FEBRUARY 2007

REMEMBER...THIS MONTH'S MEETING IS FEB. 21 !

PRESIDENT'S CORNER

BY Konrad Fry

LOVE IS IN THE AIR and we will make it happen by moving the meeting from Valentines day to the **third Wednesday of February 02/21/2007**. I apologize to anyone using the SOCDC February meeting as an excuse not to do something with their significant other ;-).

We have a short month packed with activities and look forward to great turnouts. Starting with this Saturday we have our February Raftup. Our January Raftup had some of the best visibility of the last year! We have included Han's photos so you can see how clear it was.

The "viz" for the Raftup was nothing short of GREAT!

I jumped in and tried to re-set Paul Miller's anchor. Big mistake since there was a nice wind chop blowing above. Both Mike Sveen and I had to wrestle with the anchor as it yanked us across the sandy bottom. Martha Edge quickly pointed out a rock to put the tangs in and it held. After that brief moment of "Oh My God" we should have left it alone, we all noticed that the whole reef was visible from way out in the sand at 45 feet.

I lead the way to Dead man's reef from Seal Rock reef and looked back to see all the divers in a nice row following me. Vis was so good that when I got to the western edge of Dead man's I noticed, no one following me. Oh well, time to turn on the accelerator and zip around the reef to meet up with the slow pokes on the other side. This was astounding. I went to the deep end, only 51 feet at low tide and could see the surface and both ends of

the reef. I never realized how big Dead man's is. It seemed like 1/3 of a city block long as I kicked and kicked and kicked. After circling the far eastern end, I headed back to the western end and sure enough, there were the rest of the group. They had just gotten to the point I was at 15 minutes before. Martha and I headed back to the boats. I had to start my assent since I was on 800 lbs. of air. As I went slowly to the surface, I could see Wendy and Lora Cross at 45 feet from 10 feet and they were 30 feet in front of me. What really struck me was the size of the Seal Rock Reef structure. It is huge. With this visibility, you could see it end to end and what was very cool was the sand avalanches that went from 20 feet to 45 feet.

The weather was fairly awful that day. There was a big rain system moving in over Dana Point. Gary, Ferhat and Hans would have to deal with that on their way home. We would go north to Newport Harbor. But before any of that, we did our second dive. Martha wanted to go slow and see little things, I wanted scallops. We were both happy. Seal Rock is a take scallops by boat only (not shore) area. It is packed with them so I limited out very quickly. We headed back to Newport but stopped off in time to see a Whale Watch boat and, sure enough, a whale. Then the sun came out and everything was fine.

The 10 AM dives have been very successful so we will continue them. I started at Seal Rock and went to Shaw's. We had to call the one at Moss Point due to big waves and my big headache after a big wine tasting evening. If you have a dive site that you have not been to in a long time, let me know and we will make it a 10 AM dive site. The whole point is to make it interesting for those who have seen Cress Street and Crescent Bay 100 times or more. We will hit La Jolla again and maybe Redondo when the surf slows down.

Girls Gone Diving was another roaring success in January. Dr. Debbie had over 13 turn out and the conditions were excellent. I went along to take photos. The tide was an astronomically high tide so the entry was at the base of the ramp at the Montage Resort!

I went in to take shots of the women doing their entries. After they all got in safely, I swam in 8 feet of ocean to the crack in the center of the shore reef and glided into the main lagoon. Never has that happened before. I explored every crack, swim through and cave without worrying about the surge. It was spectacular. After the dive Debby and gang went to the Coyote Café for après-dive. I raced home to watch the Chicago Bears win the playoffs against the Saints. Damn Indianapolis! Next Girls Gone Diving is Sunday February 18th.

This month is the legendary Avalon Harbor Cleanup. Bill Thornton has put this together for over 8 years. Several SOCDC members have rented condos and will have a huge dinner party that Saturday evening. If you are around, let us know and we will give you a food and beverage assignment. We have to split the courses between three homes. Not to be missed. Oh yeah, the cleanup is a blast. Our choice is Casino Landing which is the breakwater between the harbor and the park. After you are done cleaning, you can take your reserve air and jump right in the U/W park for a little dive, re-fill your tank for free with the coupon and then dive it again. Several of us will take the 10 AM from Long Beach to get there early on Friday for a dive on the Valiant wreck just out side of the park.

Come join your SOCDC friends for all the fun. The weekend before the cleanup is our Temecula wine crawl. We will car pool to Temecula and have a picnic lunch at one of the wineries. Email Tina to get involved. This is always fun.

Remember that April 15th is the first SOCDC boat dive of the season. Rumor is it will be Farnsworth Banks so email Wendy ASAP to get aboard.

-Konrad

More Photos from the Raftup!

Raffle Winners

Ice Chest .....Ruth Harris

Wetsuit Hangar .....Paul Miller

1st Aid Kit .....Wayne Phillips

Fish ID Books..... Gary Cornell

Deluxe Dive Kit .....Laura Dickey

U/W LED Light .....Wayne Phillips

Dolphin Sculpture ..... Don Spencer

SOCDC Calendar

Looks like another great month at the SOCDC.

The February Meeting is THE THIRD WEDNESDAY 02/21/2007 Jeff Bozanic REBREATHERS

Tina Duarte's Winter Wine Crawl in Temecula is Saturday 02/17/2007 ridendive@sbcglobal.net

Dr. Debbie's Girl's Gone Diving is Sunday 02/18/2007 @ 9 AM email your desired dive site: debra@divein.tv

And Of Course, the Avalon Harbor Cleanup is the weekend of 02/24/2007 www.ccd.org
SOCDC chooses the Casino Landing Area so we can dive the U/W park next door. ;-)

The SOCDC has reserved 5 condo/cabins in Avalon for the weekend. If you would like to put yet anther one together Email Bill Thornton: H2Othornton@yahoo.com

CRITTER OF THE MONTH

SQUID (*Loligo vulgaris*)

By Bob Weinmann

Squid, a carnivorous mollusk belonging to the same class as the nautilus, cuttlefish, and octopus (*see* Cephalopod).

The squid has a large head and a relatively large brain. Its naked body, stiffened by an interior cartilaginous skeleton, is spherical or cigar-shaped, with two lateral fins. Around the mouth are eight sucker-bearing arms and two contractile tentacles with spatulate tips; on the latter are four rows of suction cups encircled by rings of chitinous (horny) hooks. The contractile tentacles, longer than the rest, are used to seize the prey and pass it to the shorter arms, which hold it to be torn by strong jaws shaped like a parrot's beak. Squid can swim faster than any other invertebrate by rapidly expelling water from the mantle cavity through the "funnel," which can be turned to direct movement. Many deep-sea squid are bioluminescent. They shoot out a cloud of dark ink when pursued; one genus secretes luminescent ink.

In the male squid, one smaller arm is modified for the purpose of planting a packet of sperm (a spermatophore) in the female's oviduct. In some squid, such as the common squid of the east North Atlantic coast, the sperm can also be deposited in a vesicle below the female's mouth; the spermatophore, already opened by the male, releases the sperm as the eggs are produced. The females fasten their eggs to seaweed or to the ocean bottom by a viscous filament. The eggs of deep-water squid are free-floating.

Squid species vary greatly in size. The common squid of the east North Atlantic coast is 30 to 45 cm (12 to 18 in) long, and the giant squid, at least 18 m (60 ft) long, is the largest aquatic invertebrate. It lives at depths of 300 to 600 m (985 to 1970 ft), where it is the prey of sperm whales.

Scientific classification: Squid belong to the order Tenthoidea of the class Cephalopoda. Squid that secrete luminescent ink are classified in the genus *Heteroteuthis* of the family Sepiolidae. The common squid of the east North Atlantic coast belongs to the family Loliginidae and is classified as *Loligo vulgaris.* The giant squid is classified in the genus *Architeuthis* of the family Architeuthidae.[1]

(Footnotes)

"Squid," *Microsoft® Encarta® 97 Encyclopedia.* © 1993-1996 Microsoft Corporation. All rights reserved.

THIS MONTH'S SPEAKER
JEFF BOSANIC

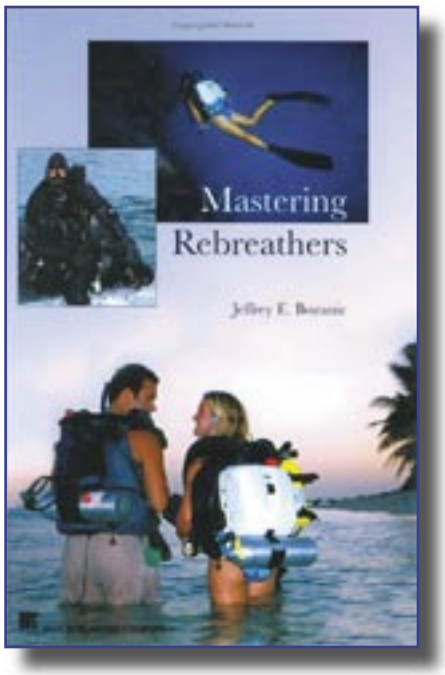
By Paul Miller

Within the Island of Cozumel in Mexico, there winds a 6-mile underwater cave system named ***Cueva Quebrada***. Almost a mile from any entrance lies a significant cache of Mayan artifacts, a burial mound, found in 1991 by cave explorers **Jeff Bozanic** and Steve Osmeroid.

This find was documented in an episode of ***"Deep Sea Detectives."***

We're pleased to have Jeff as this month's speaker.

Jeff will be giving us an overview of Rebreathers - **How they work, what's involved in training to use them and if they might be a tool to use for your future diving.**



Jeffrey Bozanic's Bio

Jeff serves as the Executive Director of Island Caves Research Center, a non-profit organization formed for the purpose of conducting scientific investigations in submerged cave systems. His research diving activities have taken him to the Bahamas, Palau, Guam, Mexico, Canary Islands, Antarctica, and other worldwide locations.

Jeff was certified as a NAUI Instructor in 1978, and as a cave diving instructor in 1983. He is certified to teach cave diving for the NSS-CDS, NACD, and NAUI. He is active in teaching nitrox, technical nitrox, and trimix, as well as semi-closed and closed circuit courses.

He has published extensively on diving education topics, with heavy emphasis on cave diving safety techniques. He has edited/reviewed many diving textbooks, the latest been "Mastering Rebreathers".

He has served on several Boards of Directors in the diving community, including as Chairman of the NSS-CDS and as Vice Chairman of NAUI. He has received the NAUI Outstanding and Continuing Service Awards; and the Silver Wakulla and Abe Davis Awards for safe cave diving.

Ask Dr. Debbie...

To Breath or Re-breath...that is the Question!

By Debra A. Hill, MD

To breath or re-breath…that is the question. That we all love to dive often is driven by the desire to "go where no man has gone before," or essentially be able to see things we don't normally get an opportunity to see in our everyday lives. Once we have been diving for awhile, this drive turns into a desire to see even more either by being able to stay down longer or to dive deeper.

Some of the ways we can do this are through training in use of **Nitrox or Tri-mix. Nitrox** extends bottom time and decreases surface intervals, but limits our depth due to the higher percentage of oxygen. Remember as we go deeper the partial pressures of a gas increases and a partial pressure of oxygen above 1.4 is toxic to our brains. Toxicity to the brain from oxygen can cause seizures. **Tri-mix** replaces nitrogen with helium in an attempt to reduce nitrogen narcosis. This allows us to dive deeper without essentially being put to sleep by the increased partial pressure of nitrogen. Tri-mix also has a decreased percentage of oxygen which allows us to go deeper and avoid oxygen toxicity. But, even with these options, the gas we breathe is exhaled out into the water and our bottom time is limited by this. Re-breathers allow us to extend our bottom time, and our depth by letting us more efficiently use the gas that we breathe. Each breath that we exhale has some oxygen in it that we can essentially conserve and re-breath again, but there is Carbon Dioxide (CO2) in that exhaled breath that needs to be removed so that we don't get toxic from it. Hence, the re-breather attempts to scrub out carbon dioxide and add oxygen to make up for the amount that we used up.

Using Nitrox adds some complexity to your dive in that you need to remember not to dive deeper than is safe depending on the percentage of oxygen in your breathing gas. Tri-mix adds even more complexity in that there are required extra cylinders of breathing gas required to get you to a depth where the trimix has a partial pressure of oxygen that is high enough to breath, and then there is the issue of extra bottle switches on ascent and for decompressing. One can simplify this a little by diving normoxic Tri-mix, which means that only the nitrogen is replaced by helium, but the percent of oxygen is normal—the same as in air, 20%. But, then your depth is limited.

A rebreather can adjust the amount of oxygen that is being breathed depending on your depth without having to change bottles, and can be used with tri-mix as well. This may seem like it would make things

Glossary of Rebreather Terms:

Scrubber or ($C0_2$ scrubber) - The part of a rebreather that removes excess CO_2 from the breathing loop. This is accomplished through the chemical bonding of the CO_2 with a reactive substance. In most current rebreathers the substance used is Soda Lime. There are a number of designs of scrubbers, but the two most widely used are axial and radial scrubbers.

Axial flow scrubber- An axial scrubber is a scrubber design in which the breathing gases move from top to bottom (or vise-versa) through the scrubber. The most common example is the current US navy fully-closed rebreather the MK16. An example of a simple axial flow scrubber would be to start with a coffee can with a removable top. Punch holes in the top and bottom of the coffee can and fill the middle with soda lime then put the top on. Seal the entire unit into the breathing loop. In this example the gases must travel from one side of the can to the other. Contrast this with "Radial scrubber".

Radial flow scrubber- A radial flow scrubber is a scrubber design in which the breathing gases move from the middle to the outside (or vise-versa) through the scrubber. The most common example is the current military rebreather built by Sherwood and Fullerton in Canada. An example of a simple radial flow scrubber would be to start with a coffee can, and then insert a tube into the

a lot easier. ***But, to make the switch to diving a rebreather is essentially like learning to dive all over again.***

I have been curious about rebreathers for a few years now, primarily because of the lack of bubbles, which for the most part allows us to see more marine life and of course better video. Hammerheads; however apparently are drawn to the bubbles. So, if you want to video hammerheads, don't use a rebreather. This was according to Howard Hall.

A few years ago I demo'd a rebreather in a pool and I liked the quiet, but was surprised to discover a different experience in terms of buoyancy. Normally I can adjust my position in the water a little with my breath alone. With the rebreather that was not the case because my breath didn't go anywhere. Also, breathing felt very different—not the usual feel of drawing a breath.

There are various types of re-breathers, such as *semi-closed rebreathers*, and *closed circuit rebreathers* that are available to recreational divers. Each of these has its advantages and disadvantages. When I began to research this, I found that there was a lot of terminology that I needed to know before I would have any clue as to what to even consider when choosing what kind of rebreather to get and which manufacturer I would want to go with. Keep in mind too, that you will always need to have enough bail out gas in case there is a failure.

I did find a nice list of vocabulary that I'm listing with this article - http://www.nwdesigns.com/rebreathers/Default.htm

PLEASE KEEP READING ABOUT REBREATHERS ON THE NEXT PAGE... THERE IS A GREAT DEAL OF IMPORTANT INFORMATION!

middle of the coffee can from the top. Punch holes in the middle tube and the outside of the coffee can. The top and bottom of the can should be sealed (with the exception of one end of the middle tube). Now the breathing gases must move "radially" in the canister. Contrast this with "Axial flow scrubber"

Breathing loop -
The breathing loop in a rebreather is composed of all the internal areas within which the diver's breathing gases flow. This includes, the counter-lung, scrubber, breathing hoses and the diver's lungs.

Counter-lung (abbr. - CL)-
The counter lung is the sealed flexible bag which inflates as the diver exhales and deflates as the diver inhales. It acts as a storage area for the diver's breathing gases. The positioning of this bag within the breathing loop can greatly affect the breathing effort.

Work of breathing (abbr.- WOB)-
The phrase "Work of breathing" relates to the amount of effort required by the diaphragm to move the breathing gases in and out of the lungs. Work of breathing is affected by many things on a rebreather including the hose diameters, mushroom valves, scrubber design, counter-lung placement and design, and more. The work of breathing is also affected by depth. As depth increases the breathing gases become denser which increases the work of breathing.

The primary problem with a high work of breathing is that it increases the build up of CO2 in the body. If CO2 levels get too high you will blackout. This isn't much fun at all while under water.

Work of breathing is not a subjective matter. There are very specific tests designed to measure the work of breathing on a breathing machine. You cannot subjectively ascertain WOB.

Diluent -
This is the gas used in a closed circuit rebreather to make up volume in the breathing loop as the diver proceeds to deeper depths and the gases in the breathing loop are compressed. Depending on the rebreather, and the type of diving, the gas used for diluent could be air, nitrox, trimix or even heliox.

Fully-closed circuit rebreather -
This type of rebreather does not release any gases from the unit except under the conditions of ascending from depth as the counter-lung expands with the reduction in ambient pressure. The advantage is the greatest possible use of the onboard Oxygen and the maximum Physiological benefits. The disadvantage is the added complexity of electronics and mechanics to monitor the ppO_2 and to inject the proper amounts of diluent and O_2 into the breathing loop.

Semi-closed circuit rebreather -
A rebreather which vents part of the exhaled gases from the breathing loop as a function of each breath, RMV, or some other method. CO_2 produced by metabolic processes is absorbed by a scrubber. Because most semi-closed rebreathers don't monitor ppO_2, they are primarily used with a premix of nitrox or trimix which in turn is mixed for the planned MOD. This may be contrasted with a fully-closed circuit rebreather.

These are concepts to remember:

EAD (Equivalent Air Depth) -
The depth relative to the partial pressure of nitrogen in a normal air mixture (21%O_2, 79%N_2). When there is a lower than normal fraction of nitrogen in a gas mix, the partial pressures of nitrogen are lower at any given depth. This allows the diver to feel less narcotic effect from the nitrogen than when breathing air at the same depth. **EAD = (fN_2*(d+33))/.79-33,** where d = depth.

EAN(x) [Enriched Air Nitrox (percent of Oxygen)] -
This is one of the naming conventions for a non-normal mixture of Oxygen and Nitrogen. Air has approximately 21% Oxygen and 79% Nitrogen, this is the normal mixture of Oxygen and Nitrogen (also called normoxic). It you have more (or less) Oxygen in the mix, it is considered nitrox. If the mixture had 32% Oxygen with the balance as Nitrogen this would be labeled EAN32.

Partial Pressure -
The pressure within a gas mix of a particular gas. In simpler terms it may be thought of as the number of molecules per given volume of gas. More molecules per volume = higher partial pressures. In more specific terms it is the Fraction of the gas (F[x]) multiplied by the absolute atmospheres.
i.e. - Air has a fraction of Oxygen equal to 21% (**$Fi0_2$ = .21**). At a depth (pressure) of 33FSW the *absolute atmospheric* pressure is equal to 2 (The 1 atm at sea level plus a 2nd atm at 33 feet). So the partial pressure of a tank of air at 33FSW is **.21 * 2 = .42 $pp0_2$.**
Partial pressures are commonly represented as “pp” followed by the atomic symbol of the gas. So that the partial pressure of Oxygen would be written as $pp0_2$ and the partial pressure of He would be written as ppHe

Fraction of gas (f[x]) –
The percent of a particular gas in a gas mix. Air contains 21 percent O_2 and 79 percent N_2. In Air the **$f0_2$ = .21** (21 percent) and the **fN_2 = .79** (79 percent). You may also hear the term “fraction of inspired gas”. This means the fraction actually inspired, or “breathed in”.

MOD (Maximum Operating Depth) -
The maximum operating depth of a breathing gas before reaching a predetermined maximum partial pressure of Oxygen, usually 1.4 or higher. This limit is to protect from Oxygen toxicity

These are types of gases:

Heliox -
A breathing mixture of gases consisting entirely of Helium and Oxygen. This is used to eliminate Nitrogen narcosis and to control the affects of Oxygen toxicity, by eliminating the Nitrogen and reducing the Oxygen in the breathing mix. Another benefit is reduced effort of breathing due to the lower density of helium. There are a few disadvantages, for working divers, helium distorts the voice and helium has less insulating value than an Oxygen/Nitrogen mix which results in divers becoming cold sooner. There have been some reports of divers feeling jittery when using heliox, and as dives go beyond about 300 FSW, classic symptoms of HPNS can begin to appear.

More on the next page....

Understanding Rebreather Risks

Inherent Risks of Rebreathers
All rebreathers have an inherent risk greater than that found in open circuit scuba. Dive instruction should work to instill respect for the potentially fatal problems associated with rebreather diving, and active rebreather divers must take care not to become complacent. The following list outlines the most obvious problems associated with rebreather diving.

HYPERCAPNIA

Because rebreathers recirculate a portion of each exhaled breath, carbon dioxide (CO_2) generated by the body's use of oxygen must be eliminated before the gas can safely be returned to the diver. Failure to remove CO_2 could cause hypercapnia - whose signs and symptoms include dyspnea, confusion, drowsiness, rigidity, spasms, loss of consciousness, and headache. CO_2 is removed by directing exhaled gas through a CO_2 "scrubber." The carbon dioxide in a diver's exhalation combines with water vapor in the loop, forming carbonic acid which is easily neutralized with a base material. Halcyon's rebreather scrubber is packed with a base material such as Sofnolime. As the carbonic acid passes through the scrubber, the CO_2 molecules bind with the base material granules, neutralizing the CO_2 from the exhaled gas. The byproducts of this chemical reaction are the formation of chalk, water vapor, and heat.

Hypercapnia's most troubling aspect is the difficulty of recognizing the symptoms in time to act. Divers should familiarize themselves with the technical problems that could cause CO_2 build-up within the breathing loop:

Bypass of CO_2 Scrubber
Since a rebreather is designed to allow gas to flow through the loop in only one direction through the scrubber, one-way valves are used on both sides of the mouthpiece. Should a one-way valve fail, the CO_2-laden gas could simply flow back and forth in the hose without going through the scrubber.

Failure of CO_2 Scrubber
Hypercapnia may also result from dives that exceed the scrubber material's duration. Rebreather divers must know how long their scrubber will last in the environment where they are diving. Certain environmental conditions, such as cold water, greatly reduce the scrubber material life. Water infiltration, either by a leak or condensation, into the scrubber and also reduce the efficiency of the scrubber medium. Divers who frequently reuse or are careless about replacing the scrubber medium are most likely to experience these problems.

Channeling due to a Poorly Packed Scrubber
In order for CO_2 to be eliminated, it must come in contact with the scrubber medium. As the exhaled breathing mixture will flow through the scrubber along a path of least resistance, any pockets or voids in the scrubber media will allow some gas to pass through the scrubber with only a partial reaction to the medium. Care must be taken to insure the scrubber media is thoroughly and correctly packed to avoid the gas forming channels, and thereby compromising the scrubber's effectiveness.

Flooding
While water vapor is necessary to form the carbonic acid required to catalyze the CO_2, large volumes of water in the scrubber will insulate the media from any gas flowing through the scrubber. It is imperative that all system integrity checks be done prior to every dive.

Meeting is Feb. 21st at 6:30 at Fudd's

Please note - this month's meeting is changed due to Valentine's Day!

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