–INCAPACITY DURING PERIODS (A) NIL (B) MILD (C) SEVERE (D) DURATION DAYS (E) ARE YOU PREGNANT NOW			
60. HAVE YOU ANY DISABILITY RELATED TO FLYING IN AIRCRAFT			

B. DIVING MEDICAL HISTORY

TABLE 2

1. APPROX. DATE OF FIRST SCHNORKEL DIVE
2. APPROX. DATE FIRST COMPRESSED AIR DIVE
3. APPROX. DATE FIRST DIVE ON MIXED GASES
4. APPROX. No. OF DIVES SINCE (COMPRESSED AIR)
5. GREATEST DEPTH OF ANY WORKING DIVE
6. GREATEST DURATION OF ANY WORKING DIVE
7. NUMBER OF DECOMPRESSION ACCIDENTS (BENDS)
8. NUMBER OF TREATMENTS IN CHAMBER

HISTORY OF	YES	NO	NOTES ON DIVING HISTORY
9. AIR EMBOLISM			
10. PNEUMOTHORAX ..			
11. EMPHYSEMA			
12. EAR SQUEEZE			
13. DRUM RUPTURE ..			
14. SINUS SQUEEZE			
15. LUNG SQUEEZE			
16. DIZZINESS			
17. DEAFNESS			
18. NEAR DROWNING ..			
19. MARINE INJURY ..			
20. N_2 NARCOSIS			
21. OTHER INCIDENTS ..			
22. O_2 TOXICITY			
23. CO_2 TOXICITY			
24. CO TOXICITY			

I CERTIFY THAT THE ABOVE INFORMATION IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

SIGNATURE ____________ DATE ____________

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C. MEDICAL EXAMINATION

TABLE 3

1. NEXT OF KIN AND ADDRESS

2. BUILD — GOOD / AVERAGE / POOR

3. HEIGHT — WEIGHT — COLOUR — EYES / HAIR / COMPLEXION

4. CHEST EXPANSION — EXP. — INSP.

5. COLOUR PERCEPTION

6. VISION — DISTANT R6/ CORR. 6/ — L6/ TO 6/

7. URINALYSIS — ALB. — SUGAR — S.G.

8. CHEST X-RAY	DATE	FILM NO.	PLACE	NORMAL
9. LONG BONE X-RAY	DATE	FILM NO.	PLACE	ABNORMAL

10. INOCULATIONS	B.C.G.	TETANUS	SMALLPOX	CHOLERA	TYPHOID	Y-FEVER	POLIO.
CURRENT							
OUTDATED							

11. RESPIRATORY FUNCTION TESTS — V.C. — $F.E.V._{1.0}$ — PERCENTAGE

12. AUDIOMETRY (ISO)	500	1,000	2,000	3,000	4,000	6,000	8,000
AIR —DB LOSS RIGHT							
DB LOSS LEFT							
BONE—DB LOSS RIGHT							
DB LOSS LEFT							

CLINICAL EXAMINATION	NOR-MAL	ABNOR-MAL
13. HEAD, FACE, NECK, SCALP		
14. NOSE, SINUSES		
15. MOUTH, THROAT, SPEECH		
16. TEETH, GUMS		
17. EARS, GENERAL		
18. TYMPANIC MEMBRANES		
19. EUSTACHIAN TUBE FUNCTION		
20. PUPILLARY REFLEXES		
21. VISUAL FIELDS		
22. EYE MOVEMENTS		
23. CHEST, LUNG FIELDS		
24. CARDIAC AUSCULTATION		
25. VASCULAR SYSTEM		
26. ABDOMEN		
27. ENDOCRINE SYSTEM		
28. UPPER EXTREMITIES		
29. LOWER EXTREMITIES		
30. SPINE		
31. POSTURE AND GAIT		
32. LYMPHATIC SYSTEM		
33. NERVOUS SYSTEM — REFLEXES		
CRANIAL N'S		
SENSATION		
CEREBELLAR FUNCTION		
34. EMOTIONAL STABILITY		
35. MENTAL CAPACITY		
36. IDENTIFYING MARKS		
37. ANUS		
38. EXTERNAL GENITALIA		

39. BLOOD PRESSURE /
40. PULSE RATE
41. E.C.G. REST/EXERCISE
42. OPHTHALMOSCOPY

NOTES ON ABNORMALITIES

FIT/UNFIT TO DIVE

REASONS (No.)

SIGNATURE ____________ DATE ____________

NOTES ON ABNORMALITIES (CONT.) OR OTHER CONSULTATIONS

NUMBER OR DATE	

DIVING MEDICAL CENTRE *6 Hale Road, MOSMAN. 2088* *Tele.No. 905422*

A. MEDICAL HISTORY QUESTIONNAIRE

TABLE 1

1. SURNAME	OTHER NAMES		2. DATE OF BIRTH
3. ADDRESS		4. SEX	5. M.B.F.

6. OCCUPATION

7. HAVE YOU ANY DISEASE OR DISABILITY ?

8. ARE YOU RECEIVING ANY MEDICAL TREATMENT ?

HAVE YOU EVER HAD, OR HAVE YOU NOW	YES	NO	NOTES ON HISTORY
9. RHEUMATIC FEVER			
10. SWOLLEN OR PAINFUL JOINTS			
11. ABNORMAL SHORTNESS OF BREATH ..			
12. HIGH BLOOD PRESSURE			
13. HEART DISEASE			
14. BRONCHITIS OR PLEURISY			
15. COUGHING UP OF BLOOD OR T.B.			
16. CHRONIC COUGH			
17. SPONTANEOUS PNEUMOTHORAX (LUNG COLLAPSE)			
18. CHEST INJURY OR BROKEN RIBS ETC. ..			
19. ASTHMA OR OTHER CHEST CONDITIONS ..			
20. HAY FEVER			
21. OTHER NOSE, THROAT TROUBLE			
22. DISCHARGING EARS			
23. DEAFNESS			
24. EYE TROUBLE, WEAR GLASSES			
25. FAINTING, BLACKOUTS			
26. SEVERE HEADACHES, MIGRAINE..			
27. SLEEPWALKING, FREQUENT NIGHTMARES			
28. SEVERE DEPRESSION			
29. OTHER MENTAL ILLNESS			
30. KIDNEY OR BLADDER DISEASE			
31. INDIGESTION OR ULCERS			
32. VOMITING OR PASSING BLOOD			
33. RECURRENT DIARRHOEA			
34. DIABETES			
35. JAUNDICE			
36. MALARIA OR TROPICAL DISEASE			
37. VENEREAL DISEASE			
38. SEVERE LOSS OF WEIGHT			
39. HERNIA (RUPTURE) OR PILES			
40. SKIN DISEASE			
41. SEVERE REACTION TO DRUGS			
42. SEVERE HEAD INJURY--CONCUSSION ..			
43. MAJOR KNEE, BACK, JOINT INJURY ..			
44. BROKEN BONES			
45. PARALYSIS			
46. OTHER ILLNESS OR INJURY			
7. UNCONSCIOUSNESS			
8. DENTURES			
MOTION SICKNESS (CAR, SEA, PLANE)			
DO YOU SMOKE			
APPROX. DAILY NUMBER			

5. EDMONDS, C; FREEMAN P; THOMAS R; TONKIN J and BLACKWOOD, FA (1973). Otological Aspects of Diving. Australasian Medical Publishing Co., Sydney.
6. MILES, S (1969). Underwater Medicine. Staples Press, London.
7. SEEMAN, K (1969). Medical Requirements for Divers. Nautilus 6 Documents Geigy.
8. THOMAS, RL and LOWRY, CJ (1974). Medical Examinations for Diving. A review of 478 candidates. Paper presented at XXth World Congress in Sports Medicine, Melbourne, February 1974.
9. YARBROUGH, OD (1955). Outline of major problems of underwater swimming and self-contained diving. Proceedings of First Underwater Physiology Symposium.
10. Diving Medical Centre examination format, Diving Medical Centre, 6 Hale Road, Mosman, Sydney.

BUBBLES

SPUMS CONFERENCE ‘75

Over a few glasses of Heisswine, it was ascertained that the conference next year is likely to be in Indonesia. The sub-committee has done some very intensive work in planning the ideal site, which unfortunately does not include Bali. Perhaps Bali will be included as a conference site, with the other areas designated as diving sites. This would please both divers and the non-diving spouses.

2ND AUSTRALIAN UNDERWATER FILM FESTIVAL

The Second Australian Underwater Film Festival is to be held in Sydney on November 8th and 9th, 1974.

The location for the opening night film presentation is the main Concert Hall of the Sydney Opera House. Films will be presented on a giant screen by the most modern 16mm projection equipment in the world. Leading Australian underwater film producers will be in attendance to narrate and/or introduce their latest film. The programme will commence at 8pm and will last three hours. Ticket price will be in the vicinity of $5 each and will be available from the Opera House eight weeks in advance.

On Saturday November 9th, the afternoon will be reserved for special films, slides and lectures presented by specialists directly associated with professional diving and photography. Location is yet to be announced but it will be either the Union Theatre (seating capacity 624) or the Menzies Hotel Banquet Room. Admission in the vicinity of $2 per person.

Saturday evening will feature two special lectures, a film and a display of the latest in diving and photographic equipment. Location is the Menzies Hotel Banquet Room and admission will be free. This will be a wonderful opportunity to meet experts and professionals from all aspects of the diving industry.

The Australian Underwater Film Festival is directed by John H Harding and enquiries can be made to PO Box M456, Sydney Mail Exchange, 2012. Tickets will be available from the Opera House from September 8th. Additional information will appear in Skindiving in Australia magazine and in The Sydney Morning Herald amusements section.

ISLE OF PINES NAUTI CLUB

A group of SPUMS members visited the Isle of Pines, and had the most mind boggling series of dives, run by the very French Nauti Club. The area is thoroughly recommended, both because of the facilities for diving and the excellent French cuisine. The diving was also particularly economical, costing approximately $50 for 7 dives, all found. When one considers this includes all equipment, and professional guides, it makes our Australian prices seem some what inflated. There is no guarantee that these prices will remain as they are now, but in the opinion of the SPUMS members who remained there one week, the prices could have been doubled without us complaining. Other aquatic pursuits are well represented, although it is probably not exciting enough socially for non divers to spend more than a few days there. The apres-dive was considerably benefited by some group psycho therapy sessions instigated by popular demand.

NAUTI CLUB PRICE LIST and possibilities FOR DIVERS ON THE ISLE OF PINES

The following information is supplied by the Nauti Club. The underwater life is very rich with corridors on coral reel. Animals, fish, shells and coral are very beautiful. Very few sharks, improving security for divers. Visibility is over 80 feet on flat water which occurs during the high season from September to March. Underwater diving guides are available. There are 3 of them, fully qualified: TONY - ALBERT - LELO, at a rate of 1,000 F CFP an hour.

Package Diving - The following prices include: full equipment, tanks, wet-suits, flippers masks, tubes, weight-belts and may-west for leaders if any. Guide, boat trip, air, etc. Approximately 2 to 3 hours from the start. Diving time is approximately 1 hour.

Prices - From 1 person to 5 persons	1,500 F CFP per person
From 5 persons to 8 persons	1,200 F CFP per person
From 8 persons to 10 persons	1,000 F CFP per person
From 8 persons to 10 persons	900 F CFP per person
Over 15 persons	800 F CFP per person

Special Request - All divers should bear a recent medical certificate, diploma if any, and a previous record of diving, plus licences.

Special Diving - If the weather does not permit the diving in the sea, an unusual diving in a grotto, inside the island, may be arranged. Only for experienced divers, by groups of three persons, all equipment, lights and security are furnished by NAUTICLUB, with a guide. Price for three persons 5,000 F CFP

Other Activities - Besides skin-diving, NAUTICLUB organises PICNIC and Barbecue fish on islands, with spearfishing parties and night fishing in the reef for lobster-catching.

Relais de Kanumera - The Relais de Kanumera offers you a complete board (American Plan) with continental breakfast at the following prices:

	1 person	2 persons	3 persons
Bungalows luxe	4,000	5,600	7,800
Bungalow Standard	2,750	4,400	—
Transport from airport to Relais and back	200	400	600
Island tour in car	400		

(visit of the grottos, the village and ruins of former places of the deported political convicts).

We point out that the Relais de Kanumera and the NAUTICLUB are ready to study each price suggestion for groups of 15 persons (with a guide free of charge) or all other kinds of groups and also for weekend holidays.

DIPLOMA OF DIVING AND HYPERBARIC MEDICINE

Foundation Diplomas

The following are recommended as Foundation Diplomas, based on the following criteria:

1. 2 Years or more full time experience in Diving or Hyperbaric Medicine.
2. Classified by the Royal Australian Navy as a specialist in Underwater or a similar classification by an appropriate statutory body.
3. Promoted the interest of Diving or Hyperbaric medicine in its instructional, research or clinical aspects.

The following Physicians have been proposed, in alphabetical order:

DR G BAYLISS	DR C LOWRY
DR C EDMONDS	DR R THOMAS
DR R GRAY	DR I UNSWORTH

Foreign Medical Officer -Modified requirements

A small number of physicians have successfully undergone the full time 3 months Underwater Medicine Course at the Royal Australian Navy School of Underwater Medicine, and attended the Prince Henry Hospital Hyperbaric Unit. Because of the considerable expense entailed in completing some of the requirements for the Diploma, and the extensive travelling - involved it is thought that some consideration should be given to granting the Diploma to these members. In some cases there is the added difficulty of the member having to communicate in English, in a highly technical sphere. This also should be taken into consideration when assessing some of the candidate's problems. The fact that we are a South Pacific Society, obliging our members to use the English tongue, must put them at a disadvantage; despite that, some of the candidates have exceeded the qualifications required by their Australian colleagues. The first three in this list are in this category.

DR JIMMY HOW YEW CHEN
DR KEE PENG LEONG
DR TAI LUNG HO
DR MADE SUBRATA
DR HARIJONTO
DR HARTONO
DR GENE CHAN

The above physicians are from Indonesia, Malaysia and Singapore, and it is considered that the South Pacific Underwater Medicine Society will not lose by having such eminent representatives in an area so involved in diving, together with oil and mineral exploration. Most of these physicians are still in the Armed Services, who will be responsible for sponsoring many other of their Doctors to obtain a similar qualification. In this there will be the bilateral advantage of sponsoring knowledge in the field of Diving Medicine, and the promotion of SPUMS.

Diploma Candidates The following candidates for the Diploma have undergone training at both the School of Underwater Medicine (1 month course) and the Prince Henry Hospital Hyperbaric Unit (1 week course), with the following results:

DR MURPHY	(93.5, 91.5)
DR TAI	(93, 88)
DR KEE	(92.5, 95.5)
DR RIGBY	(79.5, 85)
DR SUTHERLAND	(91, 84)
DR MADE	(60, 79.5)

Of these candidates Doctors Kee, Tai and Made have completed both their projects and their extra practical course at the School of Underwater Medicine. Doctors Sutherland, Rigby and Murphy have completed their projects, but not the practical course. The next practical course will commence on the 10th November, 1974.

Diploma Presentations It is proposed that all the above receive Diplomas of Diving Hyperbaric Medicine, subject to the completion of the specific items mentioned above, at the end of 1974, and prior to the commencement of the next Diploma course in January, 1975. Other members who have completed the main School of Underwater Medicine Course, but who have yet to complete the Prince Henry Hospital, project and/or practical course, and who also may be eligible for the Diploma if these omissions are completed, include Doctors Bowman, Lucas, Ball, Douglas, Blackwell, Hazel and Roberts.

SCUBA DIVING AND THE EAR NOSE AND THROAT

The following information has been supplied to the editor of Newsletter, together with a copy of this little booklet. It is certainly a delightful book to read, and is clear enough for divers to understand the terminology and identify their problem. I can thoroughly recommend it, although I feel a little envious that Dr Roydhouse's results seem uniformly successful, unlike my own.

Publisher: P. Roydhouse
11 Westbury Crescent,
Remuera, Auckland 5

Author: Noel Roydhouse
Published: 31 August 1973
Price: $2.50

For the first time ever published, a Scuba Diver's handbook on his own aspect of Sports Medicine. The author's close association with Sports Medicine, his practical knowledge of underwater swimming, coupled with his experience as an Ear, Nose and Throat Surgeon make this book, as important as an item of equipment as the Scuba diver's face mask.

Wade Doak, Editor of "Dive" magazine wrote in Vol. 12 No. 5: "Noel Roydhouse has just written an excellent book, 'Scuba Diving and the Ear, Nose and Throat'. In it he has assembled available ENT knowledge (illustrated with case histories of NZ divers) in a form easily understood by the skin diver so that he appreciated how to take care of his ear nose and throat functions and how to seek the appropriate attention should troubles occur. Personally I feel sure that with better knowledge the skindiver will be able to avoid many of the serious complaints which in past years have forced a number of divers to abandon their favourite pastimes."

This book is available from bookshops and most Underwater Sports Shops and the publisher invites you to write direct regarding any information you may require.

THE UNIVERSITY OF HAWAII SCHOOL OF MEDICINE
announces a Course in Diving Medicine
February 22 - March 1, 1975

This course is designed to acquaint physicians with the medical aspects of scuba diving. Topics include the physiology of diving, decompression sickness, air embolism, barotrauma, oxygen toxicity, nitrogen narcosis, breath-hold diving, marine hazards, hyperbaric medicine, and the examination of divers. Instruction is carried out through lectures, demonstrations, and participation. A syllabus is provided as permanent record. The course is presented in co-operation with the Undersea Medical Society and the National Association of Underwater Instructors, and is accredited under the American Medical Association's continuing medical education program. Tuition is $200. Approximately 40 students will be accepted.

FACULTY

RICHARD H STRAUSS, MD
COURSE DIRECTOR
Associate Professor of physiology University of Hawaii School of Medicine and Physician for University Diving Activities. Formerly, Diving Medical Officer and Instructor, US Naval School of Submarine Medicine

CARL EDMONDS, MD
Surgeon Lieutenant Commander, Royal Australian Navy; Officer-in-Charge, School of Underwater Medicine

GLEN EGSTROM, PHD
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ALLAN ERDE, MD
Commander, MC, USN
Chief, Submarine and Diving Medicine, Pearl Harbour, Hawaii

SUK KI HONG, MD, PHD
Professor of Physiology University of Hawaii School of Medicine

ERIC KINDWALL, MD
Director of Hyperbaric Medicine, St. Luke's Hospital, Milwaukee; Assistant Clinical Professor of Environmental Medicine, Medical College of Wisconsin

JON PEGG, MD
Anaesthesiologist, Queen's Hospital, Honolulu; Clinical Professor of Physiology, University of Hawaii School of Medicine

Lahaina, Maui, will be the primary location, with the final two days in Honolulu for access to nearby hyperbaric facilities. In general, four hours of medical lectures will be held in the morning, diving will be available in the afternoon, and optional seminars will be presented on occasional evenings. It is recommended that those who are not certified divers attend the concurrent scuba course leading to certification by the National Association of Underwater Instructors. The scuba course fee is $70.

A room for two at the Pioneer Inn will be approximately $21 per night. Requests to share a room with another course member will be honored when possible. Families are welcome.

For further information contact Richard H Strauss, MD, University of Hawaii Conference Center, 2500 Dole Street, Hawaii 96822.

REPORT ON DIVING INCIDENT LEADING TO DEATH OF DIVER IN DECOMPRESSION CHAMBER

On Day 1 a bounce dive was carried out to 492 feet by the diver to sling the temporary guide base. The dive was carried out successfully and was completed without incident in 13 minutes.

During decompression upon reaching 90 feet the diver reported a tightness in his chest, some shortness of breath and discomfort while breathing.

The diver was recompressed to 100 feet where he had complete relief and felt completely normal. The chamber atmosphere was at this point changed over to a Saturation atmosphere and the diver was decompressed at a saturation decompression rate.

The Diving Superintendent at this point informed Mr A on shore that a treatment procedure was being carried out.

When the diver reached 85 feet the symptoms made themselves manifest again and treatment procedures were instituted.

The diver was recompressed to 185 feet and brought out on a treatment schedule.

Decompression was uneventful with the diver feeling fine until Day 2 at 0253 hours, where at 105 feet, the diver had the first recurrence of symptoms.

The diver was recompressed according to the treatment schedules and then decompressed.

The diver experienced a second recurrence of the symptoms at 85 feet during decompression and he was once more recompressed to 185 feet for therapeutic decompression at 1433 hours. At this point a special treatment was instituted at Mr A’s instructions who had at this point diagnosed the case as a burst lung problem and discounted any kind of bend.

On Day 3 at 1300 hours upon reaching 75 feet during his decompression the diver complained of restriction to his breathing whereupon he was recompressed to 125 feet what he obtained complete relief.

It was decided to attempt decompression once more to see if the diver could be decompressed all the way or if there would be a further recurrence of symptoms.

At 2325 hours while reaching 83 feet in the decompression the diver again complained of breathing difficulties. Recompression to 135 feet relieved all symptoms.

At this point it was decided by Mr A that the problem could not be an ordinary decompression problem and was reasonably certain that the symptoms were the result of a pneumothorax.

A doctor was called and arrangements were made to go to the rig in the morning of Day 4. The doctor was informed of the treatment to date and of the diagnosis and was asked to bring the necessary needles with him to vent the pneumothorax.

On Day 4 at 1049 hours Mr A and the doctor arrived on the rig.

At 1349 hours while the diver was at 80 feet the doctor made a cursory examination of the diver without taking his temperature and diagnosed the diver’s condition as “full blown pneumonia and pleurisy of the left lung” and ruled out the possibility of a pneumothorax.

The doctor was challenged on the fact that the diver obtained relief by decompression however he stated that this would be the case with pneumonia and that he had previously treated a very similar case.

At this point the doctor took over the treatment and instructed the diver to be decompressed at the rate of 3 feet per hour and emphasized the fact that the diver would experience severe chest pains during decompression due to the pneumonia.

By the afternoon of Day 4 the diver was treated with penicillin injections and due to severe pain an injection of pain killer was administered by the rig medic at 2245 hours (on the) evening of Day 4.

The doctor left the rig by Day 4 evening stating that it was a routine case and that he would be available ashore for consultation.

By the morning of Day 5 the diver had been decompressed to a depth of 60 feet and his condition had steadily deteriorated. Mr A at this point requested the opinion of a second doctor regarding the diver's treatment and condition. Attempts were made by Mr B to obtain another doctor to go to the rig but he was unsuccessful.

The attending doctor was notified of these attempts and of the worsening of the diver's condition.

During Day 5 the diver received injections of penicillin and pain killer with little apparent effect.

During the early hours of Day 6 further drugs were administered and the diver's condition was worsening. The doctor had been summoned who examined the patient at 0340 hours while the diver was at 39 feet.

The doctor stated that the diver's condition had improved, that the pneumonia was disappearing and that the decompression rate was to be increased so that the diver could be transferred to a hospital as soon as possible.

At 0900 hours the diver's pulse had stopped and by 0915 he was pronounced dead by the doctor.

CAUSE OF DEATH

1. Death resulted from a pneumothorax of the left lung.
2. Cause of the pneumothorax is unknown, however, it was learned that unknown to the diving supervisor, the diver had a slight chest cough on the day before the incident and complained to the rig medic of some pain on the left side of his chest then over the central area.

ACKNOWLEDGEMENTS

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