Antarctica Facts

* Antarctica is a continent covered by up to two miles (2000-4500 meters) of surface ice. If it all melted, it would raise worldwide sea level by up to 55 meters or 165 feet.
* Antarctica has more than a dozen active volcanoes including Mt. Erebus.
* Antarctica is the driest desert in the world with less than 1" of precipitation.
* Antarctic ice contains 70% of the world's fresh water.
* For six months of the year, the sun shines 24 hours a day at the South Pole then for six months it is dark.
* The first humans saw the continent in 1820, but did not land until 1895.
* People don't live there except to man the nearly 60 research stations.
* Today Antarctica is governed by a treaty signed by 45 nations who agreed no military activity, nuclear weapons or mining is allowed. Antarctica is a region that is devoted to science and is a "Zone of Peace"
* Famous Antarctic explorers are Roald Amundsen, the first to reach the South Pole in December 1911 and Robert Falcon Scott, who froze to death in 1912 on his way back from the South Pole; Sir Ernest Shackleton, whose ship the Endurance got stuck in the ice in 1915 forcing Shackleton and his crew to abandon the ship and seek land (Shackelton made an 800 mile journey an open boat to seek help) Richard E. Byrd, first person to fly over the continent.
* The Antarctic is the coldest part of the world.
* Because Antarctica is a continent the interior is not warmed by the ocean like the Arctic.
* The ice covering 98% of the continent reflects most of the sun's light rather than absorbing it.
* It is very dry because heat is radiated out and not absorbed by water vapor.
* In winter the mass of ice doubles the size around the continent forming a barrier from the warmer ocean.
* The high elevation due to the layers of ice keeps it cold.
* The World record coldest temperature was -129° F recorded at the Russian Vostok station in 1983.

Biology - the science that studies living organisms
- **Marine biology** – the study of ocean life
- **Carnivore biology** – the study of meat eating animals
- **Diving biology** – the study of the mechanics and effects of diving on living species

Animal physiology - the study of body functions and structures of animals, especially humans.
Exercise physiology - the study of the body's response to short-term and long-term physical activity.
Foraging behavior - the act of searching for food
Global warming - the effects of an increase in the Earth's temperature.

Antarctica comes from the Greek arktos or bear, for the northern constellation Ursa Major, or Great Bear. Therefore, Antarctic is the "opposite Arctic", the bottom rather than the top of the world.

Find Out More!

1. My website describing research and the Center for Marine Animal Nutrition and Analysis (MANA): http://bio.research.ucsc.edu/people/williams/
2. Careers in marine mammal science at the Society for Marine Mammalogy: www.marinemammalogy.org/strat.htm
3. National Science Foundation Polar Programs Discoveries: www.nsf.gov/discoveries/index.jsp?org=OPP
4. My book for the inside view of Antarctic exploration, life on the ice and seals: *The Hunter's Breath: On expedition with the Weddell seals of the Antarctic*

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Animal physiology • Exercise physiology Foraging behavior • Animal conservation • Global warming • Blizzards

Terrie Williams - Large Animal Physiologist

My home life growing up:

From as young as I can remember I always loved the water. Family trips were always to the beach and my summers were spent splashing around the community pool at home. I was a lifeguard and taught swimming to younger kids. I also loved animals. I saved injured birds, bunnies, snakes and squirrels. Most of my books were about animals – from *Winnie the Pooh* to veterinary textbooks.

My college experience:

After a childhood surrounded by brothers, my parents decided that I should attend an all girl's high school and college. These schools had a huge influence on me. At first, I was afraid that the schools would be filled with prissy girls in frilly dresses. Instead, they were filled with amazing, creative women. I wasn't the smartest in my classes but I had a lot of imagination and creativity that I use every day in my science.

Graduate school was the real turning point. Should I go to medical school or become an animal physiologist? One professor told me that I was wasting everyone's time because I would get married and never get a job in science. Fortunately, I chose to ignore him – growing up with my brothers taught me that boys don't know everything. Another professor, who worked with polar bears and Arctic weasels, welcomed me into his lab. I knew that I had chosen the right path.

My early research:

Because I spent so many years pulling youngsters out of the water while I was a lifeguard and swimming instructor, I decided to study animals that were the best swimming athletes. I figured that I could learn to be a better swimmer if I knew how seals, dolphins and sea lions swam. So I began to study every type of mammalian swimmer from minks and otters to seals, dolphins and killer whales. I've found that the trick to being an aquatic athlete is GLIDING. Most marine mammals don't rely on swimming strokes like humans. Instead they take one powerful stroke and glide for as long as they can though the water. During diving, some of these glides can last for many minutes as the animals drop like rocks through the water column. Humans generally are not very effective gliders; we tend to float and our bodies are not streamlined – at least compared to a dolphin. Over the years I've had Olympic athletes and even swim fin manufacturers ask me about the dolphin's secret to swimming. I tell them that it is all in the glide.

imagine NOTES

• Biology • Marine biology • Carnivore biology • Diving biology • Animal physiology • Exercise physiology •

What I'm doing now:

Over the years, using the knowledge from my biology classes, I have saved hundreds of sea otters during the Exxon Valdez oil spill, studied the reasons why Steller sea lions are disappearing in Alaska, determined how man-made sounds hurt dolphins and seals, and traveled to Africa to study diseases in cheetahs. Today, I spend my days partly as a professor of biology at the University of California in Santa Cruz and partly on expeditions to conduct research on big animals. My primary question is, how do big animals survive in our changing world? With pollution, global warming, habitat destruction, diseases and competition with humans, it is a difficult time for animals all over the world. The key to survival for both humans and animals is food. Recognizing this, I've created the Center for Marine Animal Nutrition and Analysis (MANA) at my university. With my team, I work with aquariums and wild animals across the globe to ensure healthy oceans that marine animals and people depend on to survive.

My advice:

My philosophy is to trust the Great River that is in your heart. I like to think of our life's journey as a river that we travel. We begin as a trickle and get progressively larger as we grow. Along the way we encounter difficult times that are rapids to navigate, as well as easy times when we can simply slip along happily. Every once in a while there are big boulders that are like the professor who said I could not be a scientist. These boulders try to steer us off course. It is best to ignore them and go around. Sometimes we get caught in eddies, but recognize that eventually you can swim out if you try. Rather than spending your days trying to fight the current in the wrong direction, trust that your instincts and your internal river will deliver you to where you need to go, allowing you to be the person you are destined to be. Learn to GLIDE and be willing to live the adventure - dolphins do and they are always smiling.

"Antarctica is the coldest, highest, windiest, driest, and iciest continent on earth."

Seals in Antarctica

The seals in Antarctica depend on squid, fish like cod, anchovies and krill for survival. Most have 2-4 inches of blubber to help them stay warm in the freezing temperatures. Most seals live on the pack ice or on the shores. Killer whales hunt seals. Seals have the richest milk of all mammals because pups nurse for only a few weeks, as the mothers have to go back into the water to feed. Ross Seals live on the pack ice. The Crab Eater seal has interlocking teeth that act like a strainer so they can spit out water while keeping the fish inside their mouths. Leopard seals are ferocious and hunt penguins shaking them to death. Southern Elephant seals are noted for their large noses. The fur seals are so named because of their value for their skins.

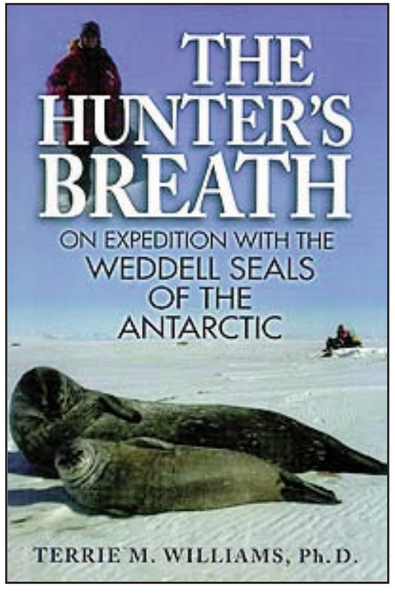
Here's a Challenge!

Although swimming is a fun activity for people, we're not very good at it compared to marine mammals. Fortunately for us, we don't rely on having to swim, dive, or hold our breath in order to find food, the way a Weddell seal does. Our bodies and Weddell seal bodies are different physiologically. For example, Weddell seal bodies are able to hold much more oxygen in their blood and their muscles than human bodies. This allows the seals to hold their breath for much longer than we can. Since oxygen is necessary for muscles to be able to work, Weddell seals also have developed special ways of swimming that minimize the amount of oxygen their muscles use. By compressing and moving the air in their lungs, they can change sink to the bottom of the ocean during the descent part of their dive and then surface like a balloon on the ascent portion. In this way they can take fewer flipper strokes – which enables the diving seal to save oxygen. Weddell seals can cruise around underwater with very little flipper movement at all.

Animal conservation - the protection, preservation, management, or restoration of wildlife and of the natural resources, such as forests, soil and water, that wildlife depends on.

Part One:

First, let's get some perspective on just how deep a Weddell seal can dive. A Weddell seal can dive as deep as the Empire State Building is tall. The Empire State Building is 1,453 feet, or about 443 meters, tall (one meter is equal to 3.28 feet).



Measure and mark the length of your school hallway in meters. How many times do you need to go down your hallway to equal a Weddell seal dive? (Empire State Building length divided by hallway length) # of times:_____

Part Two:

Second, let's compare how fast we usually move about on land to how fast a Weddell seal typically cruises around underwater. A Weddell seal's average speed is 2 meters per second, or 10 meters in 5 seconds. Use the meter marks you measured before. Using a stopwatch, see how far you go in 5 seconds if you walk normally. # meters in 5 sec: ___

Part Three:

Weddell seals can hold their breath for 70 minutes. Now, let's see how long you can hold your breath. Take 2 slow deep breaths (without hyperventilating!) This will help you store as much oxygen as you can in your blood. Then take one deep breath and start your stop watch. Stop your timer when you have to breathe out. # seconds per breath:___

How do you compare with a Weddell seal?

The Geographical South Pole is the point at which the earth's rotation axis passes through the southern hemisphere and is where all meridians meet. Because all time zones meet at the Pole, Antarctica follows New Zealand's time.