

## Disharmony of the Spheres: Recent Trends in Planetary Surface Nomenclature

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Inadvisable departures from tradition in naming newly mapped features on Mars, Mercury, and the Moon have been implemented and proposed since 1970. Functional need for place names also has become confused with cartographic convenience. Much of the resulting new nomenclature is neither unique, efficient, nor imaginative. The long-standing classical orientation in Solar System geography needs to be firmly reasserted. The Mädler scheme for designating smaller craters on the Moon should be retained and extended to the farside. Names of surface features on other bodies might best reflect the traditional connotations of planet and satellite names: for example, most craters on Mars would be named for mythical heroes and military personalities in ancient history, craters on Mercury might commemorate explorers or commercial luminaries, and features on Venus would bear the names of famous women.

*Introduction.* The naming of surface features on bodies of the solar system has departed from traditional practice along a new, and questionable, course. The most conspicuous results of the divergent trend are some 300 names recently bestowed on small lunar and large Martian craters (Kinsler, 1975; de Vaucouleurs *et al.*, 1975). They are inferior to the older names in both utility and aesthetics. This sudden deterioration of the nomenclature, which is serious enough to warrant major remedial decisions, arises partly from the rapid growth of planetary science over the last decade. In response to the pressing need for new names to accommodate several planetwide mapping programs, the International Astronomical Union has begun to accept additions to the nomenclature of Mars and the Moon. Most results of the I.A.U. deliberations and rulings, which have appeared in various published and provisional maps of both planets, can be divided conveniently into two groups: pre-1971 decisions and subsequent decisions.

The earlier changes in lunar and Martian geography seem to have been better than the later ones. Most of the 1961, 1964, and 1970 amplifications to the Moon's nomenclature (Arthur *et al.*, 1963, 1964, 1965, 1966; Menzel *et al.*, 1971) harmonize well with the familiar Mädler terminology that was systematized in the 1932 I.A.U.-sponsored compilation (Blagg and Müller, 1935). Most of the new names, which properly commemorate deceased scientists and philosophers, were assigned to large craters on the limbs or farside, and the existing nearside

nomenclature was not disturbed. Appropriately, many new names proposed earlier as replacements for lettered nearside craters by H. P. Wilkins and others (Wilkins and Moore, 1961) have not been adopted by most lunar specialists.

The first changes in the nomenclature of Mars also were quite successful. Because topographic features revealed by the Mariner spacecraft often did not match the named albedo features visible from Earth, an entirely new nomenclature had to be created. The framework of the new system is a planetwide grid of thirty 1:5,000,000 scale quadrangles (Batson, 1973). The names of these areas correspond as closely as practicable to the designations of nearby albedo features from the traditional nomenclature (MacDonald, 1971). The names chosen subsequently for most noncrater topographic features such as canyons and plains also come from names of neighboring albedo markings on the classical maps of Antoniadi and Schiaparelli, and generally are both proper and euphonious (I.A.U., 1974; de Vaucouleurs *et al.*, 1975). A two-lettered locational designation has been assigned provisionally to large craters on Mars (I.A.U., 1971; de Vaucouleurs *et al.*, 1975). This system relies unduly on the 1:5,000,000 grid, but is an acceptable interim convenience pending selection of permanent names and introduces no disharmony into Martian nomenclature.

Not all of the new I.A.U.-approved or provisional nomenclature has followed traditional practice as consistently, however, and the resulting terminology has not been as successful.

The purpose of this paper is to point out specific inconsistencies in recent decisions on planetary nomenclature, to suggest possible alternative approaches, and to open up the problem of place names on the planets to a more general discussion than has occurred in the past.

*New names on the Moon.* No real problem existed with lunar place names until after the 1970 I.A.U. XIVth Assembly, when several new policies were introduced hastily by the Working Group on Lunar Nomenclature of Commission 17:

(1) The 1:1,000,000 scale LAC series maps were formally designated "Regions" and the new 1:250,000 scale LTO maps were designated "Provinces."

(2) Small craters previously designated by Roman capital letters would gradually be reassigned surnames of deceased individuals.

(3) Craters could now be named after non-scientists.

(4) Each new published map would be titled after a named crater within it.

(5) Very small craters would be assigned the first names of persons, and ridges and rilles would bear surnames of deceased individuals.

(6) New Latin terms would distinguish linear from sinuous rilles and also designate landslides.

These decisions, which were approved by the XVth I.A.U. General Assembly at Sydney (I.A.U., 1974), have forced abandonment of the universally accepted Mädler nomenclature for most features on the 1:250,000 LTO maps. The changes have proven to be controversial at the very least (Ashbrook, 1974), and some lunar specialists have chosen not to use the post-1970 lunar designations (Pike, 1974).

The changes instituted at Sydney in 1973 have adversely affected lunar terminology with respect to communication, convenience, and aesthetics, and the problems thus created are expected to worsen as more LTO maps are published:

(1) Use of "Region" and "Province" is incorrect and artificial; the terms denote natural geographic or physiographic areas, not map sheets.

(2) Without the Mädler lettered craters, it is now much more difficult to get located on the Moon, especially using larger scale maps such as the LTOs.

(3) The need to refer to craters mentioned in the existing literature now requires one to keep track of two names for a great many features.

(4) The many new names of small craters

unnecessarily burden the memories of lunar specialists who still are trying to learn the geography of the limbs and farside. The problem is compounded by naming ridges, rilles, and very small craters.

(5) Insignificant craters on the nearside have been named simply to give formal titles to maps.

(6) Use of nonscientist names needlessly disrupts a 300-year tradition and wastes nomenclatural categories that might better be applied to other bodies of the solar system.

(7) Making a genetic distinction between linear and sinuous rilles through Latin terms is unwise, and a formal designation for lunar landslides is unnecessary.

All-in-all, effects of the changes on lunar nomenclature have been the reverse of those anticipated. The new system intrinsically is neither "more precise" nor "more detailed" than the Mädler scheme or a potential expansion of it, but instead hampers communication of information on lunar surface features.

*New names on Mars.* The state of the nomenclature for craters on Mars is, if anything, worse than that for lunar craters. The two systems that have been proposed to supplant provisional (lettered) names of Martian craters duplicate names used on other planets and contrast harshly with the traditional nomenclature. About 180 of the largest craters already have received names of deceased astronomers and other individuals connected with the planet (I.A.U., 1974; de Vaucouleurs *et al.*, 1975), and a few craters on Phobos and Deimos have been similarly named (Veverka *et al.*, 1974). These designations, which were suggested by the Working Group on Martian Nomenclature of Commission 16 and approved by the XVth I.A.U. General Assembly in Sydney, were unfortunate for several reasons, some of which were belatedly acknowledged by the subsequent I.A.U. Working Group for Planetary System Nomenclature (I.A.U./WGPSN, 1974).

First, many of the names on Mars, Phobos, and Deimos are borne by lunar craters. This duplication defeats the very purpose of a nomenclature, a unique designation for each feature of interest; the uniqueness should obtain throughout the solar system, not just for individual planets. The double use of names also creates unnecessary confusion and extra work for investigators who compare craters and other topographic features from planet to planet. Finally, most of the Martian crater names commemorate scientists, a category that traditionally has been reserved for the Moon and has nothing at all to do with the classical Martian place names of Schiaparelli.



The shortcomings introduced into Martian nomenclature by the new names of large craters are about to be multiplied by an even less acceptable scheme for naming the smaller craters, in anticipation of projected 1:1,000,000 and 1:250,000 series of Martian maps. Names for a great many craters 5 to 100km across have been chosen from a list of small towns and villages of the Earth (I.A.U./WGPSN, 1974). Not only are the proposed names unrelated to Mars in any way, but they duplicate place names on another planet. Their adoption also would result in two nomenclatural categories for one type of feature on the same planet, a confusing and needless inconsistency. Finally, the many new names would severely tax the memories of investigators working with craters.

*New names on Mercury and Venus.* Only three features on Mercury have been officially named at this time (Caloris Basin and the craters Kuiper and Hun Kal). Current proposals for future designations on Mercury follow the excellent example of Mars for regional names and albedo markings, but also include the wholly inappropriate notion of naming craters for birds and/or cities of the Earth (I.A.U./WGPSN, 1974). The latter suggestion suffers from all the shortcomings of the town/village class proposed for Martian craters. Birds and cities also would clash with the more rational categories that have been proposed for other types of features on Mercury (Davies and Batson, 1975), and there is some danger that the nomenclature of Mercury could become an unappealing mixture of disharmonious terms. Finally, to the late G. P. Kuiper falls the ironic distinction of becoming the first individual to have been provisionally commemorated on no fewer than three planets, an excessive gesture that ignores the scrupulous care Kuiper took in seeing that the nomenclature of the lunar limb regions was properly revised (Arthur *et al.*, 1963; Ashbrook, 1974).

Firm decisions on the nomenclature of Venus have not yet been made by the I.A.U., although categories connected with women are under study for such time as radar observations permit features to be named. This is an excellent suggestion indeed (I.A.U./WGPSN, 1974). No serious recommendations have been made for nomenclature on the remaining planets and satellites, save to acknowledge that many more categories of names eventually will be required and should be planned for well in advance of actual need.

*Guidelines for nomenclature.* Among the various resolutions recently adopted by the new I.A.U. Working Group for Planetary System Nomenclature (I.A.U./WGPSN, 1974), is a list of

seven toponymic principles (Appendix I). The four working tenets *a*, *b*, *c*, and *e* at the heart of this resolution evidently did not figure prominently in 1971–1974 decisions on planetary nomenclature. In retrospect, some of the current problems on the Moon and Mars would have been avoided simply by emphasizing principle *e* more than *f*. The results of naming craters “on an international basis” have proven to be far less appealing and useful than the traditional Mädler nomenclature on the Moon and the quasifanciful combination of classical mythology and Mediterranean geography heretofore used on Mars.

Other shortcomings in recently approved and pending designations of craters stem from mixing nomenclatural categories on one planet, e.g., scientists vs nonscientists on the Moon and scientists vs towns and villages on Mars, and from using the same name class on more than one planet, e.g., scientists now on the Moon, Mars, Mercury, and Phobos. These inconsistencies could be avoided by faithfully observing the spirit of WGPSN principles *a* and *c*, to which might be added two working guidelines: only one category of names should be used for each type of surface feature on a planet; and name categories applied to one planet shall not be used on another. As a rule, modern place names on Earth also should be excluded, to assure uniqueness in the geography of the planets.

If the nomenclatural problems raised by the maps of the Moon are any indication of what can be expected when other planets are systematically mapped, moreover, a clear distinction must be drawn between functional needs for place names and strictly cartographic requirements. The two have become confused. The decision to change the Mädler lettered crater designations on the Moon arose from a supposed need for unique proper-name titles for map sheets of the 1:250,000 LTO series. In fact such names are inappropriate for these maps, and ample precedent exists in terrestrial cartography for a more functional system of designating LTO map sheets. Two examples are the U.S. Department of Defense 1:1,000,000 scale Operational Navigation Charts of the Earth and the U.S. Geological Survey 1:63,360 scale maps of Alaska.

Most of Alaska is so sparsely inhabited that there are very few place names compared with the conterminous United States, and some sheets of the 1:63,360 series do not have a single name anywhere within the neatline. The cartographers who laid out this series refrained from arbitrarily naming natural features just to have titles for their maps. Instead, the 1:63,360 maps are systematically lettered and numbered within

sheets of the 1:250,000 scale map series, all of which are named. This scheme is conceptually identical with the geometric relation of the lunar 1:250,000 LTO maps to the 1:1,000,000 LAC series (I.A.U., 1974; Kinsler, 1975). It is comparatively easy to get located in Alaska on the 1:63,360 maps once one knows where most of the named 1:250,000 maps are. Similarly, users of the lunar LTO maps would be much better served by the existing alphanumeric map subtitles, e.g. LAC 39A-2, keyed into the LAC with which they already are well acquainted. Analogous schemes would work equally well on Mars and other planets.

Some procedural changes in the way that new nomenclature is proposed and officially adopted might prevent recurrences of the present controversy. Responsibility for new nomenclature should rest largely with those who are the most likely to use it. Although previously the I.A.U. has closely overseen planetary nomenclature, increasing numbers of workers in planetary science are not even astronomers, let alone members of the I.A.U. Decisions on planetary place names should be opened up to a wider circle of potential users than has been permitted in the recent past, so that new nomenclature meets all needs. Changes in nomenclature proposed by study groups such as the I.A.U./WGPSN need to be published and circulated for an extended period, perhaps five years or more, for comment and criticism by the wider scientific community. Only after due deliberation should new nomenclature be formally submitted to the I.A.U. General Assembly for approval.

Planetary place names actually are sanctioned only by widespread use over many decades. Inconvenient or unpopular designations are not likely to gain general acceptance, regardless of official approval, or to reflect favorably upon the sanctioning body. We needn't be stuck with poor nomenclature, however. Decisions that do not serve the best interests of communication and aesthetics can be reviewed by the I.A.U., and the offending designations rescinded in favor of more acceptable terminology.

*Recommendations for the Moon.* The Mädlar system of crater nomenclature, which already is familiar to lunar specialists through the University of Arizona maps and catalogs as well as the 1:1,000,000 LAC maps, should be preserved intact. It works very well indeed and should not be changed. Amplifications of the Mädlar scheme of lettered designations to include very small craters on the lunar nearside and small limb and farside craters generally can be carried out to accommodate any cartographic

need for more detail. Additional large craters on the farside probably should receive proper-name designations so that eventually the densities of named and lettered craters will approach those on the nearside. If the 1:250,000 LTO maps simply must have formal titles, then the Mädlar designations—extended to smaller craters as needed—will suffice. The system is sufficiently flexible to resolve any ambiguities that might be encountered in naming map sheets.

The question arises of what to do about the published LTO maps that carry the new, non-Mädlar names. The fact that a map has been published, distributed, and its nomenclature used does not somehow annoint or hallow the names on it, especially on the Moon. Many of the map names given to lunar craters since 1610 never caught on and have since faded from memory. Few of the new crater names added by Wilkins to his well known 300-inch map of the Moon, for example, have passed into use (Wilkins and Moore, 1961). Subsequent printings of the LTOs can revert to the Mädlar nomenclature and necessary extensions of it.

One final problem remains: the 49 crater designations formally approved at Sydney in 1973, and the many more new names that still are pending I.A.U. approval but already have appeared on the LTO maps. The pending designations all should be dropped, some of the names perhaps being reserved for appropriate farside and limb craters. The 49 approved designations should be mulled over by recognized authorities in the field of lunar nomenclature: undesirable designations should be eliminated and not used again on the Moon; acceptable names should be retained. The new designations for rilles, ridges, and very small craters all should be replaced by Mädlar-type terminology.

*Recommendations for planets.* Whereas the long-standing Mädlar scheme precludes much toponymic innovation on the Moon, greater liberty can be taken in naming localities on Mars and its satellites, on Mercury, and eventually on Venus and the larger planets and their satellites. The principal task is to create convenient and tasteful schemes for designating the abundant craters on many of these bodies. The practice initiated on the Moon, naming craters after prominent philosophers and scientists, astronomers in particular, should not be extended beyond the Moon to avoid duplicating names and also exhausting the roster of truly outstanding individuals in these few categories. The tradition of naming craters for deceased distinguished persons, however, can be continued on other planets with little difficulty.

The need for a greatly expanded nomenclature



for bodies of the solar system can be met by adopting designations from fields of human endeavor not heretofore used. Nomenclature categories that have been proposed by the I.A.U. include artists (painters), musicians, sculptors, and writers and poets (I.A.U./WGPSN, 1974). Although these groups are unobjectionable on general principles, there is no compelling rationale for assigning a specific category to one planet or another. A more logical approach is to let the ancient connotations of the names of these bodies determine, as much as possible, the categories of place names. To the classical Greeks and Romans, Mars or Ares signified war; fittingly, its satellites were dubbed Panic and Terror. Mercury or Hermes represented commerce, fleetness or travel, deftness and wit, and eloquence. Venus or Aphrodite symbolized love and beauty. The rich diversity of these categories might be exploited in expanding planetary nomenclature on a broad cultural basis within the classical tradition that evolved the lunar terminology. For craters, a separate Mädler-type arrangement could be set up on each planet for the less significant objects, once enough of the larger craters were assigned apt proper names.

*Mars and its satellites.* Besides harmonizing as much as possible with the traditional nomenclature of Schiaparelli, Martian place names should reflect the martial arts. Although thus far the I.A.U. has not accepted military figures as a nomenclatural group (I.A.U./WGPSN, 1974), this well-intentioned effort to avoid possible controversy has eliminated the most appropriate class of place names for Mars. Undeniably, if unfortunately, warfare is one of mankind's chief preoccupations and much of the capacity and ingenuity of his civilization has been given over to it. The ancients understood this well, indeed they named a planet after their god of war. Perhaps we should be no less venturesome. An adequate supply of unique Martian place names would be assured, as there are warriors in mythology and recorded history to accommodate every crater on the planet.

The largest craters on Mars should bear the names of mythical heroes (if the named asteroids can be ignored) and military personalities prior to about A.D. 300, the functional end of the Roman Empire in the West and the close of Ancient History, e.g. Achilles, Themistocles, Ramesses, Hannibal, Pompey, Vercingetorix. Emphasis should be on the older personalities to assure that names of the most prominent craters also reflect the same ancient Mediterranean cultures from which Schiaparelli derived his classical designations of Martian albedo features (MacDonald, 1971). These names would replace

the 180 I.A.U. crater designations approved at Sydney in 1973. Smaller Martian craters could be named for military personalities of the Medieval Period, between about 300 and 1500; if still more named craters are needed, an absolute cut-off should be established well before the American Revolution and the Napoleonic era. Designations in this group might include Saladin, Charles Martel, Alexander Nevsky, and Marlborough.

Although it may not prove essential to name very many features on the tiny satellites of Mars, apt designations would reflect anxious states of mind. Terms of opprobrium, evil spirits of mythology, and dark events in the human experience could be assigned to craters on Phobos and Deimos. The perhaps unsettling, though appropriate, result might be terrain features with names like Malevolens (malevolent), Loki, and Fames (famine). Although hardly uplifting to the human spirit, such designations would nicely complement the bellicose names on Mars and also serve as eloquent reminders of the more painful lessons of history.

*Mercury and Venus.* Although the varied connotations of Mercury and Hermes to the ancients would assure a rich and diverse nomenclature for this planet, problems arise with the potential mixing of place-name categories. In any case, the geography of Mercury could well reflect one or more of the following categories: famous explorers and travellers, prominent entrepreneurs and commercial figures, persons renowned for their cleverness and wit, and orators. Such designations might include Prince Henry the Navigator, Lief Eriksson, Lord Clive, Jonathan Swift, and Cicero.

Venus, which soon will be mapped by radar, would feature particularly delightful place names under the guidelines advocated here. Designations based on beauty, grace, and endearment, as well as on historic and mythical lovers—El Amor Brujo, Fairlady, Nefertiti, Leander, and Heloise and Abelard—would also commemorate a greater number of women than have been honored by the present solar system nomenclature. Celebrated women not represented in name categories on other planets also might be considered for Venus.

*Other bodies.* With due attention to classical mythology and some imagination, a workable and aesthetic system of nomenclature can be developed for many of the satellites of Jupiter and Saturn and other members of the outer solar system as the capacity to observe and map their surfaces is achieved. Certainly difficulties will arise. Some of the smaller bodies, especially the

hundreds of named asteroids, commemorate obscure mythical figures and demigods, e.g. Mimas and Oberon, which may not inspire useful categories of nomenclature. In such cases, place names can be drawn from various fields of human endeavor that are not already represented on other planets and satellites, e.g., music, architecture, jurisprudence, literature, and medicine. In any case, the uniqueness of planetary place names and the fundamentally classical orientation of solar system nomenclature need not be seriously compromised.

At the current tempo of space exploration, the present is none-too-soon a time to anticipate the requirements of sound nomenclature for features on bodies of the solar system. A scheme such as that outlined here would reflect the broad spectrum of human experience, endeavor, triumph, and tragedy within an overall classical framework. Whatever solutions are adopted eventually, careful and prompt planning is essential, for the current unsystematic trend toward naming new features cannot continue much longer without breaking down altogether. If the planetary-surface nomenclature that we and those who follow us have to work with is unsatisfactory, we have only our own myopia and timidity to blame.

Appendix I. *Basic principles for planetary system nomenclature* (from I.A.U./WGPSN minutes, June 1974).

(a) Nomenclature is a tool and the first consideration shall be to make it simple, clear, and unambiguous.

(b) The number of names chosen for each body should be kept to a minimum, and governed by the anticipated requirements of the scientific community.

(c) Although there will be exceptions, duplication of the same name on two or more bodies should be avoided.

(d) In general, individual names chosen should be single words, and expressed in the language of origin. Transliteration and pronunciation for various alphabets should be given, but there will be no translation from one language to another.

(e) Where possible, consideration should also be given to the traditional aspects of any nomenclature system, provided that this does not cause confusion.

(f) Solar system nomenclature shall be international in its choice of names. Recommendations submitted by I.A.U. National Committees will be considered. Final approval of

any selection is the responsibility of the International Astronomical Union.

(g) We must look to the future in general discussions of solar system nomenclature and attempt to lay the groundwork for future requirements that will result from the development of the space program.

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