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# FATHOMS



## VICTORIAN SUB-AQUA GROUP

## (Official Organ of the Victorian Sub-Aqua Group)

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CLUB MEETING - 17/4/70

The next Meeting of the Group will be held on 17th April, 1970 at the Victorian Association of Youth Clubs Hall, Gisborne Street, East Melbourne, opposite St. Patrick's Cathedral at 8.00 p.m. sharp. At this meeting it is intended to have two or three of the more experienced members of the group in the form of a panel to answer questions put to them from the body of the meeting. So if any member has a question that he has had some difficulty in getting answered, come along and fire it at the panel. After the meeting there will be supper at 25c a head.

UNDERWATER VISION

When a swimmer without apparatus goes underwater, his vision becomes inadequate in three distinct ways. Firstly, his eyes are unable to focus and only blurred impressions remain, if gets rapidly darker as he descends until there is not enough light to see by; and thirdly, visual contrasts are so reduced that even if an object could be brought into focus and even if there were enough light to see by, it can scarcely be distinguished from the water background. The problem of focusing has been virtually solved and indeed the invention of the face mask must be one of the most significant in diving. The reduction of light intensity with depth can also be coped with to some extent, but the loss of visual contrasts underwater is a stubborn problem and very little can yet be done about it.

When the eye is working normally in air, light is focused by the curved cornea and by the lens on to the light sensitive retina. The focusing depends on the fact that a light ray passing from one medium to another is bent or refracted to an extent determined by the difference in the refractive index of the two media. Air has a very low refractive index while the optical media in the eye have rather high ones. Thus a ray of light entering the eye is first refracted at the cornea of the eye and this is where the main focusing power of the eye is found. The partially focused light then passes through the lens which has itself a rather higher refractive index than the media in which it is embedded.

Unlike the cornea, the curvature of the lens can be altered, and it is in this way that we can focus at will on near or distant objects. As the main focusing power of the eye lies at the air-cornea boundary, the power to focus depends on the difference in refractive index between air and the optical media. The naked eye cannot focus underwater as water and the optical media have rather similar refractive indices and the focusing power of the cornea is much reduced. The lens lacks the power to complete what the cornea has failed to do and the eye cannot focus on any object at all.

The solution is to imprison an air-space in front of the cornea and thus allow it to function properly. This is the principle of the face mask and most types of underwater contact lenses. The slight disadvantage of this system is that light passing obliquely through the face plate will be refracted in its passage from the water, through the glass, into the imprisoned air within. This has the result of making an object in the water appear to be at  $3/4$  its true distance. As the object is optically nearer, a larger image of it will be projected on the retina, but this does not necessarily mean that it will seem to be bigger. On land a near object is not judged to be bigger than an identical object

further away, because distance is unconsciously taken into account when estimates of true size are made. Underwater, the increase in image size should be offset by a decrease in the apparent distance of the object. An object underwater should therefore appear to be nearer but not bigger than on land. Nevertheless, an inexperienced diver frequently judges things underwater to be bigger than they really are and this may be because he does not unconsciously compare the size of the retinal image with the optical distance of the object, but rather because he compares image size to true distance which he has judged by some non-optical means.

Contact lenses are being developed for underwater use although they are not yet on the open market. They either depend on the air-space principle of the face mask, when a small cap containing air is cemented to the outside of the contact glass, or they have a small lens of very highly refractive material embedded in the contact glass. In its simple form the air-space type has the advantage that it allows equally good vision on land as underwater, but is rather bulky. The lens type cannot be worn in air but has less bulk. Neither type has yet been perfected sufficiently to allow extended periods of wear and they do not give the protection against cold and polluted water provided by the face mask. Nevertheless, contact lenses do provide a wider field of view than the standard mask and the elimination of the inner glass surface of the face plate with its scratches, condensation and water drops should make a useful contribution to the clarity of vision underwater.

Scattered Light and contrast reduction. A distant object underwater is usually detected because it is either a little darker or a little brighter than the background it is seen against. This brightness contrast is very important in the study of underwater vision and it is defined by the equation:

$$\text{Contrast} = \frac{\text{Object brightness} - \text{background brightness}}{\text{background brightness}}$$

Contrasts are low underwater because much of the image-forming light from an object is either scattered out of the light path or absorbed by the water before it reaches the eye, whilst daylight is scattered out of its downward path into the eye thus interposing a veil of brightness between the object and the eye. It is this scattered daylight which is responsible for the brightness of the water background. Taking the results of absorption and scatter together, bright objects become darker and dark objects become brighter as they recede until neither can be distinguished from the water background. The rate at which this happens depends upon the rate that a beam of light is reduced by the water and

upon the direction of sight. Obviously if the rate of contrast decrease remains the same, the distance that an object can recede before it becomes invisible depends on the original contrast with the water background.

A close black object has a brightness of zero and therefore the contrast is  $-1$  irrespective of the background brightness. As man can generally detect contrasts greater than about  $\pm 0.01$  in good light and with large targets, the distance at which a large black object can just be seen depends only upon the rate at which contrast decreases in water. Thus the distance at which a black body greater in area than 1 sq. ft. can just be seen when viewed horizontally is an excellent method for measuring the light-absorbing properties of water.

In practice, a good way to make the measurement is for two divers wearing black suits to stretch a measuring tape between them. The "black body" distance being that at which it just becomes impossible to decide the position of the co-diver's limbs in the water.

The reduction of light with depth and the sensitivity of the eye. The rate at which daylight is absorbed by different bodies of water varies greatly and depends on the amount of dissolved and suspended matter in the water. In Britain it is common enough to find it too dark to see at 50 ft. (15 metres), whilst in the Mediterranean this limit is still far off at the deepest aqualung depth. The eye is able to cope with great differences in light intensity by switching between its two visual systems, one adapted for use during the day and the other at night. In day vision relatively bright light is needed but colours can be seen and there is a good perception of contrast and detail. Night vision is much more sensitive to low light intensities but colour vision is lost and there is some reduction in the ability to distinguish contrasts and detail. It takes between 20 and 30 minutes for an eye adapted to bright light to achieve maximum sensitivity in very dim light. In diving terms this means that a dive into darker water is usually completed before the eye has had time to reach its greatest sensitivity.

In biological diving where a torch can upset the animals being observed a technique has been successfully used to overcome the slow rate of dark adaptation. The technique takes advantage of the fact that the night vision system is quite insensitive to red light and thus if a well fitted red visor is worn for the 25 minutes before a dive and only removed at depth, the night vision system reacts as though it were dark and adapts accordingly. It has been estimated that this technique provides a 30 per cent greater working depth when no torch is used.

Colour Underwater. The eye is sensitive to a band of electromagnetic radiation extending its wavelength from about 350 nanometers ( $1 \text{ nm} = 10^{-9}$  metres) to about 750 nm. When all wavelengths are present in about equal amounts the sensation of white is produced, but when a narrow band of wavelengths predominates, the sensation of colour is produced.

Pure water absorbs most red and orange light, less yellow, still less green and relatively little blue light. Therefore the deeper daylight penetrates into pure ocean water the poorer it becomes in red light relative to blue. Inshore waters, on the other hand, are usually stained by the yellow products of vegetable decay. These substances are very persistent and have the property of absorbing much blue light, less green and very little yellow or red. If these yellow substances are present in quantity they act as such strong light filters as to over-ride the blue filtering properties of pure water and the reddish-brown colour of freshwater lochs and burns results. If the yellow stain is rather more diluted, the red and yellow light is absorbed by the water and the blue by the yellow substances and this leaves green as the colour least absorbed. This is the explanation for the green colour of the water around our coasts.

This colour-filter action of a water mass is chiefly responsible for the fact that colours appear different below the surface. An object is coloured because it absorbs some wavelengths more than others. The wavelengths that it does not absorb but reflects are responsible for its colour. For instance, at about 100 ft. in the Mediterranean the water has absorbed most of the red light so that an object which is red on the surface because it absorbs all save red light will not be exposed to the only wavelengths it reflects and will thus appear black. In reddish-brown peat-stained water the blue is absorbed more than the red (although both are absorbed more rapidly than in pure water) and it is the blue objects which appear black.

Painting objects to be conspicuous underwater. To begin with a distinction must be drawn between objects which can be seen at a distance underwater and those which are conspicuous when seen at close range lying amongst weed or stones on the bottom. In the former case it is the brightness contrast which is much the most important, and in the latter case it is more usually a combination of colour and brightness contrast which renders an object conspicuous.

Safety considerations usually require divers to go down in pairs and it is important for one diver to see the other at the furthest possible distance. It has already been explained why an object presenting the highest brightness contrast with the water background

will be visible at the greatest distance. In practice it is white objects which present the greatest contrast with the water background in all directions except directly upwards when black will be best. This leads to the suggestion that large areas of equipment should be painted white whilst the suit should be black. On the other hand, parts which break the surface whilst swimming should be painted the colour which shows up best against the sea. Fluorescent orange might be the best choice here.

In all except peaty water fluorescent oranges and reds show up with great brilliance at close range. This is because fluorescent pigments have the ability to absorb the short wavelength light at the blue end of the spectrum and re-emit longer wavelength light at the red end. Non-fluorescent objects in oceanic or coastal water tend to assume the bluish or greenish colour of the water itself, but fluorescent objects will stand out as bright red or orange in strong contrast to their background. As objects on the bottom tend to assume the colour least absorbed by the water it follows that colours which contrast most strongly with the bottom are those which are most-absorbed by water. Thus, objects which will give the best colour contrasts at close range are precisely those which lose their colour fastest as the range increases.

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### T R A I N I N G

#### BLACK ROCK 1.3.70

A semi-training session was held at Black Rock for the purpose of introducing members to the joys of wreck diving. There were 8 members present and these were escorted around the wreck of the "Cerberus" on the lower deck and taught the easy way of getting in and out of the wreck through holes in the side.

The eight spent two hours moving through the wreck, looking into every nook and cranny. There were one or two relics taken for placement on mantelpieces as it does not appear that the National Trust is going to do anything about preserving the wreck and its condition appears to get worse on every visit. The wreck still attracts quite a lot of visitors who swim out to it and it is a good venue to teach confidence in the newer diver.

A new course has started at the city baths and is going strong with 9 trainees. If anyone requires lessons or if anyone knows any person who desires to learn how to use the aqua-lung, get in touch with Pat Reynolds, 232-5358 and book in for the next course. Compare our prices with all other schools and value for value the Sub-Aqua can do a better job and by virtue of being a club can

make your diving more enjoyable after the course is finished. Unlike professional schools, we are not just after your money, but your companionship, on club dives.

PAT REYNOLDS  
Chief Instructor.

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P A S T O U T I N G S

Long weekend, March 7th/9th - Wilson's Prom.

Seven divers turned up for this camping weekend at the Prom. and the weather was most kind to them. All were a bit disappointed that there was only one boat available, but pressing personal needs negated one of the boats being present on this weekend.

Even so, all dived from the one boat available and all managed to get a feed of fish and/or crays. One highlight of the trip was a member's loss of a demand valve and after a search, the resignation that it had gone for good. Another member poking around outside a small cave was fortunate in placing his hand nearly on it and it was returned to its happy owner who was contemplating giving up diving in disgust.

March 22nd - Cape Woolamai

Because of forecast gale force wind warnings for ocean waters and Bass Strait, this dive was forced to be cancelled. It was regretted that this had to be done and it is regretted if anyone travelled all the way to San Remo and found the trip cancelled. As stated at many meetings in the past, if there is some doubt as to an outing being cancelled due to weather conditions, it is wise to ring an officer of the committee before proceeding to the meeting place.

Easter, 27th/30th March, Battangabee.

Because of the inclement weather over the Easter break there were no diving activities. At least none were reported to the newsletter editor.

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GAR STICKERS - These are now available ~~to~~ the club at 40 cents each.



P A S T M E E T I N G20.3.70

There were 32 members and friends present at this meeting and items discussed included diving training, (course being conducted at the present time) and social events. It was decided to hold a white elephant sale and bar-b-que on 16th May, 1970, a Saturday night, at Bill Gray's place. Further details in this issue. At the close of general business, Rod Taylor's film on the Mount Gambier lake area was screened and was greatly enjoyed by all present.

Treasurer's Report -

The club for this time of the year, is not holding too badly with over \$80.00 in the main account and about \$20.00 in the social account. Don't forget that I have with me at all times, club badges, pocket badges and pennants. Buy now and help swell the club funds.

A. CUTTSS O C I A L N E W S

It has been decided to hold a white Elephant Sale and Bar-B-Que at the home of Bill Gray on Saturday night, 16th May, 1970 at 8 p.m. The address to go to is 4 Pimm Court, Syndal. The White Elephant Sale will help you get rid of all that odd gear that you have lying around. So bring along any old masks, snorkels or flippers, fishing rods or weights, or anything at all that you have no further use for - somebody might be able to use it. The secretary is going to write to other member clubs of S.D.F. inviting them to participate. Members of Sub-Aqua have no dive on the following day so it is expected that all members will turn up.

There will be steaks and chops aplenty and liquid refreshments like lemonade, etc. will be available. The cost per head will be notified in the next newsletter, so keep your eyes open for more information on this function.

It is hoped that the weather will be reasonably kind to us as Bill has a decent sized pool in his back yard and if members bring wet suits and associated gear, we could have some fun like a game of underwater polo or a treasure hunt with numbered discs to find on the bottom with a blacked out mask.

The range of things to do are endless so keep in mind the date - 16th MAY, 1970 at 8 p.m.

FUTURE OUTINGSApril 26th - Crawfish Rock

Meet at Hastings Jetty at 10.00 a.m. This will be a boat trip and it will be first in, best dressed as accommodation on the small boats is limited.

May 10th - Loch Ard

This will be a boat trip and firm bookings for this trip will be taken on the night of the next meeting on 17/4/70.

FUTURE OUTINGS TO END OF YEAR

	MAY 24th	- POE'S EYE - Boat
QUEEN'S BIRTHDAY	JUNE	- CAPE LIPTRAP
	" 21st	- CAFE SCHANK
	JULY 5th	- VICTORIA TOWERS - Boat
	" 19th	- FRANKSTON WRECK - Boat
	AUGUST 2nd	- SNOW TRIP
	" 16th	- PORTSEA
	" 30th	- TO BE DECIDED
	SEPTEMBER 6th	- DIAMOND BAY
	" 20th	- GEELONG PIER
	OCTOBER 4th	- CHANNEL FORT - Boat
WEEKEND TRIP	" 18th	- BLACKWOOD - Gold Dive
	NOVEMBER 1st	- PHILLIP ISLAND
	" 15th	" KELP FARM - Boat
	" 29th	- RYE
	DECEMBER 12th	- DINNER

S.D.F. MEETING - 5th FEBRUARY 1970

The S.D.F. meeting was held at its new venue at the Federal Hotel who offered a conference room in return of the delegates having a meal. The meeting dealt with -

- (a) tests to be carried out on university diving novices by member clubs.
- (b) Armbands were supplied to all member clubs consisting of the "diver below" flag, to be worn by all dive captains, especially on boats.
- (c) Report on the artificial reef and its placing. Resolution next reef must go on a hard bottom.
- (d) Safety rules, all clubs to produce something in writing for next S.D.F. meeting. Safety council will be asked to include "diver below" flag information on boat registration papers. S.D.F. will also send notices to yacht clubs.
- (e) S.D.F. to write to Sandringham Council advising them of the dangerous condition of the "Cerberus". Should be warning signs to make the public aware that the vessel is in a dangerous condition. The Federation has also had reports that the Army Commandoes are using the "Cerberus" as a training ground for demolition work. If correct this should be stopped immediately.
- (f) Mud being dumped in the bay by dredges is causing the demise of many forms of fish life. Does not appear possible to stop the practice.

WHAT'S UP DOWN-UNDER !

A team of men from Hungary, London and Canada are rumoured to be going to raise the 'Titanic'. She lies in 1,200 ft. of water and the project could cost up to \$5 million.

New laws in certain States of America make it an offence to search for sunken treasure or artifacts without a permit costing \$600. If a permit has been obtained and items of interest found a further licence costing \$1,200 is required to lift the object,

A South Korean seaman fell overboard from his ship 113 miles from the Nicaraguan coast and was picked up 15 hours later clinging to the back of a giant sea turtle. Good thing the turtle didn't take it into its head to dive.

A new secret underwater cutting tool has been thought up by Alan Cutts. Its underwater debut will be made shortly.

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STORY COMPETITION

It would appear that not one of the readers of 'Fathoms' have had any noteworthy experiences whilst diving, considering the amount of stories that have been forwarded to the editor.

Come on you budding authors, send along your tales and I will see that they are published as soon as possible.

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HOUSE DIVING

R. Addison, V.S.A.G.

The gravel road we had been travelling along took a dip down to the left, and instead of heading away from the lake the road continued into the water and disappeared. The fences that were along the road also entered the water and we could see the tops of the posts heading in a straight line twenty feet out into the lake before disappearing beneath the surface. Big Moe and I looked at each other in excitement. This was the spot that we had been told about in Bonnie Doon.

We had heard rumours about sunken houses in Eildon Weir for some time and had decided to go up and see for ourselves if they were true. Directions given to us in the little town had lead us to this spot and as we prepared to dive I couldn't help thinking of the people who had lived here and had been given four years to move out lock, stock and barrel before it was estimated that the lake would fill to this spot.

These people had taken their time about moving and seven months later were still there when Victoria had unseasonal rains and had been having them for some time. The lake was filling fast and it was time to move now. No time to pull the houses down or more them to new spots; just enough time to round up all the live stock and get furniture and fittings out before the water overwhelmed them.

We donned our gear and slid beneath the water and discovered to our surprise that visibility was about 10 feet, much better than we thought looking at the surface. We followed the road down and mover over to the side near one of the fences. As we got deeper, the water temperature got colder and it became darker, but visibility was still the same.

We continued on down the road until we reached a gate in the fence. At this we knew the house we were looking for was no more than 50 feet away. At the gate another fence met the one beside the road and it was decided to follow this one as it most likely was the one around the house proper, to keep the sheep and cattle off the flower and vegetable beds.

We found we could move much faster by moving along the top of the fence and pulling ourselves along by the top strand of wire which was in fairly good condition, only having been down a few months. A speed could be gained so that it was necessary only to grab each post in a leap-frog motion to speed along. I checked the depth gauge at this point and discovered we were at 60 feet, and then something dark loomed up on the left.

False alarm, it was only a tree, but I thought it would be good sport to have a go at climbing it. I left the fence and made my way to the base of the tree, gliding along about 3 feet from the bottom. When I reached the base of the tree I swam up the trunk and I looked upward. I could see the dead branches of the tree eerily stretched out above my head, reaching for the sun that it would never see again.

I looked behind me and I could see Moe about 6 feet below me sitting on a branch. We could see quite well at this depth, about 30 feet down, so we started to do a few tricks, like walking on our hands along a branch and cart wheels from the branches and swinging from branch to branch like Tarzan. It was great fun but better things lay ahead.

Continued next issue.

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