

Fisheries to place a moratorium on the taking of Alligator Snapping Turtles.” The resolution notes that these turtles have “historically been a vital and integral part of the Louisiana wildlife ecosystem [and are] presently suffering excessive exploitation for meat in local commercial markets, as well as an increasing international market.”

The impact of such a resolution will go far in setting the system right for Alligator Snappers in Louisiana. Other states should consider taking similar steps to protect their turtle species. Although resolutions are only suggestions, and the state’s wildlife department does not have to honor them, such a suggestion by a state senate is a positive start. The Louisiana Wildlife and Fisheries Commission has now taken action and voted to “stop the taking and possession of Alligator Snapping Turtles by anybody with a commercial license.” Recreational trapping of Alligator Snappers was not affected.

I asked Dr. Joseph Pechmann, a biologist at the University of New Orleans, how he thought the Louisiana senate had ever

been able to pass a resolution that would protect the turtles. “They accepted the idea that part of Louisiana’s natural heritage was going to disappear if commercial harvest was allowed to continue. Recreational harvesting of Alligator Snappers is a pastime important to many in the state, but the current levels of commercial removal were clearly unsustainable.”

The southeastern turtle saga is not over, and I’m not sure how it will end before meaningful regulations are in place in all states. I do know the loss of Alligator Snappers from the commercial scene will have little effect on the turtle soup au sherry at Commander’s Palace restaurant in New Orleans. But I do not know whether the South Carolina legislature will realize that it must now step forward and take some action to protect its own turtles. When I asked Dr. Pechmann how he personally felt about the resolution to protect the giant turtles in Louisiana, he said, “It’s about time.” Let’s hope tight restrictions on overharvesting will not be too late coming for Alligator Snappers in Louisiana, or for other turtles elsewhere.

## Global Climate Change: Should You Care?

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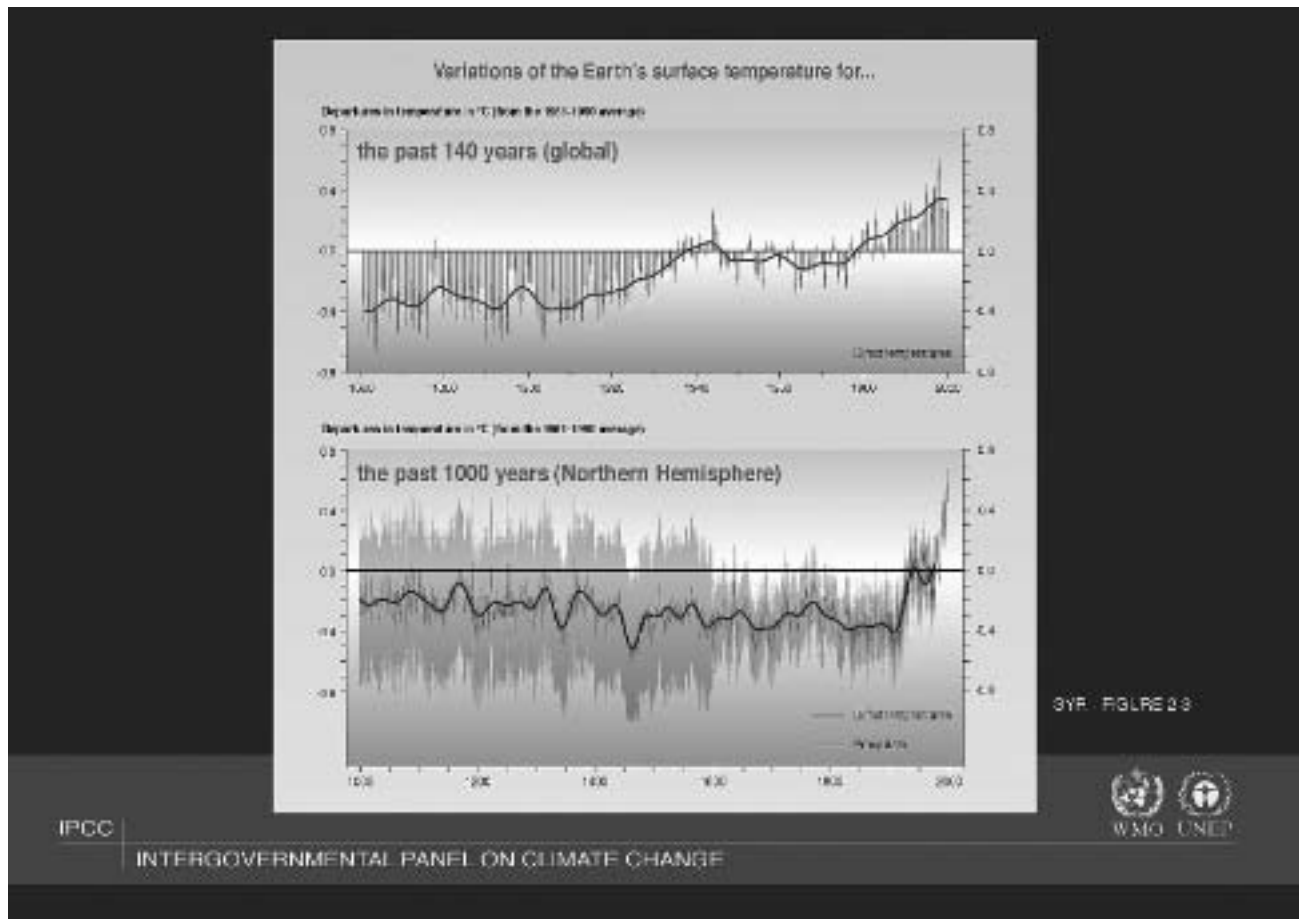
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About ten years ago, I was seated at a large lecture hall at Ohio State University, waiting for an economist to talk about environmental issues. It’s good to get a different perspective every once in a while, after all. The speaker was clear: “I don’t believe for a moment that global climate change is happening,” he stated emphatically, then paused for dramatic effect. “But if it is,” he continued, “all that means is that we need bigger and better air conditioners!” Reactions in the room were mixed. About one third of the listeners cheered, another third seemed unclear about what he had said, and the final third were close to apoplectic. A decade later, things have not changed much. Some people are still warning that the future does not look good. The remainder appears to be divided between those happy not to think about environmental issues and an influential sector that pretends nothing is going on or that bigger AC units will solve our problems.

So, does a problem really exist? Much of the U.S. political and business leadership has spent the last decade or more claiming either that climate change is not occurring or that it is occurring as a consequence of natural processes over which we have no control. Recently, this argument received surprising support from author Michael Crichton. His 2004 book, *State of Fear*, used a hunt for environmental terrorists as a device for bashing environmentalists, and especially anything to do with climate change. Sounding a lot like my economist, one of the characters stated (p. 407): “The threat of global warming is essentially nonexistent. Even if it were a real phenomenon, it would probably result

in a net benefit to most of the world.” Although climate scientists have repeatedly shown the book to be scientifically lacking, an adventure yarn is certainly entitled to have a preposterous premise (consider some of Crichton’s other novels, such as *Jurassic Park*, for which one must suspend any critical analysis to enjoy the story). However, for the U.S. Senate to invite Mr. Crichton to testify on environmental issues is just wrong — and my students using his fiction as an authority by which to reject the evidence compiled by many hundreds of scientists is even worse. Science is built on observing a phenomenon and making predictions that are supported by previous knowledge. A climate expert would know that CO<sub>2</sub> acts as a greenhouse gas and would consequently predict that global climate will change in certain ways if CO<sub>2</sub> levels continue to rise.

Could climate change scientists be wrong? Of course they could. Our data remain limited, and the pattern that has emerged might not be representative of long-term trends. Nonetheless, we have to work with the data at hand, revealed by multiple scientific papers and reports by individual scientists and national and international bodies. The hallmark of science is to test those predictions, which have so far proven depressingly realistic, varying only in assessments of the extent to which the damage will accrue. The scientific community overwhelmingly agrees: Global climate change is occurring, appears to be tied to human activities, and is likely to have devastating effects on both people and other organisms. Because of the magnitude of the impacts and



These graphs, released by the IPCC (<http://www.ipcc.ch/present/graphics/2001syrlarge/05.16.jpg>) show the increase in temperature in the recent past (top) and last 1000 years (bottom).

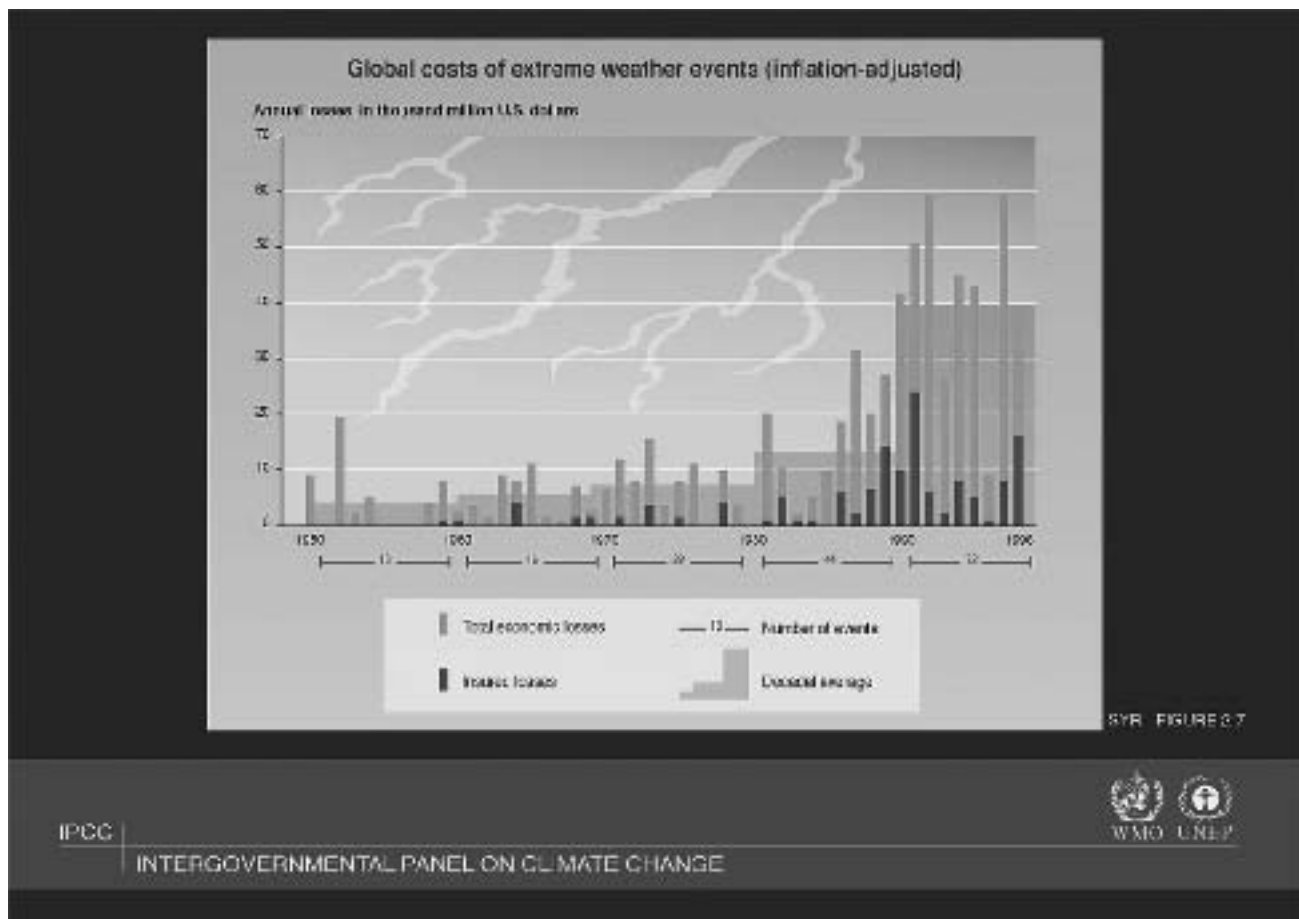
the long time required to reverse global climate changes, many feel that the risk of not doing anything if climate change is indeed occurring far exceeds the cost of reacting to a threat that we cannot yet fully predict.

This is a good time to distinguish the commonly-used but naïve “global warming” from the more appropriate “global climate change.” The first term implies two things: First, that we are going to see higher temperatures everywhere, and second, that no other impacts are to be expected. In fact, neither of these is correct. The best predictions current science allows us to make indicate that different locations are likely to be affected in different ways, with impacts to some, such as the Arctic, far exceeding those to others. In 2001, the Intergovernmental Panel on Climate Change (IPCC) released its third report. It was based on the work of about 1,200 scientists from all over the world, went through three review cycles, and is thousands of pages long. The authors concluded that an increase in extreme temperature events is to be expected, with higher maximum temperatures, more hot days and heat waves, and fewer cold days. However, these impacts were not going to affect the entire globe uniformly, so some areas might see a cooling trend even as most become warmer. The IPCC also predicted an increase in extreme precipitation events in many places. With more intense storms dropping more rain in less time, increased flooding, more intense drying during the

summer, and more frequent droughts are likely in many regions.

Data collected in the past few years have certainly supported these predictions and raised additional concerns. Doubting the validity or the magnitude of the problem has become increasingly difficult for the unbiased observer. After all, the ten hottest years ever recorded have all occurred since 1990. Moreover, this past year’s climate brought the issue closer to home for many of us. In December, NASA scientists estimated that 2005 would be the hottest year since reliable records have been kept for about the past 125 years. More viscerally, people notice when a hurricane the magnitude of Katrina slams into the U.S. gulf coast. When storm after storm gets wide media coverage — 26 named storms developed in 2005, an all-time record, and an unprecedented 16 became hurricanes — climate becomes a topic of discussion. “ConocoPhillips recognizes that human activity, including the burning of fossil fuels, is contributing to increased concentrations of greenhouse gases in the atmosphere that can lead to adverse changes in global climate,” now states the energy giant ([www.conocophillips.com/about/Sustainable+Development](http://www.conocophillips.com/about/Sustainable+Development)). Impacts on humans have begun to be quantified. Here are a few numbers from recent reports:

- Worldwide, natural disasters caused by climate change cost over \$60 billion in 2003, according to the UN (<http://news.bbc.co.uk/2/hi/americas/3308959.stm>).



The economic damage of extreme weather events is on the rise (source: IPCC, <http://www.ipcc.ch/present/graphics/2001syr/large/08.17.jpg>).

- A June 2005 report by the Association of British Insurers ([www.abi.org.uk/climatechange](http://www.abi.org.uk/climatechange)) predicted that the cost of cleaning up after climate change will have risen by as much as two-thirds by 2080. Reducing carbon emissions now could reduce insurance costs by 80%.
- According to the members of the G8 economic group of nations (<http://www.g8.gov.uk/servlet/Front?pagename=OpenMarket/Xcelerate/ShowPage&c=Page&cid=1098795669277>), the number of people affected by floods worldwide has already risen in the last four decades from 7 to 150 million today — much faster than population growth. The 2002 flooding in Europe caused 37 deaths and \$16 billion in damages. The 2003 European heatwave caused 26,000 premature deaths and \$13.5 billion in damages.
- In the U.S., in 2005 alone, over 1,300 people lost their lives to Hurricane Katrina and costs are estimated at up to \$200 billion. Damage from Hurricane Rita topped \$9 billion.

So far I have discussed broad patterns that should concern every citizen, but this journal is aimed at people who are interested in biological diversity and its conservation. Should we as biologists be especially concerned? Yes! The data to support that now include dozens of studies on hundreds of species and encompass up to 50 years. Plants are flowering, frogs are emerging, and bird spring migrations are starting earlier than they have in recorded history. The distributions of species are changing, with many

extending their ranges towards the poles or higher elevations and contracting in lower elevations or latitudes. In addition, coral bleaching, associated with warmer water, is becoming more prevalent — being recorded for the first time at two of the Caribbean sites where I work. Even more disconcertingly, the effects of climate change are meshing with those of habitat degradation and invasive species. For example, the *Observer* has reported ([http://observer.guardian.co.uk/uk\\_news/story/0,6903,1670017,00.html](http://observer.guardian.co.uk/uk_news/story/0,6903,1670017,00.html)) that Atlantic Puffins (*Fraterecula arctica*), colorful seabirds that nest in Scotland, are in trouble. Over-fishing has depleted their food source, and now global climate change is allowing the invasive Tree Mallow (*Lavatera arborea*) to expand its range, covering the ground where birds used to nest. Such effects are not going to limit themselves to puffins. Unfortunately, the impacts to non-humans are rarely monitored. How many iguanas died when storms lashed the Caribbean this year? How many sea turtles will lose their nesting beaches as sea levels rise in the decades ahead? How much money would each of these lives be worth, if we could replace it?

What to do? This is where things get tricky. Different people see the threat of climate change in different ways and have widely varying views on the acceptable price for addressing it. Many in the business and political sectors have taken the stance that doing anything about climate change would cost too much. In a September 2002 speech in New Jersey, President Bush took an unusually clear position: “We need an energy bill that encour-

ages consumption” rather than reducing greenhouse gas emissions. In his much-hyped book, *The Skeptical Environmentalist* (on which Crichton based much of his novel), Bjorn Lomborg estimated the cost of controlling climate change to be between \$3 and \$33 trillion, compared to a benefit of \$5 trillion, and recommended against doing anything. Lomborg’s work has been widely attacked as inaccurate and biased but, not being an economist, I do not feel qualified to judge the details. However, this kind of argument has been made many times. For example, a similar attitude was used to delay the banning of leaded gas and lead-based paints in the U.S. The overwhelming experience with environmental legislation has been a huge payoff in improving public health, developing new technology, and environmental benefits. For example, the CDC estimates that banning the use of lead has reduced the number of U.S. children suffering from lead poisoning from nearly 15 million in 1978 to fewer than 900,000 by the early 1990s. In analyzing the costs and benefits of additional regulations related to the use of lead, the EPA estimated an economic benefit of over \$2.5 billion per year (just as with climate change, however, that is rarely the real issue — in 2004, the EPA decided to scrap the new lead rules). Similarly, the banning of CFCs after a hole was discovered in the ozone layer was initially predicted to create a huge economic impact, yet quickly led to development of alternative chemicals that also allowed more energy-efficient cooling.

Unlike the national U.S. leadership, others inside and outside the country have shown considerable concern. “In my view, climate change is the most severe problem that we are facing today, more serious even than the threat of terrorism,” said Sir David King, chief scientific adviser to Britain’s Prime Minister, in a January 2004 article in the journal *Science*. “We must protect our environment even if it results in great sacrifices,” said Mayor Richard Ward of Hurst, Texas, regarding the climate agreement (<http://www.ci.seattle.wa.us/mayor/climate/default.htm>) unanimously approved by the U.S. Conference of Mayors in June 2005. In December 2005, New York Governor George Pataki, a Republican, led the governors of seven northeastern U.S. states in signing the Regional Greenhouse Gas Initiative, which hopes to use market-based initiatives to first freeze gas emissions at current levels, and then reduce them. The expectation is that household expenses will initially rise slightly (up to \$24/family/year), but that the development of cleaner technologies will ultimately offset the extra cost. The Kyoto Protocol, an international treaty intended to address greenhouse gas emissions, was negotiated in



Michelangelo’s view of the biblical flood illustrates the catastrophic impacts of sea level rise.



Glaciers are melting all over the world. In this example, released by Greenpeace (<http://www.svalbard-images.com/spitzbergen/climate-change-a.php>), the top picture was taken in 1918 and the bottom picture was taken in 2002.

1997, ratified by 156 countries so far (not including the U.S., which was also one of the last to ban lead), and has come into force in early 2005. The Protocol has helped raise awareness and hope. Over 90% of companies responding to information requests from the Carbon Disclosure Project (<http://www.cdproject.net/report.asp>) identified risks and opportunities associated with global climate change. Just over one half have put in place programs to reduce emission levels. Yet plans and pacts are not enough. While 13% of companies in the Fortune 500 reported reductions in emission levels over the past few years, 17% reported increases.

As individuals, we hope to be here for many more years. As a species, we would like to stick around for a few million more years before going extinct. As people interested in conservation, we hope that as many other species as possible will see that future with us. The impacts from global climate change add up quickly, and the excuses for delaying action grow more and more feeble. Unfortunately, both the citizens of the U.S. and their elected leadership are characterized by an abysmal lack of scientific proficiency, which makes many people unable to assess issues as complex as global climate change. We need to remedy this, and we need to act on global climate change before too much more damage is caused. Scientists already estimate that many decades will pass before the effects of our past actions on global climate can be countered.