probable the situation would be stressful, particularly as she was swimming against the current and trying to keep close to her far more experienced buddy. There was indeed frequent "OK?" check contact but, as the buddy told the coroner, no buddy keeps constant sight of his companion as he will on occasion look at the underwater scene and check his own gauges. The fact that he was swimming a little ahead of the victim was an adverse factor. There is uncertainty concerning the time for which the victim was out of his sight, but the fact that she was not far from him and above him implies that it cannot have been long as otherwise his swimming would have put him far ahead of her. So it is unlikely that she had time to ascend far before she lost consciousness and started to sink.

It is obvious that even the presence of a careful buddy is not a complete safeguard for a novice diver swimming in the never never depth of mid water in the open sea. Once again air embolism has been shown to occur without the victim (apparently) ascending a significant distance and without coming to the surface.

THE RIGHT TO DIVE, A CASE STUDY

Douglas Walker

SUMMARY

For sheer determination, albeit misdirected, the victim of this incident must be awarded full credit. He was not only overweight with extremely poor sight but had suffered from an accident which so scarred his forehead it made obtaining mask sealing difficult. In addition he had a medical history which he partially suppressed. A consideration of his contacts with a series of medical practitioners and conscientious, reputable diving instructors forms the core of this report. None of the latter regarded him as fit for certification, all informed him of this fact, and on the fatal dive he was being "specialed", a degree of supervision given only to disabled persons having a visit to the underwater world but not regarded as being scuba divers. That he died was probably not a consequence of diving but rather an event which could have occurred at any time. But he was diving at the critical time and the efficient response of the instructors illustrated the value of the training they receive and the responsibiient response of the instructors illustrated the value of the training tncommon fact of an autopsy report which disregarded relevance to the circumstances. This was made almost unavoidable by the practice of including only minimal information to the pathologist performing an autopsy. An additional element was the presence as an "expert witness" of a representative of a government department. His evidence, as has been the pattern in previous instances where there has been a similar assistance offered to a Coroner, was based very firmly on an interpretation of the Diving Law and had minimal relevance to the actual circumstances of the case. The report is divided into sections dealing with the diving instructors, the actual incident, the medical examiners, and the pathologist reporting the autopsy. Throughout there is The Pupil, a victim of his medical problems but struggling to achieve his aim, the freedom of scuba diving.

THE PUPIL/INSTRUCTOR INTERACTION

Joe first attempted to obtain entry to a scuba course in 1983, presenting a medical certificate which mentioned this was a "conditional approval". It is not known what conditions were stated. This particular dive shop had a policy that each pupil must be unconditionally fit and he was told to obtain a further medical check. He returned in November 1984 but again the medical approval was "conditional". When he was examining brochures about the course he was noted to hold them close to his eyes in order to read them. The instructor therefore felt that if the applicant ever returned carrying a certificate to state he was medically fit he, the instructor, would demand his further assessment, by a "diving" medical practitioner.

In April 1985 he attended the first lecture of a dive course run by another dive shop. He was instructed to bring a medical fitness certificate and the staff noted his extremely poor sight, excessive weight, and a deformed forehead which had the effect of making it difficult to fit a mask. He was noted to hold a paper 4 inches from his eyes to read it. The diving instructor spoke to him after the second lecture, pointing out to him that diving was not in his best interests and would be a safety risk not only to himself but to others. He got quite upset and stated it was unfair, that he had a right to choose whatever he wanted to do. He brushed aside the suggestions of alternative sports he might undertake. It was agreed he could attend the first pool training. It was with difficulty that a suitable wet suit was found, and the size of his abdomen was a problem in finding a weight belt. The pool was only 4 ft deep and the day sunny but he was unable to read the gauges or his diving watch. He seemed slow to learn and it was difficult to obtain a water tight seal for his mask. He appeared to accept the verdict that he discontinue the course but arrived at the next lecture. He was again told he was totally unsuitable for scuba diving and a danger to himself and others, was spoken to at some length of the problems of scuba diving, even told that he was a candidate for a heart attack, and offered a refund if he attended a diving medical centre and brought a certificate stating he was "unfit to dive". The instructors were entirely confident such a certificate was appropriate. Then he claimed the right to attend the remaining lectures as he had paid for the course. He was not allowed to sit the written examination at the end of the lectures, a precaution designed to prevent a later

attendance at another dive shop claiming to he required only the practical portion of a course. He produced a medical certificate of fitness for scuba diving at the first lecture, this so surprising the instructors that they checked that the doctor existed as they could not believe a doctor could reach such a conclusion!

This did not quench his determination to learn how to scuba dive and in May 1985 he got a friend to enquire whether a diving instructor he knew would accept as his pupil someone who had poor eyesight and was keen to dive: he received back a message that such a person might be allowed to dive if he was accompanied by a person with good sight. A week later he made contact by phone with this instructor and said he had already completed the theory and pool work of a course but the diving school then seemed not interested in completing his training. He was told he should bring a medical certificate and said he would get one, that his original certificate and documentation of his course had been lost by the dive shop concerned. There was an impression conveyed that his poor sight was the reason for his problems with the former instructor.

In June 1985 he attended for instruction bringing the necessary medical certificate. He was seen to be a large man with deformed eyes and "was possibly somewhat overweight". The instructor who supervised his first pool dive noted there was no sight in one eye, poor sight in the other. This made use of hand signals almost impossible. He was also clumsy. Despite a full awareness of these adverse factors one instructor allowed him to attend two shore dives but attended on him personally, a one-to-one care. He was found to have no problems with mask clearing but to be clumsy in the water. Throughout these dive lessons the instructor maintained hand to hand contact. After this he failed to attend until April 1986 because he had been injured in a motor cycle accident. No details of his injuries are recorded, neither is it explained how he managed to obtain a motorcycle licence. He was allowed to resume his attendance at the training dives, making two shore based dives and a boat dive before the index dive. Maximum depth of the dives was 10 metres and he was closely supervised because he tended not to stay with the diving group but to wander off by himself.

THE INCIDENT

On the morning of the fatal dive the chief instructor discussed with the instructor and assistant instructor due to take the group of pupils for this dive the need to take extra care in watching Joe. He intimated that, although he might not be granted certification, because he was so keen to scuba dive he would be permitted to continue attending dives at which an instructor was in charge. At no time did the instructors have any significant reservations concerning Joe's health although well aware of his obvious visual problem.

There were eight students on this boat dive under the supervision of an instructor and an assistant instructor. The skiper and the boat hand remained on board through the dive. The instructor entered the water first, collecting everyone in a group as they entered the water after an equipment check by his assistant. Joe was the last pupil to enter the water, then the assistant joined the group and was detailed to buddy Joe. Before commencing their descent they allowed the seven divers with the instructor to descend, then they followed after their first descent was aborted at 4 ft depth because Joe needed to resurface to clear his mask. After reaching the bottom of the anchor line they swam to join the others, and Joe managed mask clearing calmly after knocking his own mask off. His contents gauge was checked by his buddy and the pair then swam over to a rock ledge to cllect sea urchins to feed to the fish, about 15 to 20 feet distance. Here Joe gave a thumbs-up signal that showed he wished to surface and his buddy, who maintained hand contact with Joe from the time of his sea bottom mask problem and was now facing him, tried to find the reason for this wish to ascend. Although the buddy did not discern signs of panic, one of the other divers reported that he was breathing rather rapidly at this time, a sign of agitation. His weight belt now slipped down to his hips and despite his efforts and the help of both instructors it could not be replaced round his waist. The instructor had noted on previous dives Joe's shape caused his weight belt to fall down over his hips but only before he entered the water. This was the first time that it had caused any problems during a dive.

The instructor decided that to get Joe to the surface safely his weight belt had to be retained, so he allowed it to descend as far as Joe's knees, which he had flexed and thereby prevented it from falling off. Both he and the buddy now took hold of Joe and, their buoyancy vests inflated, by finning hard slowly brought him to the surface. Joe was able to calmly deflate his buoyancy vest as needed during the ascent although, for obvious reasons, he was unable himself to fin. Once at the surface the instructor let go of Joe's legs to permit them to straighten and so allow the weight belt to fall free. Instead it caught on his fins, but this created no problems as both of the instructors were with him and his buoyancy vest was inflated. The instructor checked that the buddy could now manage before he descended to rejoin the other pupils. He checked all their contents gauges, brought up one who was getting low on air, and then made a final descent to bring up the remaining six pupil divers. They were instructed to inflate their buoyancy vests, then he escorted them back to the dive boat.

The buddy noted that Joe appeared to be tired but did not foresee any problems in him back to the dive boat 100 feet away. His contents gauge showed that he still had 1000 psi of remaining air. As a precaution the boat hand was summoned and he helped support Joe while the buddy duck-dived and released the weight belt, then he towed

him back to the dive boat where the buddy instructed Joe to hold onto the side of the boat as the boat hand boarded the boat and the buddy removed his back pack. He was helped into the boat and orders given for him to be placed in the recovery position and his breathing checked: the buddy was told he was all right but found a short time later, after coming aboard, that he was not answering questions which were directed to him, only groans being elicited, and there was an apparent deterioration occurring in his breathing.

A radio call for emergency medical assistance was now made, then his condition rapidly worsened and breathing ceased but resumed after he was placed on his back in preparation to commence mouth-to-mouth resuscitation so they rolled him back into the recovery position. There was fluid escaping from his mouth. His breathing again ceased and expired air resuscitation was commenced, which was applied in turn by several of those present. The dive boat took the victim to shore as soon as the Coast Guard boat came and picked up the pupil divers. Cardiopulmonary resuscitation resuscitation was kept up during the return to land where paramedics waited to continue resuscitation attempts, but these were unavailing. A doctor in the dive group diagnosed the cause of the fatality as being a myocardial infarction with cardiac arrest, not an air embolism or diving-related illness. The maximum depth was 15 m and the duration was 20 minutes. Visibility was at least 15 m.

THE APPLICANT AND THE DOCTORS

The several medical certificates he had obtained were produced at the inquest. They showed comments on the presence of poor sight, an old middle ear infection (no other details), poor vision, and mild hypertension (Nov. 1983, 140/90 and in Nov. 1984 150/95). His statement concerning of his previous health added nothing to this. When he was examined in December 1984, his first attendance on this doctor, he had BP 150/90 but this had fallen to 140/90 when seen two weeks later after taking a Betaloc 50 mg tablet once daily. It was then that he requested a Fit to Dive certificate. When his poor visition was mentioned he assured the doctor that he would be diving with a group of partially sighted people and would be under close supervision at all times. This statement was accepted. He had no problems with his ears or chest and denied having suffered from asthma or other respiratory complaints. A chest X-ray taken 15th May 1985 was reported as being completely normal. However it came to light during the investigation that his regular doctor had refused to provide a fitness certificate in December 1984, but could not recall why although he reported that the victim was in receipt of a blind pension, had been injured when a car hit his motor cycle, and attended frequently for Mogadon and Valium scripts, being addicted to these preparations. He attended the Allergy Clinic of a major hospital and suffered from migraines, eczema, allergies, and obesity. He developed an allergic wheeze particularly to redwood in January 1983 and suffered a severe asthmatic episode in March 1985, and again in November 1985, on the second requiring hospitalisation. His asthma in December 1985, was considered by this doctor to be mild and not to be a contraindication to recreational diving. He had suffered from further asthma since November 1985 for which he required oral steroids. Not surprisingly Joe was far from frank when he was asked about his health record.

PATHOLOGICAL OPINIONS

The pathologist who conducted the autopsy noted there was evidence of myocardial infarction, coronary artery atherosclerosis and hypertensive heart disease but decided that the death resulted from drowning. The coroner called a RAN diving medicine specialist to give evidence and he, tactfully, made it clear that the history and the findings both indicated little basis for the drowning diagnosis. On reflection, therefore, one of the colleagues of the pathologist admitted that it was the practice to provide the pathologist with only minimal details of the cases. This is the probable reason for autopsy reports which blandly assume asphixia results when a scuba diver runs out of air underwater. The coronary vessels were all involved by atherosclerosis but narrowing never appeared to exceed 40-50% at worst. Microscopy showed a slight increase in fibrosis within the ventricular wall. Areas of increased eosinophilic staining of myocytes were found, cardiac stains confirming the presence of widespread ischaemic changes with some areas that showed focal changes with lymphocytic infiltrate. The changes were taken to indicate he had suffered an undiagnosed cardiac infarct a couple of days before this dive with ischaemia such that cardiac decompensation occurred when there was need to support the increased physical demands which result from the restrictions of a wet suit and buoyancy vest, weight belt and back pack. Both the lungs were described as heavy and congested, with fluid flowing quite readily from the cut surfaces: there was no focal abnormalities to be seen and microscopy showed a congested, oedematous lung. No mention was made of any changes suggestive of asthma.

THE VOICE OF AUTHORITY

A representative of a government department which had responsiblity for commercial diving was also called to offer expert advice to the coroner. He had in previous times been a RAN diving instructor and admitted that the department wished to apply Australian standards to sport diving and implied the dive charter boats were irresponsibly managed, failing to have oxygen aboard or to check the training of the divers who they carried. Neither point was relevant in this case. He appeared to have a strong belief that regulations necessarily increase safety, but presented a valid argument that diving instructors

would find it far easier to refuse an unsuitable applicant if it was possible to say "The law does not allow me to instruct you to dive as you have failed the medical fitness standard". As in this case the applicant showed no signs of respiratory, or cardiac, inadequacy when examined, and concealed his medical history, it was not necessarily unreasonable for these doctors to consider him fit to dive, subject to careful supervision in view of his poor vision. The significance of the obesity when deciding on fitness to dive is far from defined, although easy to assume the reverse. Alexander Lambert was famous for feats of daring diving in the days of Fleuss and Siebe Gorman diving suits but was also known for his beer belly. Although all subscribe to generalities concerning medical fitness for diving, when it comes to particular cases there are likely to be many where a serious division of opnions will be found. Indeed the victim made it plain that he did not wish to accept any advice which said he was unfit, and his death could have occurred regardless of his chosen activity.

INQUEST FINDINGS

There was some criticism directed at the dive shop as there had been no attempt made to contact the persons who the victim stated had provided him with the theory training. This was valid criticism but irrelevant because of the decision to provide one-to-one in-water attention and to refuse him scuba certification. It was noted that while both instructors were assisting the victim to ascend their other pupils, unattended, remained on the sea bed. But these pupils were far into their training, the visibility was good, the emergency real. Possibly all should have ascended together but this would have been an unsupervisable ascent. The victim had successfully taken part in previous dives with the same instructor support and diving companions and nobody regarded him as a candidate for a heart attack. The cause of death was acute cardiac failure two days after a (presumed) "silent" myocardial infarction and occurred despite excellent supervision and care by the instructors who were present.

DISCUSSION TOPICS

1. How great a freedom should a person be permitted to follow some activity for which they are not fully physically fitted. This question must be faced by medical examiners, those having the responsibility of training, those who accompany them later and insurers of any of these. A person cannot be permitted to put others at risk (or undue expense?) through his activities and there must be a protocol to prevent risk of legal actions being taken subsequently by relatives should death occur.

2. Is the level of medical expertise expected the same from a doctor without a special knowledge of diving medicine as from one so trained.

3. Should it be mandatory to have a diving medical from those doctors only who have obtained special training in connection with diving medicine.

4. What evidence is there that such medical examinations play a significant part in increasing diving safety.

5. Many instances will arise where the decision on fitness to dive will be debatable (such as in diving for the disabled). Who is to give a deciding opinion in such cases. How certain are the criteria of fitness, how high a "medical guarantee" is beling claimed. In this case neither his obesity nor a history of asthma was relevant to his death, and careful management by his instructors saved him for drowning.

6. Should pathologists be better informed of the case history before performing and reporting on an autopsy or would this too influence their conclusions. Do they require reminding of the need for considering the implications of their findings.

7. Should expert witnesses be expected to directly relate the opinions they offer to the actual incident under examination.

8. Can fitness standards be defined with absolute certainty or can conditional grades be permitted.

9. As the analysis of cases had demonstrable value will you in future report diving-related information to the DIVEDATA PROJECT (Project Stickybeak).

PROJECT STICKYBEAK

This project is an ongoing investigation seeking to document all types and severities of diving- related accidents. Information, all of which is treated as being CONFIDENTIAL in regards to identifying details, is utilised in reports and case reports on non-fatal cases. Such reports can be freely used by any interested person or organisation to increase diving safety through better awareness of critical factors. Information may be sent (in confidence) to:

Dr D. Walker
P.O. Box 120,
Narrabeen,
N.S.W. 2101.