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Cover: The Chinese have used danggui root (*Angelica sinensis*) for more than 2,000 years to treat blood-related disorders such as anemia, irregular menstruation, and high blood pressure. Now, Western researchers are beginning to weigh the promise of traditional herbal remedies against the standards of modern medicine. (Photo: Steven Foster)



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Science Service, which publishes SCIENCE NEWS, is a nonprofit corporation founded in 1921. It gratefully accepts tax-deductible contributions and bequests to assist its efforts to increase the public understanding of science, with special emphasis on young people. More recently, it has included in its mission increasing scientific literacy among members of underrepresented groups. Through its Youth Programs it administers the International Science and Engineering Fair, the Science Talent Search for the Westinghouse Science Scholarships, and publishes and distributes the Directory of Student Science Training Programs for Precollege Students.

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## Letters

### Can temperature be averaged?

"Dusting the Climate for Fingerprints" (SN: 6/10/95, p.362) fails to note that averages are indicators of the central tendency of data.

What if there is no central tendency of average temperature or average temperature change? What if the distributions of those statistics are bimodal?

Global temperatures vary diurnally, seasonally, with the position of Earth in its orbit, geographically, and apparently with sunspot activity. Those who study Earth's temperature and temperature changes should study such variability and determine whether they can realistically report a single average.

*F. McD. Ervin  
Chicago, Ill.*

### Nature's CFCs

Deana M. Crumbling's letter (SN: 6/10/95,

p.355) repeated the standard line on volcanic sources of ozone-reactive chemicals: Naturally occurring chlorine and fluorine compounds from ground sources cannot penetrate the troposphere because they are water soluble and highly reactive.

Is this a demonstrable fact or a "reasonable" but invalid assumption? Thomas A. Dobbins' letter (SN: 3/25/95, p. 179) suggests the latter. If volcanic hydrogen fluoride can reach the upper levels of the hot, wet atmosphere of Venus, what prevents it from happening in the cold, dry, dark atmosphere of Antarctica in winter?

*Paul R. Johnson  
Houston, Texas*

As early as 1924, Zeis reported on the emissions of hydrogen chloride and hydrogen fluoride from Alaskan volcanoes. The recent documentation by Symonds (NATURE, 8/4/88), Chaun (NATIONAL GEOGRAPHIC, 4/90),

Kyle (GEOPHYSICAL RESEARCH LETTERS 11/90), and Le Guern (in a report presented at the 1994 congress of the Volcanology Society of Japan) provide ample evidence that Mother Earth belches vast quantities of CFCs and halogenated chemicals into the atmosphere. Gribble reported in the July 1994 ENVIRONMENTAL SCIENCE & TECHNOLOGY that 2,000 different halogenated chemicals are discharged into the atmosphere by natural processes.

The sources of these natural compounds are orders of magnitude greater than anthropogenic sources. Even if 99 percent of the natural halogenated compounds are removed from the atmosphere by precipitation, the net amount of natural compounds remaining in the atmosphere at any given time is thousands of times greater than that of anthropogenic compounds.

*Charles R. Hosler  
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