



The Haughton-Mars Project.
Photo credit: NASA Haughton-Mars Project 1998/Bill Clancey.

SLOWING METABOLISM SAVES LIVES »

By studying the effects of small, protein-like molecules called peptides that can slow down metabolism in hibernating Arctic bears and ground squirrels, scientists are trying to better understand metabolic change in humans so they can design drugs to precisely control a patient's metabolism and temperature. The aim of "targeted temperature control" is to minimize brain damage from strokes, spinal cord injuries, drowning, and traumatic brain injuries. Controlling body temperature in humans pharmacologically could be a safe, effective, and inexpensive improvement over current mechanical practices that are based on ice bags, chilled intravenous saline, and other difficult and expensive methods.



Arctic Ground Squirrel, *Spermophilus parryi*. Photo credit: Lesa Hollen and Leone Thierman.



Polar vortex freezes the Potomac River in Washington, DC, in January 2014.

DESTINATION MARS. FIRST STOP...

THE ARCTIC? » Before heading to Mars, space scientists and engineers are traveling to the Canadian Arctic to live and work in the Haughton impact crater. Its climate and geology are as Mars-like as can be found on Earth—cold temperatures, low precipitation, and permanently frozen impact-ejected rubble. The Haughton crater provides opportunities to test new technologies and field procedures and to study human behaviors that result from extended contact in close quarters. The knowledge gained from these investigations is being used to plan, design, and ultimately to conduct the first manned and continued robotic missions to Mars and other planets and their moons.

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WHY THE ARCTIC MATTERS

Often perceived as being remote and disconnected, the Arctic directly impacts the rest of the world. Examples based on weather, security, research, health, and the environment demonstrate these close links.



United States Arctic Research Commission
arctic.gov



The Arctic Institute
www.thearcticinstitute.org

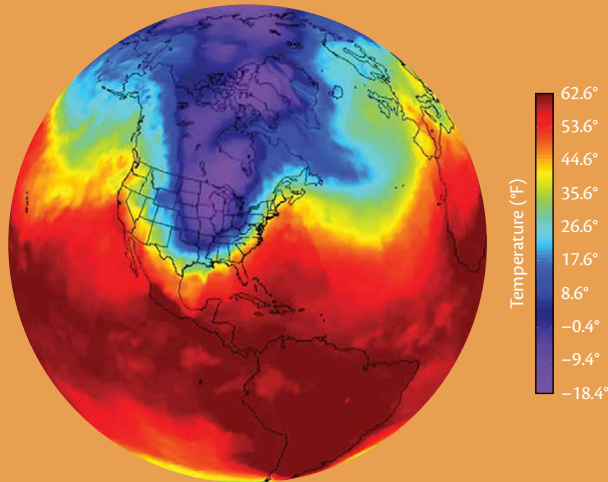
THE ARCTIC IMPACTS OUR WEATHER » The “polar vortex” events of early 2014, when frigid air descended into the continental United States, demonstrate the direct impact the Arctic has on Northern Hemisphere weather. Because the Arctic is warming twice as fast as the global average, the equator-to-pole temperature difference and sea ice cover are decreasing, and these impact weather. The normally straight-flowing jet stream, which separates the northern mass of cold air swirling counterclockwise (polar vortex) from more southerly air masses, becomes wavier to the north and south, bringing icy Arctic air to mid-latitudes of the United States, Europe, and Asia. Scientists are researching this weather pattern to see if it will result in more frequent and longer-duration cold-air outbreaks. At the same time, an increasing number of storms with greater rainfall and stronger winds is projected for Western Europe, and higher snowfall is expected in Eurasia.



A glacier in the Sukkertoppen ice cap, Southwest Greenland, flows down a rocky canyon. Photo credit: NASA.

ARCTIC ICE MELT RAISES SEA LEVEL » Melting of Arctic land ice (glaciers, ice caps, and the Greenland Ice Sheet) is a major contributor to global sea level rise and will continue to be as the Arctic warms. Coastal regions and low-lying inshore regions will have to cope with increasing flooding, shoreline erosion, infrastructure and property damage, and displaced citizens. These consequences will not be distributed equally along the US coastline. The 1,000-mile stretch of the highly populated coastline from Cape Hatteras, North Carolina, to Boston, Massachusetts, is a sea level rise “hotspot,” with the greatest projected sea level increase to occur on the shores of New York City. Significant storm surges, such as the one that occurred during Superstorm Sandy in 2012, will likely be more frequent.

January 6, 2014



Blistering cold air from the Arctic plunged southward during the winter of 2013/2014, breaking US temperature records. On January 6, 2014, alone, approximately 50 daily record low temperatures were set, from Colorado to Alabama to New York, according to the National Weather Service. Credit: NASA’s Goddard Space Flight Center. Image courtesy of NASA/JPL.

GLOBAL SECURITY INCLUDES THE ARCTIC »

As the extent and thickness of Arctic sea ice declines further during the summer months and even during spring and fall, resource development, maritime transportation, and marine tourism will rise. Anticipating these changes, and assessing its capabilities, the US Navy is increasing Arctic research and is considering its presence and scale of Arctic operations. Among several research initiatives, the *US Navy Arctic Roadmap (2014–2030)* identifies the interagency, multidisciplinary Scientific Ice Exercise (SCICEX) program as a priority. Using nuclear-powered submarines, SCICEX acquires comprehensive data about sea ice thickness, ocean water chemistry and biology, and the depth and shape of the seafloor to improve our understanding of the Arctic Ocean basin and its role in Earth’s climate system. Naval operations will also benefit from this research, including improving vessel design and understanding and predicting the maritime environment.



USS Annapolis in the Arctic. Photo credit: US Navy.