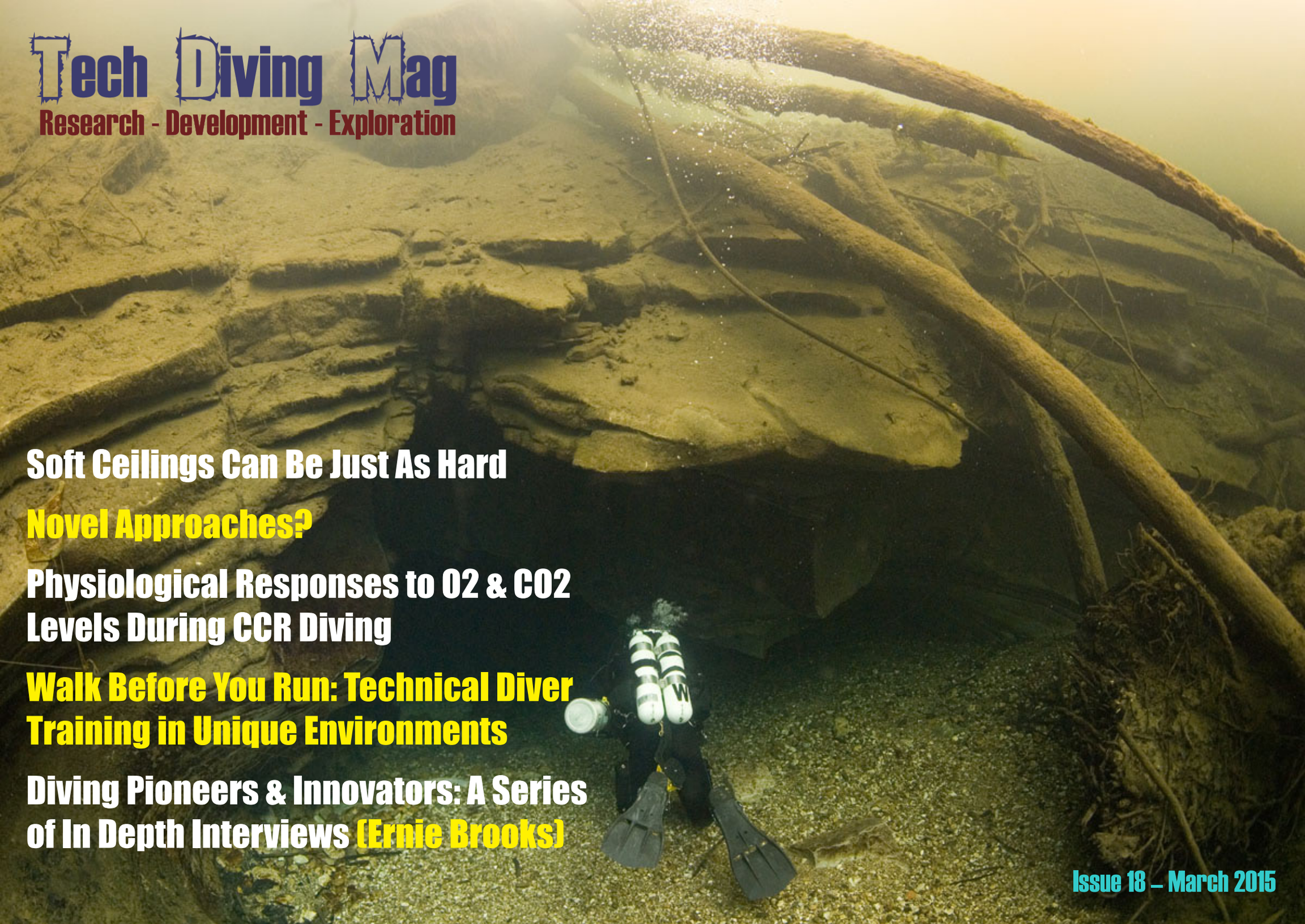
Tech Diving Mag

Research - Development - Exploration



Soft Ceilings Can Be Just As Hard Novel Approaches?

Physiological Responses to O2 & CO2 Levels During CCR Diving

Walk Before You Run: Technical Diver Training in Unique Environments

Diving Pioneers & Innovators: A Series of In Depth Interviews (Ernie Brooks)

Issue 18 – March 2015

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Front cover image © Ron Freijer.

Editorial

Welcome to the 18th issue of Tech Diving Mag.

My book *Deep Into Deco: The Diver's Decompression Textbook* is finally out. And it's available from Best Publishing Company as print book, eBook and package set! How does it compare to other deco-related titles? This one has all the basic topics covered, and is more into modeling and up-to-date research.

The contributors for this issue are world renowned industry professional Bret Gilliam, commercial diving instructor Konstantinos Alexiou, technical diving instructor and operator Tom McCarthy, along with multimedia producers Michele Gilbert and Danielle Alary. Take a look at their brief bio at www.techdivingmag.com/contributors.html.

Tech Diving Mag is based on article contribution, so you're always welcome to volunteer a piece and/or some photos. The guidelines could be found at www.techdivingmag.com/guidelines.html.

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Asser Salama
Editor, Tech Diving Mag

Soft Ceilings Can Be Just As Hard

By Bret Gilliam

Almost any diver can understand the "hard" reality of classic overhead environments such as caves, ice or wrecks. For the uninitiated, "overhead" means literally that: an impenetrable barrier that precludes direct escape to the surface. That's a bad situation to have to deal with if you have the misfortune of running out of something to breathe. Usually no amount of head-banging will relieve a diver of the burden of going out the way he came in, even if it requires a lengthy re-tracing of route while engaged in spirited air sharing with a buddy… who by now wishes he'd never met you. Well, we've all got a good vision of those classic scenarios by now, I'm sure.

But there is another ceiling out there that most technical divers must deal with as a matter of routine: the decompression ceiling. It's not hard like cave limestone, the rusted steel under-deck of a shipwreck, or as chilly as the bottom of an iced-over lake, but it's just as real. And the obligation of its reality must be factored into each dive's plan and its contingency factors.

With more and more divers realizing the physiological safety advantages of switches from air (or mixed gas) to alternate supplies of oxygen or nitrox, the gas management equation has added another dimension to planning.Two decades ago, most divers did their entire dives simply on compressed air. That meant the "bottom" portions *and* the decompressions. With the influence of the technical diving community however, it was clearly demonstrated that "air" was a particularly poor selection for decompression when compared to the efficiency of a hyperoxic mixture that would provide a better gradient for out-gassing inert nitrogen or helium in the tissues.

Now a gas switch for decompression is the norm, not the exception, and that has necessitated a few changes in how divers approach "the ceiling". In a properly planned dive, it's possible to very accurately predict the volumes needed for the "bottom phase" and the "decompression phase". A contingency margin can be added to both volumes for those inevitable scenarios when your best laid plans decide to take a dance around the floor with Mr. Murphy. Let's take a look at four sample situations and how divers can cope with them:

Case 1. For whatever reason, a diver runs out of primary breathing gas deep on a wreck and has a 30-minute deco obligation to fulfill. If his buddy is near enough, they can ascend sharing breathing gas by any of several methods to his first stop. He can then switch to his decom gas and complete the dive as planned.

Case 2. If the diver arrives at his decom stop to find that his oxygen or nitrox cylinder has mysteriously emptied, he now has to complete his stops either on the air (or other gas) still left in his primary cylinders or he may have the option of using backup surface supplied decom gas deployed from his vessel. Or he can share whatever gas supplies available from his buddy.

Case 3. A diver plans his dive to return to the anchor line and ascend to a surface supplied decom source but he is swept away by the strong current. If he's smart, he will have carried a 30-45 cubic foot cylinder either as a contingency stage tank or mounted to his primary cylinders with a versatile mixture like 80/20 nitrox. This can be breathed as deep as 30 fsw and will bring him out OK. But since he is now drifting away in the current while underwater, he should deploy a surface marker buoy (SMB) on a reel to hang under so the boat can track him and pick him up.

Decompression doesn't have to be boring or tedious: following the contour of the bottom as you ascend from a drop-off wall can provide great entertainment at your stop depths. Peter Meyer enjoys a school of bigeye jacks at his 30-foot deco stop in Papua New Guinea.

Case 4. Our diver loses his deco cylinder *and* runs out of primary breathing gas with no buddy for assistance. Not a good day. Assuming he survives the emergency ascent from depth, he arrives at the surface with a violated decom ceiling. If the boat is swift to respond (hopefully in 3-5 minutes), he can re-enter his decompression schedule with a fresh oxygen or nitrox cylinder and complete it with added extensions for a safety cushion. I'm not crazy about this scenario but it beats waiting to go numb on the boat. And diver transfers from the ocean to deck chambers are common in commercial diving within similar time frames for more comfortable decompression environments.

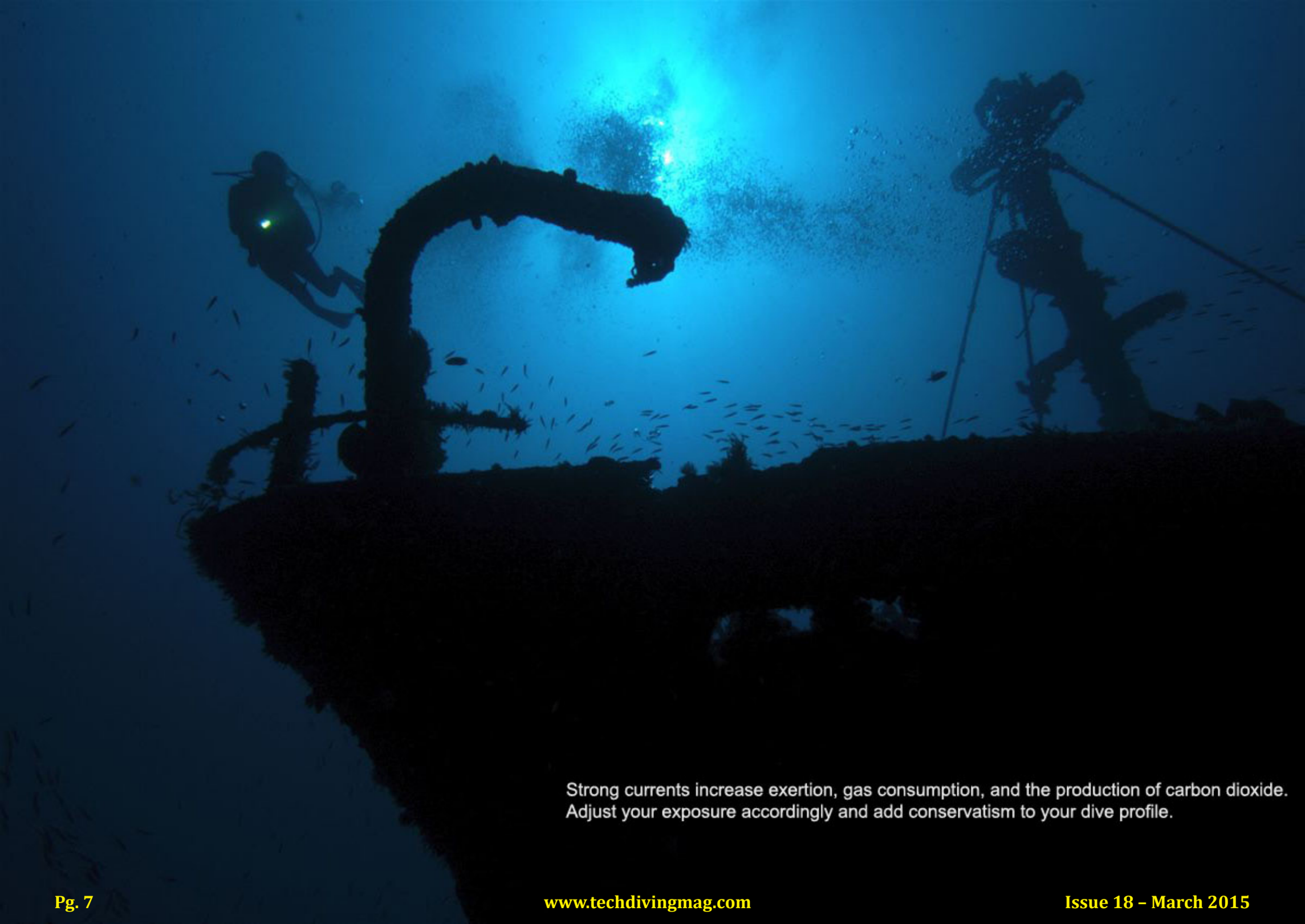
The bottom line in each case is that there are methods of dealing with a busted dive plan if you think them out. While you should never break the "glass" on that decompression "ceiling", in a complete disaster it is still possible to make repairs as in Case 4. Planned overhead environments, whether literal or implied by deco obligation, require extra caution in pre-dive planning. I always urged all divers to allow at least a 50% safety margin for gas volume in their deco cylinder in case an extra stop is incurred or if they need to share. Primary cylinder volumes and gas management rules can be matched to the site and its particular conditions. The rule-of-thirds, half-plus-200, etc. can all be used effectively. But the rationale and situational awareness of each dive must be factored into the reality of choosing the breathing gas turn-around protocol.

In many ways, the advent of a second deco supply has improved the contingency planning since in a total primary gas failure a diver now only has to make it back to his first decom stop. That can make a big difference.

Of course, the best accident management plan ever devised is "don't have an accident". Observe gas management rules, carry a suitable bail-out bottle, and always carry deco gases with you. Sure it's OK to use a surface supply system but you better be sure you can get to it if the current comes up or the boat breaks loose. Carry at least 30 cubic feet of deco gas and a SMB rig for those situations.

Treat the deco ceiling with the same respect you would with other overhead environments. The ceiling in a cave, wreck or ice dive can drown you. The ceiling in decompression diving may not kill you but it can ruin your whole day with a case of bends. Plan accordingly.

Bret Gilliam is a 44-year veteran of the professional diving industry with over 18,000 logged dives. He is President of Ocean Tech and founder of TDI and its companion training agencies SDI and ERDI.



Strong currents increase exertion, gas consumption, and the production of carbon dioxide. Adjust your exposure accordingly and add conservatism to your dive profile.

If you drop your stage cylinders at your ascent point on a wreck, be precise in your navigation, penetration, and exploration to ensure a safe and timely return to your deco gases. Far too many divers have gotten lost on wrecks and been forced to make emergency ascents leading to DCS. If you have any doubts about your ability to return to a site area, keep your cylinders with you on all phases of the dive. Joe Giacinto explores the cargo hold of a Japanese shipwreck from WWII in the south Pacific.

Novel Approaches?

By Asser Salama

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In 2008 a study theorized that the at-depth endothelial dysfunction caused by a temporary loss of haemostasis due to increased total oxidant status is the most significant factor in the progression of DCS.[1] It argues that this increased total oxidant status is a result of breathing oxygen at any pressure, because this would cause vasoconstriction. Fortunately, this increase can be prevented by using antioxidants such as Vitamin C. Although the study argues that bubble formation is an "aftermath," it highlights that bubbles have the potential to exacerbate the situation of decompression by damaging the vascular endothelium either through ischemia/reperfusion, physical contact with the endothelium or by an increase in shear stress. It claims that this damage may manifest itself in the form of released endothelial membrane fragments (microparticles).

Some studies suggest that a single bout of exercise some 24 hours before diving would prevent bubble formation.[2] In 2004, 12 healthy male divers participated in a study where the test subjects underwent a single bout of strenuous exercise for 40 minutes then were compressed in a hyperbaric chamber 24 hours later to the equivalent pressure of 18 meters (60 feet) for 80 minutes at a "descent" rate of 10 meters/min (33 feet/min). On their 9-meter/min (30-foot/min) ascent, they stopped at 3 meters (10 feet) for seven minutes. After reaching the surface pressure, an ultrasonic scanner monitored venous gas bubbles. The results demonstrated that compared with dives without preceding exercise, the average number of bubbles in the pulmonary artery was significantly reduced (from 0.98 to 0.22 bubbles per square centimeter). By undergoing pre-dive exercise, the maximum bubble grade was decreased from 3 to 1.5, thus safety was increased.

A study on rats demonstrated that the administration of a nitric-oxide releasing agent 30 minutes prior to diving has the same effect of pre-dive exercise.[3] This confirmed the results of a former study suggesting that nitric oxide synthase inhibition increases bubble formation.[4] No tests have been conducted on humans so far.

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"*Deep Into Deco* is a stimulating read which covers almost every facet of diving from breathing to technical decompression. It is well referenced and dives into (forgive the pun) great detail concerning the past and present of diving theories. I recommend this book for all divers from novice to technical expert because Asser Salama makes even the most difficult topics seem easy and understandable. No diving collection is complete without this super overview book. I will keep mine on the coffee table as a discussion piece."

—Commander Joseph Dituri,
US Navy Saturation Diving Officer (ret) and Vice President of IANTD

"This book is long overdue. And it's worth the wait. What Asser Salama has accomplished with this book is remarkable. He has taken that early history of experimental trial and error and produced a stunning reference text that brings the science into sharp focus."

—Bret Gilliam, founder of TDI

"Asser's book is the best general overview of decompression modeling I have seen. The information it contains is relevant to divers of all levels, from the occasional sport diver who wants to know more about how their dive computer works to the technical diver planning extended decompression dives. It certainly is a welcome addition to my dive library!"

—Jeffrey Bozanic, PhD, author of *Mastering Rebreathers*

ASSER SALAMA, a technical diver and instructor, is founder of *Tech Diving Mag* and developer of Ultimate Planner decompression-planning software. He has a bachelor's degree in engineering and a master's degree in business administration. A software developer with an interest in decompression modeling, Salama plans to implement computational algorithms based on credible research papers to prevent some pioneering work from fading into academic obscurity.

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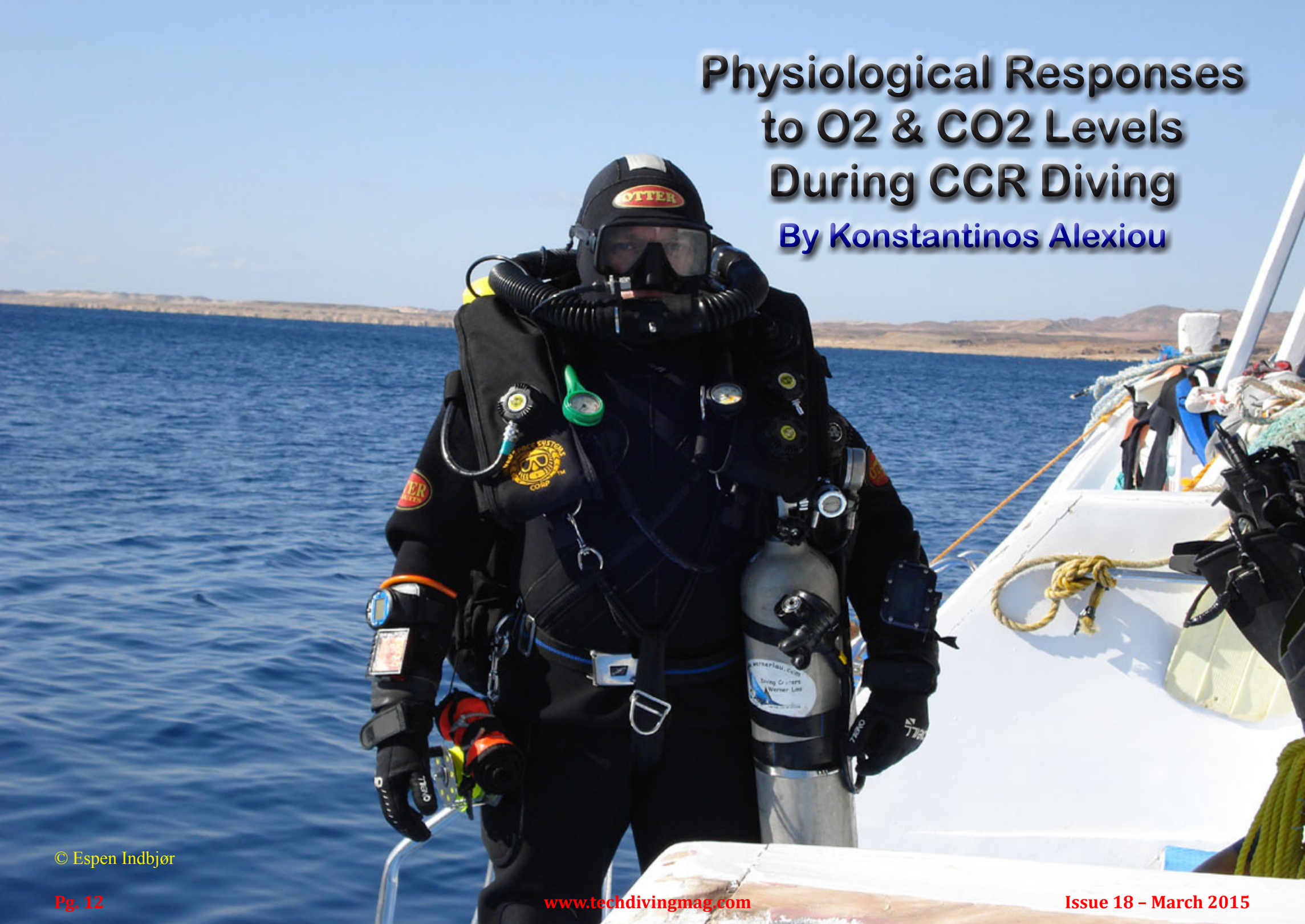
The Diver's Decompression Textbook

Asser Salama

Physiological Responses to O2 & CO2 Levels During CCR Diving

By Konstantinos Alexiou



Introduction

In closed-circuit rebreather (CCR) diving, it is essential that both oxygen and carbon dioxide are actively controlled. Failure to perform an active monitoring may lead to one or more of oxygen toxicity, hypoxia, or hypercapnia, which are silent hazards of rebreather diving. The above three factors tend to appear much more in CCR diving than in open-circuit diving.The underwater environment is unique and any exposure to it presents a number of stresses to the human system. To follow is the physiological responses of the human system to oxygen and carbon dioxide concentrations in the breathing mixture.

The respiratory system: gas exchange

The cells in the human system need energy to survive. This energy comes from nutrients via a series of chemical reactions, the metabolism. During metabolism, each cell combines nutrients and oxygen to produce energy in the form of adenosine triphosphate (ATP) and waste products, mainly carbon dioxide and water. The body obtains the nutrients through a variety of processes, but the most common are through inhalation, as in the case of oxygen, and ingestion, as in the food we eat. The primary function of the respiratory system is to exchange gases at the capillaries of the lungs, or conduct respiration. Oxygen flushes into the cells and carbon dioxide is disposed. The process of respiration includes ventilation, diffusion of oxygen and carbon dioxide between the blood and the pulmonary alveoli, and finally the transport of oxygen and carbon dioxide in the human system. Ventilation, or pulmonary ventilation, is the process of moving air in and out of the lungs and consists of two phases: inhalation (inspiration) and exhalation (expiration). Fresh air is a mixture of approximately 78% nitrogen, 21% oxygen, and 1% of other gases, primarily 0.9% argon and 0.03% carbon dioxide. The human system does not use all the inhaled oxygen included in the atmospheric air that passes into the body. Exhaled air contains approximately 16% oxygen and 3-5% carbon dioxide, and the rest is nitrogen. The mechanical process of respiration contains the phenomenon of diffusion, which is the movement of solutes (oxygen, carbon dioxide) from an area of high concentration to one of low concentration. This is caused due to different gas partial pressures in the system, as well as concentrations of the solutes in the cells. The term partial pressure describes the amount of gas dissolved in liquid, such as the blood, and is governed by the familiar to the divers Henry's law. The law, formulated in 1803, states that the amount of gas in a solution is directly proportional to the partial pressure of that gas in equilibrium with that liquid, in our case the blood. Oxygen and carbon dioxide tend to move from an area of high pressure (high concentration) to an area of an area of lower pressure (lower concentration). We have, in that way, diffusion of the gases in the system, until a balance is reached. From Dalton's law, the partial pressure of oxygen in the atmospheric environment is 0.21 x 760 mm Hg = 159.6 ≈ 160 mm Hg (0.21 bar). In a healthy person, the partial pressure of oxygen in air residing in the alveoli is around 100 mm Hg (0.13 bar), while the partial pressure of carbon dioxide is 40 mm Hg (0.05 bar). Venous blood has a partial pressure of oxygen that is lower than the partial pressure of oxygen in the alveoli. This is because the deoxygenated blood has just returned from the systemic circulation and has lost much of its oxygen. The partial pressure of carbon dioxide in the alveolar capillaries is relatively high, because the blood returning from the systemic circulation has picked up carbon dioxide. The body attempts to balance the pressure differences, so oxygen diffusion takes place across the alveolar-capillary membrane into the blood. Carbon dioxide diffusion happens into the alveoli and the carbon dioxide is eliminated as waste during expiration. Both oxygen and carbon dioxide diffuse until the partial pressures in the air and in the blood are the same. This process also occurs in the tissues, when the arterial blood reaches to them. Oxygen diffuses into the cells, and carbon dioxide out of the cells and into the tissue fluid and blood.

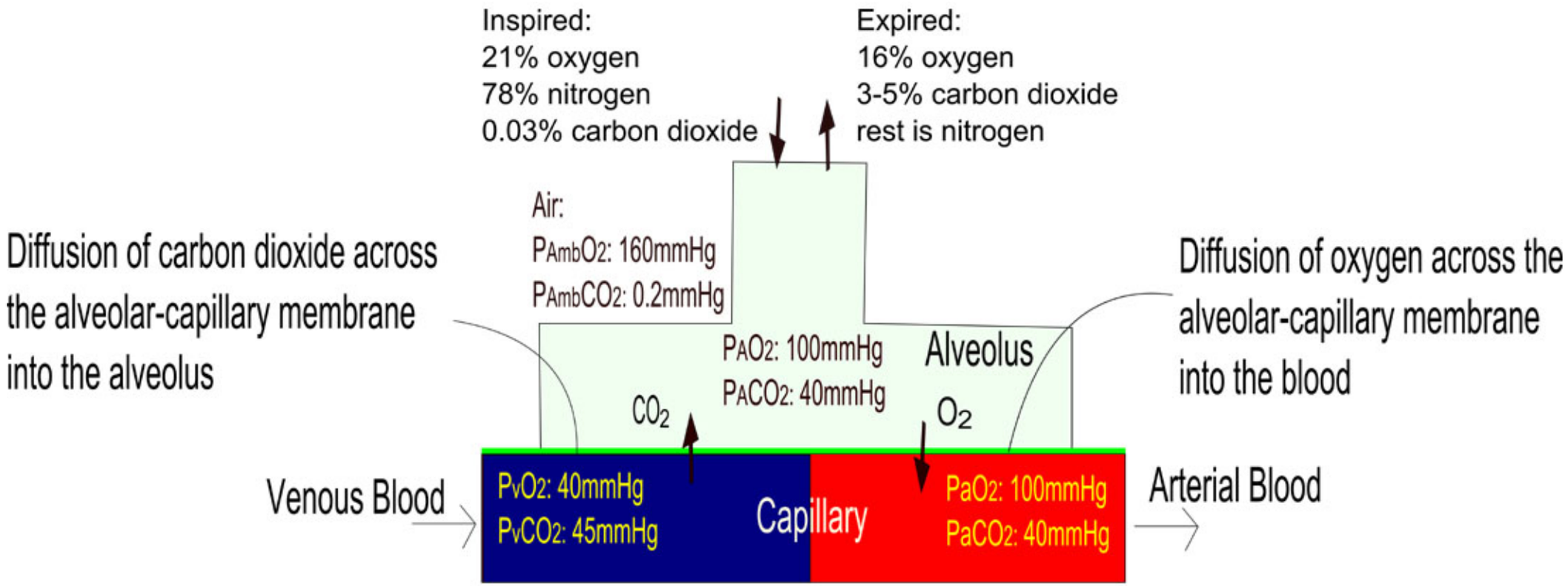


Figure 1. Schematic of gas exchange process.The mechanical process of respiration contains the phenomenon of diffusion, which is the movement of solutes (oxygen, carbon dioxide) from an area of high concentration to one of low concentration.The balance in the different partial pressures betweenthe alveolus and blood occurs very quickly. Therefore,the partial pressure of the gases in the arterial blood are the same as the partial pressure of the gases in the alveolus.(Illustration: Alexiou, 2015)

But what is the relationship between oxygenation and ventilation? Oxygenation, which is the process of oxygen molecules loading onto the bloodstream, cannot occur without ventilation. In other words, the breathing mixture needs to contain an adequate percentage of oxygen for cell survival. However, ventilation is possible without oxygenation. This may happen in cases where ventilation occurs but the partial pressure of oxygen is not sufficient for the cellular metabolism. Simply put, in that case, it is the alveolar partial pressure of oxygen and not the percentage of oxygen in the breathing mix that determines a normal metabolic function.

Partial pressure of oxygen

Oxygen is life essential and important therapeutic tool for several pathological situations. Nevertheless, it possesses toxicity effects when there is an excess supply of oxygen in the tissues and cells. Oxygen toxicity occurs when the partial pressure of oxygen residing

in the alveoli (P_AO_2) exceeds that which is breathed under normal conditions. The dose of oxygen leading to a possible event of oxygen toxicity is determined by the following factors: exposure time, ambient pressure, and fraction or percentage of inspired oxygen (FIO_2). Additional factors relevant to technical rebreather diving include the work level, low ambient temperature, increased partial pressures of carbon dioxide, some drugs and, of course, the individual variation. The toxic effects of oxygen at partial pressures between 0.45 bar and 1.6 bar primarily affect the lungs and this condition is termed as pulmonary toxicity. The time to onset of symptoms is highly variable but most individuals can tolerate 12-16 hours of oxygen at 1.0 bar, 8-14 hours at 1.5 bar, and 3-6 hours at 2.0 bar before developing mild symptoms.When the partial pressure of oxygen ranges from 1.3-1.6 bar, divers may experience hyperbaric induced myopia during which the vision becomes impaired. Repetitive and prolonged exposure to hyperoxic gases (at least 30 hours in 10 days of an oxygen partial pressure greater than 1.3 bar) can cause the above manifestation. The toxic effect at partial pressures of oxygen over 1.6 bar affects the brain and it only requiresa short-time exposure. This type of conditionwas firstly described by Paul Bert in 1878 and is toxic to the central nervous system (CNS). Central nervous system toxicity results in seizures followed by coma in most people within 30 to 60 minutes. Seizures often occur without warning and are likely to be lethal. Other symptoms include nausea, muscle twitching, dizziness, disturbances of vision, irritability, and disorientation. Technical divers are aware of this diving hazard. However, recreational divers also use EANx mixtures so the wise choice of the breathing gas refers to both technical and recreational diving communities. Central nervous toxicity can also affect a diver at partial pressures of oxygen of 1.3-1.6 bar. There are cases where divers increase the concentrations of oxygen in their circuit in order to reduce the amount of required decompression. This may increase the risk of oxygen toxicity that is why most of CCR manufacturers recommend the partial pressure of the oxygen in the loop to be maximum 1.3 bar. Long dives or repetitive days of CCR diving may be a reason to decrease the partial pressure of oxygen (< 1.3 bar).Central nervous oxygen toxicity is a result of cumulative damage in the cells. At the end of a CCR dive that requires decompression, a significant amount of damage has occurred. If during that stage, the oxygen arterial tension (partial pressure) in the human system increases, the risk of potential toxicity becomes higher even though the diver is at rest.

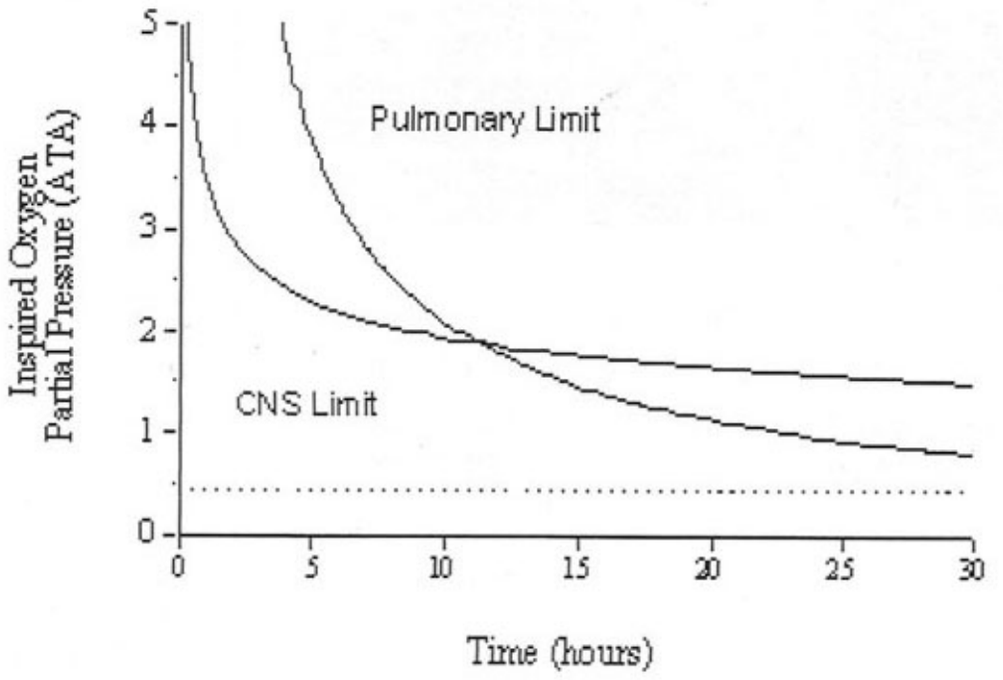


Figure 2. Graph of the predicted pulmonary and CNS toxicity limits of exposure to varying partial pressures of oxygen. Oxygen can be tolerated for longer periods at lower partial pressures.
(Source: www.diverite.com/education/rebreather/tips/oxygen%20toxicity%20signs%20and%20symptoms/)

On the other hand, failure to meet the body's needs for oxygen may result to hypoxia. Hypoxia is a dangerous condition in which the P_aO_2 is too low (when the inspired oxygen partial pressure drops below about 0.16 bar) for the tissues and cells to function properly, and, sometimes, death may occur quickly. Sudden blackout due to hypoxia is caused by low oxygen fractions, due to mechanical failures or technical operational errors. The above combined with a drop at the external pressure during the ascent phase of a divecould raise the risk of hypoxia. It is of vital importance that the diver constantly monitors and crosschecks the primary and backup displays of his/her apparatus.

Carbon dioxide elimination

High arterial amounts (P_aCO_2) of carbon dioxide can lead to unconsciousness, a pathological situation known as hypercapnia. In rebreather diving, the carbon dioxide elimination is affected by immersion, physical work, gas density, ventilation rate, control of the breathing pattern, mechanical failure, such as CO_2 scrubber failure, and breathing apparatus design. The respiratory centre located in the brainstem controls breathing. There are nerves in this area that sense the level of carbon dioxide in the blood and spinal fluid. The main respiratory stimulus is accumulation of carbon dioxide in the blood (P_aCO_2). When CO_2 rises, breathing will be stimulated, and when CO_2 levels fall, the breathing to drive will be reduced. In the absence of carbon dioxide rebreathing, hypercapnia is due to inadequate lung ventilation causing carbon dioxide production. Any pattern of inadequate ventilation (altered respiratory control with reduced sensitivity to CO_2, conscious overriding of the drive to breath, "skip-breathing", adoption of a disadvantageous breathing pattern, and respiratory failure)can easily cause increase the CO_2 arterial tension. One of the main causes of increased carbon dioxide production is increased physical work at depth. The increased gas density and the apparatus design are factors that influence the diver's effort. The CO_2 scrubber failure is another cause of hypercapnia. If there is such a mechanical failure, the disposal of waste products via ventilation becomes inadequate. Early signs of hypercapnia include anxiety, headache, and shortness of breath. In some cases, unfortunately, by the time those signs were noticed the diver was deprived of strength or ability to react. Since the P_aCO_2 is the main respiratory drive, increased levels of carbon dioxide in the blood could cause a massive flow of oxygen radicals in the brain even if the oxygen partial pressure remains constant. An accumulation of oxygen radicals result in damage of the brain cells. A further increase in the oxygen partial pressure could probably cause CNS toxicity. Therefore, the early detection of abnormal carbon dioxide levels in the system is essential. The design and manufacture of CO_2 monitoring systems in rebreathers is an area of emerging interest. Monitoring of the inspired gas detects carbon dioxide coming through the scrubber and warns the diver that he/she is rebreathing carbon dioxide. However, the reason of the diver being hypercapnic could also be inadequate ventilation (CO_2 retention) without any warning from the sensor. The valuable information is the expired P_aCO_2 because thenthe diver has an accurate value of carbon dioxide in the arterial blood. Thus, we have the information that hypercapnia occurs for any reason - either carbon dioxide rebreathing or retention.

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Walk Before You Run: Technical Diver Training in Unique Environments

By Tom McCarthy

I often have divers call me up asking about getting out on one of our technical dive trips. Great! We have some of the best wrecks in the world off the coast of Long Island and New Jersey.

It's at this point that any good Captain will ask a few questions to perspective divers who they aren't familiar with.

Personally, if I don't know you and you're calling up for a deep trip, I'm going to try to get to know you by the end of your call. For instance:

- Who do you normally dive with?
- What boats do you dive off?
- Are you Trimix certified?
- With whom and where did you do your training?

These are qualifiers. Technical divers in the North East United States are a small group. If I don't know you, someone I know does. If nobody knows you, well, red flag.

Why do we do this? Is it to be cruel? Is it because we're an elitist club trying to protect our ranks from outsiders?

Nah. It's because we know what happens if we don't.

Diving, like many things, is a blanket term. There's Recreational Diving, Technical Diving, Rebreather Diving, Cave Diving, Wreck Diving, Trimix Diving, etc. Unfortunately, what some people don't understand is that there are subcategories of all of these types of diving as well.

Let me elaborate.

Technical Diving has become a word used more and more commonly. What was once looked at by many as a lunatic's game has become accepted by even the largest training organizations. This has been a double edged sword. While increased popularity has led to wonderful advances in diver education, technology and the ability for some to make a living teaching; it has had the inevitable side effect of creating a profit driven business model from what was long regarded as a labor of love. There's nothing inherently wrong with profits, however when there's a profit to be made those of lesser character will often cut corners.

We see technical "instructors" being created who have little to no practical experience and who are certainly not qualified to teach students in the environment they live around.

True story, I once had a person contact me who informed me they were a local technical diving instructor with a large following and then proceeded to ask me what the water temp is for a 130' (40m) dive they would be bringing technical students on. For an instructor, a "technical diving instructor" at that, to be so unfamiliar with the general local diving conditions that they are unsure of the water temperatures is mind boggling to me.

This brings me to the point. I truly believe that you should try to take your dive training in the environment that you intend to dive in. If you are a North East shipwreck diver, take your training in the Northeast. If you are a cave diver, do it in the caves. If you plan on hot dropping the wrecks of South Florida, you should take your training there.

I want to be clear. This doesn't mean that if you train in South Florida you can't dive in New York. This doesn't mean that if you train in Cave Country you can't dive in South Florida. What I'm trying to get

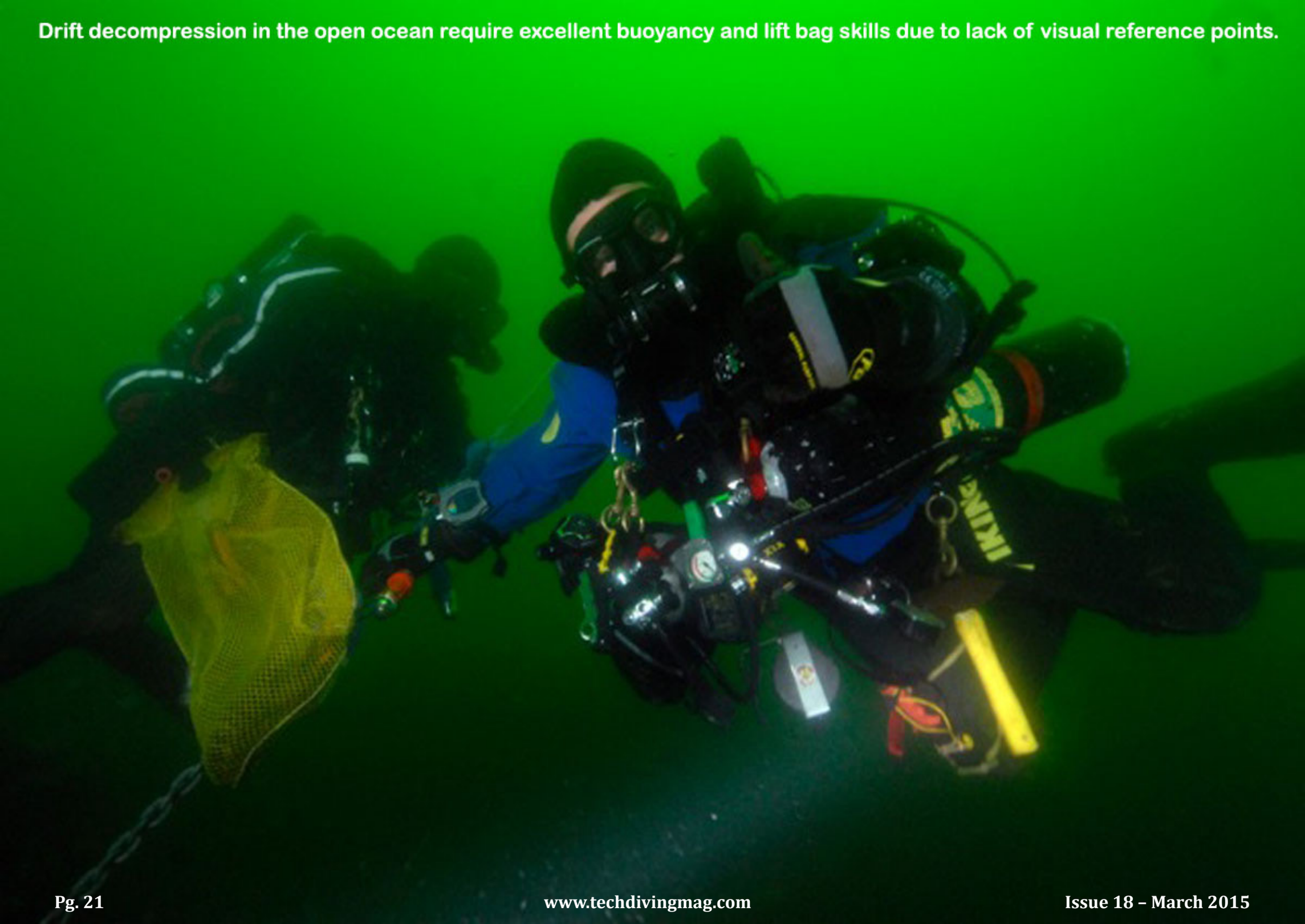
at is that you will benefit most from the tutelage of an instructor with local diving experience. An instructor intimately familiar with the local diving will lessen the learning curve for you on certain things unique to where you dive. Sometimes these things are as simple as dive boat etiquette or something as important as how to properly run a cave reel.

This is also my opportunity to rant a bit. A quarry is not a replacement for true open water training! Yes a quarry has its purpose. For early dives in training where skills may be introduced for the first time, a controlled environment such as a quarry may make it easier for both instructors and students alike. I'm a rEvo rebreather instructor. It would be madness to throw a student off the boat in the North East for their first non-pool dive. However, it's when I see entire technical diving courses conducted there it's a different story.

Let me make an analogy, doing all your training at a quarry with the intent of becoming an ocean capable technical diver would be like doing your entire pilot training on a simulator. Yes it teaches you the basics in wonderful controlled environments but at some point you need to actually get into the environment you intend to dive in. Wouldn't you rather do it with your instructor at your side than the less than comforting feeling of "well I could do this in the fresh water quarry so I should be fine in the ocean."

Similarly I see countless instructors doing "wreck diver" specialty training there as well. Again, yes the skills can be done but you aren't doing anyone a favor. You aren't instilling confidence in new divers or holding their hands while they get their first taste of a true awe inspiring shipwreck. Some will even be hesitant to go off and try it on their own. Besides, an underwater scrap yard is not a shipwreck. What you are doing is making money the easiest way possible without having to do the work of molding an actual wreck diver.

Wreck diving in low visibility may require running a reel to navigate.


Drift decompression in the open ocean require excellent buoyancy and lift bag skills due to lack of visual reference points.

If this annoys you then, to be blunt, you are part of the problem. You don't create strong passionate local divers by coddling them. You do it by challenging them. You do it by giving them a true sense of accomplishment and having them earn it through dedication and hard work.

So this is why we ask questions. This is why doing your Trimix training in Bonaire does not instantly qualify you to hop on the next trip to the *Andrea Doria*. In any new environment you must pay your dues. You may be one of the best divers around in any of these environments but if you've never been to any other you should start off small until you get the lay of the land. Actually in the case of Cave Diving you can't start off at all unless you train there.

Want to be a great cold water shipwreck diver? Train and practice in the North East, Great Lakes, UK, etc.

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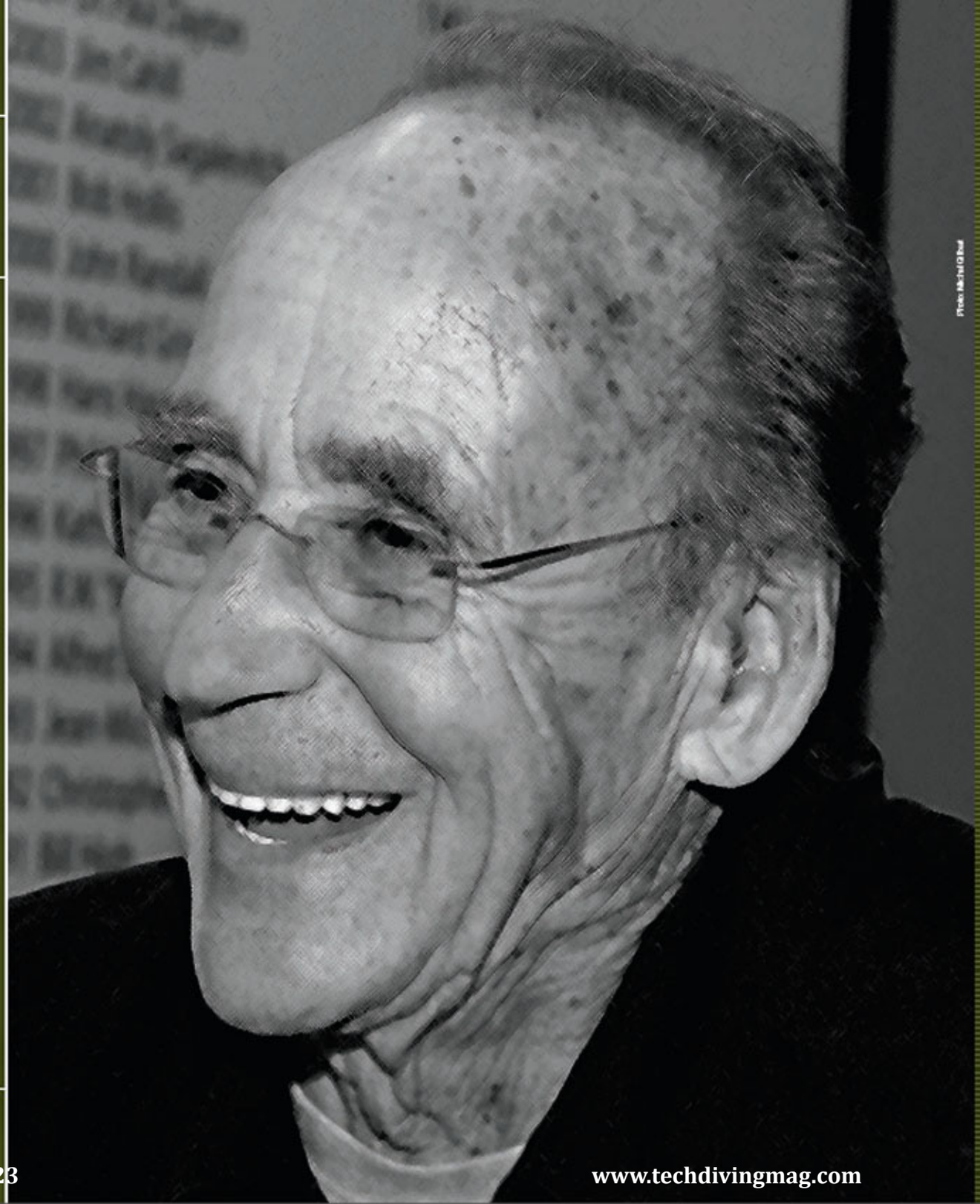


ALL PHOTOS FROM ERNIE BROOKS COLLECTION EXCEPT AS NOTED

: ernie brooks

Ernie Brooks

MAKING A STATEMENT WITH IMAGES

BY MICHELE GILBERT & DANIELLE ALARY

The year was 1975 or was it 1976... time flies and I cannot relocate that copy of the late Skin Diver magazine. The issue included a portfolio of images from a California-based photographer. Contrary to most color-addicts, he was shooting exclusively in black and white.

I was addicted to color too, the cheap GAF-brand slide film I was using cost less than $0.10/image, processing included! My images were so bad that it made a lot of sense to use it.

But the b&w portfolio left an imprint in my mind and some 20 years later, I decided I would try to do a bit of work in black and white… I quickly learned that mastering that media was far more complicated than splashing a colorful fish on a slide… and went back to color.

Fast forward: the year is 1999, Danielle is a member of the still photography jury at the World Festival of Underwater Images in Antibes, an event where the attendees list looks like the Who's Who of the underwater imaging world. Officially they say they attend because of the inspirational flavor of this unique gathering. After a few Pastis, a drop of Rosé over patés and cheese they candidly confess that it is an addiction: the food, the wine, the French Riviera's relaxed atmosphere and topless beaches or the fact that they can play Rolling Stones songs in the impromptu u/w photography band that rocks the night, at the Festival's improvised bistro. Any excuse, including photography, is a good reason to be there!

Let's get back on track here: Danielle was a member of the stills jury chaired by the black and white portfolio man: Ernest H. Brooks II. Besides being the quintessential gentleman – a title that he shares with Stan Waterman – Ernie, as he likes to be called, exudes calmness second only to what is required from micro-surgeons. Instructions were straightforward: Pick the 10 images you prefer. Danielle was anxious beyond belief – cramps and cold sweat included thinking: "I am not a bad photographer and managing our photobank provides me with kind of an eye but how will he react to my choices?"

The jury later met and, as expected, there were discrepancies; mixing an American, a Canadian, two French and an Italian in a jury is asking for trouble: North Americans tend to agree whilst the European fight each other and shout like crazy! As jury members were quarrelling over composition, lighting and whatever other Cartesian arguments, the soft-spoken Chair simply said: "Pick the image that has the strongest message."

All of a sudden, there were not twenty different choices - it took less than five minutes to pick the winners! And Danielle was relieved since her ten initial picks matched Ernie's for all images but two… She was even more relieved when Mr. Brooks whispered her name to the President of the Festival as a good choice for jury Chair. Coming from a man of his stature, this was the best recognition she could receive. As a teacher, a mentor for generations of photographers and more so for underwater trigger-happy up and coming image-makers, Ernie loves to share, stimulate, recognize and promote what others do.

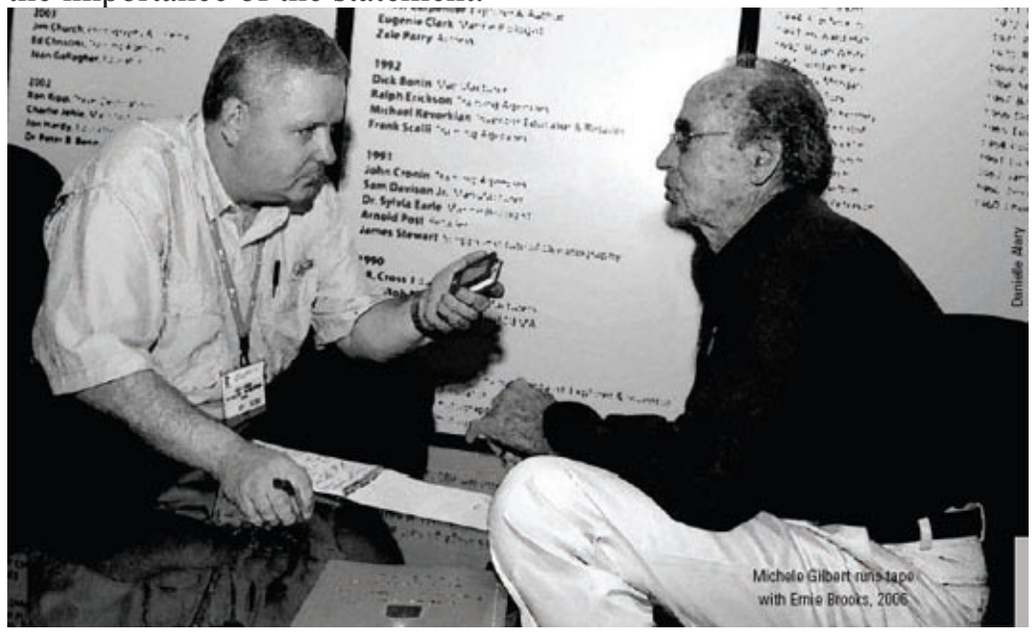
We had wanted to interview him for so many years without finding the time or the right occasion. Finding Mr. Brooks is not a simple task. He is a secret man who surfaces once in a while at DEMA, Our World Underwater, the Boston Sea Rovers, or in Antibes… only to disappear again. So we made arrangements for an interview in March 2006 at Beneath the Sea … and conducted it at DEMA the following November. Oh yes, we are still working on some black and white underwater images...

Was photography always your career?» I was born to be an image-maker. My grandmother was a portrait photographer, my uncle was a landscape photographer, both in black and white. My father turned the corner in color; he became a world-famous flower photographer before founding a photography institute. Photography was in the conversations. I loved the process, it was time consuming but beautiful. Being in the dark was also a very important part of it. It took a lot of time so it gave you time to think, time to be with yourself. And I think a lot of my work is that way; it is very peaceful, at peace with itself.

All the work we have seen from you is done in black and white. Has it always been like that?» Definitely. My father was colorblind; I can't see how he accomplished what he did. Black and white has always been in my life. This is how I have seen everything. Coming from a photographic school later in my life, the black and white process was just fantastic; having complete control of everything, starting from the light up to the finished product. It also has to do with my mentors, the people that I studied: Ernst Haas, Ansel Adams, Edward Weston, Alfred Stieglitz and Edward Steichen. I just love the quality of black and white, and the color.

You mean the absence of color?» No, the color of black and white; it has its own color. Grey is beautiful; and black; and white.

Did you want to emulate what Ansel Adams has done in land photography?» Only his light. I tried to learn and apply the way my mentors were seeing the light; the way they were capturing it… the details in the highlight and the details in the shadow. You have to know where to put the exposure and you have to know in what range you want to process it. It needs to fit the emulsion, the range of the film. That's the way we were raised. That curve has to be there. Today, it is possible to falsify that a bit with computers and software, but the joy then was getting that on the negative and into the darkroom making the print. That was an important part of my work and so was the importance of the statement.



And what about underwater photography?» Portrait, landscape, nature and flowers were already taken so, I was left with very little to explore: I turned to the sea.

When did you start diving?» 1949, that was very early skin diving.

Did you start in underwater photography at that time?» It was around; Dr. Hans Haas was my hero. He and his wife produced beautiful black and white images. I would show those pictures to my parents and they would say, "Their blacks and their whites are not that great." But for me it was the discovery of a whole new world. In the late 1940s and early 1950s there were some great underwater photographers that produced wonderful work. Jerry Greenberg and Luis Marden, for example. The latter even presented me with the NOGI Award in 1975.

You were also part of an emerging breed of great photographers?» We can say so. People like Ron Church. He and I used to enter competitions and it was great. He was good and so was I. He had the advantage of photographing turtles and corals in all these exotic places. I would have kelp and sea lions. Al Giddings, then a still photographer, along with Bob Hollis were just starting. We founded the Academy of Underwater Photographers at the time.

What was your first underwater camera and how did it evolve from there?» My father had an old Exakta, a very primitive camera. I built a housing for it. It leaked miserably. I took one or two photographs with that rig and decided that 35mm was not for me. Remember, the only film we had was Panatomic X, ASA 40 – try to push that one some place… it didn't work. So 2x2 and 70mm became my style.

Which camera did you use then?» The Rolleimarin, a Hans Haas-designed housing manufactured by Franke and Heidecke that enclosed their twin-lens Rolleiflex camera. It was housing number 107. I had an f2.8 Rollei lens.

Many of your published work was done with a Hasselblad; when did it come into action?» I went from the Rolleimarin directly to the Hasselblad SWC. The former was too limiting for me. I like wider angles and I didn't like macro. I don't care for close-ups. I like the vista, the feeling… the great expanse of the ocean. I liked the wider view, the sunlight, the "landscape".

Haven't you done macro photography underwater?» In 1975 I made two rolls of 35mm macro pictures and the resulting images created an exhibit later that year in Beijing. For me there was no challenge in underwater macro photography.

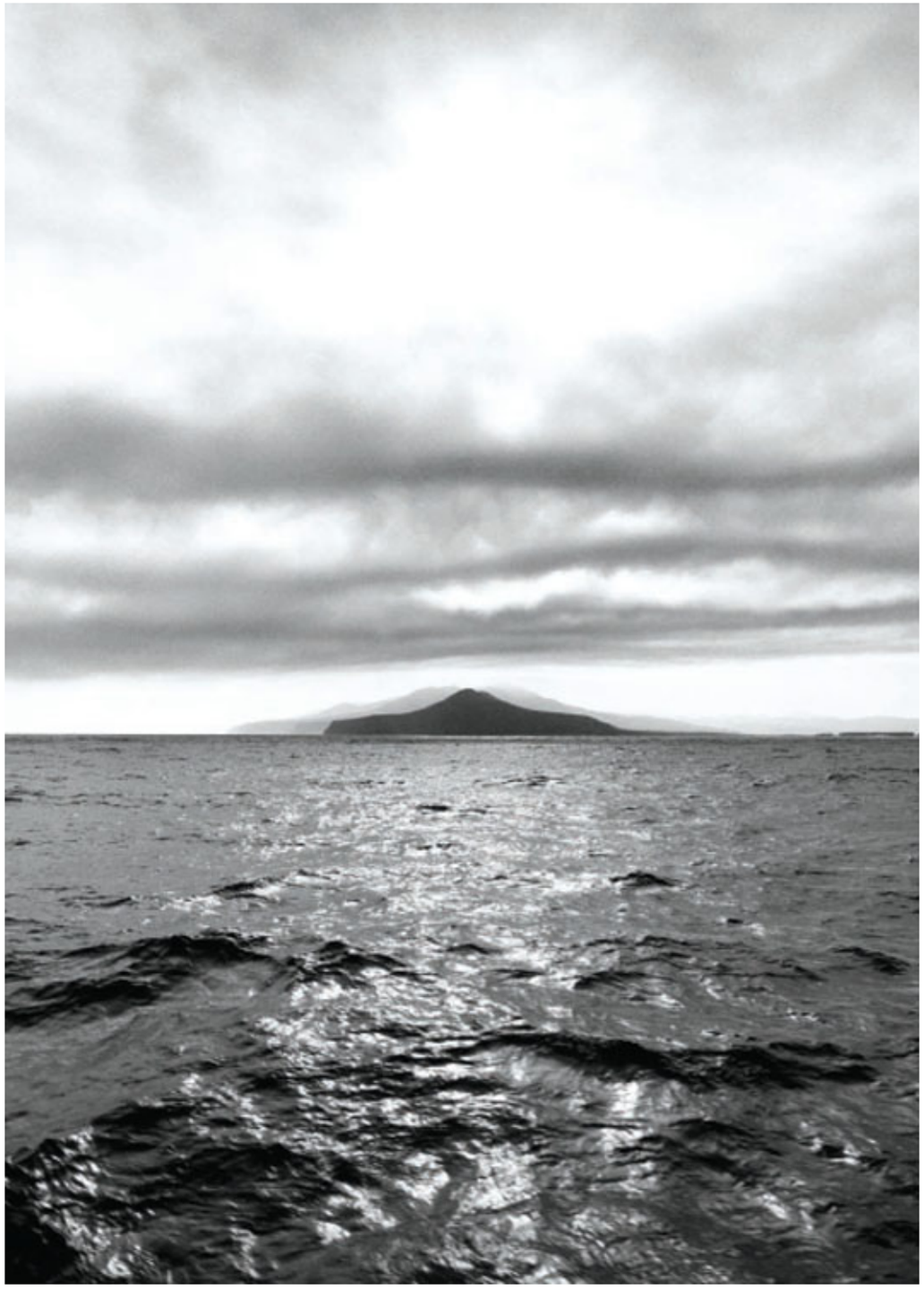
Your father founded the Brooks Institute of Photography; did you introduce underwater photography in the program?» My father founded the Institute back in 1945. I came along and assumed the presidency in 1971. I turned the school into a four-year university-level program. I introduced the audio-visual, the undersea technology, the high science end of it, physics and optics. I brought it into more of a liberal education and created a graduate school for master degrees in art and science. But the undersea program gave me my birth, everything I ever wanted in life. It was the students that made it.

Was the underwater photography program always your favorite at the Institute?» Definitely, without it I wouldn't have stayed! As divers know, there is a calling into the ocean. We wanted our students to make a statement on what they felt about a subject and publish their work. This made the program different.

Was the underwater photography program profitable?» It never made money. It was the costliest one. I would meet with my board of directors and tell them, "Let's see how much publicity this underwater photography program can create for us, how much energy it can generate for the institution."

You later sold the Institute but I think that they still have an underwater photography program, don't they?» The have a smaller underwater photography program than what it used to be. Had I stayed there I would have made it into a four-year program.

North Americans tend to talk too much about equipment and/or technique. Was it hard for you to tell students that equipment and technique are part of the work but there is far more to it?» F-stops and shutter speeds don't work! You learn technique early in school and you are right, photographers tend to concentrate too much on technique. You see it so much in the portraiture field and also in other aspects of photography. It's all about optics, physical optics, shutter speeds. It has nothing to do with what I wanted to say. I learned my craft very well. I could walk outside, look at the sun and tell you exactly what exposure I need in the deepest shadows, in the brightest highlights. So, what else do you want to talk about? Let's talk about how we will light the subject, this is important. How will we separate it from the background so it comes forward? Or do you want it to come forward? What is the most important thing you want to say with your image? Those are the important issues.



How do we tell or teach someone to go beyond the f-stop question, start seeing the light and use it effectively?» Today, with the technologies that drive the profession and the amateur field, they are slowly learning what it took us years to absorb. They are realizing that digital photography cannot record the highlights and shadows on the same exposure like film did. They are thus using techniques like masking, adjusting it, fine tuning it. In other words, getting a foundation probably without even knowing it. This is almost a self-taught process today. Also, everyone must get continuing education. I personally love to go to school and to continue to learn. You cannot stop learning. I opened up a book today and I looked at some of the images where I found new scenes, new ways of looking at things. There are also new media created and all of this is very exciting.

Wouldn't it make us better photographers if we started in black and white? It imposes an approach where one has to concentrate on contrast, shapes, texture and composition. Isn't it the best school to learn the basics?» I tend to agree with the statement. Black and white is like starting with a blank piece of paper. It is one tone and you create something on it. The 21 or 8 steps of grey create such delicate transitions. I definitely would not be where I am, had I had just color in my background. Some of the best photographers in the business today started that way. This is all we had then.

However, when I look at Chris Newbert's work or at your work for example, so much of it has to be in color. It is nature's way of living. My work takes some of that away. In my case, I love the way highlights and shadows fall on the subject. Also, it is easy today to turn a color picture into a black and white one. In the end, it depends on the subject.

As photographers, we found that the learning curve is not straight. It starts slowly and then, over the years, there is a dramatic improvement. Has this been the case for you as well?» One becomes more selective. You know what you want to do, which statement you want to make with your images. Your eye becomes more selective. In my case, since I only had 10 exposures to work with, I would take just one or two photographs during a dive. I was searching for light first and then for the subject or, conversely, if I found a subject, I would search for proper light and try to bring the subject into this light. The idea is to make a statement with light. I had a rule on my boat, Just Love, which I used to teach underwater photography. I told my students that they had to control their index finger. They did not have to come back from a dive with a full roll of exposed film. The selective eye is a key notion in photography and there were many books written on this concept.

In the case of your imagery, were most of the images made in your mind before entering the water?» No, it was not the case. A few maybe, but not the majority. An image that comes to my mind is the three sea lions perfectly positioned, shot against bright sunlit background from 60-ft. deep that became my signature. I squinted and saw that they were in the ideal composition and made only one picture. Each time I would go in the water with sea lions afterward I would try to make a similar photograph and it never happened.

Your book, Silver Seas, contains incredible images. Tell us how it came to be?» I never even thought about doing a book. I had always promised to myself that at 65 I would retire and do something else. A good part of my life was spent as an administrator and this was not my favorite type of work. I loved the students and the teaching though. So, when I was preparing to retire, my Vice-President and former students convinced me. They found a publishing company and told me that I simply needed to pick the negatives and they would do the rest of the work. The name Silver Seas, a natural, came up from Media 27, those involved in the publishing. Also, the proceeds, when they come, will go to organizations like Ocean Future and when they are exhibited, it should also benefit the kids.

There are many images in the book, which one is your favorite?» It has to be “Spot” the harbour seal because there is a story behind the image, an interesting story. It is 6:30 one morning in August, 12 students are aboard Just Love. We are anchored off Anacapa in the

Channel Islands near a sea lion and harbor seal rookery. I am alone, snorkeling, looking through the kelp. Here comes this harbor seal. I think it is a boy since it is fat. It comes up, grabs one of my fins, spits it out and leaves.

I swim back to my boat with one fin as the students are getting up. They ask, "Mr. Brooks, how come you only have one fin?" My answer, "Don't talk to me, get me my Hasselblad." The students add, "Isn't it early to go snorkeling?" I said, "That's enough, can I borrow your fins?" Someone hands me those very long blade fins – I hate them. I get my snorkel, look down, it's 7:15 and I say to myself, "I am diving down to 15 feet, he's going to be 1/125th at about f/8, ISO 800, and I'll nail him!"

I dive, snap one image, and come back up. The seal leaves and, as I swim back to the boat, the guy tries to grab my snorkel with its mouth - a terrible character. We photographed Spot many times over the years but I never got the same image again. Also, one year, we get there and Spot had a little one… this is when I realized that the seal was female. She comes forward and pushes her pup towards me… this brought tears in my eyes as I realized the bond that existed between us. Spot is my favorite picture because of the story.

Tell us a bit about your technique?» I know how to read light and here's an interesting story. I got my Hasselblad in 1961 and gave it up in 2000 without ever changing an O-ring! Some water would creep in and, eventually the shutter got stuck at 1/125… Of course, I wouldn't tell my students… Since the shutter and the aperture were coupled together, I ended up with a fixed combination, it was either 1/125 at f/8 or 1/250 at f/4 and so on… those became my settings. I would go and find a subject to fit them.

And you never seem to use a strobe?» I only used a strobe once with my underwater work. The image is in my book. It is called "Magnificent Blue"; a Blue shark lit from underneath. This is the only picture I lit with a strobe.

What would be your first advice to someone who would like to take up underwater photography, as a hobby or a profession?» First, education is really important. You need to understand today's craft. Not so much what I was raised with but today's technologies and techniques. You need to perfect that up to a point where the person comes up with a realistic image. Then the person needs to find an outlet for what he or she wants to say. It does not need to be a magazine; it can be through books, the Internet, etc. There needs to be an audience, an outlet for what you need to say. If I was starting today I would go see the Hemisphere magazine people or the American Way magazine publisher, En Route magazine editor and bring them my story, my statements. I would tell them, "Here's what I want to say to your customers, here's my story." It needs to be done more. You need to go beyond the obvious.

And where should underwater photographers go for inspiration?» This is a good point. I would go to a library, a hardcopy library. I'd look at books. I'd look at the pages, the paper they were printed on, the beauty of the images and the statements that are made by the artists. It could be pictures from years ago. Look at them like you do with all art. You cannot go "www.photography.com" and find it. You find those things under Library of Congress number XYZ. Look at Adams, Steichen, Stieglitz, Weston and others. Look at those who influenced the earlier people. Who did they look up to? You have to go way back in history as well as exploring contemporary photographers and artists.

Is it easier to make a photographer out of a diver or a diver out of a photographer?» Good question, because they are mixed techniques. But I'd rather work with a photographer. First, because we speak the same language. And I think that if you do a cross-section of today's underwater photography it is done by someone who truly loves photography and wants to do something with it. There are exceptions but someplace, there is land-based photography in their blood.

How does someone learn to see in an artistic way like you do?» It is hard to say; some of those things are in your genes. For whatever reason, I have always been able to see the little ants walking on the ground. My uncles and my parents have always been visual people. They would look at people differently; you have to have that. Language creates the vision; the words create the vision.

What is the most overlooked aspect of underwater photography in what you see from contemporary photographers?» What we need yet to do is to make statements that are significant and that make some changes within the ocean environment to a positive stance. That's easy to do with shark-fining or whaling, for example. What is much harder to do is to make pictures that will help in reducing water pollution.

There is a need to do more visually to show to the world what is happening when we use cyanide to capture fishes for aquariums. The same applies to the dynamite use in fishing. Also, we need to show the true aspect of bleaching. We have a responsibility with our craft to do something. We see artists doing it and we are artists. This is one of the reasons we created the Ocean Artists Society.

What do you see in the coming years in the underwater photography field?» It is now global; it is an international subject. Many photographers from all around the world are making statements. This is healthy. I see more and more documentary work about what is happening in the ocean and how we can contribute. We need to publish more in foreign languages, not only in English.

Is digital a blessing or a curse for photography?» It is truly an incredible blessing because it allows more people to do it, with the help of modern technology, in their homes. It is healthy.

Should someone start by learning the craft using film or digital?» I think that you do not need to learn with film. It won't be long before you won't see much film around. I don't look for Fuji or Kodak to continue this foolish polluting process that is chemical photography. I have seen too much chemicals go down the drains.

Is there an image that you would want to make but have never been able to achieve in your lifetime?» Not really. I love my craft and the joy of making images fulfilled my dreams. Something interesting: many times I would not realize how good the image was until I started working on it in my lab. I would watch the image materialize on the paper and see how much better it was than when I tripped the shutter.

So, on many occasions, the print would be better than what you thought it would; was it the case more often than the opposite?» Yes, and there is an image in particular in the book; it is called California Gold. You are looking up at the kelp on the surface and just where the bubbles are on the kelp there is a little starburst. I did not see it when I was making the picture. I saw the whole kelp but not that detail. I happened to make my test strip just in the middle of the image where this starburst is located. When I saw that I felt lucky; to me this came as an extra.

If you had to relive the past, would it be the same or would it be different?» I wish I had been more of a shepherd, to bring more young people into the program; help more those who could not afford it. Education is expensive and I wish I had gone to other schools and found ways to attract more students through scholarships. I did as much as I could but I could have done more.

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