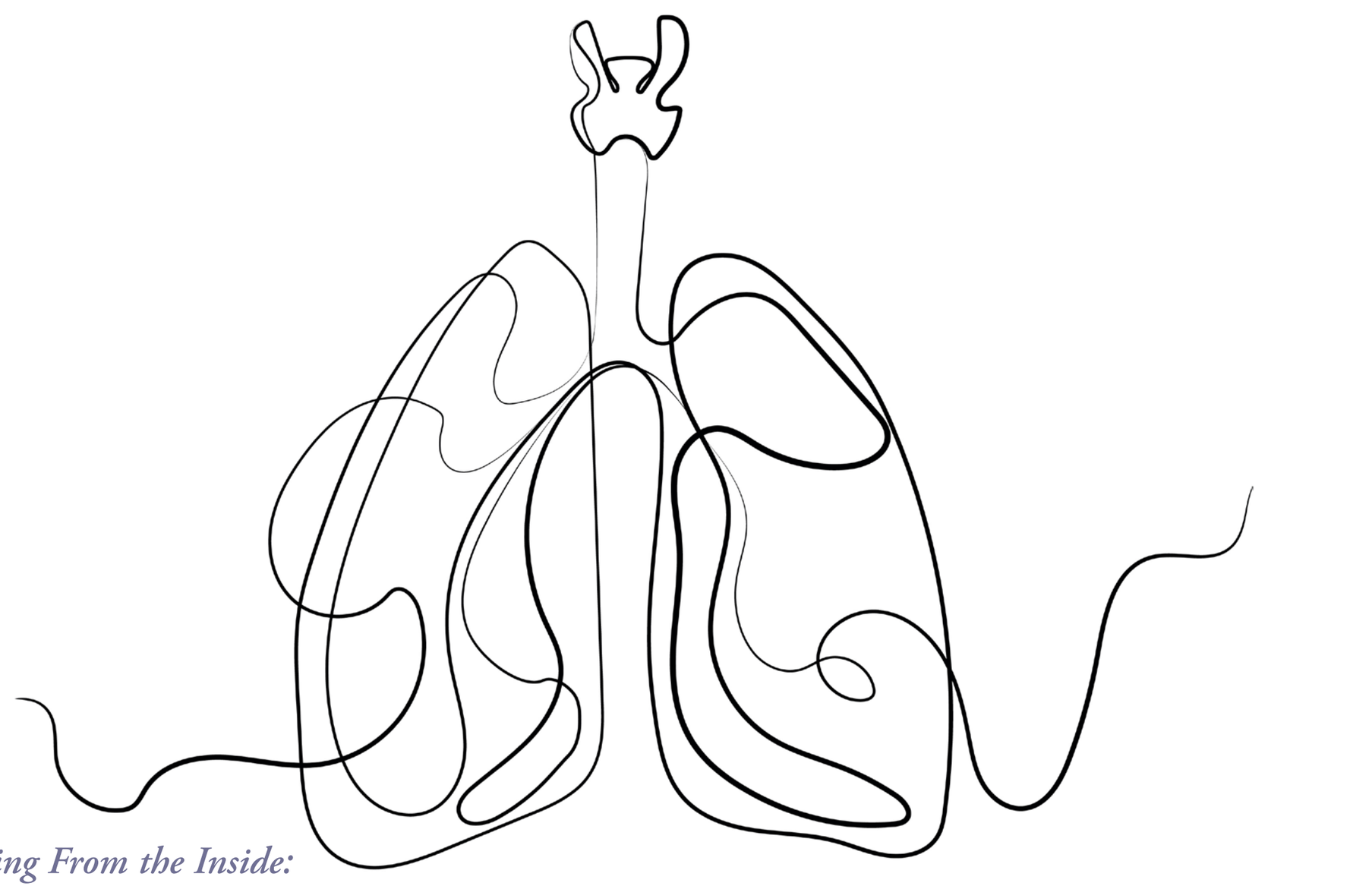

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Drowning From the Inside:

The IPO Threat

Text by Simon Pridmore

Immersion pulmonary oedema is a significant yet little-known risk for athletes, snorkellers and scuba divers that all of us should be aware of. Simon Pridmore provides important information about IPO and how to recognise it.

In the last few years, there has been an increasing focus on a phenomenon that has been fatal for many scuba divers, snorkellers and triathletes. This phenomenon is called Immersion Pulmonary Oedema (IPO, or IPE in the United States, where "oedema" is spelt without the "o").

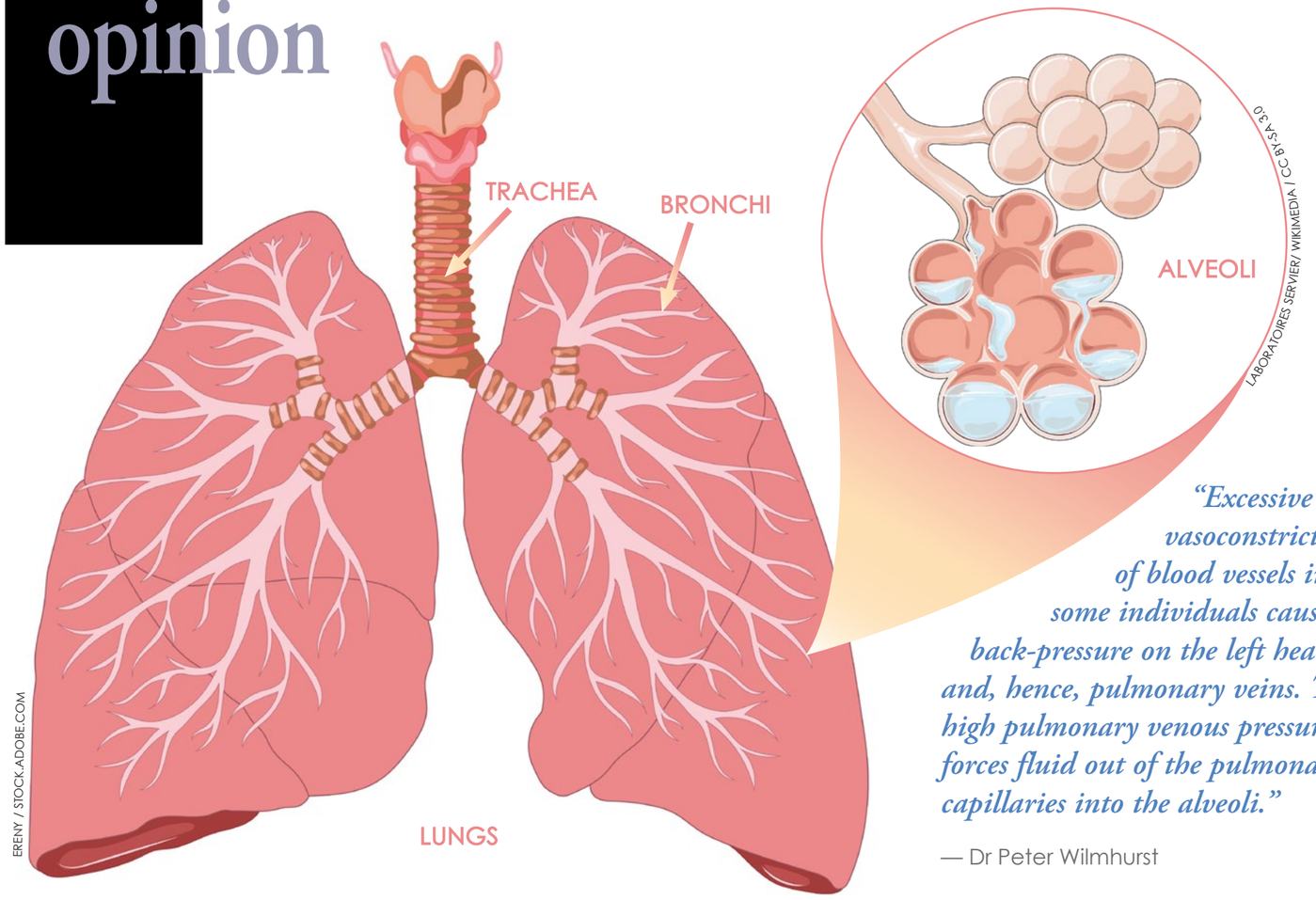
IPO has been referred to as drowning from the inside, and it can occur without warning. Dr Peter Wilmhurst, who was one of the first diving medical specialists to identify IPO in sports divers, described it thus:

"Excessive vasoconstriction of blood vessels in some individuals causes back-pressure on the left heart and, hence, pulmonary veins. The high pulmonary venous pressure forces fluid out of the pulmonary capillaries into the alveoli."

There is plenty of information about IPO online. Medical experts have held conferences, published research papers and delivered lectures on the topic, while several articles have appeared in magazines and online. Yet, the general scuba diving population remains largely unaware of it. Even most dive professionals know nothing about it, and training manuals hardly mention it.

This means that neither divers nor the people who take them diving know how to recognise IPO if they or their fellow divers experience it. Nor do they know which divers may be more susceptible, what steps you can take to reduce the risk, what to do if you think you have it or how to look after a diver afflicted by IPO.

In December 2024, members of the South Pacific Underwater Medicine Society (SPUMS) and the United



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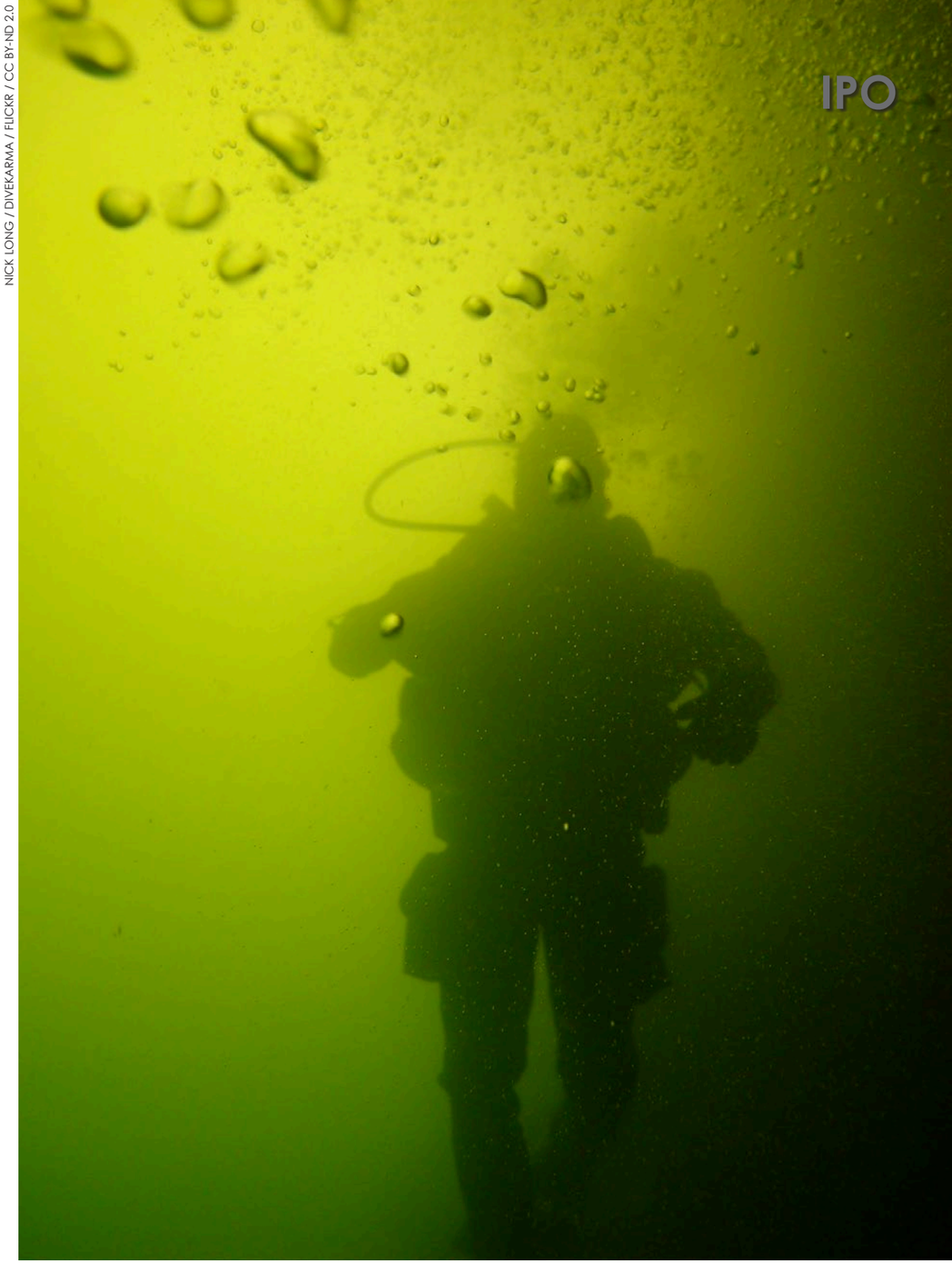
"Excessive vasoconstriction of blood vessels in some individuals causes back-pressure on the left heart and, hence, pulmonary veins. The high pulmonary venous pressure forces fluid out of the pulmonary capillaries into the alveoli."

— Dr Peter Wilmhurst



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Kingdom Diving Medical Committee (UKDMC) released a joint position statement. They concluded:

1. Immersion pulmonary oedema (IPO, or IPE in the USA) is a life-threatening condition that affects divers and surface swimmers, including snorkellers.
2. Most triathletes who die during an event die during the swim rather than during the cycle ride or run, and there is increasing evidence that many of those triathletes die from IPO.
3. There is also evidence that IPO may be the most common cause of death in amateur scuba divers.
4. Factors increasing the risk of IPO are:
   a. pre-existing cardiac disease and hypertension,
   b. immersion in cold water,
   c. excessive pre-hydration before immersion,
   d. exertion and
   e. stressful events during immersion.

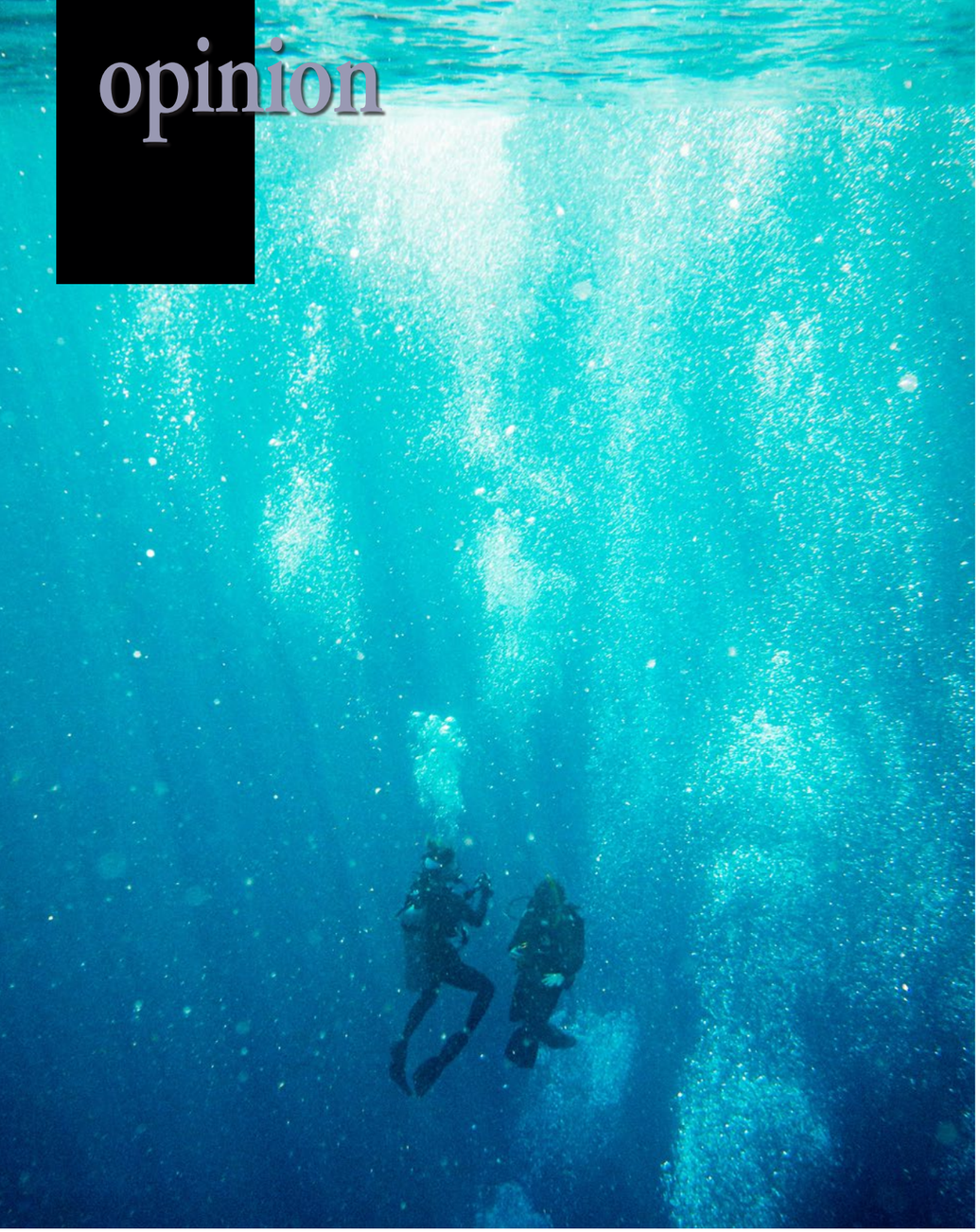
(Note the word "excessive" in 4c. They are not saying that you should not be well-hydrated before you dive. Just don't overdo it.)

A case review

As part of the British Sub Aqua Club's (BSAC) annual report for 2023, the authors reviewed the accounts of diving incidents in earlier reports to see which of them may have involved IPO, given what was now known about it, and they found hundreds of possible cases, at least 20 in each of the previous 13 years.

These were the criteria that the BSAC used to assess whether IPO could be implicated. If one or more of these factors were present in the record, then it was reasonable to assume that IPO had been at least part of the problem.

1. If the diver had been underwater and had experienced breathing difficulties when not exercising particularly strenuously.
2. If these breathing difficulties had been indicated by rapid, uneven or heavy breathing or coughing uncontrollably, with or without bloody sputum.
3. If the diver had found it difficult to breathe on the surface and was confused and swimming in the wrong direction or in random directions.
4. If the diver had been unable to carry out normal functions and was concentrating exclusively on



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their breathing.
5. If the diver had believed that their regulator was not working properly.
6. If the diver had indicated that they were out of air, even though they had plenty of air, and their regulator was subsequently found to be working fine.
7. If the diver had refused or rejected an alternate source when it was offered.

This is a useful list for us to keep in mind to help us recognise IPO in ourselves, our buddies or, as professionals, the divers we are guiding, teaching or supervising.

If you experience any breathing difficulties underwater, you should terminate the dive, ascend safely and exit the water.

IPO guidelines

Here is a summary of the latest advice, taken from guidance recently issued by BSAC and other diver training agencies.

1. If you experience any breathing difficulties underwater, you should terminate the dive, ascend safely and exit the water.
2. If you notice that a buddy or a diver you are leading or supervising is having difficulty breathing underwater, then assist them from the water as quickly as it is safe to do so.
3. A diver who is breathless at depth must not surface alone. The ascent can cause a rapid reduction in the partial pressure of oxygen in the blood and brain, and the diver may lose consciousness as they get shallower. So, don't dive alone, and if you are escorting a possible IPO victim back to the boat, make sure you are both positively buoyant on the surface and keep hold of the victim in case they pass out.
4. Once out of the water, the victim should remain sitting upright (lying down increases the chances of drowning), stay warm, refrain from drinking (taking on water in this situation is like adding fuel to a fire) and start breathing 100% oxygen as soon as possible.
5. Get the victim to a hospital as soon as possible. Drugs and ventilation may be required to remove the fluid from their lungs.
6. Anyone who has experienced even mild symptoms of IPO in the past is likely to be affected again in the future.

Bob's story

These are the events that persuaded me to write a column on IPO.

Bob had been diving for most of his adult life, but he was no longer as fit as he used to be. Age had taken its toll, and he had had some health issues. These days, he preferred to dive with full-service liveaboards who would look after him and make sure that his diving was as stress-free as possible.

He joined a liveaboard he had travelled on before. After a long journey halfway around the world to get to the port of departure, he was feeling tired but relieved as he boarded the vessel. He didn't sleep well on the first night, so he skipped the early morning dive on day one. But after breakfast, he felt well enough to join the second dive.

About 30 minutes into that dive, though, at a depth of about 20m, Bob signalled to the divemaster that he was finding it difficult to breathe and that he wanted to ascend. The divemaster escorted him to the surface

NEW 4 in 1!

Simon Pridmore has released a new single-volume e-book, bringing together four books in his bestselling *Scuba* series:

- ***Scuba Fundamental – Start Diving the Right Way***
- ***Scuba Confidential – An Insider's Guide to Becoming a Better Diver***
- ***Scuba Exceptional – Become the Best Diver You Can Be, and***
- ***Scuba Professional – Insights into Sport Diver Training & Operations***

As Simon puts it, this is "a remastering and repackaging of the original albums rather than a greatest hits." Nothing is missing. *Scuba Compendium* gives e-book readers the advantage of being able to access all the knowledge contained in the four books in one place, making this a unique and easily searchable work of reference for divers at every level.

Simon has always promoted the idea of safer diving through the acquisition of knowledge, which is why he has chosen to release this highly accessible version. If you have read his work before, you will know that he provides divers with extremely useful advice and information, much of it unavailable elsewhere; his points often illustrated by real life experiences and cautionary tales. He examines familiar issues from new angles, looks at the wider picture and borrows techniques and procedures from other areas of human activity.

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Towing a diver in Rescue Diver training

via a five-minute safety stop, helped Bob get his equipment off and passed it up to their tender driver.

Bob climbed up the ladder, he was given a bottle of water, and the tender boat headed back to the mother ship. Bob was coughing and vomiting and evidently finding it hard to breathe.

The journey took eight minutes, and once there, Bob climbed up the ladder to the dive deck and was given a second bottle of water. He sat down and started removing his suit, still complaining that he couldn't breathe properly. Then, he suddenly collapsed onto the deck and became unresponsive.

The boat crew placed him on his back and administered oxygen via a mask. Bob's pulse was weak, and at one point, he vomited violently. Then, he stopped breathing, and the crew were unable to detect a pulse. Various efforts were made to revive him, but Bob did not recover.

Ignorance not negligence

Bob died that day not because he was a bad diver and made a mistake, nor because the people looking after him were negligent. He died because none of them knew what was happening.

If you look back at the criteria that the BSAC researchers used to assess the possible presence of an IPO in historical cases, you can see that there is a good chance that Bob had IPO. A crucial clue that IPO was the culprit, rather than serious decompression sickness, is that the problems began to manifest themselves at depth, not after Bob had ascended, and the problems centred around the difficulty he had breathing.

Had either Bob or the liveaboard team known about IPO and considered the possibility, then Bob would have exited the water immediately, omitting his safety stop, and would not have been given, or would have refused, the water. He would have been seated upright, monitored closely and placed on oxygen immediately.

Bob may have lived or he may have died, nevertheless. But the message here is that knowledge is key. Whether you are a diving customer or a service provider, keep up to date, stay informed and pass information around the community, even when that information comes in the form of a simple three-letter acronym. ■

Simon Pridmore is the author of the international bestsellers Scuba Fundamental: Start Diving the Right Way, Scuba Confidential: An Insider's Guide to Becoming a Better Diver, Scuba Exceptional: Become the Best Diver You Can Be *and* Scuba Professional: Insights into Sport Diver Training & Operations*, now available as a compendium. He is also co-author of the* Diving & Snorkeling Guide to Bali *and the* Diving & Snorkeling Guide to Raja Ampat & Northeast Indonesia*. His latest books include* The Diver Who Fell from the Sky, Dive into Taiwan, Scuba Physiological: Think You Know All About Scuba Medicine? Think Again! *and the* Dining with Divers *series of cookbooks. Visit:* ***SimonPridmore.com.***

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A New Dive Book from Simon Pridmore

"Simon Pridmore's new book, 'Technically Speaking' is an outstanding tour de force from one of modern diving's most accomplished practitioners and best-selling authors."

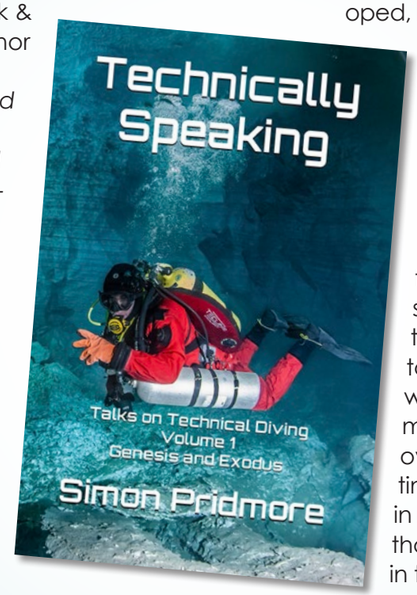
— David Strike, Oztek & Tekdive Convenor

"Simon has completed a complex task with consummate skill and has accurately unravelled the when's, the who's and some of the why's, much of which would have been unjustifiably lost in the mists of time if not for this work."

— Kevin Gurr, Technical Diving Inventor & Innovator

"It will take some doing to better this account of tech's first steps… as no matter how much you know or think you know; you will still find many obscure historical gems..."

— Kevin Denlay, Early Adopter & Wreck Finder



Technically Speaking is the latest book from best-selling Scuba series author Simon Pridmore. It is a selection of themed talks telling the early history of technical diving—where it came from, how it developed, how it expanded across the world, who the important movers were and how, in the decade from 1989 to 1999, the efforts of a few determined people changed scuba diving forever.

These ten years saw the greatest shake-up the sport has ever seen but technical diving's road to universal acceptance was anything but smooth, many obstacles had to be overcome and there were times when even viewed in retrospect, it seemed that its advocates might fail in their mission. Ultimately, success came down to perseverance, people power, good timing and more than a little luck.

Available in hardback, paperback and ebook at ***Amazon Worldwide***, ***Apple***, ***Kobo****, and Tolino. See* ***SimonPridmore.com***