



SWIMMING WITH POLAR PENGUINS



by Bill Edwards >>>

When Lewis Gordon Pugh gets ready for a swim, he dons his swimsuit, goggles and cap, just as any other open water swimming enthusiast might do. After that, however, the similarities end.

If Pugh's swim will be in extremely cold water—which has occurred on more than one occasion—then his next step before plunging into the icy brine is to raise his core body temperature by 2.5°F—

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up to more than 101°F. Tim Noakes, a University of Cape Town, South Africa, physiologist

who monitors Pugh's cold-water excursions, calls the process "anticipatory thermogenesis." This is the swimmer's ability to generate body heat simply by mentally preparing for his grueling freestyle swim.

"As soon as I see the water, my temperature goes up," says Pugh, a 37-year-old British lawyer who grew up in South Africa. "Before a swim, my body is like a furnace. It realizes I am cold and so turns on the burners."

Noakes describes anticipatory thermogenesis as a conditioned response Pugh has developed through a rigorous training program involving repeated exposures to water ranging from freezing to around 40°F. Although scientists are beginning



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Victoria Cork

to believe normal humans can learn to raise their body temperatures at will, the feat has been recorded only rarely.

This ability to warm his body's core has helped Pugh survive for swims of more than 30 minutes in water cold enough to kill instantly. This past July, he swam at the geographic North Pole for 18 minutes and 50 seconds in water that was -1.7°C (28.9°F), the coldest swim ever recorded. (Water saturated with salt can remain liquid below the normal freezing point of 32°F .) In December 2005, Pugh swam for 30 minutes and 30 seconds off the coast of Antarctica. Pugh made these polar swims—setting new records for the northernmost and the southernmost swims—with considerable discomfort and not a smidgen of a wetsuit.

Jason Roberts + inset

LEWIS GORDON PUGH swam in the icy waters of the geographic North Pole this past July. Although warming has reduced arctic ice by 25 percent, Pugh and arctic guide **JORGEN AMUNDSEN** (inset, left) had to scout for safe open water for Pugh's swim. In 2006, Pugh (pictured above at the Tower of London) also swam the 203-mile length of the River Thames.

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Pugh says he persevered because he focused on “getting the job done, and not thinking about the cold. If you start thinking about how cold it is, then that’s it. You’ve lost.” On his North Pole swim, members of Pugh’s expedition team

placed markers every 100 meters, and Pugh says he just concentrated on getting to the next marker until he was done.

But Pugh Wasn’t the First

Pugh is not alone, however, in his distinction as a swimmer of polar waters. There is at least one other. Californian Lynne Cox, 50, was there before Pugh. When Cox was 15 in 1972, she overturned both the men’s and women’s speed records for swimming the English Channel. She was one of the first people ever to make the trip in less

than 10 hours, and the youngest person ever to succeed in the cold-water crossing.

But the 60°F water of the channel was not challenging enough. Cox went looking for other cold-water swims. In 1987, when the world’s superpowers were still entwined in the Cold War, Cox became the first to swim from Alaska to the Soviet Union—a 5-mile swim in the 40°F waters of the Bering Strait. In 2003, she swam 1.22 miles in 25 minutes off the coast of Antarctica in water right at 32°F, an accomplishment she chronicles in her best-selling 2005 book, *Swimming to Antarctica: Tales of a Long-Distance Swimmer*.

Cox attributes at least part of her success to a fairly even layer of body fat that protects her core and extremities from

the crippling effects of the cold. For her swims, Cox maintains a body fat percentage of about 35 percent, compared to less than 15 percent for many female athletes. But that factor is only part of her formula for success.

“My ability to handle extremely cold water comes from training, training and training, and good genes and a body that is the perfect size and shape to do what I do,” Cox says. There’s a strong mental component as well. Cox says she learned from an early age to focus on something besides the cold when she is in the water.

“There were many things going through my mind during that swim,” she wrote of her Antarctic feat. “The first was to breathe. The water was so cold

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Gabriella Miotto



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LEWIS GORDON PUGH (left) entered the water head first on his December 2005 Antarctic swim, while **LYNNE COX** (right, above and below) chose to enter the Antarctic waters feet first for her 2003 swim.

it was very difficult to catch my breath. At the same time I was fascinated with the clarity of the water. You could look down through it and see forever.”

The beauty of the polar regions holds an attraction for both swimmers. Pugh says he undertook his North Pole swim to focus attention on the Arctic Ocean, a region that scientists estimate has lost about 25 percent of its sea ice during the past five years due to warming.

Weird Science

Scientists haven't really been able to determine whether people

such as Pugh and Cox are unique physiologically, but researchers have been fascinated. Pugh has been the subject of at least two articles in the British medical journal *The Lancet*, which profiled him just prior to his 2005 Antarctic swim. During an Arctic swim earlier that year, wrote *The Lancet's* James Butcher, “Pugh lost 1°C

of core body temperature for every 10 minutes he was in the water, so starting at [an elevated] 38°C helped him complete the swim. A positive mental attitude and an intense determination to succeed also mark him out from the crowd.”

Similarly, Cox has puzzled experts. University of London Professor Bill Keatinge, an

expert on hypothermia, brought Cox to his lab in London to study her response to cold swimming. In an interview with CBS News, Keatinge said Cox is able to maintain a very stable body temperature while swimming with her head above the surface in water temperatures as low as 44°F.

Hypothermia experts generally



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San Francisco area Masters swimmers acclimate themselves to the chilly waters of the Bay. The South End Rowing Club and the Dolphin Club both sponsor swimming events year round. At the 2006 Golden Gate Swim (above) a swimmer dives into the Bay. This past winter, the Dolphin Club's **RALPH WENZEL** (below) tied his club's 356-mile distance record for the 90-day Polar Bear Challenge.



Courtesy, The Dolphin Club

agree that most people die quickly in water as cold as Pugh's and Cox's polar swims. Notes Alan Steinman, a physician who served as director of health and safety for the U.S. Coast Guard, the effects of hypothermia can appear when people are in water colder than about 77°F. In really cold water, a phenomenon called "cold shock" occurs within the first four minutes, with increases in heart rate and metabolism, and breathing difficulties. Scientists concur that a human body cools down 25 times faster in cold water than in air of exactly the same temperature.

Experts in sea rescue also say the initial shock of cold water can cause a gasp response that kills almost instantly if a victim's head is still underwater. The person may inhale water instead of air—and drown. The shock of cold water also can cause the heart to simply stop beating.

"For those surviving the cold shock response," Steinman says, "significant cooling of peripheral tissues, especially in the extrem-

ities, continues with most of the effect occurring over the first 30 minutes of immersion." Loss of feeling in the hands, poor coordination and loss of muscular power make it difficult to execute survival procedures such as grasping a rescue line or hoist. At this stage, the usual cause of death is drowning rather than loss of body heat.

Hypothermia, the loss of core body temperature, rarely impacts survival until the person has been in cold water for more than 30 minutes. Experts say hypothermia occurs when the normal core body temperature of around 98.6°F drops to about 95°F or lower. Between 95°F and 89°F, the body starts to go haywire—the person loses muscle control and cannot think clearly. Between 89°F and 82.5°F, the victim stops shivering, begins to lose consciousness and has problems with heart-beat. Below 82.5°F, death from hypothermia usually occurs.

Another Kind of Cold-Water Swimmer

The good news is that people sometimes defy medical science and logic—surviving cold water against all the odds. Rescuers say children are especially resilient. Some have survived long periods of time in and under cold water, going into a sort of state of "suspended animation" that allows them to be gradually thawed out and resuscitated.

And Steinman says new research may indicate that when a boat overturns in cold water, competent swimmers sometimes may be better off heading for shore.

"Apparently, it's more of a trade-off," Steinman says. "If you stay with the boat too long in cold water, you're going to drown anyway. If there's no likelihood of a quick rescue, and the shore is reasonably close, a strong swimmer may be better off swimming for it."

Not only that, people who acclimate themselves to cold-water swimming and train pro-

gressively can record extraordinary accomplishments in cold water, even if they don't reach the level of Pugh and Cox. According to the three associations that document English Channel swims, more than 800 people have completed more than 1,100 solo crossings of the channel waters, which are typically less than 60°F—cold enough for most swimmers.

A significant number of the Americans who have accomplished this swim come from two neighboring clubs in San Francisco: the Dolphin Club and South-End Rowing Club. Both clubs were founded in the 1870s, and since that time have been sending significant numbers of their members to cold-water swimming events—including the annual Alcatraz Invitational, sponsored by the South-End club, and the Joe Bruno Golden Gate Swim, sponsored by the Dolphins.

The South-End club counts Lynne Cox among its members and at least 14 who have swum the English Channel. The Dolphin Club has at least eight English Channel swimmers, including club President Tom Keller, who points out that the passageway between England and France is generally warmer than his club's training waters in San Francisco Bay.

"It [the Bay] ranges from the sub-50s in the winter to a high of around 62," says Keller, a 35-year-old high-school Latin teacher who has been a Dolphin for 18 years. When we swim, there is often significant procrastination at the water's edge."

Swimming by the Dock of the Bay

Keller and about 90 of the Dolphins' more than 900 members take part annually in an event they call the Polar Bear Challenge. (Not to be confused with polar bear clubs.)

To succeed, participants in the Dolphin Club's Polar Bear Challenge must swim at least 40 miles in 90 days between December 21 and March 21,

when the water stays below 50°F. Wetsuits are allowed, but frowned upon, Keller says. “Most of us wear a Speedo, goggles and a cap. Forty miles in 90 days might not seem like much to people who swim long distances regularly, but when it’s that cold, it’s not that easy.”

Keller says Polar Bear veterans encourage new swimmers training for the event to acclimate themselves to the cold, beginning with a wetsuit and working their way to swimming without the protection of neoprene. Most swim through the gradually declining temperatures of the fall season so they can be ready for their winter swims.

They also learn how to recognize when they’re getting too cold to continue swimming safely. Keller says swim caps are important for keeping body heat inside during swims, and parkas and wool caps are essential once swimmers leave the water.

“We pay very close attention to what is happening to our bodies,” Keller says. “If you notice you have a hard time keeping your fingers together, or are having trouble with hip flexion, then you know it’s time to get out of the water and warm up. Those are signs of hypothermia, and our swimmers have gotten various stages of hypothermia at times. We prefer to err on the side of safety.”

Some Dolphins can swim in sub-50 water for as long as two hours at a stretch, Keller says, and thus are able to rack up lots of miles in excess of the 40-mile minimum for the Polar Bear Challenge. The winner for the longest distance in 2006-2007 was a 48-year-old San Francisco baker named Ralph Wenzel, who recorded 356 miles.

When the club’s Polar Bear swimmers get out of the water, they typically head for hot showers to progressively warm up. Many then enter the club’s sauna, where they continue to warm up while discussing the day’s swims.

Warming up safely is important for cold-water swimmers. Both

Pugh and Cox experience their lowest and most dangerous core body temperatures after they leave the water and begin to warm up. Their doctors say that during their immersion in the cold water, the swimmers’ bodies send most of their blood supply to the core to protect internal organs from heat loss. But once warming begins, a loss of core temperature may occur because the body sends blood back out from the core to warm fingers and toes that have been numbed from the cold.

Cox generally tries to warm slowly by wrapping up in

warm clothes and blankets, while doctors closely monitor her condition to make sure her vital signs are stable. Pugh, on the other hand, goes into a hot shower immediately after leaving the water. Pugh says he has changed a few other assumptions about cold-water swimming.

“Lynne is the true pioneer of cold-water swimming,” Pugh says. “She really paved the way for people like me. But she and I don’t do everything the same way.” Cox has typically entered the water slowly, and she keeps her head above the surface while she

swims. Pugh dives in and swims a fairly standard freestyle, with his head in the water.

Pugh also says he doesn’t try to protect himself from the cold by coating his body with grease, once a common practice among English Channel swimmers. “I especially did not want to use grease on my body in my North Pole swim,” he says. “Polar bears can appear out of nowhere, and if that happens, I don’t want to be slippery. I want my crew to be able to grab me and pull me out of the water really fast.”

As if 28.9°F water isn’t challenging enough. <<<

Warm Up and Stay Warm During Competition

Temperatures around the pool at the USMS Long Course Nationals this past August in The Woodlands, Texas, reached near-record highs. Yet, competitor Tracy Grilli (also the USMS administrator) says when she went into the event’s reception area, the large ventilation fans gave her a chill because of her wet bathing suit.

Grilli’s experience is not rare for swimmers. Experts on hypothermia say loss of body heat is possible whenever and wherever people are in and around the water, regardless of the air temperature, and successful competitive swimmers have learned to pack their parkas no matter where they plan to swim.

Even when hypothermia is unlikely, lack of body heat can impact athletic performance, a fact that swimming coaches and trainers have long recognized. Muscles perform best when they are warm, and that is why nearly every swimming drill starts with a warm-up sequence. Coaches and sports medicine experts say swimmers not only should warm up before competing, but they also should keep their muscles warm.

“We live in our parkas at a swim meet,” says Sheila Klausner, a former NCAA competitive swimmer who is physical therapist for athletes at the University of Central Florida in Orlando. “Clothing helps you stay warm once you do your big main warm-up, but as a general rule, you will start to cool down again after about 15 minutes. I wouldn’t let more than about 30 minutes go by without warming up again.”

Warmups enable muscles to relax and contract faster, reducing the likelihood of injury and improving muscle economy by 20 to 30 percent, says Genadjis Sokolovas, director of sport science for USA Swimming at the Olympic Training Center in Colorado Springs, Colo. “You can swim

at a higher pace and consume less oxygen.”

Sokolovas says proper in-pool warmups also provide swimmers with good rehearsals for their swimming technique, starts, turns and intensity prior to a race. Combined with stretching before and after an event, warmups also help swimmers rid themselves of muscle waste products like lactic acid, inorganic phosphates and hydrogen ions, all of which can impact subsequent performance.

A “good warmup” varies for each athlete, based on the event and the swimmer’s individual physiology, but Sokolovas’ basic formula calls for both general and specific warmups. General warmups, which include stretching and flexibility exercises, increase the functional potential of the body. Specific warmups consist of swimming exercises.

Sokolovas says to do a general warmup first, for about 10 minutes. Make sure you warm up the shoulders, lower back, knees and ankles. After that, get into the pool for 20 to 60 minutes. Start with easy swimming for 10 to 20 minutes. Then do some repeats of various distances at race pace. Practice starts and turns, preferably in the lanes you will use in actual competitive events. Finish the warmup with 5 minutes of easy swimming about 15 to 20 minutes before your race starts.

Every pool is different every day, so it is important to duplicate the actual race experience as closely as possible. Use stretching exercises every 20 minutes or so to keep muscles warm and the heart rate elevated. Dress warmly between races—even put on hats, shoes and gloves if that’s what it takes.

“Don’t get so warm you are sweating, but stay comfortably warm,” Sokolovas says. “And make sure you have enough fuel, especially at a cooler venue, where the outside temperature is less than 70° F. Drink warm drinks and take in carbohydrates.”