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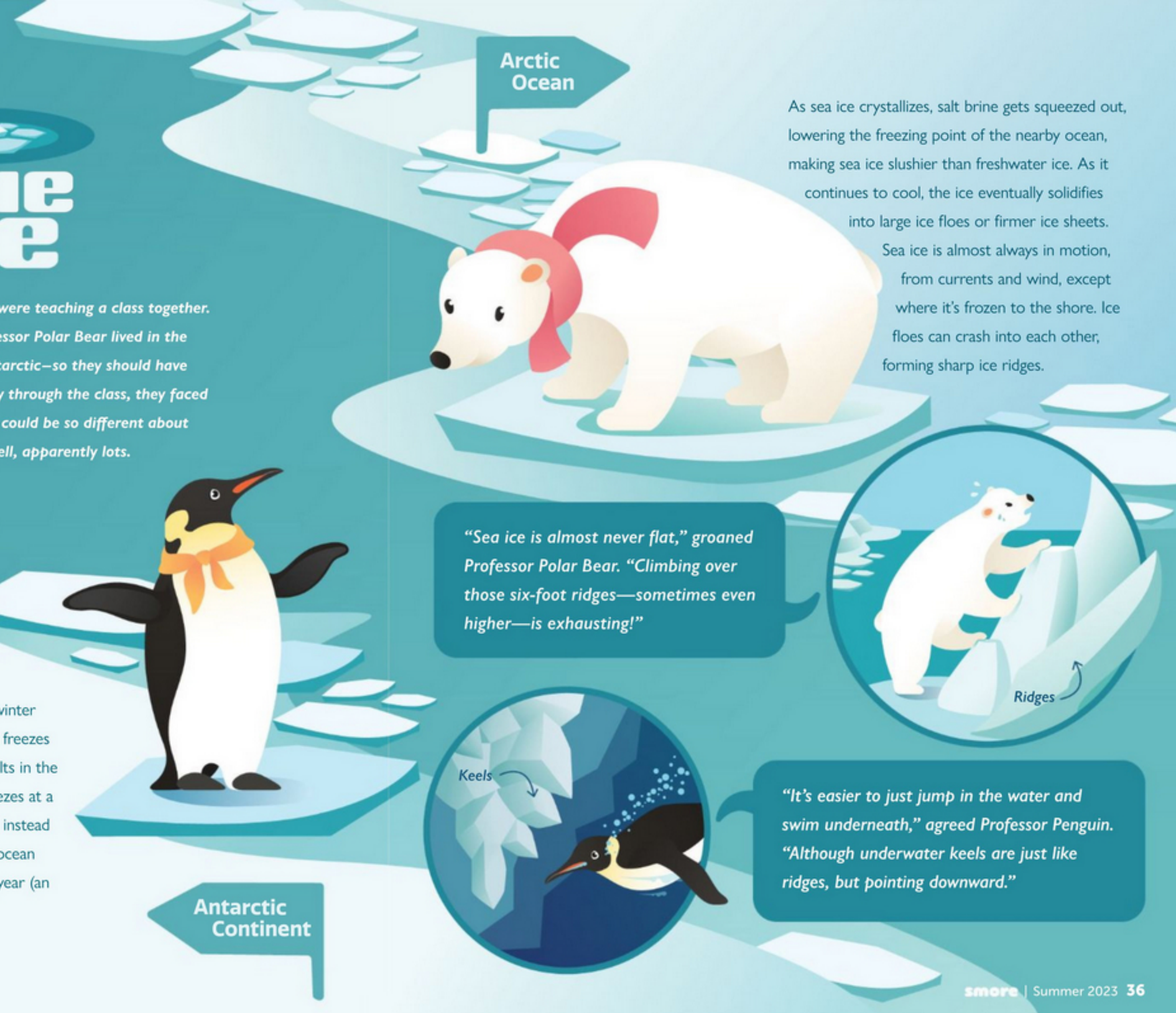
Going With the Floe

Professor Polar Bear and Professor Penguin were teaching a class together. The topic? Sea ice! Both were experts—Professor Polar Bear lived in the Arctic and Professor Penguin lived in the Antarctic—so they should have agreed on everything, right? Wrong! Halfway through the class, they faced off—nose to beak—their mood chilly. What could be so different about sea ice in the Arctic versus the Antarctic? Well, apparently lots.

What did they agree on?

During the cold winter months—remember, winter in the Antarctic is March to October—sea ice freezes over a large area of the polar oceans, then melts in the summer. And because the ocean is salty, it freezes at a lower temperature than fresh water, at 28.8°F instead of 32°F. About 10 million square miles of the ocean is covered by sea ice during some part of the year (an area 2½ times the size of Canada).

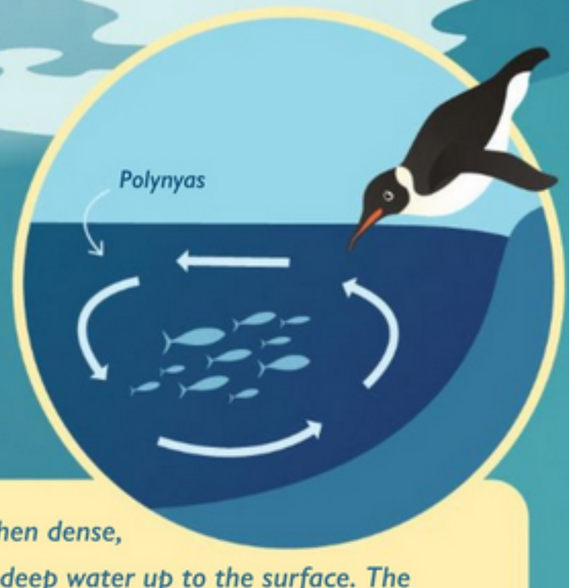


As sea ice crystallizes, salt brine gets squeezed out, lowering the freezing point of the nearby ocean, making sea ice slushier than freshwater ice. As it continues to cool, the ice eventually solidifies into large ice floes or firmer ice sheets. Sea ice is almost always in motion, from currents and wind, except where it's frozen to the shore. Ice floes can crash into each other, forming sharp ice ridges.

"Sea ice is almost never flat," groaned Professor Polar Bear. "Climbing over those six-foot ridges—sometimes even higher—is exhausting!"

"It's easier to just jump in the water and swim underneath," agreed Professor Penguin. "Although underwater keels are just like ridges, but pointing downward."

When sea ice gets tugged apart, it opens up channels, or leads. "Leads are where I wait for delicious seals to come up for air. Yum!" said Professor Polar Bear, licking her chops.



A gap in sea ice also forms when dense, salty water sinks and pushes deep water up to the surface. The continually upwelling water prevents freezing. Called polynyas, these open waters are also teeming with life. "Polynyas are where I jump in to go fish-hunting!" beamed Professor Penguin, chomping her beak.

But, unfortunately, that's when they stopped agreeing.

"Sea ice is really thick and old." stated Professor Polar Bear. "And when it melts, I can even drink it!"

"You silly pile of fur!" sputtered Professor Penguin. "Most sea ice is thin. Plus, it's covered in snow!"

How could sea ice be so different?

Sea ice in the Arctic is different than in the Antarctic because the Arctic is an ocean almost completely surrounded by land, whereas the Antarctic is land surrounded by ocean.

The land around the Arctic Ocean is like a fence, keeping the ice from leaving the polar zone, so more of it stays frozen year after year. Trapped, floes are more likely to crash into each other, and pile up into ridges, making the ice thicker (6–30 feet thick). Before recent global warming, over half of Arctic sea ice stayed frozen more than nine years. As sea ice ages, it loses salt, so older ice can be melted for drinking. Ice covers the North Pole, not land.

The Antarctic continent covers the South Pole. Sea ice forms around Antarctica and drifts freely, with nothing to keep it from floating north into warmer waters where it melts. So Antarctic sea ice is thinner (3–6 feet thick) and most of it reforms every year. Antarctic winter storms drop more snow than in the Arctic because they pick up moisture as they sweep across the Antarctic Ocean.

How do we know about sea ice?

Before fur and feathers started flying, the two professors agreed to disagree and shook paw to flipper. "One thing's for sure. In both the Arctic and Antarctic, sea ice is super cool to study." How? Satellites and aircraft can map the ice's extent and measure sea ice thickness from the air. Submarines and undersea drones scan the ice's underside. In 2019, the research boat Polarstern was intentionally frozen into Arctic drifting sea ice for an entire year, with scientists from over twenty countries. Inuit people have lived with Arctic sea ice for thousands of years. Their expertise is invaluable in sea ice science. Sea ice is complex: growing and melting, crashing together and breaking apart, always moving. To understand it, you have to go with the floe.