



Re-evaluating state stem cell initiatives

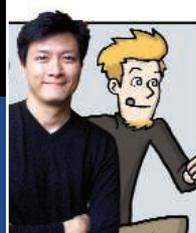
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pressures on the local natural resources.”

A more immediate threat to the environment comes from “people taking advantage of a power vacuum,” says An Bollen, a biologist who coordinates an international conservation organization based in Toamasina in eastern Madagascar called the Madagascar Fauna Group. Marojejy National Park has been shut

down due to “looting and destruction,” according to its Web site. It reports that “gangs of armed men (led primarily by foreign profiteers in conjunction with the rich local mafia) are plundering the rainforests. . . . Most worrisome is the well-being of the highly endangered Silky Sifaka,” a lemur that exists only in the park’s forests and the surrounding area.

Madagascar’s new government is being greeted with international condemnation, and most nonhumanitarian aid to the nation has been frozen. In terms of conservation, “it is unclear what the new government will bring,” says Bollen, noting that the new environment minister is a former employee of a major nickel-cobalt mining company. **—JOHN BOHANNON**

## GLOBAL WARMING

# Arctic Summer Sea Ice Could Vanish Soon But Not Suddenly

Global warming is causing trouble for polar bears, no doubt about that, but how long the bears will have floating ice for summer seal hunting has remained unclear. Just a few years ago, it looked as if summer ice would still be around at the end of the century, but when ice melting took a sharp turn for the worse in 2007, some scientists started talking about catastrophic “tipping points” and a possible imminent demise of summertime ice.

After paring their suite of 23 climate models down to the best half-dozen, two researchers now say with new confidence that summer ice will most likely disappear around 2037. But none of the select models predicts a tipping point—a sudden jump to an ice-free summer Arctic. “They’ve identified the most credible models,” says polar researcher John Walsh of the University of Alaska, Fairbanks, and “the most realistic models are the most sensitive to future [greenhouse] changes.” All in all, it’s bad news for the bears.

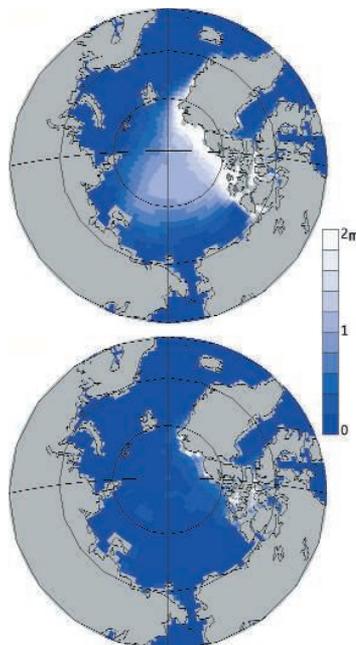
The new model study recognizes that not all climate models are created equal. For the 2007 Intergovernmental Panel on Climate Change (IPCC) assessment, modelers around the world ran 23 different climate models with and without rising greenhouse gases. The fate they predicted for arctic ice ranged from complete loss in the summer by 2020 to only slight losses by 2100, and almost everywhere in between. Modeler Julienne Stroeve of the National Snow and Ice Data Center (NSIDC) at the University of Colorado, Boulder, and her colleagues shrank the IPCC list to the 13 models that did a reasonable job of reproducing the observed slow decline of the extent of summer sea ice, but that still left them with a considerable range of losses by 2100.

To further narrow the possible outcomes, arctic researchers Muyein Wang of the Univer-

sity of Washington, Seattle, and James Overland of the Pacific Marine Environmental Laboratory in Seattle added another constraint: Usable models must reasonably reproduce the ups and downs of sea ice area from summer to winter and back. As they report in a paper in press at *Geophysical Research Letters*, that shortened the list to six models. “That’s a very important improvement,” says Wang, because those models should have the most realistic response to the rising heating by the strengthening greenhouse.

Wang and Overland then examined each simulation to see how many years it took summer sea ice to dwindle from its current 4.6 million square kilometers to an essentially ice-free summer Arctic Ocean. The “expected time frame” for ice-free summers is about 30 years. Ice-free conditions aren’t likely before the late 2020s, according to these models. And none of them go ice-free in a single, abrupt jump; there are no tipping points.

Researchers have long worried that the models don’t have ice tipping points because they simulate some key physical process poorly. In the real ocean, for example, a decline in ice coverage decreases the amount of solar energy that ice reflects back to space while increasing the amount of heat absorbed by the darker open water. This ice-albedo feedback, if unopposed, could drive the system past a tip-



**Won’t be long.** The six best climate models available show global warming clearing the Arctic Ocean of summer ice (top) within about 30 years (bottom).

ping point, but ice physicists Ian Eisenman of the California Institute of Technology in Pasadena and John Wettlauffer of Yale University believe they have discovered what tends to counteract it.

In the 6 January issue of the *Proceedings of the National Academy of Sciences*, Eisenman and Wettlauffer report an underappreciated ice-thickness feedback that strongly opposes the ice-albedo feedback. When added summer heat thins the ice, the ice can grow back in winter all the faster because the ocean can lose heat faster through thinned ice. “The harder you kick the ice, the harder it tries to get back to where it was,” says Eisenman. “The models do agree

with our claim” that the competition between the two feedbacks that will hold off a tipping point, he says.

The loss of summer sea ice in 25 or 30 years “is probably the best estimate that models can come up with at the moment,” says sea ice specialist Josefino Comiso of NASA’s Goddard Space Flight Center in Greenbelt, Maryland. It coincides with the central tendency of expert opinion, adds Walsh. “We’re resigned to losing the ice,” says sea ice specialist Mark Serreze of NSIDC. And it looks as if that will happen sooner rather than later.

**—RICHARD A. KERR**