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16*a*. SOUS-COMMISSION DE LA NOMENCLATURE MARTIENNE

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PROGRESS OF RESEARCH

The successful launching of artificial satellites has inaugurated a new era in planetary astronomy. Already a greatly improved model for the uppermost layers of the terrestrial atmosphere has resulted [1] which has repercussions on the general problem of escape of planetary atmospheres to space. The interaction of planetary atmospheres with the interplanetary gas flowing from the Sun and the effects of planetary magnetic fields on the motion of this gas promise to be clarified next. The surface of the Moon, of such great interest to both planetary astronomy and geophysics, may soon be accessible to direct exploration. A much-broadened interest in planetary astronomy has resulted.

Progress has not been limited to these spectacular developments. Radio astronomy has progressed to the point where both extremes of the spectrum transmitted by the atmosphere ($\lambda \simeq 1$ cm and 15 meters) are well observable for some of the planets; and radar pulses reflected by the Moon have been recorded in such detail that they aid materially in the study of its surface texture. Nor have the more conventional approaches—visual, photographic, photo-electric, polarimetric, and spectroscopic—been lacking in important results.

Books or monographs were published on the following topics: *The Planet Jupiter*, by B. M. Peek [2]; *Transfer of Radiation in the Atmospheres of Stars and Planets*, by V. V. Sobolev [3]; 'Planetary Investigations at Kharkov', by N. P. Barabashev [4]; 'The Nature of Planets', by V. V. Sharonov [5]; *The Moon*, by H. P. Wilkins and P. Moore [6]; 'Lunar Eclipses', by F. Link [7]; 'Study of the Planets from the Polarization of their Light', by A. Dollfus [8].

ROTATION

R. S. Richardson [9] in 1956 made a new spectroscopic determination of the rotational motion of Venus and found it to be very small. The dispersions were 0·84 Å/mm and 2·7 Å/mm. Since the axis of rotation is presumably roughly known from the ultra-violet cloud belts, the true period of rotation could, in principle, be computed. Thus 14 days was found, with *retrograde* motion, but with a standard error in the rotational velocity equal to the amount itself. This means that the probability is 6% that the rotational period is *outside* the limits $P > 14$ days direct and $P > 5$ days retrograde [9]. The problem is still as vexing as ever.

Carr, Smith, Pepple and Barrow [10] observed the intermittent radio omission of Jupiter at 18 Mc/s and concluded that several sources appear to exist that have a common period of rotation, $11^{s}8$ shorter than System II. System III, so defined, has a period of $9^{h}\,55^{m}\,28^{s}8$ and may represent the period of the solid planet [10]. R. M. Gallet [11] came independently to the same conclusion.

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H. Camichel [12] measured the rotation of Saturn from a spot observed on plates taken in 1946. The period is $10^h\ 21^m.4$ for latitude $-12°\ 30'$. He also continued his work on the pole of Mars, confirming his earlier results [13].

PHOTOMETRY, COLORIMETRY, POLARIZATION

A. Dollfus [14] constructed a photometer for the study of planetary surfaces based on a new principle, involving a bi-refringent prism and a polariscope. The instrument can be used both visually and photo-electrically, and can be calibrated with stars. It has been used primarily for measurement of planetary photographs.

V. I. Ezersky [15] published a photographic photometry of Venus, confirming V. P. Barabashev's mirror effect from the apparent planetary surface. V. N. Frolov [16] studied theoretically a three-layer model of the Venus atmosphere in an effort to reconcile the intense twilight phenomena and the low value of the horizontal refraction found from Venus transits. Photo-electric photometry on Mars was carried out by Glagolovsky and Kozlova [17], who found the morning side of the planet to have a slightly different color index ($+1^m.48$) from the evening side ($+1^m.59$); by D. E. Shchegolev [18]; and at Abastumani Observatory. V. V. Sharonov continued his visual determinations of planetary colors with a color-wedge photometer and measured Venus, Mars, Jupiter, and the Moon in 1954 [19] and Venus, Mars and Saturn in 1956 [20]. V. N. Lebedinetz [21] published the results of the photographic photometry with color filters made of Jupiter and Saturn in 1951–4. The brightest part of Ring B during opposition was found 0·43 of that of an ideal white surface in visual light.

Dollfus found from his 1952 observations of Mars the phase coefficient $0^m.0145$ per degree and for the magnitude at opposition $-2^m.12$. He also measured the variation between 0·45–0·65μ of the luminance of the bright areas when central on the disk. Further, he determined the luminance in absolute units as a function of the inclination of the surface element, for different phase angles and wave-lengths. These data, compared to calibrations with minerals, confirmed his result obtained from polarization measures, that the desert regions of Mars are covered with pulverized limonite.

A very thorough discussion of the photometric and colorimetric data on the planets and satellites in the interval 0·35–1μ has been given by D. L. Harris [22]; much new material, derived with the 82-inch telescope, is included. The photometry of the lunar surface can be treated in great detail and serves also as a reference standard for the terrestrial planets. This topic has been dealt with by M. Minnaert [23]. The photometry of lunar eclipses is discussed by D. Barbier [24], a topic also treated in the monograph by F. Link [7].

J. H. Focas [25] measured the polarization of different parts of Mars in 1954 and 1956 both at the Pic-du-Midi (1439 measures on 78 nights) and at Athens (563 measures on 52 nights). He also measured on 237 plates the contrast of surface detail with the bright areas near the center of the disk. In this manner he placed the seasonal intensity variations on a quantitative basis and found that the darkening observed in spring moves from pole to equator with a velocity of 36 km per day. Focas made a 3-year series on Jupiter at Athens, which showed the negative polarization to be slightly stronger in the dark belts than in the bright zones, while the Red Spot and the brilliant white clouds showed a still stronger negative polarization.

Dollfus [26] studied the polarization of Venus in green and yellow light, and found the distribution non-uniform over the disk. The perturbed regions do not seem to coincide with the visible and ultra-violet clouds. The plane of polarization is often abnormal, suggesting striations in the clouds. The polar regions show always abnormal polarizations. The polarization makes possible an estimate of the atmospheric pressure at the cloud level; approximately 90 millibars is found. Dollfus [27] concluded from the variation of the polarization of Jupiter with wave-length that the atmosphere above the cloud level is not pure, but contains fine droplets or crystals approximately 1μ in diameter. Dollfus reports further that new observations of the polarization of the variable dark areas on Mars show an abrupt change at the time of Martian spring, approximately coinciding with the inferred passage of the atmospheric water vapor from the evaporating pole. He concludes that these Martian regions have a granular structure and finds it difficult to interpret his observations on the basis of simple mineral processes; instead some microscopic form of life may tentatively be assumed. A. Dollfus has summarized his extensive work on planetary polarization in the monograph referred to [8], and has assembled his associated laboratory investigations in a separate publication [28]. Measures of the polarization of Venus at 1μ and 2μ were made by G. P. Kuiper [29] and used by him in a discussion of the nature of the Venus cloud layer. It was found that the clouds cannot be composed of water droplets, but may be polymerized C_3O_2.

SPECTRA AND TEMPERATURES

A good synopsis of spectral studies of planets and related atmospheric problems is found in *Les Molécules dans les Astres* [30], Section 1 (Papers 1–27). A few of the studies are mentioned here. N. A. Kozyrev [31] with the 50-inch reflector at the Crimea obtained spectra of the dark side of Venus and discovered the emissions $\lambda 3914$ and $\lambda 4278$ of N_2, which occur in the terrestrial aurora; several unidentified lines were found also. The total luminosity of the Venus night sky was estimated to be about fifty times that of the Earth. The presence of $\lambda 4278$ in the Venus spectrum, and two emissions at $\lambda 4140$ and $\lambda 4188$, were confirmed by G. Newkirk [32] at High Altitude Observatory, Colorado. The total energy in the three bands was found about 200 times that received from $\lambda 5577$ in the terrestrial airglow. Kozyrev [33] also made a detailed photometric comparison of the Sun and Venus between 3800 and 6500 Å. He found two unidentified molecular bands, $\lambda 4372$ and $\lambda 4120$, which are not present in Mars and Jupiter, but are present in the solar spectrum when photographed near the horizon. Kozyrev concluded that the molecules that cause these bands have an abundance in the terrestrial atmosphere of about 10 % of that of Venus.

C. C. Kiess [34] and collaborators took high-dispersion spectra of Mars and were unable to see the CO_2 bands near 8000 Å. This is not surprising in view of the weakness of the Martian bands at $1{\cdot}6\mu$, only twice those in the terrestrial atmosphere. The $\lambda 8000$ bands of CO_2 are invisible in the telluric spectrum. Similar negative results were found by R. S. Richardson [35]. Kiess [34] *et al.* also tested the presence of Doppler-shifted companions to the telluric O_2 and H_2O absorptions, but found no trace of them.

G. P. Kuiper [36] observed the $2{\cdot}0\mu$ bands of CO_2 on Mars with an improved IR spectrometer; the intensities are compatible with those of the $1{\cdot}6\mu$ bands. W. M. Sinton [37] observed the spectrum of Mars near $3{\cdot}5\mu$ and found an indication of absorptions attributed to the C–H bond. This would favor the presence of organic matter on the planet. Kuiper [36] examined the infra-red spectra of the Jupiter satellites and found II and III to be quite deficient beyond $1{\cdot}5\mu$ which is attributed to the presence of H_2O snow on these bodies. A similar abnormal reflexion spectrum is shown by the rings of Saturn.

Temperature measures of Venus were published by Pettit and Nicholson [38] and by Strong and Sinton [39]. In both series the temperature of the dark side and the bright side were found to be essentially equal, at 240° K. The rotational temperature of Venus derived from the near-infra-red CO_2 bands was computed by Chamberlain and Kuiper [40]; the result is $285°\ K \pm 9°$. Of special interest are the temperatures derived from $\lambda = 3$ cm described below (Radio Observations). The Venus temperatures were used by Kuiper [29] in his study of the atmosphere of that planet. Studies of Martian temperature regime were made by A. I. Lebedinsky [41] and S. L. Hoss [42].

ATMOSPHERIC AND LABORATORY SPECTROSCOPY

An Atlas of the Solar Spectrum with identifications, for the interval from $2{\cdot}8\mu$–$23{\cdot}7\mu$, was published by Migeotte, Neven and Swensson [43]. This Atlas is the basis of planetary studies beyond the PbS region. Associated laboratory spectroscopy on N_2O, CH_4, NH_3 for $2{\cdot}8\mu$–10μ was done by the same authors jointly with E. Vigroux [44]. A. Adel continued his studies of ozone temperatures by spectroscopic methods. Because of the importance of CO_2 for the thermal regime on Venus and Mars, attention is called to three papers by G. N. Plass [45] and references there given. G. Herzberg reports on laboratory work, as follows:

In *Transactions*, vol. IX, attention was called to the near agreement in the wave-lengths of the diffuse lines found by Kuiper in Uranus near 7500 Å and an absorption band found in the laboratory and at that time believed to be due to the HCO radical [46]. Further laboratory work on this spectrum has shown that it is in fact not due to HCO but to HNO [47]. Previously only the spectrum of the deuterated molecule had been observed but now both HNO and DNO have been studied. The prediction of a spectrum of HCO on the basis of that believed to be due to DCO was of course not borne out by the observed data for HNO, and, therefore, agreement between the HNO band at 7500 Å and the Kuiper band observed in Uranus no longer exists. The near coincidence of the two bands must be considered as chance and neither HCO nor HNO can be considered as having been detected in the atmosphere of Uranus [48].

The main spectrum of HCO which has been found in the laboratory is not affected by the reassignment of the 7500 Å band [49]. Detailed wave-length data and constants for the HNO spectrum will be presented shortly.

The spectrum of CH_3 has been observed for the first time both in the quartz ultra-violet and in the vacuum region [50]. Neither of these spectra are at present accessible in planetary observations but an attempt is being made to find an additional predicted spectrum of CH_3 which should lie in the accessible region and which might be detected in the atmospheres of the major planets with their large amounts of methane.

The analysis of the spectrum of NH_2 has been completed and on this basis it is now possible to see which particular lines of NH_2 if any, should be observable in the atmospheres of the outer planets [51].

An extensive investigation of the spectrum of CO_2 in the near infra-red has been completed [52], containing accurate molecular constants and precise wave numbers of a large number of bands which may eventually become important in the study of the absorption spectrum of the atmospheres of Venus and of the Earth.

Further work on diatomic molecules has been carried out. Of possible importance for the study of planetary atmospheres may be the work on the forbidden transitions of CO in the region below 2000 Å [53], as well as the work on NO and NO^+ [54], and on O_2 [55].

RADIO AND RADAR OBSERVATIONS

The sensitivity of microwave receivers has been increased to the point that radio observations of planets are now possible. They are still limited to the extremes of the observable radio spectrum: the thermal component, $\lambda < 10$ cm, an extension of the infra-red emission spectrum, and the non-thermal (presumably ionospheric) component, with $\lambda \simeq 15$ meters (20 Mc/s), the region just above the critical frequency of the terrestrial ionosphere. If the non-thermal component is indeed due to the planetary ionosphere, the electron density must be roughly 10^6 cm^{-3}, the same or slightly higher than in our F layer.

A synopsis of the status of planetary radio astronomy is found in the special Radio Astronomy issue of *Proc. Inst. Radio Engrs, N.Y.* January 1958. Meyer, McCullough and Sloanaker [56] published the first microwave temperatures of Venus, Mars, and Jupiter, based on observations made in 1956; for Venus at $\lambda = 3{\cdot}15$ cm they found $T = 580°$ K $\pm 60°$ (m.e.); for Venus at $\lambda = 9{\cdot}4$ cm, 580° K $\pm$ 230° (m.e.); for Mars at $\lambda = 3{\cdot}15$ cm, 218° K $\pm$ 76° (m.e.); and for Jupiter at $\lambda = 3{\cdot}15$ cm, 144° K $\pm$ 24° (m.e.). Improved signal-to-noise ratios have since been obtained on Jupiter and Saturn by Ewen and Drake [57] with a broad-band radiometer operating at $\lambda = 3{\cdot}75$ cm. Since the antenna gain was not well calibrated, the Jupiter temperature, about 200° K, is somewhat uncertain; the total emission from Saturn and its rings was 4·3 times smaller than for Jupiter. Still better signal/noise was obtained by Townes and Sloanaker [58] using a MASER at liquid-helium temperatures on several planets.

Jupiter was the first planet to show long-wave ($\lambda \simeq 15$ meter) emission, discovered by Burke and Franklin [59]. Reference is made to chapters by Burke [60] and Gallet [11] and to the paper by Carr, Smith, Pepple and Barrow [10], in which the radio sources were found to exhibit constant rotation. F. F. Gardiner and C. A. Shain [61] found the greatest intensity to be at 19·6 Mc/s and lesser intensities at 14 and 27 Mc/s; and that the cone of emission was greater at 19·5 than at 27 Mc/s. The origin of the emission is thus assumed to be a plasma oscillation in an ionized region with a critical frequency around 20 Mc/s. H. J. Smith at Yale University reports observations of Jupiter at 21·1 Mc/s and suspected emission from Saturn, both early 1957.

The lunar microwave emission, in its dependence on the monthly phase cycle, has been derived by Piddington and Minnett [62] at $\lambda = 1·25$ cm, by Akabane [63] at $\lambda = 10$ cm, by Zelinskaya and Troitski [64] at $\lambda = 3·2$ cm, and by Gibson [65] at $\lambda = 0·85$ cm. Gibson also observed the total lunar eclipses of 1953 January 29, and 1954 January 18, which caused no decrease in the radio emission. The phase curve for 8·5 mm was found to indicate a dust layer on the average of several cm or more in depth [65].

Lunar radar echoes have become an important tool. The principal result to date is that at $\lambda = 10$ cm and $\lambda = 150$ cm the lunar surface is quite smooth [66, 67]; this is found from the sharpness of the returned pulse: half of the returned energy at $\lambda = 150$ cm is received in the first 30–40 μsec. This is very different from the optical range where the Moon has no limb darkening. The Moon is, therefore, very rough in the micron and submicron range. At 1·5 meters the reflected beam has half the energy confined to a circle of one-tenth of the lunar radius [67]. Similar results have been obtained by Lovell. Such near-specular reflexion may be observed on the Earth above dry sandy soil [66]. The reflexion at $\lambda = 10$ cm seems to depend on the lunar libration, which adds to its potential interest.

VISUAL AND PHOTOGRAPHIC STUDIES OF SURFACE DETAIL

Venus. A. Dollfus [68, 69] found that when photographs taken in yellow light are copied into contrasty composites they usually show large dusky spots that can also be seen visually. A combination of such records tends to show a stable configuration with respect to the terminator that is disturbed only by overlying veils. This result would indicate that the periods of rotation and revolution are equal—unless the configuration is meteorological in origin. Ultra-violet photographs show bright areas that appear to coincide with the obscured areas seen in yellow light. J. Focas made similar observations with the 16-inch at Athens. He privately reports an observation made in 1948 showing the planet near dichotomy, with the illuminated portion broken up into small bright cumuliform elements. G. P. Kuiper and A. P. Lenham, with the 82-inch, a binocular eyepiece (900×), and excellent seeing on 1956 August 28, independently observed the same type of structure except that the bright spots were smaller and much more numerous (several hundreds), not unlike solar granulation, but much smaller (about $0''.2$).

Discussions of the planet Venus were published by F. Link [70, 71, 72], G. P. Kuiper [29], and Urey and Brewer [73]; the latter discussion includes Mercury and Mars.

Mars. The 1956 opposition was awaited with keen interest but proved somewhat disappointing for studies of surface detail, owing to the planet-wide dust storms that developed about 12 days before opposition. Several reports on this opposition have already been published: R. S. Richardson [74], Mt Wilson; G. P. Kuiper [75], McDonald; S. Miyamoto [76], Kwasan; A. Dollfus and J. Camus [77] and A. Dollfus [78] on reports received; and the B.A.A. Mars Section [79] for the B.A.A. Programs at several observatories were co-ordinated by the Mars Committee; observations in the U.S.S.R. were co-ordinated by a national committee. A. A. Kalinjak obtained photographs of Mars at 0·85 μ and 0·95 μ with an image converter. Numerous photographs were taken at Kharkov, Stalingrad, Tashkent (Leningrad expedition) and Alma Ata. Observations were made at the Pic-du-Midi by J. Focas and A. Dollfus, which attained a resolution of 60 km.

A map of visual and photographic detail observed at Pic-du-Midi in 1954 and 1956 was constructed by J. Focas. At Athens some 100 calibrated plates with 2000 images in yellow

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and red light were made, which are being measured photometrically and for the extent of the polar cap. At Mt Stromlo, Australia, a series was taken with the 26-inch refractor showing some degree of blue clearing [80]. At the Lowell Observatory 305 plates with 15 000 images were taken which show some blue clearing between 20 and 26 August. A long series was obtained by E. C. Slipher at Bloemfontein, South Africa.

Some conclusions of the 1956 opposition were listed by E. H. Collinson [79]. Kuiper and Lenham [75] found the colors of the dark areas to be neutral gray. Several observers have charted cloud motions.

G. de Mottoni made a series of planigraphs based on the Mars photographs taken at Pic-du-Midi during the oppositions 1941–54. These planigraphs greatly facilitate the study of seasonal and irregular changes. They are reproduced in a chapter by A. Dollfus [81]. Reference is made to the report of Commission 16*a*, below, showing an 'average' map constructed by de Mottoni, and based on his several seasonal maps. H. M. Jeffers [82] has announced that photographs of Mars taken at Lick Observatory since 1939 are being reproduced and are available to interested astronomers. Excellent color photographs were obtained by W. S. Finsen both in 1954 and 1956 [83].

Jupiter. Visual observations over the past three years have shown:

(*a*) The South-Tropical Disturbance reappeared quite strongly in 1955–6, only to fade again by late 1957 [85].

(*b*) A South-Tropical dark streak appeared in 1957 [86, 87].

(*c*) Two South-Equatorial spots with a rotation period of $9^h\ 58^m$ were seen in 1957 and appeared to belong to the circulating current [87].

(*d*) A new South-Equatorial outbreak started April 1958 [88].

J. Focas during 1955–7 took some 100 plates with 2000 images for a study of the drift of the belts and the lifetime of cloud formations. He made also extensive visual observations. V. G. Fessenkov discussed the nature of the Jupiter cloud motions. See also under 'Radio Observations'.

Saturn. H. Camichel made a photometric study of Rings A, B, C. A. Dollfus determined the detailed intensity distribution of the Rings with the 82-inch telescope, and the polarization at the Pic-du-Midi. A theoretical study of the mass distribution was made by M. Leroy. The occultation of B.D.-20° 4568 on 1957 April 28 by the Rings was observed by Westfall [88 *a*].

PLANETARY INTERIORS

H. Jeffreys [89] and P. J. Message [90] developed the second-order theory of the figures of Jupiter and Saturn. They found that the data for Saturn fit well with the model S_2 of Miles and Ramsey, with 17% of the mass in a central body; and those for Jupiter with model J_3, with 5% of the mass in a central body. It is noted that the absolute masses of the central bodies are thus nearly equal, which accords well with Kuiper's conclusion that the proto-planet masses of Jupiter and Saturn were nearly equal [91].

Jeffreys [92] has found that the damping of the variation of latitude can be explained by elastic afterworking in the Earth's shell on two hypotheses, according to which the time needed to approximate to the final yield under long-continued stress is a few weeks or 250 days. The former is found to give satisfactory explanations of the rotations of the Moon and Mercury. The latter is doubtfully adequate for the Moon and definitely inadequate for Mercury. Elastico-viscosity is also inadequate. Application to the satellites of Mars shows that bodily tidal friction in Mars cannot account for the published secular accelerations on either hypothesis; however, the published values may be spurious.

In further work [93] he has examined a rule of C. Lomnitz, found to fit rocks in the laboratory, according to which the creep increases logarithmically with the time, and a modification in which it increases like a low power of the time. The data indicate $t^{0.17}$ or possibly $t^{0.2}$. These are also capable of providing enough tidal friction.

K. E. Bullen [94] re-examined the constitution of Mars on the basis of improved empirical data. S. V. Kozlovskaya [95] examined the hydrogen content of Jupiter and Saturn and found 70–90% for Jupiter and 50–70% for Saturn. On the basis of new computations on the thermal and mechanical properties of hydrogen and helium, W. C. de Marcus [96] found the hydrogen contents in excess of 78% and 63% respectively. A summarizing chapter on planetary interiors was completed by R. Wildt [97] who published a descriptive version elsewhere [98].

ASTEROIDS

The Yerkes-McDonald Survey of asteroids was completed [99]. The results include a list of photometric magnitudes for the Ephemeris asteroids (1–1616), which has since been supplemented by additional work by Gehrels *et al.* [100] The combined list has been presented to Commission 20 and is reproduced on pp. 305–16. The Survey also led to a determination of the brightness distribution of asteroids in different distance rings from the Sun. Considerable population differences were found and within each of the three principal rings the distribution was shown to be bimodal. Detailed photometry and the study of asteroid rotations was continued by T. Gehrels [101] and I. and C. J. van Houten [102]. Asteroid magnitudes were also derived at Heidelberg by Pohl. The derivation of asteroid shapes and obliquities was discussed by C. Cailliotte [103]. H. Haupt made 306 two-color observations of Vesta at Lick Observatory in 1951–2 and derived a retrograde rotation.

LUNAR STUDIES

A. Dollfus [104] made polarimetric and photometric observations with the coronograph which enabled him to put an upper limit of 10^{-10} terrestrial atm. for a possible lunar atmosphere. Costain, Elsmore and Whitfield [105] observed a radio occultation of the Crab Nebula and Elsmore [106] derived 10^{-13} atm. as a plausible upper limit. Observation of the phase lag of the emission at $\lambda = 1{\cdot}5$ mm allowed W. M. Sinton [107] to derive a mass absorption coefficient of $2{\cdot}9$ cm^2 g^{-1} for the lunar surface material. Gilvarry and Hill [108] studied the theory of lunar impacts. R. B. Baldwin reports that he has derived improved relationships between diameter, depth, rim width, rim height, and energy, for explosive craters ranging in diameter from 6 cm to the largest lunar craters. He derived similar relationships from sub-surface bursts.

A. Senouque attempted to determine from stereoscopic measures the relief and figure of the Moon by a method described before [109]; the uncertainty is $\pm 0{\cdot}5$ km per point. Th. Weimer is measuring 120 plates for a new determination of the physical libration and the quantity f. Preliminary result is $f = 0{\cdot}60$. He is also deriving for 24 small craters the three polar co-ordinates. Reference is made to Dr Watt's report in Commission 17.

G. Fielder [110] and D. Alter [111] have discussed the significance of certain lunar surface detail. H. C. Urey [112] gives a survey of previous lunar studies and presents his own views. G. P. Kuiper [113] discusses a set of new photographs and an interpretation of lunar surface features.

Many investigations of the lunar surface and its spectro-photometric properties have been carried out in the U.S.S.R. J. Dubois [114] had reported evidence of luminescence on the Moon in the visual spectrum. N. S. Kozyrev [115] appears to have found confirmatory evidence in the Aristarchus-Herodotus region. Colorimetric studies were made by N. P. Barabashev and colleagues at Kharkov [116] and by V. V. Sharonov *et al.* at Leningrad [117]. The results obtained by V. V. Sharonov, N. S. Orlova, L. N. Radlova, and N. N. Sytinskaya have enabled the last author to develop the hypothesis that the lunar surface is covered with a dark scoria originating from bedrock through high temperatures due to meteorite impact explosions [118]. N. S. Orlova published a photometric list of eighty-six lunar details [119] and obtained diffusion curves for maria and continents [120]. She further compared these curves with terrestrial samples and artificial models with very rough surfaces. The lunar diagrams are even more extreme, showing that the lunar surface is more cut up than any laboratory samples [121]. A. V. Markov [122] constructed a self-recording electro-polarimeter and measured forty lunar areas of different types. Dark-bottomed craters (Schickard, Grimaldi, etc.) were found to have less polarization than maria of the same albedo. Comparisons with meteorites were also made. N. N. Sytin-

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skaya [123] derived the brightness of full Moon as 0·34 ± 0·01 lux. A study of the physical libration was published by G. S. Rechtenstamm [124].

G. P. Kuiper and associates are producing a photographic Lunar Atlas. The visible part of the Moon is divided into forty-four areas, each of which is shown under four different illuminations in Part I of the Atlas, which contains also a co-ordinate grid and names or other designations.

Lunar eclipses were observed by J. H. Focas [125] at Athens and by V. V. Sharonov and collaborators at Leningrad [126]. They were treated in monographs by F. Link [7] and D. Barbier [24].

PROBLEMS OF ORIGIN

H. Spencer Jones [127] reviewed 'The Origin of the Solar System'. More recent reviews are given by G. P. Kuiper [128] and H. C. Urey [129]. H. C. Urey has considered various aspects of the origin of the solar system including: the possible existence of bodies of roughly lunar mass during early stages in the planetary development [130]; problems presented by the structure and composition of the meteorites and of diamonds [131]; a possible origin of tektites [132]; chemical heating resulting from reactions of unstable compounds acquired during the accumulation stages [133] (with B. Donn); and the cosmic abundances of Potassium, Uranium and Thorium and their relation to the heat balances of the Earth, Moon and Mars [134]. The hypothesis of turbulence in the protoplanetary cloud is considered by V. S. Safronov and E. L. Rouskol [135]; the accretion of terrestrial planets is studied by V. S. Safronov [136]. G. P. Kuiper [137] and E. Rabe [138, 139] have discussed problems connected with the origin of Pluto and its subsequent orbital developments. The separation of molecules during the formation of the planets has been investigated by B. J. Levin [140].

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President of the Commission

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16*a* SOUS-COMMISSION DE LA NOMENCLATURE MARTIENNE

Le travail de la Sous-Commission a pour but d'améliorer le procédé d'identification et de désignation des détails de la surface de la planète Mars.

Ce programme a été entrepris au début par G. Fournier, et l'Union Astronomique l'avait chargé, au cours de sa huitième Assemblée, de diriger la Sous-Commission. Le décès ne lui a pas permis d'achever cette tâche.

La Commission désire d'abord exprimer sa gratitude envers son regretté Président G. Fournier.

Le nouveau Président a recueilli les propositions et suggestions des divers membres de la Commission, et de plusieurs autres personnalités.

Après examen de ces documents et consultation auprès de plusieurs observateurs planétaires qualifiés, la Commission a retenu et élaboré les propositions suivantes:

I. BUT

Les désignations et identifications des régions martiennes doivent convenir à deux besoins actuels:

(1) Les études topographiques à moyenne ou grande résolution, en réservant éventuellement pour l'avenir la possibilité d'observations à beaucoup plus grande résolution, sans entrainer un accroissement de la complexité des désignations.

(2) Les études physiques telles que les mesures radiométriques, photométriques, spectrales, polarimétriques, qui concernent le plus généralement des régions relativement étendues de la surface du disque.

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Ces études sont souvent mises en œuvre par des astronomes ne connaissant pas nécessairement la nomenclature martienne traditionnelle. Il doit être tenu compte:

(*a*) De la quasi permanence des grandes formations de la surface du sol, malgré des variations saisonnières ou fortuites souvent importantes.

(*b*) Du caractère éphémère de toutes les formations martiennes de petite dimension, lesquelles apparaissent presque toujours aux oppositions successives avec des configurations nouvelles.

(*c*) De la continuité avec les habitudes antérieures et les mémoires publiés.

II. PRINCIPE

Afin d'éviter la complexité croissante ayant résulté de l'accumulation de désignations nouvelles, la Commission a établi les principes suivants:

(1) *Les grandes régions* sont désignées par un nom propre emprunté à la mythologie, conformément au procédé classique antérieur.

Un nom est relatif à l'ensemble de la région considérée, il la désigne globalement. Exemple: Arabia; Mare Sirenum.

(2) *Les petits détails* sont désignés par leurs coordonnées planétographiques. Ces coordonnées sont reportées sur une carte avec la précision des meilleures déterminations actuellement disponibles. Elles définissent en elles-mêmes un étalon de référence, indépendamment des modifications que les mesures ultérieures plus précises pourraient entrainer: exemple: (189°, −2°); (22°, +28°).

Les coordonnées ne doivent pas être considérées comme un nom décerné au détail de la surface, mais comme un procédé pour en désigner l'endroit ou le décrire.

Dans le texte, on peut employer en outre les termes descriptifs tels que: fons, palus, nix, lacus, regio, mare, et adjoindre le nom de la contrée ou de celles voisines.

(3) Les désignations non retenues mais antérieurement en usage restent toujours justifiées, mais dans l'avenir ces dénominations deviendront de plus en plus difficiles à identifier, et leur emploi n'est pas conseillé.

III. REMARQUES

Les mesures physiques effectuées sur différents points du disque peuvent être repérées soit par le nom de la région concernée, soit par les coordonnées du centre du domaine examiné.

Les coordonnées permettent d'identifier ou de désigner les petites taches, les accidents d'un contour, les extrémités d'une traînée, les limites des régions variables, le pourtour des nuages.

Les coordonnées permettent le calcul des dimensions d'une région, de sa surface, de la distance de deux points, de la vitesse de déplacement des nuages.

La position d'une région sur le disque au moment de l'observation, l'inclinaison des rayons lumineux qui l'éclairent ainsi que la direction d'observation peuvent se calculer immédiatement par la connaissance des coordonnées.

IV. DÉTERMINATION DU RÉSEAU DES COORDONNÉES

On a sélectionné et comparé les meilleures déterminations classiques des coordonnées des taches; les mesures les plus précises semblent résulter de l'étude des clichés récents. H. Camichel a déterminé sur les clichés obtenus au Pic du Midi de 1941 à 1954 le diamètre du globe: $d = 9''.33$, la position du pôle Nord: $\alpha = 316^{\circ}.8$, $\delta = +53^{\circ}.0$, et les coordonnées relatives aux éléments précédents de 260 taches caractéristiques de la surface. Parmi celles-ci, 38 points particulièrement bien définis ont été sélectionnés, afin de constituer un choix de repères fondamentaux.

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V. CONSTRUCTION DE LA CARTE

Six cartes planisphères ont été établies par G. de Mottoni, à l'aide de la collection des clichés du Pic du Midi. Ces cartes reproduisent l'aspect de la surface martienne pour chacune des oppositions successives de 1941, 1943, 1946, 1948, 1950 et 1952. Elles ont ensuite servi à l'établissement d'une carte finale, ne contenant que les détails qui se sont révélés suffisamment permanents pendant les onze années consécutives.

La carte finale est représentée pour les portions du globe comprises entre les latitudes +60° et −60° selon le système de projection de coordonnées en usage depuis Schiaparelli; cette projection est voisine de celle de Mercator mais elle n'en suit pas exactement la loi en latitude. Les régions polaires sont reproduites en projection zénithale équidistante, avec même échelle que les régions équatoriales.

VI. CHOIX DES DÉNOMINATIONS

Dans son mémoire classique sur la planète Mars publié en 1930, E. M. Antoniadi avait catalogué 558 régions nommées; un grand nombre de ces dénominations concernent des taches petites, que les observations antérieures ont révélé variables ou éphémères. Cette liste a été réexaminée par G. Fournier; le rapport de la Sous-Commission présenté en 1955 à la huitième Assemblée de l'U.A.I. ne contenait plus que 404 noms. Cette nouvelle liste a encore été examinée, et finalement 128 dénominations seulement ont été retenues. Les régions nommées de la sorte sont réparties à peu près uniformément sur la surface du globe.

Quelques modifications ont dû être apportées à la nomenclature classique:

(1) La région (90°, −40°) primitivement nommée Thaumasia-Foelix est désignée seulement Thaumasia.

(2) La région centrée sur (75°, −20°) ne possédait pas de nom. En raison de sa proximité avec Mare Erythraeum, cette tache claire, probablement élevée a été désignée Sinaï.

(3) La région non dénommée (100°, −20°) voisine de Phoenicis Lacus a été baptisé Syria.

(4) Les deux régions voisines et pourtant très différentes (255°, −40°) et (263°, −25°) étaient désignées Ausonia Australis et Ausonia Borealis. Le nom plus court Ausonia a été attribué à la première de ces deux contrées.

(5) L'ancien Ausonia Borealis (263°, −25°) a été désigné Trinacria. Ce choix est suggéré par les positions respectives des formations Hellas, M. Hadriacum, Ausonia, Libya, M. Tyrrhenum, etc. dont les configurations rappellent celles de la carte terrestre du bassin de la Méditerranée. L'ancien Ausonia Borealis occupe la position de la Sicile (Trinacria).

(6) Dans plusieurs cas les désignations anciennes concernaient des régions trop étroites. Dans l'esprit du présent travail, qui attribue une dénomination à l'ensemble d'un territoire, les mêmes noms ont été étendus à un territoire plus vaste.

VII. PRÉSENTATION ET UTILISATION

Le travail précédent est résumé grâce à trois documents:

(*a*) Une carte complète, avec les régions polaires, contenant le nom des différentes formations.

(*b*) Une carte des régions centrales seulement, contenant le réseau des coordonnées, mais dépouillée de la nomenclature.

(*c*) Un catalogue alphabétique des dénominations, contenant les coordonnées du centre de la région désignée.

Pour désigner une tache, l'observateur identifie la région sur les cartes et il lit le nom ou les coordonnées.

Pour trouver une région nommée, le catalogue alphabétique fournit les coordonnées et permet de localiser sur les cartes.

VIII. INDICATIONS COMPLÉMENTAIRES

Les contrées sombres de la surface de Mars subissent des changements de forme et de contraste, le plus souvent associés aux saisons. Certaines de ces modifications sont rythmées et reproductibles au cours des années martiennes successives. Il est donc souvent convenable d'accompagner les observations de l'indication de la longitude héliocentrique η, donnée par les annuaires. Afin de permettre de retraduire cette indication en données sur les saisons martiennes, le commentaire de la carte donne les longitudes héliocentriques correspondant au début de chaque saison, pour l'hémisphère Nord.

Les commentaires de la carte reproduisent aussi les données relatives à l'orbite: Distance moyenne au Soleil, excentricité, longitude du périhélie, inclinaison du plan de l'orbite, longitude du nœud ascendant, durée de révolution.

Ils donnent aussi les données relatives au globe: Coordonnées de l'axe de rotation sur la sphère céleste, inclinaison de l'axe de rotation sur la normale au plan de l'orbite, durée de rotation, diamètre du disque, valeur de 1° aérographie sur la surface du globe, selon les déterminations les plus récentes.

A. DOLLFUS
Président de la Sous-Commission

CARTES DE LA PLANÈTE MARS

Les deux cartes jointes (I et II) sont destinées à permettre de façon simple la désignation et l'identification des taches de la surface de la planète Mars. Le procédé, adopté et recommandé par l'Union Astronomique Internationale, est conforme à celui en cours depuis le siècle dernier, mais, il est simplifié et adapté pour tenir compte des exigences actuelles.

Méthode de désignation

Les grandes régions sont désignées par un nom propre, emprunté à la mythologie, conforme au procédé classique antérieur. Une désignation concerne l'ensemble d'un territoire; elle permet de localiser une région sur laquelle ont été effectuées des observations, ou bien, des mesures spectrales, photomètriques, radiomètriques, polarimètriques, etc.

Les petits détails sont désignés par leurs coordonnées planétaires lues sur les cartes. Ces cartes sont aussi précises que le permettent les déterminations de coordonnées actuelles; elles servent d'étalon absolu de référence. Les coordonnées s'expriment par la longitude, suivie de la latitude, entre parenthèses. Exemple: (189°, −20°); (22°, +28°). Le procédé de repérage permet de localiser des détails aussi petits et nombreux que le révèlent les instruments d'observation puissants, malgré leurs caractères souvent éphémères ou variables.

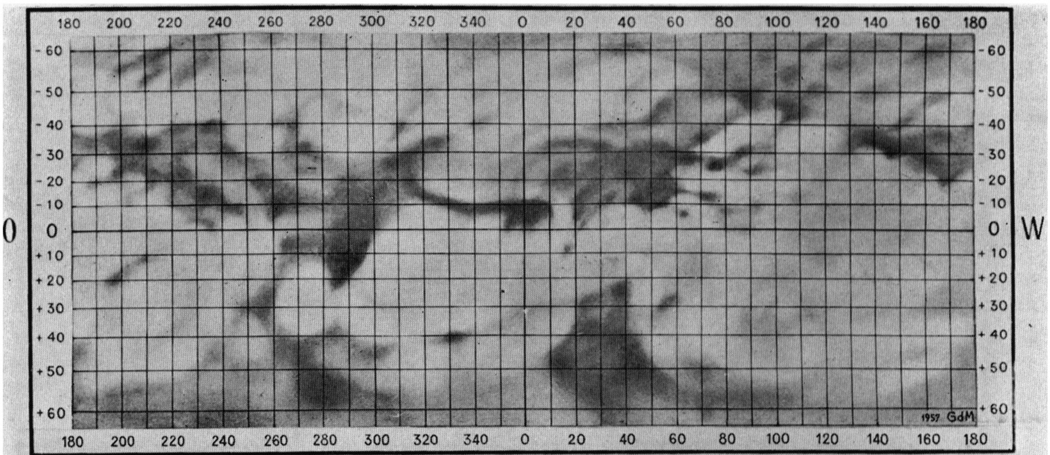
Emploi des cartes

Pour désigner une tache vue sur la planète, l'observateur identifie la région sur la carte contenant les noms (II) et il lit la désignation ou bien les coordonnées.

Pour localiser une région dénommée, le catalogue alphabétique joint à la carte muette (I) fournit les coordonnées correspondantes et permet de trouver l'emplacement sur la carte.

PLATE I

NOMENCLATURE MARTIENNE—MARTIAN NOMENCLATURE I



Longitude de l'équinoxe de printemps boréal	=	84°,0	=	Beginning of northern spring.
Longitude du solstice d'été boréal	=	174°.0	=	Beginning of northern summer.
Longitude de l'équinoxe d'automne boréal	=	264°,0	=	Beginning of northern autumn.
Longitude du solstice d'hiver boréal	=	354°,0	=	Beginning of northern winter.
Distance moyenne au Soleil	=	227,7.10⁶ km = 1,5237 U.A.	=	Mean distance from the Sun.
Excentricité de l'orbite	=	0,0933	=	Excentricity of the orbit.
Longitude du périhélie	=	334°35′	=	Longitude of perihelion.
Inclinaison du plan de l'orbite	=	1°51′	=	Inclination of the orbit.
Longitude du nœud ascendant	=	48°56′,5	=	Longitude of ascending node.
Durée de révolution	=	686 j 23 h 30 m 41 s	=	Martian year.
Coordonnées célestes de l'axe de rotation	=	$\alpha = 316°,8$ $\delta = +53°,0$	=	Celestial coordinates of the axis of rotation
Inclinaison de l'axe sur la normale à l'orbite	=	24°.8	=	Inclination of the axis of rotation.
Durée de rotation du globe	=	24 h 37 m 22 s 6	=	Martian day.
Diamètre équatorial du globe	=	0.530 = 6760 km	=	Equatorial diameter.
Valeur de 1° planétocentrique sur le disque	=	60 km	=	1° Planetocentric at the surface.

Les petits détails sont désignés par leurs coordonnées planétographiques.
Small features are designated by their planetographic coordinates.

Les grandes régions sont désignées par un nom dont voici la liste et les coordonnées.
Main markings are designated by names according to the following record and coordinates.

Acidalium M. (30°, + 45°)
Aeolis (215°, — 5°)
Aeria (310°, + 10°)
Aetheria (230°, + 40°)
Aethiopis (230°, + 10°)
Amazonis (140°, 0°)
Amenthes (250°, + 5°)
Aonius S. (105°, — 45°)
Arabia (330°, + 20°)
Araxes (115°, — 25°)
Arcadia (100°, + 45°)
Argyre (25°, — 45°)
Arnon (335°, + 48°)
Aurorae S. (50°, — 15°)
Ausonia (250°, — 40°)
Australe M. (40°, — 60°)
Baltia (50°, + 60°)
Boreum M. (90°, + 50°)
Boreosyrtis (290°, + 55°)
Candor (75°, + 3°)
Casius (260°, + 40°)
Cebrenia (210°, + 50°)
Cecropia (320°, + 60°)
Ceraunius (95°, + 20°)
Cerberus (205°, + 15°)
Chalce (0°, — 50°)
Chersonesus (260°, — 50°)
Chronium M. (210°, — 58°)
Chryse (30°, + 10°)
Chrysokeras (110°, — 50°)
Cimmerium M. (220°, — 20°)
Claritas (110°, — 35°)
Copaïs Palus (280, + 55°)
Coprates (65°, — 15°)
Cyclopia (230°, — 5°)
Cydonia (0°, + 40°)
Deltoton S. (305°, — 4°)
Deucalionis R. (340°, — 15°)
Deuteronilus (0°, + 35°)
Diacria (180°, + 50°)
Dioscuria (320°, + 50°)
Edom (345°, 0°)
Electris (190°, — 45°)
Elysium (210°, + 25°)
Eridania (220°, — 45°)
Erythraeum M. (40°, — 25°)
Eunostos (220°, + 22°)
Euphrates (335°, + 20°)
Gehon (0°, + 15°)
Hadriacum M. (270°, — 40°)
Hellas (290°, — 40°)
Hellespontica Depressio (340° — 6°)
Hellespontus (325°, — 50°)
Hesperia (240°, — 20°)
Hiddekel (345°, + 15°)
Hyperboreus L. (60°, + 75°)
Iapigia (295°, — 20°)
Icaria (130°, — 40°)
Isidis R. (275°, + 20°)
Ismenius L. (330°, + 40°)
Jamuna (40°, + 10°)
Juventae Fons (63°, — 5°)
Laestrigon (200°, 0°)
Lemuria (200°, + 70°)
Libya (270°, 0°)
Lunae Palus (65°, + 15°)
Margaritifer S. (25°, — 10°)
Memnonia (150°, — 20°)
Meroe (285°, + 35°)
Meridianii S. (0°, — 5°)
Moab (350°, + 20°)
Moeris L. (270°, + 8°)
Nectar (72°, — 28°)
Neith R. (270°, + 35°)
Nepenthes (260°, + 20°)
Nereidum Fr. (55°, — 45°)
Niliacus L. (30°, + 30°)
Nilokeras (55°, + 30°)
Nilosyrtis (290°, + 42°)
Nix Olympica (130°, + 20°)
Noachis (330°, — 45°)
Ogygis R. (65°, — 45°)
Olympia (200°, + 80°)
Ophir (65°, — 10°)
Ortygia (0°, + 60°)
Oxia Palus (18°, + 8°)
Oxus (10°, + 20°)
Panchaia (200°, + 60°)
Pandorae Fretum (340°, — 25°)
Phaethontis (155°, — 50°)
Phison (320°, + 20°)
Phlegra (190°, + 30°)
Phoenicis L. (110°, — 12°)
Phrixi R. (70°, — 40°)
Promethei S. (280°, — 65°)
Propontis (185°, + 45°)
Protei R. (50°, — 23°)
Protonilus (315°, + 42°)
Pyrrhae R. (38°, — 15°)
Sabaeus S. (340°, — 8°)
Scandía (150°, + 60°)
Serpentis M. (320°, — 30°)
Sinaï (70°, — 20°)
Sirenum M. (155°, — 30°)
Sithonius L. (245°, + 45°)
Solis L. (90°, — 28°)
Styx (200°, + 30°)
Syria (100°, — 20°)
Syrtis Major (290, + 10)
Tanaïs (70°, + 50°)
Tempe (70°, + 40°)
Thaumasia (85°, — 35°)
Thoth (255°, + 30°)
Thyle I (180°, — 70°)
Thyle II (230°, — 70°)
Thymiamata (10°, + 10°)
Tithonius L. (85°, — 5°)
Tractus Albus (80°, + 30°)
Trinacria (268°, — 25°)
Trivium Charontis (198, + 20)
Tyrrhenum M. (255°, — 20°)
Uchronia (260°, + 70°)
Umbra (290°, + 50°)
Utopia (250°, + 50°)
Vulcani Pelagus (15, — 35)
Xanthe (50°, + 10°)
Yaonis R. (320°, — 40°)
Zephyria (195°, 0°)

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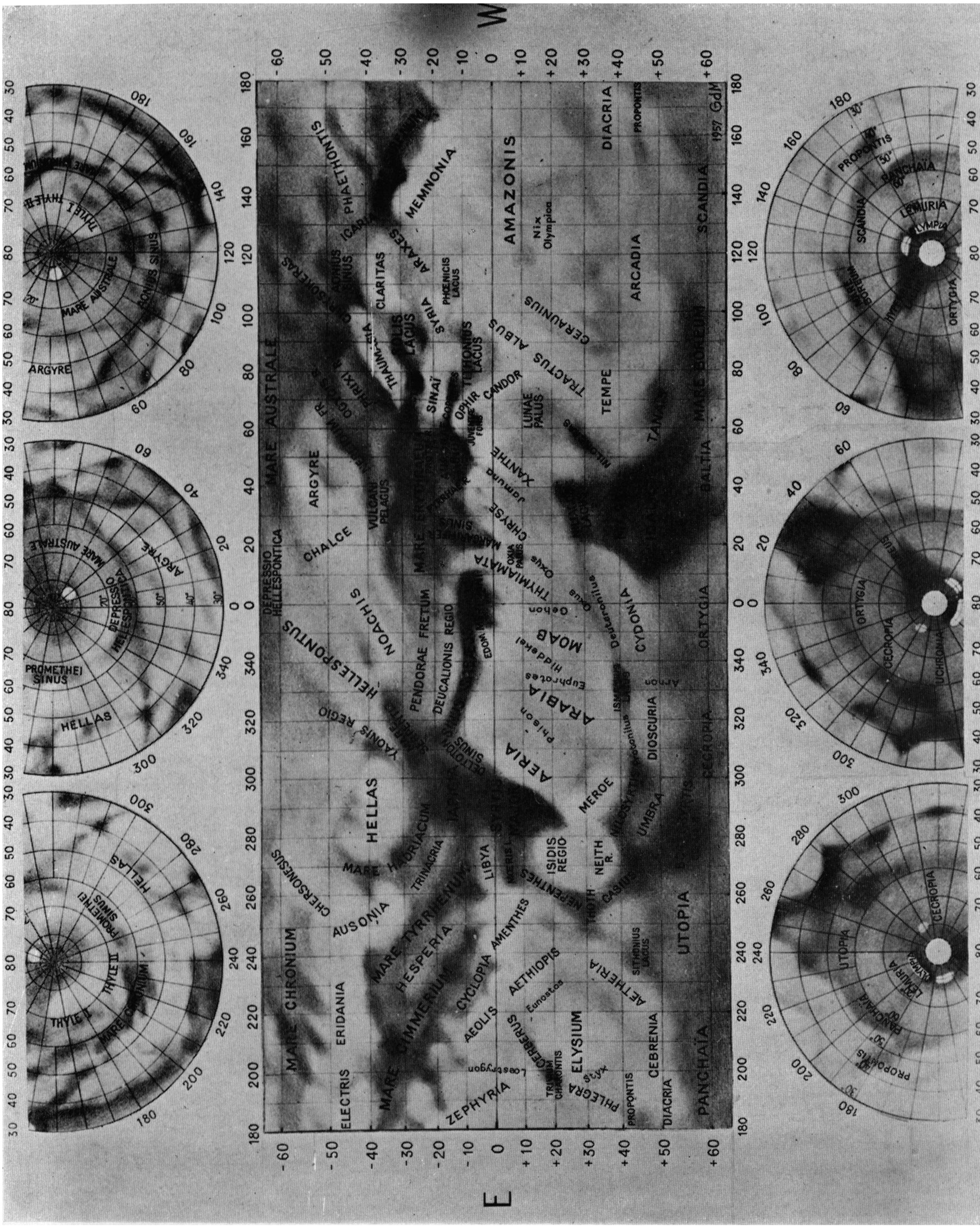
PLATE II


W
E
MARE AUSTRALE
ARGYRE
CHALCE
DEPRESSIO HELLESPONTICA
HELLESPONTUS
NOACHIS
YAONIS REGIO
HELLAS
MARE HADRIACUM
AUSONIA
CHERSONESUS
MARE CHRONIUM
ERIDANIA
ELECTRIS
MARE CIMMERIUM
MARE TYRRHENUM
HESPERIA
CYCLOPIA
AEOLIS
ZEPHYRIA
LIBYA
TRINACRIA
AMENTHES
AETHIOPIS
ELYSIUM
CEBRENIA
PHLEGRA
AETHERIA
UTOPIA
PANCHAIA
DIACRIA
PROPONTIS
NEPENTHES
ISIDIS REGIO
NEITH R.
THOTH
CASIUS
UMBRA
MEROE
AERIA
ARABIA
MOAB
CYDONIA
DIOSCURIA
ORTYGIA
CECROPIA
BALTIA
PENDORAE FRETUM
DEUCALIONIS REGIO
THYMIAMATA
CHRYSE
XANTHE
TEMPE
TANAIS
MARE BOREUM
ARCADIA
TRACTUS ALBUS
CERAUNIUS
LUNAE PALUS
CANDOR
OPHIR
SINAI
SYRIA
CLARITAS
PHOENICIS LACUS
ARAXES
MEMNONIA
AMAZONIS
Nix Olympica
DIACRIA
SCANDIA
PHAETHONTIS
ICARIA
ARGYRE
MARE AUSTRALE
PROMETHEI SINUS
HELLAS
THYLE II
LEMURIA
OLYMPIA
ORTYGIA
UCHRONIA
1957 GdV

ETUDE PHYSIQUE DES PLANETES

CHARTS OF THE PLANET MARS

The two accompanying charts (I and II) are intended to provide a simple method of designating and identifying spots on the surface of the planet Mars. The system, adopted and recommended by the International Astronomical Union, is in conformity with that used since the last century, but it is simplified and adapted to present-day requirements.

Method of designation

Main features are designated each by a name drawn from mythology, in accordance with the former classical system. Each name refers to the whole of a district; it indicates the locality on which observations or spectroscopic, photometric, radiometric, polarimetric or other measures have been carried out.

Small features are designated by their planetocentric coordinates read off from the charts. These charts are accurate enough to determine present-day co-ordinates; they provide an absolute standard of reference. The co-ordinates are expressed by the longitude, followed by the latitude, between brackets—for example: (189°, −20°); (22°, +28°). However small and numerous may be the details revealed by powerful instruments of observation, this system of reference will enable them to be located, even though many of them may be ephemeral or variable.

How to use the charts

To designate a spot seen on the planet, the observer should examine the region on the chart containing names (Plate II), and should read off the name or the co-ordinates.

To find a named feature, he should consult the alphabetical list (which is below the chart without names (Plate I)) for the co-ordinates, which will enable the position of the feature to be found on the chart.

Report of Meeting. 14 August 1958

PRESIDENT: G. P. Kuiper.

SECRETARY: A. Dollfus.

One meeting was held of Sub-Commission 16*a* and one of the full Commission 16. During the former its Report and Proposals were discussed (see below). The meeting of Commission 16 thereupon approved the work of Sub-Commission 16*a* and discharged it with thanks for its important service to planetary astronomy. The adopted system of Martian nomenclature was referred to the General Assembly for action, where it was approved. As was agreed in the meetings of Commissions 16*a* and 16, Drs Dollfus and Kuiper will on request supply prints of the adopted system for use at observatories.

A few additional references were submitted during the meetings for inclusion in the Report of Commission 16. The *Draft Report* was approved.

Compte rendu de la Séance de la Sous-Commission 16*a*. 14 août 1958

PRÉSIDENT: A. Dollfus.

SECRÉTAIRE: C. Luplau Janssen.

Le Président expose les différentes parties du rapport de travail de la Sous-Commission et les propose successivement à l'adoption par les membres. Chacunes des parties sont approuvées. Le Dr Markov demande que soient exposées explicitement les modifications apportées à la nomenclature traditionnelle par la création des noms nouveaux: Sinaï, Syria, Trinacria. Le Président dessine au tableau ces configurations et explique le choix des nouvelles désignations; elles sont adoptées à l'unanimité. Le système de projection des cartes fait l'objet également de quelques explications; il est ensuite adopté.

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Le Président propose que le rapport ainsi que les cartes de la nomenclature de Mars soient reproduits dans les *Transactions* de l'U.A.I. pour pouvoir y être consultées. De plus, les cartes devront être reproduites en exemplaires séparés pour pouvoir être distribuées aux observatoires concernés par l'étude des planètes et tenues à la disposition des observateurs qui en feraient la demande. Un mode d'emploi sera joint aux cartes pour en faciliter l'usage. La Sous-Commission charge le Président de la rédaction de ce mode d'emploi et exprime le vœu que les cartes soient reproduites à un format suffisamment grand. Le format commercial 21 × 27 cm est retenu et il est suggéré que la reproduction soit faite photographiquement sous forme de trois feuilles contenant respectivement les deux cartes et le mode d'emploi. Les Observatoires de Meudon et de Yerkes peuvent se charger de l'opération matérielle de ces reproductions et de leurs diffusions.

Les membres de la Sous-Commission demandent que ce travail soit effectué aussi rapidement que possible, afin que les cartes puissent être utilisées dès les prochaines oppositions de Mars, en particulier celle de Novembre 1958. Le Président remarque que l'achèvement complet des reproductions et leurs diffusions demandent un délai un peu plus long que Novembre prochain, mais que des exemplaires ont déjà été distribués à chacun des membres de la Commission 16 et que quelques exemplaires restent encore disponibles.

Tous les éléments du travail ayant été achevés, la Sous-Commission a achevée sa tâche. Le Président propose que celle-ci soit maintenant dissoute. Cette proposition est adoptée.