

SCIENCE NEWS®

The Weekly Newsmagazine of Science

A Science Service Publication
Volume 142, No. 19, November 7, 1992

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SCIENCE NEWS (ISSN 0036-8423) is published weekly on Saturday, except the last week in December, for \$39.50 for 1 year or \$68.00 for 2 years (foreign postage \$6.00 additional per year) by Science Service, Inc., 1719 N Street, N.W., Washington, DC 20036. Second-class postage paid at Washington, DC, and additional mailing office. POSTMASTER: Send address changes to SCIENCE NEWS, P.O. Box 1925, Marion, OH 43305. Change of address: Four to six weeks' notice is required — old and new addresses, including zip codes, must be provided.

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Editorial and Business Offices:
1719 N St., N.W., Washington, DC 20036
(202-785-2255)

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Subscription Department:
P.O. Box 1925, Marion, OH 43305
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This Week

- 308 Liver Cancer: Homing in on the Risks
- 308 Sounding out a sharper ultrasound echo
- 309 Radio study finds drier Martian atmosphere
- 309 Better traces of whale pedigree discovered
- 310 Anti-impactors have their day in K-T court
- 310 Vessel residue taps into early brewing
- 311 Craving fat? Blame it on a brain protein
- 311 Hypertension battle plan
- 311 Anticancer enzyme imaged

Research Notes

- 317 Astronomy
- 317 Biomedicine
- 318 Biomedicine
- 318 Chemistry

Articles

- 314 Strangers in Paradise

Cover: This native Hawaiian tree snail, *Achatinella mustelina*, looks like lunch to a species of imported carnivorous snail now sweeping Hawaii. Alien species such as the carnivorous snail, African grasses, feral pigs, and yellow-jacket wasps are causing ecological trouble in the island paradise.
(Photo: Michael G. Hadfield, Kewalo Marine Laboratory, Honolulu)

Departments

- 306 Books
- 307 Letters

Science Service, a nonprofit corporation founded in 1921, 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 Program 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

We blue it

Your photograph of the *Commelina* sp. accompanying the cover story "True Blue" (SN: 9/19/92, p.184) is upside down. In those species of *Commelina* with dimorphic blue and white petals, the two large (lateral) blue petals are uppermost, with the reduced (median) white petal below.



Albert F. W. Vick/Natl. Wildflower Res. Ctr.

Wendy B. Zomlefer
Florida Museum of Natural History
University of Florida
Gainesville, Fla.

The world viewed askew

In the last sentence of "The Warped World of Mental Maps" (SN: 10/3/92, p.222), the author asks, "... who would think to question whether

a map on the wall depicts Earth's continents as they truly are?" My answer is, "Anyone who does not believe that the world is flat."

Only in R. Buckminster Fuller's icosahedral projection (in which he projects the features of the globe onto a concentric icosahedron, whose 20 equilateral triangles are then reassembled in a certain way on a flat surface) are the shapes and relative sizes of the continents accurately represented. Alas, this effect is achieved at the expense of an accurate indication of their relative positions, which most mapmakers (and map users) would consider more important.

Saarinen instructed the subjects to concentrate on "countries or features they considered important," which they apparently did. This, and the fact that the subjects were not selected for their drawing skills, seriously weakens the conclusion that they displayed ignorance about geography. Had they been specifically asked, "Which is larger, Europe or Africa?" the majority may well have answered "Africa."

Does Reginald G. Golledge really mean to imply that a country's set of closest trading

partners is determined by mental impressions of their relative sizes? If this were the case, I'd expect to see us doing much more trade with Greenland than with Japan.

Jeffry D. Mueller
Eldersburg, Md.

Saarinen reports asking subjects to draw a map of the world on a flat sheet of paper. Since it is mathematically impossible to do so accurately, he should not have been surprised when they failed.

A flat map can show the areas of the land masses in their proper relationship only at the cost of severe distortion of their shapes or positions, or both. Saarinen may consider it obvious that area is the most important criterion, but unless the subjects in this experiment were specifically so instructed, he should not assume that they thought the same way.

Undoubtedly, cultural bias does influence how we see the world, and probably few people consciously chose one projection over an-

Letters continued on p.319

NOVEMBER 7, 1992

307

wildfires, D'Antonio concludes.

Pigs are one of the oldest habitat-disrupting alien species in Hawaii. First brought to the Hawaiian islands by the Polynesians, the pig's proclivity for eating bark and roots has wrought major damage to many areas, according to David Foote of the Hawaii Volcanoes National Park on the island of Hawaii.

Foote and U.S. National Park Service colleagues Charles P. Stone and Linda W. Cuddihy have studied the ecological effects of exclosures — areas surrounded by pig-proof fences — in Volcanoes National Park. The park contains many species-rich enclaves, called kipukas, that exist between the fingers of recent lava flows.

Foote told the August ecology conference that exclosures built in kipukas during the early 1980s contain more species of native arthropods and fewer species of alien arthropods than do similar exclosures constructed two years ago. He attributed the difference to the elimination of feral pigs, which uproot large tree ferns and gnaw the bark of hardwood trees, killing and toppling them. This, in turn, exposes the forest floor to more sunlight, which can disrupt the entire forest ecosystem.

Foote's group found that only one ge-

nus of native arthropods — damselflies — benefited from the presence of pigs. The delicate insects thrived in the more recent exclosures, the researchers discovered, by taking advantage of water-filled pig wallows as sites for laying eggs.

Further studies of the effects of feral pig populations and other alien species are among the seven goals of the Hawaii Conservation Biology Initiative, a project organized by the Nature Conservancy of Hawaii in Honolulu and initially funded by a \$500,000 grant from the John D. and Catherine T. MacArthur Foundation. The initiative — drafted by representatives from 19 universities, federal and state agencies, environmental groups, and botanical gardens — seeks to coordinate ecological research in Hawaii.

"There's a great deal of research being done," says one of the initiative's chief organizers, Colin Bassett of the Nature Conservancy of Hawaii and the University of Hawaii. "But even more is needed if we're going to understand and protect the unique ecosystems here," he says.

Besides feral pig research, the initiative aims to stimulate studies of alien plant species, native forest birds, the ecology of rare native plants and animals, and the vegetation dynamics of selected plant communities. It also plans to facilitate the monitoring of native and alien

organisms, as well as studies of the best ways to restore Hawaii's ecosystems to a "self-sustaining, natural condition," according to an outline of research priorities.

Patrick Dunn, an ecologist at the Nature Conservancy of Hawaii, says the initiative will dispense money for a small number of "seed" grants to get researchers started on enterprising projects — especially those that cut across academic disciplines. Initiative administrators will then help such researchers obtain further funding from government and private organizations.

The initiative plans a system of biological field stations throughout the Hawaiian islands to serve as outposts for researchers working in the field. Two such stations have already been built — at Pelekunu on the island of Molokai and in the Haleakala National Park on Maui. The initiative also has established a Secretariat for Conservation Biology at the University of Hawaii to organize scientific conferences and serve as ongoing headquarters for the project.

Dunn hopes the research initiative will help target studies in areas useful to conservation managers, the keepers of Hawaii's great diversity. "Managers are faced every day with the possibility of species going extinct," he says. "The threat is tremendous, but we expect [the initiative] to make a real difference." □

Letters continued from p.307

other; but shapes and positions (which are shown relatively accurately on the much-maligned Mercator projection) may well be easier to remember than sizes.

It might be interesting to see how people do with a blank globe.

Chris Keavney
Arlington, Mass.

The adoption of the area-preserving Robinson projection by NATIONAL GEOGRAPHIC is appropriate to our era, in which the extent of real estate owned is a primary concern. Other eras have had other considerations, however, and the Mercator projection should be recognized for what it was intended to (and admirably did) provide — namely the courses of constant compass settings as straight lines.

Such lines, when viewed on a globe, spiral away from one pole and toward the other.

Until 30 years ago, it was routine for ships to use such courses, set by hand and adjusted once or twice a day, to piece together geodesic or shortest-arc routes across oceans. Now, the compass setting of a perfect geodesic can be changed continuously in real time by an on-board computer.

Stephen Eberhart
Northridge, Calif.

I offer an alternative to Eurocentrism as the reason that most of the students' maps featured Europe in the middle. Instead, "terra-centrism" may be responsible.

From our perspective as a land-dwelling species, it makes more sense to cut the map through oceans and leave continents intact. Such a cut must logically go through either the

Atlantic or the Pacific Ocean. While I agree that most people will tend to place their home turf near the center of the world, this is impossible for dwellers of the Americas (or of India and central Asia) to do without cutting directly through the land mass on the opposite side of the globe. Thus if we are to maintain continental integrity, we are forced to accept our home turf in an off-center position. Eurocentrism may actually be an artifact of preferring to put the smaller ocean (the Atlantic) at the center of the map.

Student mapmakers may not be conscious of such considerations, but the cartographers whose maps grace classroom walls may well find them important.

Lynne M. Clos
Boulder, Colo.

Average accuracy

Regarding "Body temperature: Don't look for 98.6°F" (SN: 9/26/92, p.196), Wunderlich's original measurements, which took into account variability among individuals and even time of day, were in degrees Celsius. The average temperature was quoted only to the nearest degree: 37°C. Whoever first converted that to Fahrenheit converted to the nearest tenth of a degree, thereby implying tremendous accuracy.

Two-digit accuracy is all that 37°C implied, meaning that the average temperature was between 36.5°C and 37.5°C. These numbers convert to 97.7°F and 99.5°F. It would have been more accurate to say that average body temperature is 98°F or 99°F and await the recent million measurements to refine that to 98.2°F.

Allen E. Staver
DeKalb, Ill.

Aha...



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