



Features on Vesta can be located using two coordinate systems — the subject of scientific wrangling.

PLANETARY SCIENCE

Space missions trigger map wars

Planetary explorers rebel against nomenclature protocols.

BY ERIC HAND

When NASA's Dawn spacecraft departs from Vesta on 26 August, it will have mapped the second-most-massive object in the Solar System's asteroid belt in unprecedented detail, revealing a diverse, planet-like body with sheer cliffs and deep craters.

But don't ask for the latitude and longitude of those features. The mission team is embroiled in a dispute with the International Astronomical Union (IAU) in Paris over which coordinate system to use, and where to place the prime meridian from which longitude will be measured. At the moment, the groups each have their own meridians, separated by 155°: nearly half a world. "It's an untenable

situation to have an outside group that has no ownership, no belonging to the project, impose arbitrary things," says Chris Russell, Dawn's principal investigator and a planetary scientist at the University of California, Los Angeles.

Brent Archinal, chairman of the IAU working group responsible for coordinate systems, says that the Dawn team is welcome to use an alternate system for its own purposes. "That's not what's happening. They're saying theirs is the only system," says Archinal, a geodesist at the US Geological Survey in Flagstaff, Arizona.

The feud shows how the conquering instinct of a mission team sometimes falls foul of rules established by the IAU, which emerged as the arbiter of planetary names and coordinate systems during the early years of space exploration. Back then, standardization helped to

prevent the Solar System from being plastered with conflicting sets of names used by Soviet and US scientists. These days, the tensions are less nationalistic and more interdisciplinary: a dust-up between the geologists who tend to lead planetary missions and the astronomers who comprise much of the IAU. "Why should I let astronomers name things just because they're on another planet?" asks Mike Malin, a geologist and principal investigator for the mast camera on NASA's Curiosity rover mission, which has generated its own conflict with the IAU over the naming of a feature at its Martian landing site. "It's anachronistic," adds Malin.

The IAU's coordinate system for Vesta is based on observations from NASA's Hubble Space Telescope. It was published¹ in 1997, and puts the prime meridian at the centre of Olbers Regio, a dark, circular region 200 kilometres across.

After Dawn began orbiting Vesta in July 2011, the mission team found that the rotational pole in the IAU's system was off by as much as 10°. The team established its own coordinate system, which not only corrected the pole, but also focused the prime meridian on Claudia, a 700-metre crater. The Dawn team says that Claudia can be defined much more precisely than Olbers, and that its system produces more logical mapping quadrangles. NASA has released images that refer to the Claudia system, and the Dawn team has published papers using it, including a suite of articles²⁻⁷ that appeared in *Science* in May.

The Claudia system is not acceptable to the IAU, which states in its guidelines⁸ that changes to any established coordinate system should be avoided unless there has been a loss or change to the meridian-defining feature. But Russell says that the Dawn team will continue to publish using Claudia: "We cannot afford to change to a new coordinate system."

Michael A'Hearn, a planetary scientist at the University of Maryland in College Park, is trying to find a compromise. A member of the IAU working group, A'Hearn is also in charge of the part of the NASA database that will host Dawn data for the public — and he says that the data must use an IAU-sanctioned coordinate system. He suggests rotating the Claudia system by 155°, to put the prime meridian within one degree of the centre of Olbers Regio. That would preserve the pole correction but keep the meridian close enough to Olbers to satisfy the IAU rules.

Mark Sykes, director of the Planetary Science Institute in Tucson, Arizona, and a co-investigator on Dawn, says that the entire episode is silly and counterproductive: "Now we're going to have three systems in the literature." But he is not too surprised.

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"When an organization sets itself up as the holy mother church," he says, "you're always going to get heretics."

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Such disputes are unlikely to hinder science in the long run, but they can sow short-term confusion. Mars, which has been visited more than any other Solar System body in the past two decades, offers several examples. The latest concerns Curiosity, which touched down on 6 August.

The rover's chief target is a 5.5-kilometre-tall mountain in the middle of Gale crater⁹. Early this year, the mission's science team asked the IAU to name the feature Mount Sharp, after Robert Sharp, a planetary geologist at the California Institute of Technology (Caltech) in Pasadena, who died in 2004. But that fell foul of the IAU rule book. Brad Smith, a retired astronomer and chairman of the IAU's Mars task group, points out that large features such as mountains must be named in Latin, after nearby light and dark features discerned on Mars by nineteenth-century astronomers. In May, the mountain was granted such a name: Aeolis Mons. (Craters can be named after people, however, so Sharp got a 152-kilometre crater just west of Gale.)

But the NASA team has been referring to the mound as Mount Sharp in public discussions and press releases. Curiosity project scientist John Grotzinger, a Caltech geologist, says he is "not trying to break the law" — rather, he wanted a user-friendly name similar to that of Mars's

Columbia Hills, which were named to commemorate the 2003 space-shuttle disaster soon after they were discovered by NASA's Spirit rover in 2004. Smith says that the hills are big enough to get an official name, but none was ever requested, so the informal name stuck.

In future, says Grotzinger, the Curiosity team will use Aeolis Mons on official maps, and will indicate in publications that Mount Sharp is an informal name.

That is fine with Smith, who points out that the Curiosity team can do whatever it wants in an unofficial capacity. "There's perhaps more drama being made about all this by the media than meets reality," he says. ■

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POLICY

Companies set to fight food-label plan

California's Proposition 37 would add labels to all foods made from genetically modified crops.

BY MONYA BAKER

A battle over genetically modified (GM) foods in California is turning into an expensive war. Agribusinesses and food manufacturers last week pledged US\$13 million to the campaign against a proposition that would require food to carry labels noting its GM content.

The money swells the opponents' coffers to \$25 million, promising months of campaigning before the public vote on the proposal in November. Supporters of Proposition 37, including organic farmers and environmentalists, have so far raised less than \$2.5 million.

Those in favour of labelling argue that the public has the right to know what is in their food, citing food-safety concerns and a general mistrust of corporate interests in agriculture. Opponents say that the labels will be perceived as warnings, stoking consumer hostility to genetic engineering. They also argue that the move would raise food costs, and expose grocers, farmers and food manufacturers to frivolous lawsuits for incorrect labelling.

Similar labelling proposals have failed in other states, but a victory in California could set a national precedent. "If the ballot initiative passes, it would mark a turning point for public activism in the United States," says Charles Benbrook, chief science consultant at the Organic Center, an organic farming advocacy group in Troy, Oregon.

Labelling would certainly have far-reaching consequences: around 94% of the soya beans and 88% of the maize (corn) grown in the United States is genetically engineered to resist herbicides, insect pests or both, according to the US Department of Agriculture. The plan could affect tens of thousands of brand-name products, and food manufacturers Coca-Cola, PepsiCo and Nestlé have each contributed more than \$1 million to the campaign; meanwhile, agribusinesses DuPont and Monsanto have chipped in more than \$4 million apiece.

The labels would not reflect how the crops have been modified, or the quantity of GM ingredients in a food.

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Meat from animals fed on GM crops would not need to be labelled.

Bob Goldberg, a plant

geneticist at the University of California, Los Angeles, says the proposition is "anti-science", and could discourage research to develop drought-tolerant crops and more nutritious foods. Studies by the US National Academies¹ and Britain's Royal Society of Medicine² found no evidence that biotech crops are unsafe to eat. And, in June, the American Medical Association said that there was no scientific reason to label GM foods, but recommended that long-term studies should be vigilant for any health effects. Benbrook says that, far from being anti-science, the labelling could support health studies by helping to track people's food choices.

Pro-GM plant scientists also point out that the crops can benefit the environment by enabling farmers to use less-toxic herbicides and reduce insecticide use. But proponents of labels say that these benefits are temporary, and point to studies showing that weeds and insects have evolved resistance to the modified crops³. Seed companies can counter this by engineering new crops that are resistant to additional herbicides — such as a new soya bean developed by Dow AgroSciences of Indianapolis, Indiana — something that Benbrook argues will actually increase herbicide use.

In a poll earlier this month, 69% of Californians supported the proposition, and a national survey by Thomson Reuters in 2010 found that 93% of respondents wanted labels. But opinions can change: earlier this year, a cigarette tax that would have funded disease research was narrowly defeated at the ballot after 67% of voters initially supported it. That change of heart coincided with the cigarette lobby spending an estimated \$50 million on campaigning. Benbrook predicts that even more money will be thrown at the anti-GM-labelling campaign. ■

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CORRECTION

The News story 'Heatwaves blamed on global warming' (*Nature* **488**, 143–144; 2012) should have said that the paper by Trenberth's team will appear in the *Journal of Geophysical Research*.