THE PLANETARY NAME GAME

Naming the features of Mars is no picnic—in fact, it's more like a war

BY JONATHAN EBERHART

Agreeing on a name for a baby is hard enough for a single set of parents, but imagine if it were a super-baby, produced after centuries of study by thousands of "parent" researchers in numerous countries. Whose efforts shall be recognized? Who shall become immortal?

The problem is not dissimilar to one that has for years confronted the International Astronomical Union, the organization charged with systematizing and selecting names for surface features on other worlds. Far from being a dispassionate process, the task of naming the craters, plains and mountains of distant planets has turned out to be a matter of anger and anguish, of blood, sweat and tears. Formerly objective scientists become vocal advocates; even-tempered researchers decide that a favored predecessor is far too important for a little crater. (You have to be dead to be eligible for the name-pool.)

"Have you ever seen one of those team-wrestling matches where everyone gets thrown out of the ring and the ones who are left are the winners?" asks Harold Masursky of the U.S. Geological Survey's Center for Astrogeology in Flagstaff, Ariz. Masursky, a veteran of the seemingly endless name-game over the moon, has also been a consulting member of the IAU Working Group on Martian Nomenclature, an experience which, one readily perceives, has been difficult. "It's impossible to have an impersonal discussion on names," he says. Friends, founders, colleagues, countrymen, former professors, ex-bosses, personal favorites and other variously connected souls all have a few supporters in a running exercise of vicarious territoriality.

The latest batch of Martian place-names to be adopted by the IAU has now been published (Icarus 26:85), but the businesslike description of the rules and actual selections gives no hint of the complex negotiations from which they resulted. The group was initially appointed by the IAU Commission on the Physics of the Planets in 1970, with Gerard de Vaucouleurs of the University of Texas as chairman and including four additional members and one consultant. Two more members were "co-opted" in 1971, and two more consultants (including Masursky) the following year. The group's job was to define a set of "province boundaries" for Mars, evaluate the features photographed by Mariners 6 and 7 in 1969 and Mariner 9 in 1971 in terms of existing principles of topographic nomenclature (lowlands vs. plains, canyons vs. valleys, etc.) and, finally, propose names (aided by lists submitted by members of the Commission). Over several years, the group met nine times, issued 10 reports and exchanged volumes of correspondence, a task made harder by the fact that the members were spread over five countries.

Besides contending with national favoritisms and weeding out nominations that were simply too obscure, the group had to deal with the problem of repetition—lunar and Martian craters, for example, having the same name. There are so many named sites on the moon as a result of manned and unmanned missions that even the namers can barely keep track of them. At one point, a list of Martian names was offered with the statement that there was only a 30-percent "overlap" with the moon, only to have it turn out—*after* the list had been approved—that the nomenclature from the moon's far side had been forgotten. The actual overlap was more than 90 percent. "If it were possible to undo that aspect," says Masursky, "there are a lot of crater students who would undo it."

This does not mean that the lunar names came easily. Differences in photo-interpretation of lunar far-side images required two IAU General Assembly meetings, which only occur every three years, for resolution, and similar complexities and differences are still taking up year upon protracted year of negotiation. Of course, there are other planets to worry about. "The lunar group and the Mercury group," Masursky says, "are still having disagreements about the naming system."

The proliferation of good planetary data, in fact, has become a major problem. Camera-laden spacecraft are yielding 1,000 times as much detail as earlier methods, Masursky points out. Photos come in greater numbers, maps are produced from them more quickly, and since the IAU has no funds for travel to nomenclature meetings, the namers are often further rushed to do their work within the finite lifetimes of the spacecraft mission budgets themselves.

The names cannot simply be slapped on anywhere, however. The needs of mapping (as well as of applying future names without having to fight the whole war over again) require that there be a system. The IAU system for Mars is typically complicated.

First, the planet had to be divided into "provinces"—finite areas suitable for mapping and general location reference. The classic concept, however, defined by differences in albedo (reflectivity), "sometimes proved unworkable in practice," the Working Group reports, "because of the variability of many of these markings and the indefiniteness of their boundaries." (Some "classical" features, in fact, notably the by-now-notorious "canals," hardly seem to correlate with any physical surface markings at all—SN 8/16/75, p. 105.) The planet was therefore parceled into geometric regions corresponding to 1:5 million scale topographic charts now being produced at the U.S. Geological Survey and the University of Texas from Mariner 9 data.

Within 30 degrees of the Martian equator, the regions measure 45 degrees in longitude by 30 degrees in latitude. Moving polewards, the next sections cover 35 degrees of latitude by 60 degrees of longitude, while the polar regions themselves are considered to extend from 65 degrees North and South. The old classical features get recognition, however, in that each official region is designated by the name of a prominent classical feature within its boundaries.

Since no two surface features are exactly alike, the Working Group has divided the miscellaneous Martian markings into 13 categories, all but one named according to classical terminology from the maps of Schiaparelli and Antoniadi. A chain of craters, for example, is a *catena*, a dome-shaped hill is a *tholus*, widespread lowlands are *vastitas*.

The exception is the *valles*, or sinuous channels, which have been intriguingly named after the word for Mars in various, largely non-Indo-European languages. The 11 *valles* named so far are *Al Qahira* (Arabic), *Ares* (Greek), *Auqakuh* (Quechua, the language of the Incas), *Huo Hsing* (Chinese), *Kasei* (Japanese), *Ma'adim* (Hebrew), *Mangala* (Sanskrit), *Nirgal* (Babylonian), *Shalbatana* (Akkadian), *Simud* (Sumerian) and *Tiu* (Old English-Germanic, says Masursky, "from the Phrygian coast").

Of the craters, all those larger than

about 20 kilometers (features smaller than one km are already being mapped) are assigned a two-letter code from *Aa* to *Zz* within each region, in which the first letter is in order of increasing longitude from East to West and the second in order of increasing latitude from South to North. More than 6,000 craters have already been coded, but there's a problem. Only those craters larger than about 100 km are named for people, so the Working Group decided to name the lesser ones after "villages" on earth. Naturally, trouble has ensued. Masursky recalls a concerned letter from one delegate demanding to know, "Who is looking out for the Ethiopian villagers?" (There were even problems with the letter code. Some regions are so heavily cratered that they exceed the 676 possible two-letter combinations. A third letter has had to be added.)

The large craters, the ones that inspire most of the to-do, were to receive names of "prominent, deceased individuals having contributed either to the scientific study of Mars, or the lore of the planet, or to basic discoveries of significance to the exploration of Mars or the interpretation of its phenomena." In actuality, the definition was broadened somewhat, but the list was finally adopted by the IAU General Assembly, says the Working Group's report with awesome understatement, "after extensive discussion."

Numerous classical astronomers are included, of course—Copernicus, Galileo, Huygens, Tycho Brahe, etc.—as well as many more recent Mars-watchers. In addition, however, there are science-fiction writers (Edgar Rice Burroughs, John W. Campbell, H.G. Wells), explorers (Columbus) and all-around visionaries (da Vinci). There are also researchers who, while not associated specifically with Mars, have inspired a wide dispersion of branches from the scientific tree (Helmholtz, Newton, Priestley, Rayleigh, etc.).

Also memorialized in craterdom are several workers whose contributions were primarily biological or medical—Darwin, Mendel, Pasteur—in large measure because of the now-Mars-bound Viking probes and the general interest/hope/faith in the chances of life on Mars.

Then there are the two most recent additions to the list. Early in 1974, at the suggestion of Cornell's Carl Sagan, an original member of the Working Group, the group voted unanimously to add the names of two Mars enthusiasts, respected astronomer Gerard P. Kuiper of the University of Arizona (also a member) and University of Rochester microbiologist Wolf Vishniac, both of whom had died the year before. Both names have been accepted by the IAU Executive Committee.

One of the names that caused delay was not that of a crater at all, but of a huge network of canyons, long enough to span the United States. Named in honor of

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IAU Large-crater Names on Mars

Name	λ	φ
Adams, W. S.	197°	+31°
Agassiz, J. L. R.	89	−70
Airy, G. B.	0	− .5
Antoniadi, E. M.	299	+22
Arago, F.	330	+10
Arrhenius, S.	237	−40
Bakhuysen, H. G. (van de Sande)	344	−23
Baldet, F.	295	+23
Barabashov, N.	69	+47
Barnard, E. E.	298	−61
Becquerel, H.	8	+22
Beer, W.	8	−15
Bianchini, F.	97°	−64°
Bjerknes, W.	189	−43
Boeddicker, O.	197	−15
Bond, G. P.	36	−33
Bouguer, P.	333	−19
Brashear, J. A.	120	−54
Briault, P.	270	−10
Burroughs, E. R.	243	−72
Burton, C. E.	156	−14
Campbell, W. W. and J. W.	195	−54
Cassini, J. D.	328	+24
Cerulli, V.	338	+32
Chamberlain, T. C.	124°	−66°
Charlier, C. V. L.	169	−69
Clark, A.	134	−56
Coblentz, W. W.	91	−55
Columbus, C.[a]	166	−29
Comas Sola, J.	158	−20
Copernicus, N.	169	−50
Crommelin,	10	+ 5
Cruls, L.	197	−43
Curie, P.	5	+29
Daly, R. A.	22	−66
Dana, J. D.	32	−73
Darwin, G. H. and Ch.	20	−57
Dawes, W. R.	322°	− 9°
Denning, W. F.	326	−18
Douglass, A. E.	70	−52
Du Martheray, M.	266	− 6
Du Toit, A. L.	46	−72
Eddie, L. A.	218	+12
Ejriksson, L.[a]	174	−19
Escalante, F.	245	0
Eudoxas,	147	−44
Fesenkov, V. G.	87	+22
Flammarion, C.	312	+26
Flaugergues, H.	341	−17
Focas, J. H.	347	+34
Fontana, F.	73	−64
Fournier, G. and V.	287	− 4
Gale, W. F.	222	− 6
Galileo, G.	27	+ 6
Galle, J. G.	31	−51
Gilbert, G.	274	−68
Gill, D.	354	+16
Gledhill, J.	273	−53
Graff, K.	206	−21
Green, N. E.	8	−52
Hadley, G.	203	−19
Haldane, J. B.	231	−53
Hale, G. E.	36	−36
Halley, E.	59	−49
Hartwig, E.	16	−39
Heaviside, O.	95	−71
Helmholtz, H. von	21	−46
Henry, P. and P.	336	+11
Herschel, W. and J.	230	−14
Hipparchus	151	−44
Holden, E. S.	34	−26
Holmes, A.	292	−75
Hooke, R.	44	−45
Huggins, W.	204	−49
Hussey, T. J.	127	−54
Hutton, J.	255	−72
Huxley, T. H.	259	−63
Huygens, C.	304	−14
Janssen, P. J. C.	322	+3
Jarry-Desloges, R.	276	− 9
Jeans, J.	206	−70
Joly, J.	42	−75
Jones, H. S.	20	−19
Kaiser, F.	340°	−46°
von Karman, Th.	59	−64
Keeler, J. E.	152	−61
Kepler, J.	219	−47
Knobel, E.	226	− 6
Korolev, S. P.	196	+73
Kuiper, G. P.	157	−57
Kunowsky	9	+57
Lambert, J. H.	335	−20
Lamont, J.	114	−59
Lampland, C. O.	79	−36
Lassell, W.	63	−21
Lau, H. E.	107	−74
Le Verrier, U. J. J.	343	−38
Liais, E.	253	−75
Li Fan	153	−47
Liu Hsin	172	−53
Lockyer, N.	199	+28
Lohse, O.	16	−43
Lomonosov, M. V.	8	+65
Lowell, P.	81	−52
Lyell	15	−70
Lyot, B.	331	+50
Madler, J. H.	357	−11
Magelhaens[a]	174	−32
Maggini, M.	350	+28
Main, R.	310	−77
Maraldi, G.	32	−62
Mariner[a]	164	−35
Marth, A.	3	+13
Martz, E. P.	217	−34
Maunder, E. W.	358	−50
McLaughlin, D. B.	22	+22
Mendel, G.	199	−59
Mie, G.	220	+48
Milankovitch, M.	147	+55
Millochau, G.	275	−21
Mitchel, O. M.	284	−68
Molesworth, P. B.	211	−28
Moreux, Th.	315	+42
Muller, G. and H. J.	232	−26
Nansen, F.[a]	141	−50
Newcomb, S.	358	−24
Newton, I.	158	−40
Nicholson, S. B.	166	0
Niesten, L.	302°	−28°
Oudemans, J. A. C.	92	−10
Pasteur, L.	335	+19
Perepelkin, E. J.	65	+52
Peridier, J.	276	+26
Pettit, E. E.	174	+12
Phillips, T. E. R. and J.	45	−67
Pickering, W. H. and E. C.	133	−34
Playfair, R.	125	−78
Porter, R. W.	114	−50
Priestley, J.	228	−54
Proctor, R. A.	330	−48
Ptolemaeus	158	−46
Quenisset, F.	319	+34
Rabe, W.	325	−44
Radau, R.	5	+17
Rayleigh, J. W. (Strutt)	240	−76
Redi, F.	267	−61
Renaudot, G. (Mme C. Flammarion)	297	+42
Reuyl, D.	193	−10
Reynolds, O.	160	−74
Richardson, L. F.	181	−73
Ritchey, G. W. F.	51	−29
Ross, F. E.	108	−58
Rossby, G. G.	192	−48
Rudaux, L.	309	+38
Russell, H. N.	348	−55
Rutherford, E.	11	+19
Schaeberle, J. M.	310	−24
Schiaparelli, G. V.	343	− 3
Schmidt, J. F. C. and O. Y.	79	−72
Schroeter, J. H.	304	− 2
Secchi, A.	258	−58
Sharanov, V. V.	59	+27
Sklodowska, M. (Mme. P. Curie)	3	+34
Slipher, E. C. and V. M.	84	−48
Smith, W.	103	−66
South, J.	339	−77
Spallanzani, L.	273°	−58°
Steno, N.	115	−68
Stokes, G. G.	189	+56
Stoney, G. J.	134	−69
Suess, E.	179	−67
Teisserenc de Bort, J.	315	+ 1
Terby, F.	286	−28
Tikhov, G. A.	254	−51
Trouvelot, E. L.	13°	+16°
Trumpler, R. J.	151	−62
Tycho Brahe	214	−50
Tyndall, J.	190	+40
Very, F. W.	177	−50
da Vinci, L.	39	+ 2
Vinogradsky, S. N.	217	−56
Vishniac, W.	276	−77
Vogel, H.	13°	−37°
Wallace, A. R.	249	−53
Wegener, A.	4	−65
Weinbaum, S.	245	−66
Wells, H. G.	238	−60
Williams, A. S.	164	−18
Wirtz, K.	26	−49
Wislicenus, W.	349	−18
Wright, W. H.	151	−59

λ = Longitude φ = Latitude

[a] Mariner IV designations

Icarus

serving. To some, spinoff is a dirty word tainted with public-relations hype. NASA, which must justify the billions spent on its space extravaganzas to an ever more critical public, cranks out reams of flak about spinoff. Indeed, the introduction to the CERN report makes a remark about that. "Organizations such as NASA have already drawn attention to the existence of the 'spinoff' or 'fall-out' from space expenditures, but have tended more to follow the impact of specific technologies throughout society rather than studying the production figures of contracting firms."

CERN's approach was to be specific. The laboratory engaged the Austrian physicist and economist Helwig Schmied to interview officials of a sample of the companies it had dealt with, get them to say how working for CERN had changed their business and put numbers of Sfr on it. Schmied got information from 127 companies. He found some that had been helped a lot, some that had been helped a little and some that even felt they had been held back. Overall, he arrived at an economic utility figure of Sfr 1,665,000,000 for those firms, against a CERN expenditure of Sfr 394 million on contracts with them. From these figures the overall figure of Sfr 5 billion quoted above is extrapolated.

The businesses were divided into eight categories, and ratios of utility versus amounts of CERN contract were calculated. The ratios ranged from 1.7 for cryogenics and superconductivity, for which there is still little use aside from scientific equipment, to 17.3 for computers and 31.6 for precision mechanics.

Specific examples give the flavor of the kinds of things that happen: As the laboratory's Intersecting Storage Rings were being built, it was decided to assemble the magnets for them in the assembly hall rather than in the tunnel where the rings were to be built. A special kind of transporter was necessary for the delicate job of moving the assembled magnets. A prototype, not yet in production, was found, and CERN took the chance of ordering an advanced version.

The trucks worked successfully, and the manufacturer was later able to find other markets for them. The company said the CERN order had sped up development of the item by three years. One of the non-CERN uses is moving prefabricated sections of ships in shipyards. Shipyard officials told Schmied they probably would not have bought the trucks if they had not had evidence of their successful performance at CERN.

The particle tracks in bubble chamber photographs must be measured on special scanning tables. In CERN's years it has delivered 90 million such photographs to various European laboratories for analysis. Thus, there is a fairly sizable market for scanning tables simply among the laboratories. Companies that used scanning-table designs developed at CERN to produce models for sale to European laboratories found they could sell the tables in the United States and the Soviet Union also. They then began to find non-physics uses for scanning tables: tables to scan the salt contents of human bones *in vivo* with X-rays, and computer-controlled drafting tables for use in road building, automotive design, shipbuilding and other things.

In many instances CERN orders objects that are not standard in production lines, such as special magnets, vacuum chambers and power supplies. It imposes very strict quality standards on these contracts, and what the contractors learn in new methods of quality control has enabled them to offer higher quality goods to their other customers.

A negative example involves a power-surge balancer. Accelerators take electricity in sharp surges, and this can unbalance power grids. CERN has been working on devices to neutralize this, and the company doing the job complains that it lost a year's development time by accepting the contract. It happened that at the same time, power-generating authorities were pressuring all customers who took surging loads (electric railways, for instance) to equalize their draw. The particular company had all its capacity tied to the CERN contract and so could work for nobody else. The CERN work was so sophisticated that its parameters were inapplicable to other customers's needs. When it got off the CERN job, the company was about a year behind competitors. Nevertheless, even in this case, the company found in subsequent years that it could use some of the things it had learned.

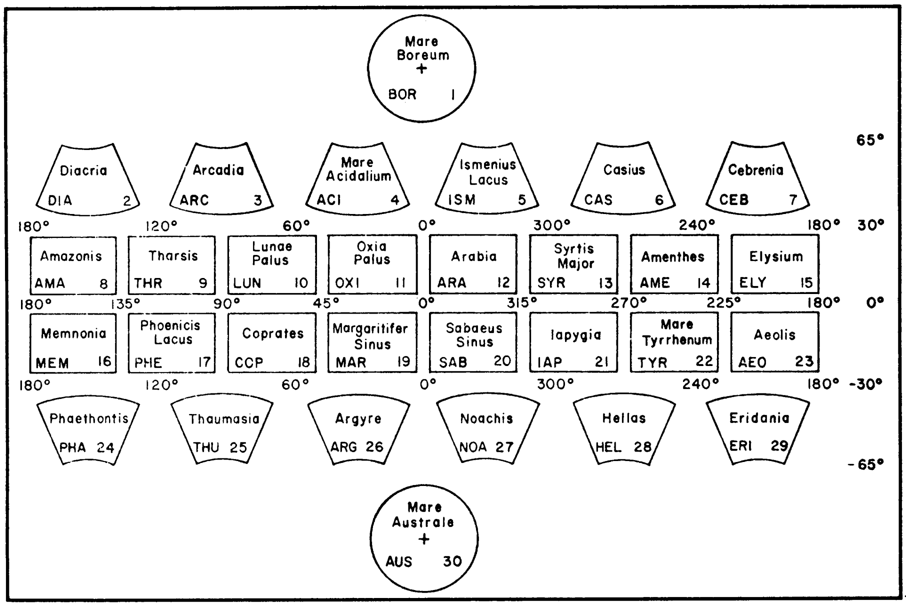
According to the report, monetary benefits to European industry are not the only thing work for CERN has provided. The laboratory's custom of awarding contracts all over Europe has given companies in non-Common Market countries products with which they could do business in the Common Market. Similarly European companies have been able to sell new items outside Europe. Finally CERN's insistence on high precision and quality have upgraded some areas of European manufacturing and helped to narrow the "technology gap" between Europe and the United States. □

. . . Mars

Mariner 9, the spacecraft that discovered it, the vast feature has been formally approved as *Valles Marineris*. At one point, however, the Working Group's Latin language consultant, a Jesuit priest, opposed the apellation for two reasons. First, rather than translating as "Mariner Valleys," he pointed out, the name instead means "valleys soaked in vinegar—*marinated* valleys." Secondly, the IAU nomenclature system contains terms for several types of "negative features," of which *valles* is not the most precisely descriptive. If one went by the official system, which applied to everything else on the list, *Valles Marineris* would instead have become *Chasmata Nauticae*. But the spacecraft would have been forgotten.

And the battle is not over—nor will it be for decades, if ever. There are more Martian names in various intermediate stages of processing, and work on the moon is far from finished. Mariner 10 added Mercury to the list, and high-resolution radar studies as well as spacecraft will soon be creating Venus problems. The current Mars group, profiting from past lessons, is working more smoothly and harmoniously, says the University of Arizona's Bradford Smith, who heads it. But at least it's a good thing that Jupiter doesn't have craters, right?

"Well," says Masursky, "Jupiter has lots of satellites. We anticipate having to put names on 30 more bodies in the next decade." Batten down the hatches. □



Icarus

Official IAU "regions" on Mars suit cartographers rather than classical astronomers.