Earth" virtual exhibit (http://www.mnh.si.edu/earth/main_frames.html). He will be remembered at the Smithsonian as an accomplished scientist, a warm and charismatic friend, and a patient, kind, and wise colleague who always was a pillar of stability.

Jim's record of professional, public, and community service was extraordinary. He served on the editorial board of *Journal of Volcanology and Geothermal Research* from 1988 onward and as an associate editor of *American Mineralogist* from 1991 to 1995. He was a member of the Science and Technology Committee of the U.S.-Mexico Foundation for Science (1993–1995), the Ad Hoc Group for Volcanic Ash of the U.S. Office of the Federal Coordinator for Meteorological Services and Supporting Research (1994–1999), and the review panel for the Princeton Earth Physics Project (1995–1996). With Tom Simkin, Jim wrote the 1993 book *Paricutin: The Volcano Born in a Mexican Cornfield* (Geoscience Press, Tucson, Ariz.), for a popular audience. He was editor-in-chief of a popular book entitled *Earth*, published in 2003 by Dorling/Kindersley.

Less well known was Jim's commitment and involvement in his community, including supervising the running of his community swimming pool and participating in a group—Shepherd's Table—that fed the homeless.

Jim's death ended a significant and original career in volcanology and igneous petrology. He was at heart a field petrologist who visited Mexican volcanoes for more than 20 seasons. Jim was always aware of the connection of the Mexican volcanic belt to regional plate tectonics. He helped to show that lamprophyric (highly potassic, feldspar-free) lavas were confined to fault-bounded valleys within the Jalisco Block and that this tectonically isolated block could be rifting from the mainland of Mexico. Jim's research did much to establish the Mexican Volcanic Belt as the most varied subduction-related volcanic province on Earth.

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FORUM

A Suggestion to Climate Scientists and the Intergovernmental Panel on Climate Change

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Scientists and the general public alike encounter scientific terms such as climate change, global warming, greenhouse effect, and carbon dioxide a few times every day in newspapers, radio broadcasts, and television news, as well as in conversation. This is perhaps the first time in the history of science that a scientific issue has gotten so much attention from the public. As a scientist, I am pleased about the public's interest in science. Unfortunately, I have found that this great interest in climatology is largely the result of a proliferation of confusing stories in the media that are based on misinterpreted information about the greenhouse effect of carbon dioxide. Many people bring up several misunderstood issues when I discuss the present warming trend. Even some policy makers and government officials seem to be confused.

I recently retired after a career that included a combined 20 years as director of both the Geophysical Institute and the International Arctic Research Center at the University of Alaska Fairbanks. Because of my position at both institutions, I have had many opportunities to discuss climate change with reporters from news organizations from Japan, Europe, the United States, and elsewhere. These reporters are looking into stories on climate change in the Arctic and subarctic. My experiences with them have led me to believe that scientists need to do better in communicating what we have found in regard to climate change.

Here are some examples of my concerns:

1. Members of the media who visit Alaska seem to use synonymously the terms "climate change," "global warming," and "man-made greenhouse effect." This perhaps leads people to think that all changes in climate are because of human activities. As we know, this is not true.

2. Members of the media use images of calving tidewater glaciers as examples of man-made climate change, as did Al Gore in the movie, *An Inconvenient Truth*. The calving of these tidewater glaciers, though dramatic and impressive, has little to do with man-made global warming. (Glaciers are "rivers of ice," so calving is natural, and spring breakup is a normal, annual event; both of these events have occurred since geological times.) Reporters unfamiliar with Arctic phenomena tend to report normal features as anomalous.

3. While members of the media I have worked with always report on recent melting of glaciers—which is indeed impressive—I rarely see stories of melting glaciers over a longer timescale. Glaciers in Alaska, Greenland, the Himalayas, and the European Alps, for which we have accurate historic records, began to recede well before 1900 or even 1800. The recession is not something that began abruptly with the warming of the past several decades or even after the beginning of the last century.

4. Many reporters travel to Alaska each year looking for stories on global warming. They almost always ask to see a house that has collapsed due to melting permafrost, and they are invariably disappointed when I tell them that I know of no such houses to photograph, because builders in Fairbanks have learned to insulate houses from frozen soil. The collapsed houses of the past were due to people building directly on the ground surface and unnaturally warming the soils below. Natural warming that would produce a widespread collapse of houses over ancient chunks of ice has not yet occurred here.

5. Reporters often depict anomalous, extreme, and unusual weather phenomena—which we experience in Alaska practically every year—as being directly related to the man-made greenhouse effect. There is little proof for this, at least here in Alaska. Many reporters, who are looking for climate change disasters that are specifically caused by carbon dioxide, visit coastal native villages that are built on sand spits in the Bering Strait, although the sea would erode the coastlines regardless of climate change. I often indicate to reporters what I perceive as greater threats to the Earth than the man-made greenhouse effect, such as the overharvesting of forests (causing floods) and fish, pollution, and the extinction of some species. These concerns have trickled into few stories.

6. Since we are all biased by our short human life spans, I try to remind reporters that many accurate climate data sets, such as those involving northern sea ice, have a very short time span. For example, scientists have had the ability to observe sea ice via satellites since 1979, so scientists who study satellite data should not use the term "unprecedented changes" (Since there are no comparable satellite data before the 1970s, scientists cannot tell whether any of the changes, even those that occurred in the 1930s and 1940s, are unprecedented.)

7. Finally, climate change is a complex issue. Ideally, every reporter would have a good scientific background before reporting on the man-made greenhouse effect. But that will not always be the case. It is our responsibility as scientists to communicate what we know as clearly as possible.

The public is greatly alarmed and thus concerned about climate change largely because of the above misunderstandings and other misinformation. People bring up these and many other misunderstood climate change issues when I discuss the present warming trend with the public. In my opinion, reporters could be doing a better job of portraying

what scientists know and, maybe more important, what we do not know.

Because there has been so much misrepresentation about climate change, I am also concerned about the inevitable backlash against science and scientists when the public ultimately learns the correct information. Even if climate scientists and other members of the Intergovernmental Panel on Climate Change (IPCC) are not directly responsible for the present confusion, they should take the necessary responsible action to help rectify the misunderstandings and clarify the confusion. I would suggest that the IPCC make an appropriate statement in this regard before the next Group of Eight (G8) meeting of governments in July 2008.

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(Editor's Note: Please also see the Brief Report by Susan Hassol on page 106.)

MEETINGS

Understanding the Atmosphere Through Radio Occultation

Second FORMOSAT-3/COSMIC Data Users Workshop; Boulder, Colorado, 22–24 October 2007

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The second FORMOSAT-3/COSMIC data users workshop was held at the University Corporation for Atmospheric Research, in Boulder, Colo., and was attended by more than 100 international participants from a dozen countries around the world.

COSMIC (Constellation Observing System for Meteorology, Ionosphere and Climate) is a joint Taiwan/U.S. mission consisting of six microsatellites, each carrying a Global Positioning System (GPS) receiver, a tri-band beacon to sense free electrons in the ionosphere via radio waves, and a Tiny Ionospheric Photometer to map ionospheric electron density via ultraviolet emission. The primary purpose of COSMIC is to demonstrate the value of radio occultation (RO) observations of the atmosphere to weather prediction, climate, and space weather. The RO technique produces a vertical profile of refractivity versus height in the ionosphere, stratosphere, and troposphere. This allows scientists to deduce valuable information on electron density, temperature, and water vapor in the atmosphere.

Among the key results presented were characterization of an atmospheric river (a band of water vapor) that produced severe flooding in the Pacific Northwest and a demonstration of the ability of RO to determine globally the height of the planetary boundary layer (the lowest part of the atmosphere that is influenced by the Earth's surface), which can be used to validate global models of the atmosphere. The electron density profiles have been used to monitor the seasonal variations of three-dimensional ionospheric structures. They are being tested for assimilation into the Global Assimilation of Ionospheric Measurements (GAIM) model for space weather forecasting, which is a project supported by the U.S. Department of Defense. A new daytime equatorial ionospheric feature, called plasma caves, has been identified as being associated with prominent equatorial plasma fountains.

Researchers from operational numerical weather prediction (NWP) centers in the United Kingdom, the United States, and France reported on improvements in the skill of their daily numerical model forecasts through incorporating COSMIC data. The soundings will soon be used operationally in Canada, Japan, Taiwan, and other countries. RO is the only data set assimilated at the European Centre for Medium-Range Weather Forecasts without a bias correction and is therefore used to "anchor" and improve bias estimates for the other observational data sets. This not only improves the accuracy of and weight assigned to other observational data sets during assimilation, but it also improves the quality of NWP analyses for climate research.

The recent U.S. National Research Council "Decadal Survey" for Earth sciences identified RO as a key element in the global climate observing system because of its unique combination of all-weather sampling, high vertical resolution, high precision, and the ability for all measurements to be traced back to absolute international standards. Furthermore, the six-satellite COSMIC constellation has demonstrated the unique ability to profile the atmosphere over the entire day, including in and below clouds, addressing the need to determine how the diurnal cycle is changing in our evolving climate. Analysis of several years of refractivity data derived from Germany's Challenging Minisatellite Payload (CHAMP) satellite by several independent RO processing centers is in progress. Initial trend comparisons confirm the expected inherent accuracy and precision of the data.

Discussions of the future included completing the COSMIC mission (2008–2011) as well as planning for a follow-on mission. New applications of RO included ocean surface reflections complementing data now gathered by satellite-borne altimeters and the use of additional frequencies 10 and 100 times higher than GPS to achieve the goal of simultaneously profiling water, ozone, temperature, and pressure from near the surface to the mesopause independently of models. Presentations from the data users workshop are available at http://www.cosmic.ucar.edu.

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