OLD BOTTLE, NEW WINE

Antoniadi mapped and named brightness features on Mercury nearly half a century ago. Now his names have been made official — even though his map was wrong.

BY JONATHAN EBERHART

Given the thousands of close-up photos taken by spacecraft of such diverse worlds as Mars and Mercury, the fuzzy maps drawn by early astronomers would seem to have become mere historical relics. Made from naked-eye observations through often-primitive telescopes at the bottom of earth's flickering atmosphere, such renderings were usually little more than collections of smudges — light and dark areas representing apparent variations in the reflectivity, or albedo, of a planet's surface.

Giovanni Schiaparelli's famous 19th-century Mars maps, for example, were replete with linear features that played a major role in the "canal" business. After comparing the maps with photos from the Mariner 9 spacecraft, however, Carl Sagan and Paul Fox of Cornell University wrote in 1975 that "the vast bulk of classical canals correspond neither to topographic nor to albedo features, and appear to have no relation to the real Martian surface."

Yet it is also true that "seasonal" albedo variations noted by some early observers of Mars may relate to surface changes caused by large-scale movements of dust by the wind. The advance and recession of the polar caps have also been long known from earth-based observations, even though they were not seen in close-up until the 1970s.

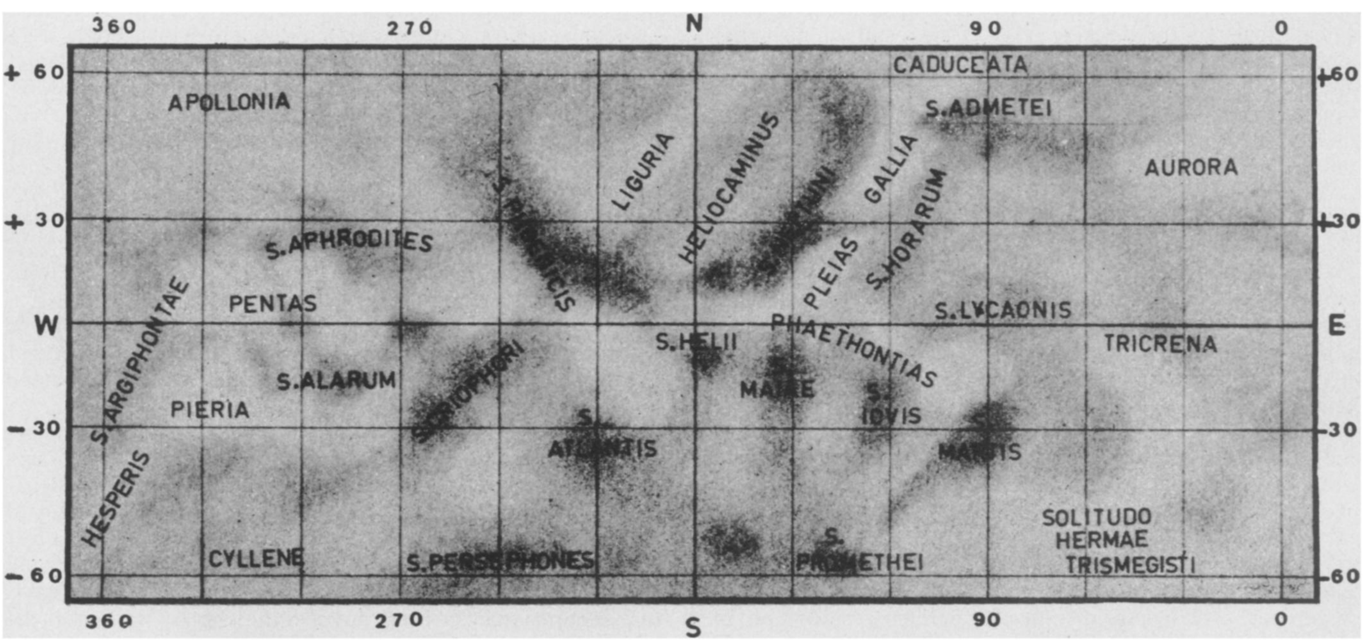
Mercury is a somewhat different matter. As the closest planet to the sun, it follows an orbit that never takes it far off the edge of the solar disk, so it is difficult to observe from earth. As a result, despite great advances in optical astronomy, it was not until the mid-1960s that radar studies revealed its true period of rotation to be just under 59 days. Prior to that time, the accepted view (due in part to Schiaparelli's authoritative say-so and the observational problems of checking him out) was that the planet took about 88 earth-days to turn once on its axis, exactly the same as the length of its year. The major consequence of this error was the mistaken belief that Mercury always had the same side facing the sun. Astronomers thus assumed that they were always seeing the same part of the surface, that the other side was forever hidden from them.

One "victim" of this misconception was the noted astronomer E. M. Antoniadi, a respected Mercury-watcher and long-time observer of its surface. After studying the planet from 1924 through 1929, he prepared an albedo map showing a variety of light and dark markings (see cover), and even gave names to the features as he had shown them. It was more than three decades before it could be known that the hemisphere drawn by Antoniadi in fact contained features from more than 180° of longitude. If a feature that had been observed several times before failed to turn up, particularly under good observing conditions, Antoniadi was sometimes obliged to conclude that perhaps a cloud had gotten in the way.

Actually, says Clark Chapman of the Planetary Science Institute in Arizona, much of what Antoniadi saw *was* from a single hemisphere, due to a peculiar confluence of Mercury's motions and the timespan of the observations. As many as 80 percent of Antoniadi's peerings may have been at the same region, although not for the reason that he assumed. And there still remained the other 20 percent or so to confuse the finished map.

Almost as soon as Mercury's nonsynchronous rotation was known, astronomers began to prepare albedo maps of the entire planet. Chapman produced one in 1967, and collaborated on another in the same year. A third was done in 1972, the year before Mariner 10 was launched to photograph the planet at close range; its authors were Bruce Murray of Jet Propulsion Laboratory (Mariner 10's project scientist), Audoin Dollfus of the Paris Observatory and Bradford Smith of the University of Arizona. When the International Astronomical Union, charged with the naming of planetary features and knowing that Mariner 10's close-ups would soon be available, established a working group on Mercury nomenclature, Dollfus (a member of the group) took an interest in naming the albedo features as well.

The official naming of a planetary surface is a somewhat contentious process, and one participant says that the group members (Dollfus, Chapman, Smith, Merton Davies, Owen Gingrich, Richard



Antoniadi's nomenclature (originally applied to only half of Mercury) as it has now been adopted by the IAU to the whole planet.

IAU Albedo Nomenclature for Mercury

name (and location)	origin of name
Light-Hued Area:	
Apollonia (330 + 50°)	geographic name derived from Apollo, brother of Hermes
Aurora (30 + 45°)	area located at east, at dawn
Australia (0 − 90°)	area around South Pole
Borea (0 + 90°)	area around North Pole
Caduceata (90 + 65°)	from Caduceus, attribute of Hermes
Cyllene (315 − 55°)	mountain in Arcadia, birthplace of Hermes
Gallia (120 + 40°)	from Gallus, cock, or rooster, holy-bird of Hermes
Heliocaminus (170 + 35°)	a room in sunshine. This is the hottest area of planet Mercury's surface
Hesperis (355 − 45°)	area located at west
Liguria (195 + 40°)	from the Italian district, birthplace of the astronomer Schiaparelli, the discoverer of the albedo features on Mercury
Pentas (315 + 15°)	five-sided, an area with five borders
Phaethontias (130 − 0°)	from Phaeton, coachman of the sun cart
Pieria (330 − 20°)	area of Macedonia, in Greece, in which Hermes stole Apollo's oxen
Pleias (140 + 15°)	Hermes, god of the wind, is the son of Pleias Maia, goddess of clouds
Tricrena (40 − 5°)	mountain in Arcadia, location of the bath of Hermes by the nymphs
Dark-Hued Area:	
S. Admetei (90 + 50°)	from Admetos, king of Thessalia, Greece, symbol of the sun-god
S. Alarum (290 − 15°)	from Alae, wings, attribute of Hermes
S. Aphrodites (275 + 25°)	from Aphrodite, goddess of love. With Hermes, she became mother of Eros and Hermaphroditos
S. Atlantis (210 − 30°)	from Atlas, father of Maia, the mother of Hermes
S. Argiphontae (350 − 15°)	from Argiphontes, agnomen of Hermes, who killed Argus, keeper of Io
S. Criophori (240 − 20°)	from Criophorus, keeper of the ram (Aries), attribute of Hermes
S. Helii (180 − 3°)	from Helios. Subsolar point at orbital perihelion for each odd revolution
S. Hermae Trismegisti (50 − 50°)	from Hermes Trismegistos, "Hermes, three times famous"
S. Horarum (110 + 25°)	from Horge, daughter of Zeus, goddess of seasons, waitress of sun-god, coached by Hermes
S. Jovis (125 − 20°)	from Jupiter, father of Hermes
S. Lycaonis (90 − 0°)	from Lycaon, the oldest god of Arcadia. Erected a fane for Hermes at mount Cyllene
S. Maiae (155 − 15°)	from Maia, mother of Hermes
S. Martis (90 − 30°)	from Mars (Ares), freed from capture by Hermes
S. Neptuni (150 + 30°)	from Neptunus, god of sea. Sacrifices were offered up in Rome, jointly for Neptunus and Hermes
S. Persephones (240 − 60°)	from Persephone, daughter of Demeter, ravished by Hermes
S. Phoenicis (230 + 25°)	Phoenix, marvellous bird, symbol of the Sun
S. Promethei (135 − 55°)	from Prometheus, brother of Atlas, associated with Hermes in several respects in the old mythology

A. Dollfus et al/Icarus

Goldstein, James Guest and David Morrison) varied in their interest in working with albedo markings while craters, scarps and other "real" features were the primary order of business. Albedo markings can be of interest, however, possibly relating to broad geochemical and morphological differences on the surface. Mariner 10's photos, furthermore, may have to be compared with as many types of ground-based data as possible, since it may be the 1990s before there is a return mission to Mercury.

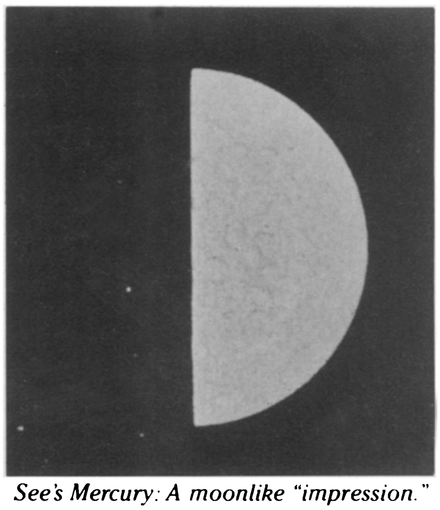
To choose names one-by-one without some guiding principle, says an astronomer who has worked on Martian nomenclature, "would be a horror show." Dollfus and the other members of the Mercury group decided to use the "classical" nomenclature proposed some 40 years before by Antoniadi, based upon mythological names relating to the god Hermes (see chart), the Greek counterpart of Mercury. The areas designated by the names, however, had to be redefined, since they were now based on the understanding that they represented the planet's full 360° of longitude. As it worked out, 28 of Antoniadi's 35 designations were retained, and four new ones were added (Australia, Borea, Gallia and Tricrena). In applying the names, as the group reports in ICARUS (34:210), dark features were given the generic name Solitudo, followed by the proper name in Latin concordance (e.g. Solitudo Alarum, or S. Alarum). The two other generic names used by Antoniadi — Vallis and Promotorium — were dropped. Light-hued features were designated by a single name without any generic term (e.g. Caduceata).

The nomenclature was arrayed on the whole-planet albedo map of Murray, Dollfus and Smith. "The Antoniadi names," says the group's report, "were reallocated in such a way that their relative positions were in some respects preserved, although this was not always possible."

At least one researcher, however, feels that it could have been done better. Writing in the same issue of ICARUS, Lawrence E. Krumenaker of Warner and Swansey Observatory at Case Western Reserve University in Ohio maintains: "While the basis of the IAU map is essentially that of Antoniadi, a casual comparison of the IAU map to the 88-day planisphere will show light region names on dark regions, two additional names of unpublished origin, some rearrangements, and deletions of names of originally prominent features." According to Krumenaker, "the original observations of Antoniadi are almost uniquely locatable on the 59-day maps, and ... a more accurate and rational system can be devised."

He cites a number of differences between his proposed system and the IAU map, such as Heliocaminus, which he says "is *not* east of Liguria but west." "It is understandable that the vallises Neptuni and Horarum are now labeled as Solitudo, as 'vallis' is now reserved for geologic features. It is not understandable how light region Helii prominotorum became S. Helii dark spot!" The naming of Mercury's albedo features does indeed, as mentioned earlier, turn out to be a different matter from the usual crater "name game."

An interesting if controversial sidelight is the matter of turn-of-the-century astronomer Thomas Jefferson Jackson See, some of whose adherents maintain, as does Andrew T. Young of Texas A&M (again in the same ICARUS) that "in 1901, [See] observed craters on the planet Mercury...." See also made a drawing based on his observations, and although extremely faint (even as reproduced in his own book), it does seem to show circular features different from the usual representations of albedo markings. Other researchers aver that it is simply impossible to see craters of Mercury from earth, even with the best of telescopes (See used a 26-inch refractor at the U.S. Naval Observatory in Washington). See did, however, grasp the essential reason — minimal atmosphere — that craters would be possible, and wrote that "in view of our present knowledge of the causes which have produced the craters and larger markings on the lunar surface, it is impossible to doubt that the impression gotten at Washington rests on a real foundation." □



T.J.J. See, from Researches on the Evolution of the Stellar Systems. Vol. II

See's Mercury: A moonlike "impression."