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FINAL REPORT

on

NGR 22-007-194

LUNAR NOMENCLATURE

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to

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Office of Scientific and Technical Information (Code US)
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NASA Final Report

The attached material comprises the third and final report to be submitted to NASA under grant NGR 22-007-194, concerned with the assignment of names to craters on the far side of the Moon by the Working Group on Lunar Nomenclature (of Commission 17 of the International Astronomical Union, IAU), D.H. Menzel, Chairman.

On the afternoon of 20 August 1970 Menzel presented to the members of Commission 17 of the IAU the Draft Report of the Working Group on Lunar Nomenclature. Several members of the Executive Committee of the IAU, including the President, Professor O. Heckmann, and the Secretary, Professor L. Perek, attended the meeting to evaluate the impact of the report on the Commission, especially the recommended inclusion of twelve living astronauts and cosmonauts.

The substance of this report appears in the Introduction to the attached material. This material is essentially a corrected, final, and official version of the Second Report submitted under the subject grant. In addition to the biographical data, the coordinates of the crater assigned to each name have been added. The report was accepted with a few minor modifications by Commission 17 and by the General Assembly of the IAU, and the names and positions given herein are now official and authorized for use.

Commission 17 raised no objection to naming craters for six living USA astronauts and six living USSR cosmonauts. Also accepted was the proposal for naming a crater APOLLO, on the far side, to commemorate the USA Manned Landing Program and all who contributed to its success. It was further agreed that the actual landing spot of Apollo 11 should be officially named Tranquillity Base (Statio Tranquillitatis), and that its location be marked with a small x on future maps, and that locations of Sinus Lunicus and Planitia Descensus be similarly marked.

At the meeting of Commission 17, D.W.G. Arthur raised objections to a few of the assignments on the grounds that the Working Group had departed from tradition by giving names to certain craters that lay within other very large craters, and that this practice would cause confusion later when Latin letter names were assigned to subordinate craters. It was agreed that the following names would be relocated: Chappell, Hagen, Ingalls, Krylov, and Das. The new locations are given with the biographies.

Other objections were raised by Arthur and E. Whitaker to the relocation of a few names from their 1964 list, where the Working Group had been unable to find any feature in the original position on the ACIC maps. Subsequent to the IAU meeting--

unfortunately after the official ACIC maps had been printed--Whitaker provided the Chairman of the Working Group with photographs of the original features, thus establishing their existence, and it was determined that the names should be restored to their 1964 locations. These names were Banachiewicz, Boltzmann, Hedin, Lamarck, Rayleigh, and Reimann.

This relocation left vacant a number of excellent far-side craters. To one of these, initially assigned to Rayleigh, at 67S, 179E, we have provisionally assigned the name of Minnaert, to honor the distinguished Dutch astronomer and astrophysicist who had participated so actively in our work on lunar nomenclature prior to his death in October 1970.

INTRODUCTION

At the Prague meeting of the IAU in 1967, a Working Group on Lunar Nomenclature was appointed, charged with the major responsibility of assigning names to craters on the Moon's far side. The members were Professor M. Minnaert, Professor A. Mikhailov, and Professor D. H. Menzel as Chairman; Professor A. Dollfus, as President of Commission 17, was a member ex officio. Later Professor B. Levin replaced Professor Mikhailov.

The Working Group held five formal meetings, the first in Cambridge, Massachusetts, and in New York City; the second in Paris, the third in Moscow, and the last two in Paris. In addition the four members have exchanged great quantities of correspondence. The list of 513 names presented herewith is a result of their study.

In order to obtain a list as completely representative and international as possible, the Chairman made contact, through the National Academy of Sciences of the United States, with the national academies or equivalent organizations in other countries throughout the world. The great majority of these responded, giving information about potential nominees for crater names. All members of Commission 17 and members of the Executive Committee of the IAU were also contacted. We could not of course use all of the many suggestions we received. In addition, we incorporated a large number of the names from the list prepared by Professor Lipsky after the observations of Zond 3.

To minimize the danger of confusion in oral usage, we eliminated one of any pair of names that sounded too similar, as well as names that resembled too closely others already assigned on the near side of the Moon. This procedure necessarily led to the exclusion of a number of highly distinguished names. For example, Rutherford had to be omitted because of the crater Rutherfurd on the near side, and Born was excluded because of possible confusion with Bohr. Some problems of this type remain in the earlier lists of Blagg and Muller and of Arthur, and need further study and clarification.

We divided the names into five categories according to relative distinction, so that we could assign the larger craters to persons of higher distinction.

The Working Group originally planned to assign the names in approximately alphabetical order, in latitude zones from the north to the south pole. This procedure would have made it practical to locate many of the craters on the maps without use of an index. Unavoidable exceptions to the rule occurred, however, and several cartographers objected on aesthetic grounds. The Working Group, after reconsideration, finally acceded to the preferences of the cartographers, and assigned names to craters, within each category of distinction, by the use of random numbers.

In so far as possible, the Working Group tried to assign names in such a way as to agree with the designations previously made by Professor Lipsky. However, we found that many of the craters named in his list, though well-defined, were considerably smaller than the limit we had arbitrarily set from the NASA Orbiter photographs. We had, therefore, to make some adjustments.

Also, certain previously named features, especially those on or near Mare Orientale, proved to be non-existent. As a result the names of four supposed mountain chains (Montes) must be cancelled: D'Alembert, Leibnitz, Doerfel, Hercynii, and Sovietici. We reassigned the name of D'Alembert to one of the larger craters. We also changed the names of three small features in the vicinity of Mare Orientale from Mare to Lacus: Aestatis, Autumni, and Veris.

One of the larger features on the far side was given the name Apollo to commemorate the USA program of that name for landing a man on the Moon. Like Mare Moscoviense, Apollo has many smaller craters in its vicinity which can be used for commemorative purposes. The names of deceased Soviet cosmonauts were assigned to features near Mare Moscoviense, and those of deceased American astronauts to features in the vicinity of Apollo, with one notable exception. The name of Gagarin, the first man to orbit the earth, was attached to one of the more prominent features on the far side.

The members of Commission 17 were invited to express their opinions on the question of using the names of living astronauts. Of those who replied, nearly all favored the use of the names of the men who participated in the first lunar landing, and a majority urged recognition of all of the Apollo astronauts who had either landed on or been in the vicinity of the Moon. The Working Group finally agreed to recognize the three astronauts of Apollo 8, who were the first to orbit the Moon and to see and photograph its far side, and the three astronauts of Apollo 11, who participated in the first landing of man on the Moon. The three astronauts of Apollo 8 were assigned craters in the vicinity of the crater Apollo, and those of Apollo 11 were assigned three previously un-named small craters near the landing point on Mare Tranquillitatis. In addition, the Working Group agreed that six distinguished living cosmonauts of the USSR be accorded similar recognition by craters in the vicinity of Mare Moscoviense.

The name Curie presented a special problem, which we finally resolved as follows, to avoid as far as possible duplication of names. The crater previously designated Joliot-Curie will henceforth be called Joliot. At the request of the Polish members of Commission 17, we assigned a separate crater to Marie Curie, to be known as Sklodowska, her maiden name. Finally, we named a third feature for Pierre Curie, to be known henceforth as Curie.

A number of years ago the British selenologist, Wilkins, named the crater previously identified as Clavius B, on the near side, for Russell Porter, the distinguished American amateur who had contributed in many ways to the development of astronomical science. He is perhaps best known for his beautiful drawings showing the detailed construction of the 200-inch Hale telescope. Although this name appeared on some lunar maps, it has never been formally accepted by the IAU. Since Porter was on our list anyway, we decided to assign his name officially to Clavius B.

We propose to commemorate the 17 additional persons listed on p. 35-36 by adding them to features on the Moon already bearing their name.

The biographical notes on all the persons selected, which form the balance of this booklet, were prepared by Dr. Barbara Bell, of the Harvard College Observatory, with the assistance of the members of the Working Group. The source of data on each name is identified as follows:

(W) = data from World Who's Who in Science (Marquis, 1968); this source was used for every name that could be found therein.

(L) = data supplied by Levin
(M) = data supplied by Minnaert
(Mz) = data obtained by Menzel and/or Bell, from correspondence, published obituaries, etc.
(A) = American Men of Science

The booklet includes identifying notes on the names adopted by the IAU in 1964 (Arthur's list) and in 1961 (USSR list), as these data have not been previously available.

Mr. Robert W. Carder of the Aeronautical Chart and Information Center (of the U.S.Air Force) gave invaluable assistance to the Working Group, providing us first with provisional lunar maps and later with the revised maps and printed overlays, which we used to make the assignments. He also supervised preparation of the Moon maps.

Donald H. Menzel, Chairman of the Working Group
Harvard College Observatory &
Smithsonian Astrophysical Observatory

Names proposed for craters on the Moon's far side,
with identifying biographical data

ABBE, Ernst K. (1840-1905), German optician, physicist, astronomer; founder & director of Jena Obs., a founder of Zeiss & Schott Opt.; theory of optical instruments, image formation in microscopes. (W)(58S, 174E)

ABUL WAFA (940-998), math'n, astronomer, Baghdad Observatory; contributed to development of trigonometry; used trig. sines, tan & cotan for first time in his work on lunar theory; believed to have discovered 2nd large deviation in Moon's orbit, 980 (discovery once attributed to Tycho Brahe). (W) (2N, 117E)

AITKEN, Robert G. (1864-1951), USA astronomer; Dir., Lick Observatory; research on double stars, New General Catalogue of Double Stars. (M)(17S, 173E)

AL-BIRUNI, (973-1048), Persian astronomer, math'n, geographer, encyclopedist, linguist; taught at Ghazni; wrote on wide range of scientific topics, incl. calendars & chronology of ancient nations; encyclopedia of astronomy & math.; astronomical instruments; fund'l constants. (W)(18N, 93E)

ALDEN, Harold L. (1890-1964), USA astronomer; Prof., Dir., Leander McCormick Obs.; research on stellar parallaxes & proper motions; variable stars; orbits & mass ratios; invisible companions of stars. (A)(24S, 111E)

ALEKHIN, Nikolai P. (1913-1964), USSR rocket design engineer; head of a designer group in Test-design Bureau for the development of liquid-fuelled rocket engines. (L)(68S, 131W)

ALTER, Dinsmore (1888-1968), USA astronomer, meteorologist; Director, Griffith Obs.; astronomical meteorology; statistical methods; celestial mechanics, orbits; lunar atlas. (A)(19N, 108W)

AMICI, Giovanni B. (1786-1863), Italian astronomer, botanist; Director, Florence Obs.; astronomical instruments, 'Amici prism'; microscope objectives, immersion objectives. (W)(10S, 172W)

ANDERSON, John A. (1876-1959), USA astronomer, Mt. Wilson Obs.; spectroscopy, ruling of gratings; seismometers. (A)(16N, 171E)

ANTONIADI, Eugene M. (1870-1944), Greek, French astronomer, Meudon Obs.; surface markings of planets, especially Mercury & Mars. (M)(69S, 173W)

APPLETON, Sir Edward V. (1892-1965), British physicist, London, Edinburgh Univ.; established magneto-ionic theory of ionosphere (with Hartree); developed prototype of radar; radio properties of sunspots. (W)(37N, 158E)

ARRHENIUS, Svante A. (1859-1927), Swedish physico-chemist; Prof., Univ. Stockholm; Dir., Nobel Inst. Phys. Chem.; Nobel prize in chemistry, 1903; theory of electrolytic dissociation; cosmic physics, radiation pressure on comet tails, aurora borealis; rates of chem. reaction; phenomena of atmospheric electricity; hypothesis of panspermia in the universe. (W)(55S, 91W)

ARTAMONOV, Nikolai N. (1906-1965), USSR rocket technologist & engineer, Test-design Bureau; leading contributor to development of liquid propellant rocket engines of Vostok, Voskhod, & Cosmos carrier rockets. (L)(26N, 104E)

ARTEM'EV, Vladimir A. (1885-1962), USSR rocket scientist, Gas Dynamics Lab., Rocket Res. Inst.; directed first launching of a rocket on smokeless trotyl-pyroxylin powder in 1928. (L)(10N, 145W)

AVICENNA, (Abu Ali ibn Sina) (980-1037) Persian physician, philosopher; greatest physician of medieval times, systematically compiled theoretical & practical medical knowledge known to his day, and added to it; made astronomical obs'ns; suggested speed of light must be finite. (W)(39N, 97W)

AVOGADRO, Amedeo (Conte di Quarengna) (1776-1856), Italian math'n, physicist; Prof., U. Turin; discovered "Avagadro's law", 1811; and Avagadro's number (of molecules present in one mole of any substance). (W) (64N, 165E)

BABCOCK, Harold D. (1882-1968), USA astronomer & physicist, Mt. Wilson Obs.; standards of wavelength in arc & solar spectra; solar & stellar magnetism; diffraction gratings. (W)(4N, 94E)

BACKLUND, Johan O. (1846-1916), Russian astronomer (b. Sweden), Dir., Pulkova Obs.; period of Encke's Comet & its progressive decrease; theory of disturbances, celestial mechanics. (W)(16S, 103E)

BALDET, Francois (1885-1964), French astronomer, Juvisy, Alger & Meudon; spectra of comets. (M) (54S, 151W)

BARBIER, Daniel (1907-1965), French astronomer, Inst. d'Ap., Paris; aurora, night sky. (M) (24S; 158E)

BARRINGER, Daniel M. (1860-1929), USA mining engr., geologist; demonstrated in 1905 that Meteor Crater in Arizona originated from impact of meteoric mass, prob. compact cluster of iron meteorites. (W)(29S, 151W)

BARTELS, Julius (1899-1964), German geophysicist; Dir., Geophys. Inst., Göttingen; developed statistical methods for study of solar-geomagnetic correlations, devel. indices for study of solar wave & particle radiation & their effects on geomagnetic field; geomagnetic field. (W)(24N, 90W)

BECQUEREL, Antoine H. (1852-1908), French physicist, Prof. École Polytechnique; discovered radioactivity in uranium & its salts; discovered Faraday effect in gases. (W) (41N, 129E)

BEČVAR, Antonin (1901-1965), Czech astronomer, founder & director, Obs. Skalnate Pleso; atlases of stars & dark nebulae; comet discoveries. (2S, 125E)

BEIJERINCK, Martinus W. (1851-1931), Dutch botanist; discovered tobacco mosaic disease was not caused by bacterial agent, 1898; used term filterable virus to describe infectious agent. (W)(13S, 152E)

BELL, Alexander G. (1847-1922), Scottish-American inventor, invented telephone & other electrical devices; studied problems of deafness; Pres. Nat'l. Geographic Society. (W)(22N, 97W)

BELLINGSHAUSEN, Faddei F. (1778-1852), Russian explorer, navigator; headed round-the-world expedition, 1819-20, discovery of Antarctic coast. (L)(61S, 164W)

BELOPOLSKY, Aristarch A. (1854-1934), Russian astronomer; Dir., Pulkovo Obs.; spectroscopic binaries, variable stars, spectrum studies of planet rotations; verified Doppler effect in laboratory. (W,L)(18S, 128W)

BELYAEV, Pavel I. (1925-1970), USSR cosmonaut, Col., Sov. Air Force, Commander of Voskhod 2, the first flight from which man walked in space, March 1965, & manually landed the spacecraft when automatic controls malfunctioned. (ob., N.Y. Times)(23N, 143E)

BERGSTRAND, Carl Ö.E. (1873-1948), Swedish astronomer; Prof., Uppsala Univ.; photographic techniques; positions & parallaxes of stars; differential refraction. (W)(19S, 176E)

BERKNER, Lloyd V. (1905-1967), USA geophysicist; theory of the ionosphere & radio propagation; active in early U.S. satellite program; President of Associated Universities, Inc., under whose leadership the Nat'l Radio Astron. Obs. was founded. (W, Mz)(25N, 105W)

BERLAGE, Hendrik P. (1896-1968), Dutch geophysicist & meteorologist; Prof., Meteorolog. Obs. Batavia (Djakarta), Prof., Utrecht; seismology; climatology, periodic phenomena in climatology; cosmogony of planetary system. (W) (64S, 164W)

BHABHA, Homi J. (1909-1966), Indian physicist; Dir., Atomic Energy Establ't, Trombay, Bombay; research on cosmic rays & quantum theory; introduced Cascade Theory (with Heitler) at same time as Carlson & Oppenheimer. (W)(56S, 165W)

BIRKELAND, Olaf K. (1867-1917), Norwegian physicist; Prof., Oslo; experiments, exposing a magnetized model of the earth in vacuum tube to cathode rays, obtained luminous electric effects suggesting cause of aurora. (W)(30S, 174E)

BIRKHOFF, George D. (1884-1944), USA mathematician; Prof. Harvard U.; linear differential equations & systems of difference eqns.; investigated periodic orbits, 3-body problems, ergodic theory. (W)(59N, 148W)

BJERKNES, Vilhelm F.K. (1862-1951), Norwegian physicist; Prof. U. Oslo, Bergen; developed theory of electric resonance; (with son) originated polar front theory of cyclones, basic to modern weather forecasting; hydrodynamic phenomena. (W)(38S, 113E)

BLAZHKO, Sergei N. (1870-1956), USSR astronomer, Dir., Moscow Obs.; photography of meteor spectra; variable stars; practical astronomy. (L) (31N, 148W)

BOBONE, Jorge (1901-1958), Argentine astronomer; determination of orbits of comets (esp. Halley's Comet) & asteroids, Jupiter VI & VII.(Mz) (26N, 132W)

BOLYAI, Janos (1802-1860), Hungarian math'n; (with father, Farkas) developed non-Euclidean geometry (independently of Lobachevsky). (W)(34S, 125E)

BOSE, Jagadis C. (1858-1937), Indian botanist, physicist; founder & director, Bose Res. Inst., Calcutta; plant physiology, photosynthesis; electrophysiology; growth & tropic mov'ts in plants; statistics of radiation quanta. (W)(54S, 170W)

BOYLE, Robert (1627-1691), British natural philosopher, chemist; Boyle's law, relating volume & pressure of gas at constant temp.; investigated compressibility of water, showed it expands at & just prior to freezing; emphasized importance of experiment in research. (W)(54S, 178E)

BRAGG, William H. (1862-1942), English-Australian physicist; Prof., Adelaide U., Prof., U. Coll., London; pioneered the study of crystal analysis by X-rays; (with son) developed X-ray spectrometer for measuring wavelengths of X-rays by crystal diffraction; determined arrangement of atoms in crystals. Nobel prize for physics (with son) 1915. (W) (42N, 103W)

BRASHEAR, John A. (1840-1920), USA astronomer, engineer; known for his astron. lenses & precision instruments; manufactured speculum-metal plates for Rowland diffraction gratings; designed astron. spectroscope; lenses & mirrors. (W) (74S, 172W)

BREDIKHIN, Fedor A. (1831-1904), Russian astronomer; Dir., Moscow, Pulkovo Obs.; meteor streams, comets & comet tails; pioneer in spectroscopic observations of solar prominences. (W) (17N, 158W)

BRIDGMAN, Percy W. (1882-1961), USA physicist, Prof., Harvard U., Nobel prize in physics, 1946; research on physics of high pressures; philosophy of science. (W) (44N, 137E)

BROUWER, Dirk (1902-1966), USA astronomer; Yale U., Prof. & Dir. Obs.; celestial mechanics, planetary & lunar theory, astron. constants. (W)(36S,125W)

———, Luitzen E.J. (1881-1968), Dutch mathematician; Prof. U. Amsterdam; a founder of modern topology; Cartesian space; intuitionism. (W) (36S, 125W)

BRUNNER, William O. (1878-1958), Swiss astronomer; Prof., Zurich; Dir., Swiss Federal Obs.; sunspots, character figures of solar phenomena; editor of Quart. Bull. Solar Activity. (Mz) (10S, 91E)

BUFFON, Georges L.L. (1707-1788), French naturalist; wrote a natural history in 44 vols.; formulated theory of slow causes & created new geological chronology; discussed degeneracy of animals & limits set for each species by climates, mtns., seas; anticipated some aspects of modern genetics & calculus of probabilities. (W) (41S, 134W)

BUISSON, Henri (1873-1944), French physicist, astronomer; verified (with Fabry) Doppler effect experimentally; wavelength standards, interference spectroscopy; atmospheric ozone. (W) (1S, 113E)

BUTLEROV, Alexander M. (1828-1886), Russian chemist, U. St. Petersburg; invented term chem. structure; made formula correspond to substance; discovered tertiary alcohols; first to prepare formaldehyde; recognized character of tautomerism; isolated & synthesized compounds in petroleum. (W) (12N, 110W)

BUYS-BALLOT, C.H.D. (1817-1890), Dutch meteorologist; Prof., U. Utrecht; Founder, Dir., Roy. Dutch Meteorol. Inst., Utrecht; first to combine meteorol. data, received by telegraph, into synoptic maps; "Law of Buys-Ballot."(W,M) (21N, 175E)

CABANNES, Jean (1885-1959), French physicist; Prof. Montpellier, Paris; spectroscopic study of light of night sky. (W) (61S, 171W)

CAJORI, Florian (1859-1930), USA mathematician & science historian; Prof. U. Calif.; author of several books on history of math. & physics.(W) (48S, 168E)

CAMPBELL, Leon (1881-1951), USA astronomer; Am. Assn. Var. Star Obs's.; variable stars, periods & light curves. (W) (45N, 152E)

———, William W. (1862-1938), USA astronomer; Dir., Lick Obs.; practical astronomy; stellar motions, radial velocities; Wolf-Rayet & bright line stars; atm. of Mars; solar eclipses. (W) (45N, 152E)

CANNIZZARO, Stanislao (1826-1910), Italian chemist; Prof., Rome; determination of atomic & molecular wts. from Aragadro's hypothesis; Cannizzaro reaction of aromatic aldehydes. (W) (55N, 100W)

CANTOR, Georg (1845-1918), German mathematician; Prof., Halle; theory of sets; theory of transfinite numbers. (W,M,L) (38N, 118E)

———, Moritz B. (1829-1920), German mathematician; Prof., Heidelberg; history of mathematics. (W) ((38N, 118E)

CARNOT, Nicolas L.S. (1796-1832), French physicist; founder of modern thermodynamics. (W) (52N, 144W)

CARVER, George W. (c.1864-1943), USA agricultural chemist, botanist; developed 300 types of synthetic material from peanuts, including dyes, soap, cheese, milk substitutes, & 118 by-products from sweet potatoes. (W) (43S, 127E)

CASSEGRAIN, Giovanni D. (1625-1712), French physician, astronomer; Prof., C. de Chartes; reflecting telescopes, developed new design. (W) (52S, 113E)

CATALÁN, Miguel A. (1894-1957), Spanish spectroscopist; Prof., U. Madrid; discovered multiplets in arc spectrum of Mn, beginning a new approach to analysis of complex spectra; research on other complex spectra. (Mz) (46S, 87W)

CERASKI, Witold K. (also Tseraski)(1849-1925), Polish astronomer; Prof., Moscow U., Dir., Moscow Obs.; astrophotometry, visual stellar & solar photometry, discovery of noctilucent clouds. (L) (49S, 141E)

CHAFFEE, Roger B. (1935-1967), USA astronaut, Lt. Commander, U.S.N.; B.S., Purdue U. in aeronautical engineering; navy pilot; killed in groundfire of Apollo testcraft, 27 Jan., 1967. (Mz) (39S, 155W)

CHAMBERLIN, Thomas C. (1843-1928), USA geologist; planetesimal hypothesis of origin of solar system. (59S, 96E)

CHAMPOLLION, Jean F. (1790-1832), French Egyptologist, deciphered Egyptian hieroglyphs through study of Rosetta stone. (W) (37N, 175E)

CHANDLER, Seth C. (1846-1913), USA astronomer; editor, Astron. J.; determined period of precession of earth around axis of figure; discovery of latitude variation. (W) (44N, 171E)

CHANG HENG (78-139), Chinese astronomer; constructed early astron. instruments; correctly explained apparent motion of celestial bodies & of lunar eclipses; Chinese constellations; estimated number of visible stars at 2500, & up to 10,000 including southern & faintest stars. (L) (19N, 112E)

CHANT, Clarence A. (1865-1956), Canadian astronomer & physicist; Dir., David Dunlap Obs.; the 'skin' effect in electric oscillators; reception by wire of electric waves; physical basis of color; meteoric displays; relativity; deflection of light by solar gravity. (W,A) (41S, 110W)

CHAPLYGIN, Sergei A. (1869-1942), Russian mathematician; USSR Acad. Sci.; theoretical mechanics; (in collaboration with N.E. Zhukovsky) developed theoretical basis of astronautics. (L) (6S, 150E)

CHAPMAN, Sydney (1888-1970), British geophysicist, math'n; Prof. Imperial Coll. Sci. & Tech., London, Oxford U., Alaska U.; research on geomagnetism, auroras, mag. disturb. in & composition of ionosphere, atm. tides; demonstrated power of thermal diffusion in highly ionized gases (solar corona, solar plasma). (W) (50N, 101W)

CHAPPELL, James F. (1891-1964), USA astronomer photographer, Lick Obs.; photography of the moon; developed special photographic techniques for astronomy. (Mz) (55N, 177W)

CHARLIER, Carl W.L. (1862-1934, Swedish astronomer; Dir., Prof., Lund Obs.; stellar clusters, astrophysics, probabilities, theoretical optics; celestial mechanics. (W) (36N, 132W)

CHAUCER, Geoffrey (c.1340-1400), English poet, best known poet of middle ages, author of Canterbury Tales & many other works; knew contemporary astronomical & astrological doctrine; prepared treatise on astrolabe. (W) (3N, 140W)

CHAUVENET, William (1820-1870), USA astronomer & mathematician; Prof., Washington U., St. Louis; spherical & practical astronomy. (W) (12S, 137E)

CHEBYSHEV, Pafnuty L. (1821-1894), Russian mathematician; Prof., U. St. Petersburg; Taylor series, prime numbers, integral theory, theory of geographical maps. (L) (34S, 133W)

CHERNYSHEV, Nikolai G. (1906-1953), USSR rocket scientist; specialist in liquid propellants; chemistry of rocket fuels. (L) (47N, 174E)

CHRÉTIEN, Henri (1870-1956), French mathematician, astronomer; invented anamorphic lens for cinemascope; designed telescope, U.S. Naval Obs. (W) (47S, 163E)

CLARK, Alvan (1804-1887), USA astronomer, lens maker, made a number of major telescope lenses, 18-36 inches for U.S. and foreign observatories; discovered (with son) companion of Sirius, 1861. (W) (38S, 119E)

———, Alvan G. (1832-1897), USA astronomer, lens maker, discovered (with father) companion of Sirius; 16 double stars; made Yerkes 40" lens. (W) (38S, 119E)

COBLENTZ, William W. (1873-1962), USA physicist, astronomer, Physicist, Nat'l Bur. Stand.; infrared & ultraviolet planetary & stellar radiation; radiometry; planetary temps. (W) (38S, 126E)

COCKCROFT, Sir John D. (1897-1967), English nuclear physicist; Prof., Cambridge U., Dir., Atomic Energy Research Establ.; built particle accelerator & pioneered in transmutation of atomic nuclei; Nobel prize 1951. (W) (30N, 164W)

COMPTON, Arthur H. (1892-1962), USA physicist; Prof., U. Chicago; Chancellor, Washington U.; Nobel prize 1927; research in X-rays & cosmic rays; Compton effect in scattered X-rays; directed work resulting in 1st atomic chain reaction. (W) (56N, 105E)

———, Karl T. (1887-1954), USA physicist; Prof., President, M.I.T.; structure of crystals by X-ray photography; photoelectric effect; thermionic emission. (W) (56N, 105E)

COMRIE, Leslie J. (1893-1950), New Zealand & British astronomer; Supt. Nautical Almanac Office; positional astronomy; extensive revision & improvement of 'Nautical Almanac', new methods of computation by machine; founded 1st company to provide large scale computation with high math. content; constructed math. tables of highest quality. (Mz) (23N, 113W)

COMSTOCK, George C. (1855-1934), USA astronomer; Prof., Dir., Washburn Obs., Wisconsin U.; double stars; the Sumner Line, navigation. (W) (21N, 122W)

CONGREVE, Sir William (1772-1828), British inventor, pioneer in rocketry, designed & developed the Congreve Rocket System, widely copied throughout Europe. (W) (0, 168W)

COOPER, John C. (1887-1967), USA jurist, pioneer in development of international aerial & space law; with A. Haley, active organizer of 1st (1958) conference on space law. (Mz) (53N, 176E)

CORIOLIS, Gaspard G. de (1792-1843), French physicist, Paris; calculated compound centrifugal force which affected moving bodies in a rotating system, (Coriolis force); 1st modern definition of kinetic energy & work. (W) (0, 172E)

COULOMB, Charles A. de (1736-1806), French physicist, research on electricity & magnetism; demonstrated applicability of inverse square (Coulomb's law). (W) (54N, 115W)

CROCCO, Gaetano A. (1877-1968), Italian rocket scientist & aeronautical engineer; research on flight mechanics & structure problems, rocketry, high altitude supersonic flight, ramjet propulsion; initiated experiments on solid & liquid propellant rockets; founder of Italian Rocket Soc. (Mz) (47S, 150E)

CROMMELIN, Andrew C. de la C. (1865-1939), British astronomer, Royal Greenwich Obs.; motion of Halley's Comet from 240 BC to AD 1910; comets. (W) (68S, 147W)

CROOKES, Sir William (1832-1919), English physicist, chemist; inventor of radiometer, Crookes tube; discovered thallium; fixation of atmospheric nitrogen. (W) (11S, 165W)

CURIE, Pierre (1859-1906), French physicist, chemist; Prof., Sorbonne; Nobel prize 1903 (jointly with Marie Curie & Becquerel); crystallography; discovered piezoelectricity; effect of heat on magnetism (Curie point); radioactivity. (23S, 92E)

CYRANO (de BERGERAC) Savinien (1615-1655), French author, playwright, soldier; wrote of imaginary visits to moon & sun: 'Comical History of the States & Empires of the Moon', & '... of the Sun'; free thinker & satirist. (Mz) (20S, 157E)

DAEDALUS, fabulously cunning artisan, Greek mythology or legend, of 2nd mil. BC; built Labyrinth for Minos of Crete; made wings of wax & feathers for self & son, to escape Crete, & flew to Sicily. (Mz) (see ICARUS below). (6S, 180)

D'ALEMBERT, Jean (1717-1783), French mathematician, physicist, philosopher; theory of differential eq'ns, calculus & its applications; 3-body problem; solved problem of precession of equinoxes, & added to Newton's results on motion of heavenly bodies. (W) (52N, 164E)

DANJON, Andre (1890-1967), French astronomer; Dir., Obs. Paris & Meudon; photometry of Mercury & Venus; brightness of eclipsed moon & its relation to solar cycle; irregularities of earth's rotation & measurement of time; prism-astrolabe. (W) (11S, 123E)

DANTE, Alighieri (1265-1321), Italian poet, 1st major author to write in Italian & one of greatest poets of all literature; major work: "Divine Comedy", part 3, "Paradiso" involves a journey through the eight concentric spheres of the moon, Mercury, Venus, Sun, Mars, Jupiter, Saturn, & Fixed Stars. (Mz) (25N, 180)

DAS, Amil K. (1902-1961), Indian astronomer; Dir., Kodaikanal Obs.; solar physics, spectrophotometric studies of sunspots, prominences, chromosphere; development of facilities of the observatory. (Mz) (27S, 138W)

DAVISSON, Clinton J. (1881-1958), USA physicist, Bell Telephone Labs.; discovered (with L.H. Germer) diffraction of electrons by crystals, 1st evidence for wave theory of electron; investigated thermionics, electron devices & optics, crystal physics. (W) (38S, 175W)

DAWSON, Bernhard H. (1890-1960), Argentine astronomer; Prof., La Plata; southern double stars, orbits of binary stars; micrometric obs'ns of comets & asteroids; occultations; variable stars; Nova Puppis; meridian circle. (A) (67S, 134W)

DEBYE, Peter J.W. (1884-1966), physicist, chemist (b. Netherlands); Prof. Univs. Utrecht, Göttingen, Leipzig, Berlin, & Cornell; Nobel prize in chemistry 1936; research on molecular structure, dipole moments, polar molecules; theory of behavior of strong electrolytes; pioneer study of polymers. (W) (50N, 177W)

DE FOREST, Lee (1873-1961), USA inventor, pioneer in development of wireless telegraphy; inventor of triode vacuum tube. (W) (77S, 162W)

DELLINGER, John H. (1886-1962), USA physicist; Chief, Central Radio Propagation Lab., Nat. Bur. Stand.; radio & telecommunications, development & applications, esp. in aviation; discovered the relationship between solar flares & shortwave radio fadeouts (Dellinger effect). (W,Mz) (7S, 140E)

DELPORTE, Eugene J. (1882-1955), Belgian astronomer; Dir., Belg. Roy. Obs.; systematic observation of asteroids, discovered many new ones; meridian astronomy; delineation of constellations. (M) (16S, 121E)

DENNING, William F. (1848-1931), British astronomer; meteor showers & their radiant points, heights & velocities of fireballs; surface markings & rotation periods of planets; discovered 5 comets & 2 novae. (W) (16S, 143E)

DE ROY, Felix (1883-1942), Belgian journalist & amateur astronomer; made some 90,000 observations of variable stars; one time president of IAU Commission 22 (meteors). (M) (55S, 99W)

DEUTSCH, Armin J. (1918-1969), USA astronomer, Mt. Wilson & Palomar Obs.; stellar spectroscopy, spectrum variables of type A; theory of electromagnetic processes in stellar atmospheres; mass-loss from red giants. (A) (24N, 110E)

DE VRIES, Hugo M. (1848-1935), Dutch botanist; Prof., U. Amsterdam; research on Mendelian laws of inheritance & developed theory of mutations & sudden origin of new species; unit of heredity. (W) (20S, 177W)

DEWAR, Sir James (1842-1923), British chemist; Prof., Cambridge U.; research on organic chemistry, liquefaction of so-called permanent gases, temperatures approaching absolute zero; measured production of He from pure radium salt, 1910. (W) (3S, 166E)

DIRICHLET, Peter G.L. (1805-1859), German mathematician; Prof., U. Berlin; definite integrals, complex numbers, hydrodynamics, potential theory, theory of numbers & functions. (W) (10N, 151W)

DONNER, Anders (1873-1949), Finnish astronomer; Prof., Helsinki; Carte du Ciel. (31S, 98E)

DOPPLER, J. Christian (1803-1853), Austrian physicist, math'n., astronomer; Prof., Vienna; discovered the influence of relative motion on the wavelength of light & sound; optics. (W,M) (13S, 160W)

DOUGLASS, Andrew E. (1867-1962), USA astronomer; Prof., U. Ariz; Dir., Steward Obs.; dendrochronology, climate cycles, tree growth, & sunspot cycle. (W) (35N, 122W)

DREYER, John L.E. (1852-1926), British astronomer; Dir., Armagh Obs.; motion of stars & nebulae; prepared NGC and IC, catalogs of nebulae and star clusters; history of astronomy. (W,Mz) (10N, 97E)

DRUDE, Paul K.L. (1863-1906), German physicist; Prof., U. Berlin; physical optics & electromagnetic theory. (W) (39S, 91W)

DRYDEN, Hugh L. (1898-1965), USA physicist & engineer, Nat. Bur. Stand.; deputy administrator, NASA from 1958; aerodynamics & aeronautics; research on boundary layer flow, wind tunnel turbulence. (W,Mz) (33S, 157W)

DUFAY, Jean C.B. (1896-1967), French astronomer; Dir., Obs. Haute-Provence; galactic nebulae, interstellar matter; light of night sky; spectra of novae. (W) (5N, 170E)

DUGAN, Raymond S. (1878-1940), USA astronomer; Prof., Princeton U.; photometry, eclipsing variable stars. (W) (65N, 103E)

DUNÉR, Nils C. (1839-1914), Swedish astronomer; Prof., Uppsala, Obs. Dir.; differential rotation of sun; stellar spectroscopy, variable & double stars. (W) (45N, 179E)

DYSON, Sir Frank W. (1868-1939), English astronomer; Astronomer Royal; distributions & motions of stars, star streaming; stellar parallaxes; eclipse obs'ns of solar spectrum, & relativity effect. (W) (61N, 121W)

DZIEWULSKI, Wladyslaw (1878-1962), Polish astronomer; Prof., Wilno, founder, Dir., Obs.; celestial mechanics; secular perturbations of minor planets; motions of stellar groups; photometry; variable stars; history of astronomy. (Mz) (21N, 99E)

EHRLICH, Paul (1854-1915), German bacteriologist, laid foundations for modern hematology; pioneer in immunology (anti-toxin, anti-body theory) & founder of chemotherapy; discovered cure for syphilis; developed diphtheria anti-toxin; Nobel prize in physiology & medicine 1908. (W) (41N, 172W)

EIJKMAN, Christiaan H. (1858-1930), Dutch physician; Dir., Path. Lab., Batavia (Indonesia); Prof., Utrecht; Nobel prize 1929; tropical pathology; proved beriberi is caused by dietary deficiency. (W) (63S, 142W)

EINTHOVEN, Willem (1860-1927), Dutch physiologist (b. Java), Prof., U. Leiden; invented forerunner of electrocardiograph; pioneered use of electrocardiograms to diagnose heart disorders. (W) (5S, 110E)

ELLERMAN, Ferdinand (1869-1940), USA astronomer, Mt. Wilson Obs.; stellar spectra; spectra of sunspots, chromosphere, solar physics. (W) (26S, 121W)

ELLISON, Mervyn A. (1909-1963), British astronomer; Dir., Dunsink Obs.; Prof., Dublin Inst. Adv. Studies; solar physics; photometry of flares; solar-terrestrial correlations, cosmic-ray flares; Editor, IGY daily charts of solar activity. (Mz) (55N, 108W)

ELVEY, Christian T. (1899-1970), USA astronomer (Yerkes & McDonald Obs.) & geophysicist; Dir., Geophysical Inst., U. Alaska; research on rotation of stars, galactic light, light of night sky, aurora. (W) (9N, 101W)

EMDEN, J. Robert (1862-1940), Swiss astrophysicist, meteorologist, U. Munich; developed theory of polytropic gas spheres, including application to stellar structure; thermodynamics of stars; applied theory of radiation equilibrium to earth's atmosphere. (W) (63N, 176W)

ENGELHARDT, Vasily P. (1828-1915), Russian amateur astronomer; made numerous observations of comets, asteroids, nebulae, & star clusters from his private observatory in Dresden. (L) (5N, 159W)

EÖTVÖS, Roland von (1848-1919), Hungarian physicist; Prof., U. Budapest; Pres., Acad. Sci., capillarity; gravitation, Eötvös balance. (M) (36S, 134E)

ERRO, Luis E. (1897-1955), Mexican astronomer & novelist; founder (1941) of the Nat. Astrophysical Lab. in Tonanzintla & director of same to 1950; Sci. Adviser to the President 1935-1955. (Mz) (6N, 98E)

ESNAULT-PELTERIE, Robert A.C. (1881-1957), French astronautical pioneer, founder of astronautics, developed rocket motors, proposed use of rockets to study upper atmosphere. (W) (47N, 142W)

ESPIN, Thomas H.E.C. (1858-1934), English amateur astronomer, Vicar of Tow Law; carried out a spectroscopic survey, searching for & finding many red stars; published catalog of red stars (3800), & later determined their Draper classifications; observed also many double stars, with his lists published in M.N. (Mz) (28N, 109E)

EVANS, Sir Arthur (1851-1941), English archaeologist; established the reality of the legendary Minoan (2nd mil. BC) civilization of Crete by his excavation of palace at Knossos. (W) (10S, 134W)

EVDOKIMOV, Nikolai N. (1868-1940), Russian astronomer; Dir., Kharkov Obs.; determination of stellar parallaxes by meridian circle; astrometric instruments. (L) (35N, 153W)

EVERSHED, John (1864-1956), British astronomer; Dir., Kodaikanal Obs.; discovered radial flow in sunspots. (W) (36N, 160W)

FABRY, Charles (1867-1945), French physicist; Prof., U. of Paris; Dir., Inst. d'Optique; interference; spectroscopy (Fabry-Perot interferometer); established int'l system of wavelengths; estimated amount of ozone in upper atmosphere. (W,N) (43N, 101E)

FECHNER, Gustav T. (1801-1887), German physicist, exp't'l psychologist; Prof., U. Leipzig; founder of psycho-physics; known for Weber-Fechner law, giving math relation between intensity of sensation & stimulus. (W) (59S, 125E)

FEN'YI, J. (Father) (1845-1927), Hungarian astronomer; Dir., Kalocsa Obs.; solar physics, prominences. (M) (45S, 105W)

FERSMAN, Alexander E. (1883-1945), USSR geochemist; Acad. Sci, USSR; research in geochemistry, mineralogy & natural resources of Europe & Soviet Asia. (W) (18N, 126W)

FIRSOV, Georgy F. (1917-1960), USSR rocket engineer, Test-design Bureau; development of high-capacity liquid-propellant rocket engines; guided flight tests of engines for carrier rockets of artificial satellites & 'Vostok' spaceships; perished during a rocket test. (L) (4N, 112E)

FITZ GERALD, George F. (1851-1901), Irish physicist; Prof. Trinity Coll., Dublin; developed electromagnetic theory of radiation; 1st to propose that head of comet consists of large stones, tail of small stones; ether theory. (W) (27N, 172W)

FIZEAU, Armand H.L. (1819-1896), French physicist; velocity of light in air & water, suggested use of Doppler effect to determine stellar radial velocities; photography; infrared solar spectrum. (W) (58S, 133W)

FLEMING, Sir Alexander (1881-1955), British bacteriologist; Prof., St. Mary's Med. Sch.; Nobel prize 1945; discovered penicillin. (W) (15N, 109E)

———, Williamina P.S. (1857-1911), USA astronomer, Harvard Obs.; photographic study of variable stars. (W) (15N, 109E)

FOCAS, Ionnas (1908-1969), Greek/French astronomer, Meudon, Pic du Midi; Nat'l Obs., Athens; planetary surfaces, visual observations. (M) (34S, 94W)

FOSTER, John S. (1890-1964), Canadian physicist; Prof., McGill U., Dir., Rad'n Lab.; experimental studies of Stark effect; quantum-mechanical theory of Stark effect in helium; microwave antenna design & analysis. (Mz) (23N, 142W)

FOWLER, Alfred (1868-1940), British astronomer; research on spectra of sun, stars, & comets; laboratory spectroscopy, produced 1st lab spectrum of He^+; identified origin of the He^+ series. (W) (43N, 145W)

———, Sir Ralph H. (1889-1944), British mathematician, statistical mechanics, thermodynamics ballistics & theoretical physics; stellar atmospheres; white dwarfs. (W) (43N, 145W)

FREUNDLICH, Erwin (Finlay-)(1885-1964), German-British astronomer; Prof., U. St. Andrews, founder & Dir., Einstein Inst., Potsdam; stellar dynamics; relativity theory, astronomical implications, empirical tests, esp. light deflection at eclipses, red-shift of spectral lines. (Mz)(25N,171E)

FRIDMAN, Alexander A. (1888-1925),Russian physicist; general relativity theory, cosmology; dynamic meteorology & hydromechanics of compressed fluids. (L) (13S, 127W)

FROELICH, Jack E. (1921-1967), USA rocket engineer; Project Director of Explorer I program at JPL/Cal. Tech., resulting in 1st U.S. satellite. (Mz) (80N, 110W)

FROST, Edwin B. (1866-1935), USA astronomer; Dir., Yerkes Obs.; astron. spectroscopy; developed stellar spectrograph. (W) (37N, 119W)

GADOMSKI, Jan (1889-1966), Polish astronomer, Krakow & Warsaw Obs.; studies of eclipsing variables; theory of exosphere; history of astronomy; Editor of "Urania." (L) (36N, 147W)

GAGARIN, Yuri A. (1934-1968), USSR cosmonaut pilot; the 1st man to carry out a space-flight, orbiting earth in the Vostok spaceship (1961); killed in crash on aircraft training flight. (L) (20S, 149E)

GALOIS, Évariste(1811-1832), French mathematician, Paris; algebra, theories of equations, theory of groups. (W) (16S, 153W)

GAMOW, George (1904-1968), USA physicist; Prof., Geo. Washington U., U. Colorado; applied nuclear physics to problems of stellar evolution; proposed neutrino theory of supernovae, shell model of giant red stars, origin of elements by successive neutron capture. (W)(65N, 144E)

GANSKY, Alexei P. (1870-1908), Russian astronomer, Pulkovo; founder, Simeis Obs.; solar granulation, corona. (M) (10S, 97E)

GANSWINDT, Hermann (1856-1934), German rocket inventor, engineer; probably the first (1891) to propose a manned spaceship based on design which in principle was feasible. (W) (79S, 110E)

GARAVITO, J. (1865-1920), Colombian astronomer, Dir., Nat'l Obs.; celestial mechanics, lunar theory, geodesy. (M) (48S, 157E)

GAVRILOV, Alexander I. (1884-1955), USSR rocket engineer; design of high-capacity liquid-propellant rocket engines. (L) (17N, 131E)

GEIGER, Johannes H.W. (1882-1945), German physicist; research on radioactive disintegrations, alpha particles; ionization chambers; perfected counter for beta & cosmic ray particles (Geiger-Müller counter). (W)(14S,158E)

GERASIMOVIČ, Boris P. (1889-1937), USSR astronomer; Dir., Pulkovo Obs.; physics of stellar atmospheres, variable stars, stellar statistics. (L) (23S, 124W)

GERNSBACK, Hugo (1884-1967), USA scientific publisher & writer of science fiction; annual world award for best science fiction called "Hugo's" in his honor. (Mz) (36S, 99E)

GINZEL, Friedrich K. (1850-1926), Austrian astronomer; studied astron. problems of chronology; canon of eclipses. (W)(14N, 97E)

GLASENAP, Sergei P. (1848-1937), Russian astronomer; Prof., St. Petersburg; one of founders of Russian Astron. Soc.; research on double stars, variable stars. (L) (2S, 138E)

GOLITSYN, Boris B. (1862-1916), Russian physicist; Prof., St. Petersburg; seismology, seismograph. (L)(25S, 105W)

GOLOVIN, Nicholas E. (1912-1969), USA rocket scientist, Chief Scientist at White Sands Missile Range in New Mexico; deputy assoc. administrator of NASA: member of staff of the President's Scientific Advisory Board. (Mz) (40N, 161E)

GRACHEV, Andrei D. (1900-1964), USSR rocket design-engineer; contributed to development of liquid-propellant rocket engines, & to design of aircraft engines. (L) (3S, 108W)

GRAFF, Kasimir R.(b. Poland)(1878-1950), astronomer; Prof., Dir., Obs., U. Vienna; stellar photometry;variable stars & star colors; obsns of planets.(W,M) (43S, 88W)

GREEN, George (1793-1841), British mathematician, U. Cambridge; theory of the potential. (W)(4N, 133E)

GREGORY, James (1638-1675), Scottish mathematician & astronomer; Prof., St. Andrews; invented the reflecting (Gregorian) telescope; studied use of transits of Mercury & Venus to calc. distance of sun; developed photometric method of estim. distances of stars; solved Keplerian problem by infinite series. (W) (2N, 127E)

GRIGG, J. (1838-1920), New Zealand; orbits & ephemerides of comets. (M) (13N, 130W)

GRISSOM, Virgil I. (1926-1967), USA astronaut, Lt. Col., USAF; B.S. mechanical engineering, Purdue U.; one of seven original Project Mercury astronauts; suborbital flight in "Liberty Bell 7"; pilot of Gemini 3, 1st 2-man spacecraft; Air Force test pilot; killed in ground-fire of Apollo testcraft, 27 Jan. 1967. (Mz) (48S, 149W)

GROTRIAN, W. (1890-1954), German astronomer, Potsdam; atomic spectra, "Grotrian diagrams" of energy levels; first identification of coronal lines; solar magnetic fields. (M)(66S, 128E)

GULLSTRAND, Allvar (1862-1930), Swedish ophthalmologist; Prof., U. Uppsala; Nobel prize for physiology & medicine, 1911; improved methods for estimating astigmatism & abnormal shapes of cornea & for locating paralyzed muscles, corrective glasses after removal of cataractous lens. (W)(45N, 129W)

GUM, C. (1924-1960), Australian astronomer, Sydney U.; hydrogen emission in southern sky; interstellar polarization in galaxies. (M)(40S, 89E)

GUTHNICK, Paul (1879-1947), German astronomer; Prof., Dir., Obs., U. Berlin; research on application of photocell to astrophotometry. (W) (48S, 94W)

GUYOT, Arnold H. (1807-1884), Swiss-American geographer, geologist; Prof., Princeton U.; 1st to formulate laws of structure & movement of glaciers; his researches led to establishment of U.S. Weather Bureau; flat topped submarine mountains (guyots) named for him. (W)(11N, 117E)

HAGEN, Johann G. (1847-1930), astronomer (b. Austria); Dir., Georgetown Obs., Vatican Obs.; Vatican zone of Carte du Ciel; variable stars; Atlas Stellarum Variabilum; Gen. catalog; "dark Interstellar dust clouds". (W, M) (48S, 135E)

HARRIOT, Thomas (1560-1621), English math'n, astronomer, pioneer in modern algebra, introduced symbols for inequality, dot for multiplication; observed sunspots & Jupiter's satellites at same time as Galileo (but did not publish his obsns); made first telescopic map of the moon. (W) (33N, 114E)

HARTMANN, Johannes F. (1865-1936), German astronomer; Dir., Göttingen, La Plata Obs.; discovered interpolatorial dispersion formula in spectroscopy, helped devel. intern'l standards of wavelength; built microphotometer, & spectro comparator, & developed method of precision testing large objectives. (W) (3N, 135E)

HARVEY, William (1578-1657), English physician, anatomist, London; founder of modern physiology, discovered circulation of the blood. (W) (19N, 147W)

HATANAKA, Takeo (1914-1963), Japanese astronomer; Prof., Tokyo; theoretical astrophysics, solar radio astronomy. (Mz) (29N, 122W)

HAYFORD, John F. (1868-1925), USA civil engineer; U.S. Coast & Geodetic Survey; geodetic astronomy; established theory of isostasy; developed & determined elements of earth's ellipsoid. (W) (13N, 176W)

HEALY, Roy (1915-1968), USA, early member & experimenter of American Rocket Society, & later President of ARS. (Mz) (32N, 111W)

HEAVISIDE, Oliver (1850-1925), English mathematician, physicist, electromagnetic theory; predicted existence of ionized layer in atmosphere & its effect on radio transmission. (W) (11S, 167E)

HELBERG, Robert J. (1906-1967), USA aeronautical engineer, Boeing Co.; as Lunar Orbiter Program manager for Boeing Co., he played a major role in development of Lunar Orbiter spacecraft & was largely responsible for decision to risk operating the Orbiters to photograph the far side of the moon, (a task for which it was not designed); research & numerous publ. papers on aerospace technology. (W) (22N, 102W)

HENDERSON, Thomas (1798-1844), Scottish astronomer; Prof., Edinburgh; 1st Scottish Astron. Royal; observed 1832 transit of Mercury; measured parallax of α Centauri; observed Encke's & Biela's comets. (W) (5N, 152E)

HENDRIX, Don O. (1905-1961), USA optics expert; Supt., Mt. Wilson & Palomar Obs. optical shop, authority on telescope optics. (Mz) (48S, 161W)

HENYEY, Louis G. (1910-1970), USA astronomer; Prof., U. Chicago, U. Cal., Berkeley; interstellar matter; illumination of reflection nebulae; stellar atmosphere; stellar evolution; electronic computing. (W) (13N, 152W)

HERTZSPRUNG, Ejnar (1873-1967), Danish astronomer; Dir., Leyden Obs.; research on double stars & colors, esp.Pleiades & Cepheids; distance of small magellanic cloud; co-inventor of Hertzsprung-Russell diagram, relating luminosity & spectral type of stars. (W) (0, 129W)

HESS, Harry H. (1906-1969), USA geologist; Prof., Princeton U.; discovered greatest depth in oceans; Chairman of Nat'l Acad. Space Science Board, contributed to planning of Apollo 11 scientific program. (W) (54S, 174E)

——, Victor F. (1883-1964), Austrian-American physicist; Prof., Fordham U.; studied cosmic rays & their biological & atmospheric effects; radioactivity. (W) (54S, 174E)

HEYMANS, Corneille J.F. (1892-1968), Belgian physiologist; Prof. U. of Ghent; Nobel prize 1938, for studies on physiology & pharmacology of respiration, metabolism, circulation, & thermoregulation; chemo-receptors of the aorta; transplantations. (W) (75N, 144W)

HILBERT, David (1862-1943), German mathematician; Prof. Göttingen; fundamental theory of multi-dimensional geometry, with special applications to mathematical physics. (W) (18S, 108E)

HIPPOCRATES (c.460-c.377 B.C.), Greek physician; founder of important medical school at Cos, code of ethics of medical profession; regarded as father of medicine. (W) (71N, 146W)

HIRAYAMA, Kiyotsugu (1874-1943), Japanese astronomer; Prof. Tokyo U.; research on latitude variation; eclipse & comet records in Japanese & Chinese classics; lunar theory, vibration, asteroids; discovered families of asteroids. (Mz) (6S, 93E)

————, Shin (1867-1945), Japanese astronomer; Prof., Tokyo U.; sunspots, solar atmosphere; founder, Mitaka Obs.; celestial mechanics; stellar astronomy. (Mz) (6S, 93E)

HOFFMEISTER, Cuno (1892-1968), German astronomer, Sonneberg; meteors, zodiacal light; variable stars. (M) (15N, 137E)

HOGG, Arthur R. (1903-1966), Australian astronomer, Mt. Stromlo Obs.; atmospheric electricity, cosmic rays; photoelectric photometry, atlas of southern open clusters. (Mz) (34N, 122E)

——, Frank S. (1904-1951), Canadian astronomer; Prof., Dir., David Dunlap Obs.; radial velocities; astronavigation; spectrophotometry. (Mz) (34N, 122E)

HOHMANN, Walter (1880-1945), German pioneer in theory of space flight, published the 1st book (1925) treating the problem of interplanetary flight with math'l accuracy, with concepts basic to modern trajectory studies; "Hohmann transfer ellipse". (Mz) (18S, 94W)

HOLETSCHEK, Johann (1846-1923), Austrian astronomer, Vienna; brightness of nebulae & comets. (M) (28S, 151E)

HOUZEAU (De Lehaie), Jean C. (1820-1888), Belgian astronomer; Dir., Brussels Obs.; "Bibliographie generale de l'astronomie"; also publ. star catalog. (W) (18S, 124W)

HUTTON, James (1726-1797), Scottish geologist; originator of modern theory of formation of earth's crust, uniformitarian theory of geology, requiring much greater age for earth than previously held. (W) (37N, 169E)

IBN YUNUS(c.950-1009), Egyptian astronomer; compiled astron. & math tables based on 200 yrs. of Arabian obs'ns; established secular acceleration of moon's mean motion; improved theory of obliquity of ecliptic, & of precession of equinoxes. (W) (14N, 91E)

ICARUS, legendary son of Daedalus (q.v.) who flew too close to sun, wax of wings melted and he fell in sea. (Mz) (6S, 173W)

IDELSON, Naum I. (1885-1951), Russian-Soviet astronomer, Inst. Theor. Astron.; theoretical astronomy; math'l processing of observations. (L) (82S, 114E)

INGALLS, Albert L. (1888-1958), USA amateur telescope maker; wrote regularly for Sci. Amer. & thereby did much to popularize amateur telescope-making; one of founders of Amateur Telescope Makers; editor of "Amateur Telescope Making". (Mz) (26N, 153W)

INNES, Robert T.A. (1861-1933), Scottish astronomer; Union Astron., S. Afr.; discoveryof nearest star, Proxima Centauri; proof of oscillations in length of the day. Studied double stars. (W) (28N, 119E)

IZSAK, Imre (1929-1965), Hungarian-American astronomer, Smithsonian Inst.; celestial mechanics & satellite geodesy. (Mz) (23S, 117E)

JACKSON, John (1887-1958), British astronomer, H.M. Astron., Cape of Good Hope; dynamical & fundamental astron. (W) (22N, 163W)

JENNER, Edward (1749-1823), English physician; discovered that cowpox lymph could be safely used as innoculation to prevent smallpox. (W) (42S, 96E)

JOFFE, Abram F. (1880-1960), USSR physicist; Dir., Phys. Tech. Inst., State X-ray & Radiology Inst., Leningrad; research on mechanical properties of crystals, di-electrics, & semiconductors; magnetic field of cathode rays. (W) (15S, 129W)

JOULE, James P. (1818-1889), English physicist; generation of heat by electric current; mechanical equivalent of heat; 1st to calc. velocity of gas molecule. (W) (27N, 144W)

KAMERLINGH ONNES, Heike (1853-1926), Dutch physicist; Prof., U. Leiden; Nobel prize in physics 1913; low temperature research, properties of metals, liquifaction of helium 1908; superconductivity. (W) (15N, 116W)

KARPINSKY, Alexei P. (1846-1936), Russian-Soviet geologist; Pres., USSR Acad. Sci.; paleontology, stratigraphy & tectonics; petrography; geology of Urals; paleogeography. (L) (73N, 166E)

KEARONS, William M. (1878-1948), USA (Mass.) minister & amateur observer of sunspots over many years; noted esp. for his fine photographs of sunspots. (Mz) (12S, 113W)

KEELER, James E. (1857-1900), USA astronomer; Dir., Lick Obs.; determined wavelength of green line in nebular spectra; measured rotation of Saturn's rings, confirming particle theory; radial velocities of Orion nebula & 13 planetaries; observed 120,000 nebulae & concluded spiral is the normal type. (W) (10S, 162E)

KEKULÉ (von Stradonitz), Friedrich A. (1829-1896), German chemist, research on structure of organic compounds; proposed tetravalence of carbon compounds & chain formation of alphatic series, 1858; originated ring or closed-chain theory of structure of benzene molecule. (W) (16N, 138W)

KHWOLSON, Orest D. (1852-1934), Russian-Soviet physicist; Prof., Leningrad U.; research on inner diffusion of light; designed actinometer & pyrheliometer. (L) (14S, 112E)

KIBALCHICH, Nikolai I. (1853-1881), Russian rocket scientist, pioneer rocket research; design of rocket spacecraft for manned flight. (L)(2N, 147W)

KIDINNU (=Cidenas) (c.343- BC), Babylonian astronomer; head astron. sch. at Sippra; discovered precession of equinoxes; described mathematically the motions of the moon, sun, & planets. (W,M) (36N, 123E)

KIMURA, Hisashi (1870-1943), Japanese astronomer; Dir., Int'l Latitude Obs., Mizusawa; research on variation of latitude & polar motion. (Mz)(57S, 118E)

KING, Arthur S. (1876-1957), USA physicist; Supt., physical lab., Mt. Wilson; electric furnace; classification & intensities of spectrum lines. (A) (5N, 120E)

——, Edward S. (1861-1931), USA astronomer; Prof., Harvard U.; determined photographic magnitudes of bright stars & planets; improved techniques of photographing stars & their spectra. (W) (5N, 120E)

KIRKWOOD, Daniel (1814-1895), USA astronomer; Prof., Indiana U.; research on asteroids, & on the rings of Saturn (Kirkwood gaps). (W)(69N,157W)

KLEIMENOV, Ivan T. (1898-1938), USSR rocket scientist, Chief of Lab. of Gas Dynamics, later Chief of Rocketry Research Institute. (L)(33S, 141W)

KLUTE, Daniel O. (1921-1964), USA rocket scientist & chem. engineer; Rocketdyne Corp., in charge of combustion research in development of the Saturn F-1 Rocketdyne engine; largely responsible for solving the combustion instability problems in the F-1 engine. (Mz) (37N, 142W)

KOCH, Robert (1843-1910), German physician, pioneer bacteriologist; Nobel prize 1905 in physiology & medicine; introduced method of making bacterial smears & fixing them with heat 1877; identified causative agent of Asian cholera & several other major tropical diseases; tuberculine vaccine.(W) (43S, 150E)

KOHLSCHÜTTER, Arnold (1883-1969), German astronomer; Prof., Dir., Obs. U. Bonn; research on spectroscopic parallaxes; star catalog. (W)(15N, 154E)

KOLHÖRSTER, Werner (1887-1946), German physicist; Prof., U. Berlin, Dir. Cosmic Ray Lab., Potsdam; pioneer in observation of cosmic rays in balloons & mines; coincidence method; cosmic ray showers; radio-activity of K. (W,M) (10N, 114W)

KOMAROV, Vladimir M. (1927-1967), USSR cosmonaut; piloted the multi-seater, Voskhod I in 1964, and Soyuz I in 1967; killed in crash-landing of Soyuz I. (L) (25N, 153E)

KONDRATYUK, Yury V. (1897-1942), USSR rocket scientist; pioneer in USSR rocketry; evolved basic principles of cosmonautics; deduced basic equations of rocket motion (independent of Tsiolkovsky); developed theory of multi-stage rockets, optimal flight paths, etc. (L)(15S, 115E)

KONSTANTINOV, Konstantin I. (1817-1871), Russian rocket scientist; pioneer research in ballistics, rocket production & design, launching technology; rocket ballistic pendulum. (L) (20N, 159E)

KOPFF, August (1882-1960), German astronomer; Dir., Rechen-Institut, Heidelberg; FK 3 star catalogs. (17S, 90W)

KOROLEV, Sergei P. (1906-1966), USSR rocket scientist; Acad. Sci., USSR; Founder, later chief of Rocket Movement Research Group that created the first USSR liquid propellant rocket in 1933; played major role in development of USSR space flights, both manned & unmanned. (L)(5S, 157W)

KOSTINSKY, Sergei K. (1867-1936), Russian astronomer, Pulkovo Obs.; photographic astrometry; parallaxes & proper motions; variation of latitudes.(L) (14N, 118E)

KOVALEVSKAYA, Sofya (1850-1891), Mathematician (b. Moscow); Prof., Stockholm; partial differential equations, Abelian integrals, theory of movement solid body around an immovable point; non-solidity of Saturn's rings.(W,L) (31N, 129W)

KOVALSKY, Marian A. (1821-1884), Russian astronomer; Prof., Kazan U.; theory of motion of Neptune, theory of eclipses, binary orbits; deduced galactic rotation, 1860, & developed proper-motion method of studying it. (L) (22S, 101E)

KRAMERS, Hendrik A. (1894-1952), Dutch physicist; Prof., Leiden; research on quantum physics, intensity of atomic spectra, normalizing problems of charge & mass; predicted (with Heisenberg) Raman effect. (W) (53N, 128W)

KRASOVSKY, Feodosy N. (1878-1948), Russian/Soviet geodesist; USSR Acad. Sci.; determination of dimensions of the earth ellipsoid; triangulation; gravimetric & astronomic observations. (L) (4N, 176W)

KRYLOV, Alexei N. (1863-1945), USSR mathematician, mechanical engineer; USSR Acad. Sci.; widely known specialist in shipbuilding; studies in differential equations; theory of gyroscope. (L) (35N, 167W)

KUGLER, F.X. (1862-1929), German Jesuit; deciphering of the Babylonian tablets on planetary motions; Babylonian chronology. (M) (53S, 104E)

KULIK, Leonid A. (1883-1942), USSR mineralogist & investigator of meteorites; led scientific expeditions to regions of fall of meteorites, including the Tunguska (Siberia) meteorite. (L) (42N, 155W)

KUO SHOU CHING (1231-1316), Chinese astronomer, many works on astronomy, computed new calendar; built instruments & made many astron. obsns. (W) (8N, 134W)

LACCHINI, Giovanni (1884-1967), Italian amateur astronomer; one of the first members of AAVSO, made thousands of observations of variables; contributed importantly to development of amateur interest in astronomy in Italy. (Mz) (41N, 107W)

LAMB, Sir Horace (1849-1934), English physicist, mathematician; Prof. Owens Coll., Victoria U., Manchester; motion of fluids; fluid hydrodynamics; hydrostatics; propagation of earthquake tremors on surface of elastic solid. (W) (43S, 101E)

LAMPLAND, Carl O. (1873-1951), USA astronomer, Lowell Obs.; visual & photographic study of planets, surface detail, temperatures; discovered many variable stars, & changes in nebulae. (W) (31S, 131E)

LANDAU, Lev D. (1908-1968), USSR physicist; Prof. Moscow State U.; head theoretical dept., Inst. Phys. Problems, USSR, Acad. Sci.; Nobel prize for physics 1962; research on solid state, low temperature & nuclear physics, quantum field theory. (W) (42N, 119W)

LANE, Jonathan H. (1819-1880), USA physicist, astrophysicist; research on compression & expansion of gases, phys. constitution & temp. of sun, density of solar gas; Lane's Law, on heat generation by contraction of a gaseous body; & various topics in physics. (W) (9S, 132E)

LANGEMAK, Georgy E. (1898-1938), USSR rocket engineer, designer of rockets using smokeless long-burning powder; one of chiefs in Lab. of Gas Dynamics, later Rocket Res. Inst. of USSR. (L) (10S, 119E)

LANGEVIN, Paul (1872-1946), French physicist; Prof., Sorbonne; research on ultrasonic sound forms, basis of modern sonar; studies on molecular structure of gases, magnetic theory; relativity, X-rays. (W) (44N, 162E)

LANGMUIR, Irving (1881-1957), USA physicist, chemist; Res. Lab., Gen. Electric; Nobel prize in chemistry, 1932; atomic & molecular structure; originated (with G.N. Lewis) the theory of chemical valence. (W) (36S, 129W)

LARMOR, Sir Joseph (1857-1942), British mathematician, physicist; Prof., Cambridge U.; math. problems in electrodynamics & thermodynamics; atomic structure. (W) (32N, 180)

LAUE, Max T.F. von (1879-1960), German physicist; Prof., U. Berlin; Dir., Max Planck Inst.; Nobel prize, 1914, for discovery of X-ray interferences, proving electro-magnetic nature of X-rays & providing technique for study of atomic structure of crystals & polymers. (W) (28N, 97W)

LAURITSEN, Charles C. (1892-1968), Danish-American physicist & rocket scientist; Prof., Cal. Tech.; responsible for development of Naval rockets used in WW II; research in elec., radio engineering. (W) (27S, 96E)

LEAVITT, Henrietta S. (1868-1921), USA astronomer; Harvard Obs.; developed methods for determining photographic magnitudes of variable stars; discovered 2400 variables & period-luminosity relation in Magellanic Clouds. (W) (46S, 140W)

LEBEDEV, Petr N. (1866-1912), Russian physicist; Prof., Moscow; experimental research on light pressure, which he proved to exist & measured; researches on light & electricity. (W) (48S, 108E)

LEBEDINSKY, Alexander I. (1913-1967), USSR astrophysicist; Prof., Moscow U.; cosmogony of stars & planets; hydrodynamics of solar atmosphere; aurora borealis. (L) (8N, 165W)

LEEUWENHOEK, Antony van (1632-1723), Dutch microscopist; ground lenses of great precision; built microscopes, described & illustrated his extensive observations on details of plants & animals. (W) (30S, 179W)

LEIBNITZ, Gottfried W. (1646-1716), German mathematician, physicist, philosopher; invented the calculus (indep'ly of Newton), introduced much of modern math'l notation; mechanics & dynamics; cosmology (held earth to be immensely old). (W) (38S, 178E)

LEMAITRE, Georges (1894-1966), Belgian mathematician; Prof., Louvain; cosmology; "primeval atom" theory of origin of universe & interpretation of red-shift; cosmic rays; celestial mechanics. (Mz) (62S, 150W)

LENZ, H.F. Emil (1804-1865), physicist (b. Estonia), Prof., U. St. Petersburg; electromagnetic phenomena; conductivity & temperature; electromagnetic induction (Lenz's Law). (W) (3N, 102W)

LEUCIPPUS (fl.c.440 BC), Greek philosopher, Miletos; credited (with Democritos) as founder of atomistic theory; said by some to be 1st to state rule of causality (every event has a natural cause). (29N, 116W)

LEUSCHNER, Armin O. (1868-1953), USA astronomer; Prof., Univ. Calif.; theoretical celestial mechanics, esp. perturbations in orbits of comets, planets, & asteroids. (W) (1N, 109W)

LEVI-CIVITA, Tullio (1873-1941), Italian mathematician, physicist; Prof., U. Rome; mechanics; developed Einstein's unified field equations, theory of tensors. (W) (24S, 143E)

LEWIS, Gilbert N. (1875-1946), USA chemist; Prof., U. Calif.; thermodynamics & the free energy of chemical substances; valence & the structure of atoms & molecules. (W) (19S, 114W)

LEY, Willy (1906-1969), German-American rocket engineer, space expert; co-founder & active member of the German Society of Space Travel (1927), experiments with early liquid fueled Repulsor rockets (1930-31); free lance writer on space science, etc.; associated with NASA. (W, Mz)(43N, 154E)

LINDBLAD, Bertil (1895-1965), Swedish astronomer; Dir., Stockholm Obs.; two-dimensional spectral classification of faint stars; galactic rotation & epicycle motions of stars; dynamics of spiral systems. (W, Mz)(70N, 99W)

LODYGIN, Alexander N. (1847-1923), Russian scientist-inventor; research on electricity; inventor of carbon filament lamp. (L)(18S, 147W)

LORENTZ, Hendrik A. (1853-1928), Dutch physicist; Prof., Leiden U.; Dir., Teyler Lab., Haarlem; Nobel prize in physics 1902; authority on quantum physics; discovered (indep'ly) the Lorentz-Fitzgerald contraction; explained the Zeeman effect; electron theory of electricity; precursor of relativity theory. (W)(34N, 100W)

LOVE, Augustus E.H. (1863-1940), British mathematician, geophysicist; Prof., Oxford U.; geodynamics, mathematical theory of elasticity, application to earth's crust; hydrodynamics & electromagnetism. (W)(6S, 129E)

LOVELACE, William R. II (1907-1965), USA physician & space scientist; Director of Space Medicine of NASA; pioneer in aerospace medicine, devel. of oxygen equipment for aviation; high-altitude escape breathing systems for pilots; research in space medicine & physiology for manned flights. (Mz) (82N, 107W)

LOWELL, Percival (1855-1916), USA astronomer; founded Lowell Obs.; research on planets, esp. Mars; calc's predicting discovery of Planet X (Pluto). (W)(13S, 103W)

LUCRETIUS, Titus C. (c.95 BC-c.55 BC), Roman philosopher; author of "De rerum natura"; exponent of atomic theory, & mechanical view of universe. (W)(9S, 121W)

LUNDMARK, Knut E. (1889-1958), Swedish astronomer; Prof., U. Lund., Dir., Lund Obs.; distances of galaxies, supernovae; history of astronomy.(M) (39S, 152E)

LÜTKE, Fedor P. (1797-1882), Russian geographer; Pres., St. Petersburg Acad. Sci.; navigation;Arctic explorer, collected data on oceanography, ethnography, zoology & botany. (L)(17S, 123E)

LYMAN, Theodore (1874-1954), USA physicist; Prof., Harvard U.; research on light at ultraviolet wavelengths, Lyman series of hydrogen. (W) (65S, 162E)

MACH, Ernst (1838-1916), Austrian physicist & philosopher; Prof., Prague, Vienna; research in supersonic projectiles, & flow of gases (Mach number in supersonic flight); studies in perception, & philosophy of science. (W)(18N, 149W)

MAKSUTOV, Dmitri D. (1896-1946), USSR optician; organizer, Dir., Astron. Optics Lab., Leningrad State Inst. Optics; research on astronomical optics; invented catadioptric (meniscus) systems for telescopes & optical devices.(W) (41S, 169W)

MALYI, Alexander L. (1907-1961), USSR rocket engineer, Lab. of Gas. Dyn.; contributed to development & tests of world's first electric rocket engine of electrothermic type. (L) (22N, 105E)

MANDEL'SHTAM, Leonid I. (1879-1944), Russian/Soviet physicist; Prof. U. Moscow; classical studies on combined scattering of light; radio-interference techniques; experimental radio location of moon. (L) (6N, 162E)

MARCI von Kronland, Jan Marek (1595-1667), Bohemian physician; Prof., Prague U.; defined kinetic motion of light as a result of compressions, expansions; research in mechanics; dispersion of light by a prism (before Newton); diffraction colors of thin layers. (W) (22N, 169W)

MARCONI, Guglielmo (1874-1937), Italian inventor, invented apparatus for wireless telegraphy; Nobel prize for physics 1909; developed applications; worked on shortwave & ultra-short-wave transmission. (W)(9S, 145E)

MARIOTTE, Edme (1620-1684), French physicist; experiments to elucidate nature of heat, cold, light, sight, color, water; hydrostatics & hydraulics; discussed rainbows, halos, parhelia, diffraction; "Law of Mariotte" (often ascribed to Boyle). (W)(29S, 140W)

MAUNDER, Annie S.D.R. (1868-1947), British astronomer; computer, Roy. Greenwich Obs.; study of sunspots, catalog of recurrent groups. (W)(14S, 94W)

———, Edward W. (1851-1928), British astronomer; Supt. solar dept., Royal Greenwich Obs. (W)(14S, 94W)

McKELLAR, Andrew (1910-1960), Canadian astronomer, Dom. Ap. Obs.; research on molecular spectra; spectra of late type stars & of comets. (A) (16S, 171W)

McLAUGHLIN, Dean B. (1901-1965), USA astronomer; Prof., U. Michigan; research on novae, Be stars, Mars. (W)(47N, 93W)

McMATH, Francis C. (1867-1938), USA engineer & amateur astronomer; with his friend Judge H.S. Hulbert & his son Robert, he founded the McMath-Hulbert Obs.; particularly active in development of equipment for cinematography of lunar sunrise & solar prominences. (Mz)(15N, 167W)

———, Robert R. (1891-1962), USA astronomer; Dir., McMath-Hulbert Obs.; pioneer in motion-picture recording of solar phenomena; design & construction of telescopes; infrared spectroscopy. (A)(15N, 167W)

McNALLY, Paul A., S.J. (1890-1955), USA astronomer; Dir., Georgetown Obs.; nebulous areas of the sky; Barnard dark spots; variable stars; lunar occultations; calendar reform; solar eclipses. (22N, 127W)

MEES, C.E. Kenneth (1882-1960), British-American photographer; Eastman Kodak Co., organized its research Lab.; research on photographic processes, panchromatic plates; light filters for photography. (W)(14N, 96W)

MEGGERS, William F. (1888-1968), USA physicist; chief, spectroscopy section, Nat'l Bureau Stand.; research in spectroscopy; tables of wave numbers & of spectral line intensities. (W)(24N, 123E)

MEITNER, Lise (1878-1968), Austrian physicist; head of physics dept., Kaiser Wilhelm Inst. Chem.; discovered thorium C, protoactinium; nuclear isomerism; uranium fission, & prediction of chain reaction. (W)(11S, 113E)

MENDEL, Gregor J. (1822-1884), Austrian biologist; discovered dominant & recessive characteristics in pea plants; 1st explanation of hybridization using controlled pollination & statistical analysis, the basis of modern genetics. (W)(49S, 110W)

MERRILL, Paul W. (1887-1961), USA astronomer, Mt. Wilson Obs., research on wavelengths of spectrum lines, red & infrared photography; red stars; interstellar matter; discovered technetium in S-type stars. (W) (74N, 116W)

MESENTSEV, Yuri B. (1929-1965), USSR rocket scientist; engine designer, worked out methods of suppressing high-freq. oscillations of pressure in engines. (L) (72N, 129W)

MESHCHERSKY, Ivan V. (1859-1935), Russian mathematician; applied mathematics; general theory of motion of body with variable mass; equations of rocket dynamics. (L) (12N, 125E)

METCHNIKOV, Il'ya I. (1845-1916), Russian-French bacteriologist; Dir., Pasteur Inst., Paris; Nobel prize 1908 for medicine & physiology; pioneer research on infectious diseases; gerontology; immunity. (W) (11S, 149W)

MICHELSON, Albert A. (1852-1931), German & USA physicist; Prof., U. of Chicago; measured speed of light with extremely high accuracy, helping to destroy ether concept; invented interferometer & measured diameter of star, α Orionis; measured a meter in terms of wavelength of Cd-line (6N, 121W)

MILANKOVIČ, M. (1879-1958), Yugoslav astronomer; noted for theory of ice ages, & calculations of effects of varying orbital parameters, on insolation received by earth; celestial mechanics. (L, Mz) (77N, 170E)

MILLIKAN, Robert A. (1868-1953), USA physicist; Dir., Norman Bridge Lab. of Physics, Cal. Tech.; Nobel prize 1923; research on X-rays & free expansion of gases; measured charge of electron; ionization chamber; cosmic rays; determination of Planck constant; photoelectric effect. (W) (47N, 121E)

MILLS, Mark M. (1917-1958), USA physicist & rocket scientist, responsible (with J.W. Parsons) for development of castable solid rocket propellants; pioneer in considering technical application of nuclear energy to rocket propulsion; co-author of the Physics of Rockets, 1945, a standard reference for some years. (Mz) (9N, 156E)

MILNE, E. Arthur (1896-1950), British mathematician & astrophysicist; Prof., Oxford U., research on stellar atmospheres; dynamics & electrodynamics; kinematic relativity; stellar interiors. (W) (31S, 113E)

MINEUR, Henri (1899-1954), French mathematician; astronomer; Dir., Inst. Astrophys., Paris; relativity; evolution of double stars; mechanics of variable masses; stellar motions; interstellar absorption; celestial mechanics. (Mz) (25N, 162W)

MINKOWSKI, Hermann (1864-1909), German mathematician; Prof., Zurich, Gottingen; provided math. basis for general theory of relativity, particularly in his 4-dimensional math.; geometrical method for number theory. (W) (56S, 145W)

MINNAERT, Marcel G. (1893-1970), Dutch astronomer, astrophysicist; Prof., Dir. Obs., U. Utrecht; research on photometry & interpretation of Fraunhofer lines, quantitative analysis of solar atmosphere; photometry of solar phenomena & of moon; member of IAU Working Group on Lunar Nomenclature for the far side of moon. (W, Mz) (56S, 124W)

MITRA, S.K. (1890-1963), Indian physicist; Prof., Calcutta; radio astronomy, ionosphere. (Mz) (18N, 155W)

MÖBIUS, August F. (1790-1868), German mathematician, astronomer; Prof., U. Leipzig; a founder of topology (developed math. figure known as "Möbius strip"); leader in introducing modern projective geometry methods. (W) (16N, 101E)

MOHOROVIČIĆ, Andrija (1857-1936), Croatian geophysicist; deduced that earth's structure is layered, from study of earthquake wave patterns, with sharp separation between layers, (Mohorovicic discontinuity). (W) (19S, 165W)

MOISEEV, Nikolai D. (1902-1955), USSR astronomer; Prof., Moscow U.; Dir., Sternberg Inst.; celestial mechanics; stability theory (L) (9N, 103E)

MONTGOLFIER, Jacques E. (1745-1799), French inventor; with brother (Joseph) built 1st successful man-carrying balloon using heated air, 1783. (W) (47N, 160W)

————, Joseph M. (1740-1810), French inventor, invented parachute. (47N, 160W)

MOORE, Joseph H. (1878-1949), USA astronomer; Dir., Lick Obs.; stellar spectroscopy, radial velocities; solar eclipses; lunar photography. (W) (37N, 178W)

MOROZOV, Nikolai A. (1854-1945), Russian-Soviet naturalist; studies in math., meteorology, history, chemistry, physics & astronomy; hon. mem. Acad. Sci. USSR. (L) (5N, 127E)

MORSE, Samuel F.B. (1791-1872), USA inventor; invented electro-magnetic recording telegraph, sending & receiving apparatus, code (Morse Code). (W) (22N, 175W)

MOULTON, Forest R. (1872-1952), USA astronomer; Prof., U. Chicago; research (with Chamberlin) on planetesimal or spiral-nebula hypothesis of origin of solar system. (W) (61S, 97E)

NAGAOKA, Hantaro (1865-1950), Japanese physicist; Prof., Tokyo U.; a founder of Japanese physics; research in spectroscopy, electromagnetism, atomic spectra; Zeeman effect in weak fields. (W) (20N, 154E)

NASSAU, Jason J. (1892-1965), USA astronomer; Prof., Case Inst. Tech.; Dir., Warner & Swasey Obs.; research on stellar spectra & galactic structure. (W) (25S, 177E)

NERNST, Walther H. (1864-1941), German phys. chemist; Prof., Göttingen, Berlin; Dir., Inst. Exp't'l Physics; devised theory of electric potential & conduction on electrolytic solutions; developed 3rd law of thermodynamics. (W) (35N, 95W)

NEUJMIN, Grigory N. (1885-1946), Russian astronomer; Dir., Pulkovo Obs.; astrophotography; asteroids & periodic comets. (L) (27S, 125E)

NICHOLSON, Seth B. (1891-1963), USA astronomer, Mt. Wilson Obs.; research in solar astronomy, magnetic classification of sunspots; stellar radiation; devised (with Pettit) thermocouple for study of planetary surface temperatures (W) (26S, 85W)

NIEPCE, Joseph N. (1765-1833), French physicist, photographer; worked with Daguerre to perfect photography; made 1st permanent photograph, 1826. (W) (72N, 120W)

NIJLAND, Albertus A. (1868-1936), Dutch astronomer; Dir., Utrecht Obs.; research on variable stars, solar eclipses, comets & meteors. (W) (33N, 134E)

NISHINA, Yoshio (1890-1951), Japanese physicist, Tokyo; pioneer in study of cosmic rays, also in development of sci. studies in Japan; Klein-Nishina formula (re Compton effect). (W) (45S, 171W)

NOBEL, Alfred B. (1833-1896), Swedish inventor; invented dynamite & blasting gelatine; inventions in ordnance & synthetics; established Nobel Prizes. (W) (15N, 101W)

NÖTHER, Emmy (1882-1935), German mathematician; Prof., Göttingen U.; Bryn Mawr, Pa.; general & abstract algebra (field theory, theory of rings, ideal theory). (or NÖTER) (W, L) (66N, 114W)

NUMEROV, Boris V. (1891-1943), USSR astronomer; founder & Dir., Inst. Theor. Astron.; astrometry, celestial mechanics & gravimetry. (L) (71S, 161W)

NUŠL, F. (1867-1925), Czech astronomer; Ondřejov Obs., Prof., Prague; circumzenithal telescope with impersonal micrometer. (M) (32N, 167E)

OBRUCHEV, Vladimir A. (1863-1956), Russian-Soviet geologist; exploration, geology of Siberia; Dir. & organizer of Inst. for Permafrost Studies of USSR Acad. Sci. (W, L) (39S, 162E)

O'DAY, Marcus (1897-1961), USA rocket builder, physicist, Air Force Cambridge Res. Labs.; originator of the "blossom" parachute program for recovering rockets & other space vehicles; pariticpated actively in the founding of Sacramento Peak Observatory. (Mz) (31S, 157E)

OHM, Georg S. (1787-1854), German physicist; formulated "Ohm's law", relating resistance to voltage & current strength. (W) (18N, 114W)

OLCOTT, William T. (1873-1936), USA writer of many popular books on astronomy; a founder of AAVSO: contributed importantly to development of organized amateur astronomy. (Mz) (20N, 117E)

OMAR KHAYYAM (c.1050-c.1123), Persian mathematician, astronomer, poet; Royal astron.; largely responsible for new Persian calendar, having an error of only 1 day each 5000 yrs.; prepared astron. tables; may have discovered binomial theorem; geometric & algebraic solutions of eqns of 2nd degree & some cubics; most famous in West for agnostic, philosophic poetry. (W) (58N, 102W)

OPPENHEIMER, J. Robert (1904-1967), USA physicist; Dir., Los Alamos Sci. Lab; Dir., Inst. Adv. Study, Princeton; contributed to development of quantum theory, understanding of cosmic rays, fund'l particles & relativity; introduced use of symmetrical fcns in scattering problems; theory of neutron stars; development of atomic bomb. (W) (35S, 166W)

ORESME, Nicole (c.1323-1382), French mathematician; founder of important school of medieval mechanics; developed a calculus of proportions & applied it to terrestrial & celestial kinematics & dynamics. (W) (43S, 169E)

ORLOV, Alexander Y. (1880-1954), USSR astronomer; founder & Dir., Gravimetrical Obs., Poltawa, Obs. Kiev; geophysics, comet tails. (M,L) (26S, 175W)

———, Sergei V. (1880-1958), USSR astronomer; Prof., U. Moscow; Dir., Sternberg Inst.; comets, cometary forms. (M,L) (26S, 175W)

OSTWALD, Wilhelm (1853-1932), German chemist; a founder of modern phys. chemistry; research in catalysis, rates of chem. reactions, equilibrium; Nobel prize for chemistry 1909. (W) (11N, 122E)

PANETH, Friedrich A. (1887-1958), German chemist; research in radioactivity, determination of ages of rocks; improved technique for measuring minute traces of helium, appl. to meteorites; ages of meteorites. (W) (63N, 95W)

PANNEKOEK, Antonie (1873-1960), Dutch astronomer; Prof., U. Amsterdam; research on astrophysics; structure of our galaxy, extragalactic systems & cosmology; stellar atmospheres; history of astronomy. (W) (4S, 140E)

PAPALEKSI, Nikolai D. (1880-1947), Russian physicist, USSR Acad. Sci.; theory of non-linear & parametric oscillations; parametric resonance; radio interferometric geodesy & navigation. (L) (10N, 164E)

PARACELSUS, Theophrastus B.v.H (1493-1541), physician, chemist, natural philosopher; wrote many works on medicine, chemistry & natural phil.; attacked over-reliance on authority & urged more reliance on personal observation. (W) (23S, 163E)

PARASKEVOPOULOS, John S. (1889-1951), South African (Greek-American) astronomer; Supt. Boyden Station of Harvard Obs.; photography of southern stars. (Mz) (50N, 150W)

PARENAGO, Pavel P. (1906-1960), USSR astronomer; Prof., U. Moscow; stellar astronomy, interstellar extinction; stellar dynamics; General Catalog of variable stars. (M) (26N, 109W)

PARKHURST, John A. (1861-1925), USA astronomer; Prof., U. Chicago, Yerkes Obs.; stellar photometry. (M) (34S, 103E)

PARSONS, John W. (1913-1952), USA rocket scientist; responsible for development of ballistite solid propellants in the 1930's, for castable asphalt-base solid propellants in the early 1940's, & for developments in liquid propellants such as hydrazine; one of the founders of Aerojet Engineering Co., in 1942. (Mz) (37N, 171W)

PASCHEN, Friedrich (1865-1940), German physicist; Prof., Tübingen, Bonn, Berlin; research on fine structure of spectral lines, X-rays, verified Sommerfeld's relativistic theory of atoms; infrared radiation. (W) (14S, 141W)

PAULI, Wolfgang (1900-1958) (b.Vienna), physicist; Prof., Zurich; Nobel prize 1945; principles of wave mechanics, Pauli exclusion principle; postulated the neutrino. (W) (45S, 136E)

PAVLOV, Ivan P. (1849-1936), Russian physiologist, St. Petersburg; Nobel prize 1904; research on nervous mechanisms controlling secretion of digestive glands; established importance of autonomic nervous system; study of conditioned reflex, esp. in dogs. (W) (28S, 142E)

PAWSEY, Joseph L. (1908-1962), Australian radio astronomer; Radio Physics Lab. CSIRO; pioneer in solar & stellar radio astronomy. (Mz) (44N, 145E)

PEASE, Francis G. (1881-1938), USA astronomer, Mt. Wilson Obs.; made direct photographs & spectrograms of nebulae & star clusters, of moon & planets; interferometer measures of star diameters; meas. vel. of light; in charge of design of 100-inch telescope. (W,M) (13N, 106W)

PERELMAN, Jakov I. (1882-1942), USSR rocket scientist, popularizer of rocket movement & interplanetary travel; author of many scientific-popular books; active member of Rocket Movement Research Group, Leningrad. (L) 24S, 106E

PEREPELKIN, Evgeny J. (1906-1940), USSR astrophysicist; Pulkovo Obs.; solar physics; concept of chromosphere as consisting of small prominences. (L) (10S, 128E)

PERKIN, Richard S. (1906-1969), USA industrialist, manufacturer of scientific equipment, esp. for astronomical use, such as large telescopes, spectrographs & Project Stratoscope. (Mz) (47N, 176W)

PERRINE, Charles D. (1867-1951), USA astronomer; Dir., Argentine Nat. Obs.; discovered motion in nebulosity about Nova Persei; 6th & 7th satellites of Jupiter, 13 comets. (W) (42N, 129W)

PETRIE, Robert M. (1906-1966), Canadian astronomer; Dir., Dom. Ap. Obs.; measurement of stellar radial velocities; analysis of double stars from spectral obs'ns; distances of high-temp. stars from spectra. (W) (45N, 108E)

PETROPAVLOVSKY, Boris S. (1898-1933), USSR rocket engineer; designer of rockets & rocket engines using smokeless long-burning powder; one of chiefs of Lab. of Gas Dynamics. (L) (37N, 115W)

PETROV, Evgeny S. (1900-1942), USSR rocket scientist & designer; Lab. of Gas Dyn., Rocket Res. Institute; contributed to development of first liquid-propellant rocket engines in USSR, & to design of solid-propellant rockets. (61S, 88E)

PETTIT, Edison (1890-1962), USA astronomer, Mt. Wilson Obs.; research on forms & motions of solar prominences; devised interference polarizing monochrometer, & a thermocouple for measuring planetary temperatures. (W) (27S, 86W)

PETZVAL, Joseph von (1807-1891), Austro-Hungarian; Prof., U. Pest, U. Vienna; theorem on the aberrations in optical systems; important contributions fo practical optics, "Petzval objective". (M) (63S, 113W)

PIRQUET, Guido von, Baron (1880-1966), Austrian pioneer in calculation of spacecraft trajectories (early 1920's), including orbit & escape trajectories; "Pirquet's paradoxon"; advocate (1930's) of manned space stations. (Mz) (20S, 140E)

PIZZETTI, P. (1860-1918), Italian geodesist; Prof., Genoa, Pisa; geodesy, theory of errors, figure of the earth. (M)(35S, 119E)

PLASKETT, John S. (1865-1941), Canadian astronomer; Dir., Dom. Ap. Obs.; research on rotation & other motions of the galaxy & its stars. (W)(82N, 175E)

PLUMMER, Henry C. (1875-1946), British astronomer; Roy. Astr. Ireland, Dunsink Obs., Prof. Math, Mil. Coll., Woolwich; Astrographic Catalogue; celestial mechanics; parallaxes of A & B stars; variable stars, binary stars. (Mz) (25S, 155W)

POGSON, Norman R. (1829-1891), English astronomer; govt. astron., Madras; proposed that a difference of 5 magnitudes correspond to stellar light ratio 1:100; discovered several minor planets, & variable stars. (W)(42S, 111E)

POINCARÉ, J. Henri (1854-1912), French mathematician, physicist; Prof. U. Paris; theory of astronomical orbits, esp. 3-body problem; theory of functions; topology; philosophy of science. (W)(57S, 161E)

POINSOT, Louis (1777-1859), French mathematician; solved problem of permanent rotation of a body about privileged axes; created the idea of inertia of ellipsoids. (W) (79N, 145W)

POLZUNOV, Ivan I. (1728-1766), Russian heat engineer; invented heat piston engine, combining the work of several cylinders on a single shaft. (L) (26N, 115E)

PORTER, Russell W. (1871-1949), USA telescope designer; designed the Mt. Wilson 100" reflector; best known for his drawings of telescopes & accessories; contrib. signif'ly to development of amateur astronomy & its organization. (Mz) (56S, 10W)

POYNTING, John H. (1852-1914), English physicist; Prof. Birmingham; the pressure of light, & effect on comet tails; measured density of earth, constant of gravitation; "Poynting vector";"Poynting-Robertson effect." (W) (17N, 133W)

PRAGER, Richard A. (1884-1945), German-American astronomer, Harvard Obs.; variable star research. (4S, 131E)

PRANDTL, Ludwig (1875-1953), German physicist; Dir., Kaiser Wilhelm Inst. Fluid Mechanics; a founder of modern hydrodynamics & aerodynamics; research on sound barrier, supersonic flow, turbulence. (W)(60S, 141E)

PRIESTLY, Joseph (1733-1804), English chemist; discovered oxygen, isolated & described various gases. (W)(57S, 108E)

PURKYNĚ, Jan E. (1787-1869), Bohemian physiologist; Prof. Charles U., Prague; discovered Purkyně cells in cortex of cerebellum; fiber network in cardiac muscle; introduced term protoplasm, Purkyně phenomenon in color-brightness vision; demonstrated importance of fingerprints, 1823. (W)(1S, 95E)

QUÉTELET, Lambert A.J. (1796-1874), Belgian statistician, astronomer; head & founder, Royal Obs.; developed methods of simultaneous obs'n of astronomical, meteorological, geodetic phenomena at various places in Europe; concept of statistics of biological & demographic phenomena. (W,M) (43N, 135W)

RACAH, Giulio (1909-1965), Italian & Israeli physicist; Prof., Jerusalem; calculation of atomic spectra by group-theory methods. (Mz) (14S, 180)

RAIMOND, J.J. Jr. (1903-1961), Dutch astronomer; Astron. Inst. Groningen, Dir., Planetarium, The Hague; long time president of Dutch society of amateur astronomers; did much to popularize astronomy by his lectures & articles. (M)(14N, 159W)

RAMSAY, Sir William (1852-1916), British chemist; Prof., U. Coll., London; discovered & investigated inert gases; Nobel prize for chemistry, 1904. (W)(40S, 145E)

RASUMOV, Vladimir V. (1890-1967), USSR rocket scientist & inventor liquid-propellant rockets; chief of Design Bureau for construction of Tsiolkovsky's all metal-airship. (L) (39N, 114W)

RAYET, George A.P. (1839-1906), French astronomer; Dir., Floirac Obs.; discovered 3 stars (with G.T.E. Wolf) in Cygnus with strong emission lines (Wolf-Rayet stars). (W) (45N, 114E)

RICCO, Annibale (1844-1911), Italian astronomer; Dir., Catania Obs.; research on sunspots, astrophysics. (W) (75N, 177E)

RIEDEL, Klaus (1907-1944), German rocket engineer; with von Braun & others, developed & tested the first oxygen-gasoline rocket engines in Germany; credited with building the first water-cooled liquid-fuel rocket; from 1937, Dir. for Ground Equipment in rocket devel. center of Peenemuende. (Mz) (49S, 140W)

———, Walter (1902-1968), German rocket scientist; chief designer at Peenemuende, responsible for design of the A4(V2); 1st in European rocket history to instrument a rocket test stand for precise measurement of all engine functions during a firing test. (Mz)(49S, 140W)

RITTENHOUSE, David (1732-1796), USA inventor, astronomer, math'n.; Prof., U. Pa.; designed his orrery (to represent motions of planets, lunar & solar eclipses for 5000 yrs.); said to have made 1st telescope in USA; research on gratings, spectra, magnetism & electricity; barometric effects.(W) (74S, 107E)

RITZ, Walter (1878-1909), Swiss physicist; research in spectral physics, devised theory called Ritz's combination principle. (W) (15S, 92E)

ROBERTS, Alexander W. (1857-1938), South African educator & amateur astronomer; observer of variable stars & visual binaries; active in popularizing astronomy in South Africa. (Mz) (71N, 175W)

———, Isaac (1829-1904), British amateur astronomer; Fellow of Roy. Soc.; pioneer work in photography of nebulae & star clusters, discovery of hitherto unknown features of these objects. (Mz) (71N, 175W)

ROBERTSON, Howard P. (1903-1961), USA physicist, mathematician; Prof., Cal. Tech.; differential geometry; relativity & cosmology, interpretation of red-shift by relativity theory, esp. the 2nd order term; government consultant. (Mz) (22N, 105W)

ROCHE, Edouard A. (1820-1883), French astronomer, Montpelier; tidal action of a celestial body on a satellite; "Roche limit". (M) (42S, 135E)

ROZHDESTVENSKY, Dmitri C.(1876-1940)USSR physicist; founder & Dir., State Inst. of Optics; research on atomic spectra; absolute oscillator strengths by "method of hooks". (L) (86N, 155W)

ROWLAND, Henry A. (1848-1901), USA physicist; Prof., Johns Hopkins U.; discovery of magnetic action due to electric convection; invented concave grating & developed machine for ruling gratings; solar spectrum (Rowland Atlas). (W)(57N, 163W)

RUMFORD, Count Benjamin (Thompson) (1773-1814), American-British physicist; best known for cannon experiments, showing heat to be a mode of motion, & thereby disproving prevalent (caloric) notion of heat as a substance. (W)(29S, 170W)

RYDBERG, Johannes R. (1854-1919), Swedish physicist; Prof., Lund; developed formula for spectral lines; discovered Rydberg constant. (W) (47S, 96W)

RYNIN, Nikolai A. (1877-1942), USSR rocket scientist; author of a number of studies in rocketry, interplanetary communications & exploration of stratosphere; experimental studies of problems related to influence of inertial acceleration on a living organism. (L)(37N, 87E)

SAENGER, Eugen (1905-1964), German rocket engineer; research & pioneer book (1930) on physics & technology of rocket propulsion; founder (1936) of Rocket Res. Center at Trauen near Hanover; research on high-altitude aerodynamics, rocket-powered 'skip plane'. (W,Mz) (4N, 102E)

ŠAFAŘIK, Adalbert (1829-1902), Czech astronomer; Prof., Prague U.; variable star observations; construction of reflectors, invention of alloys for metallic mirrors. (M,L) (10N, 177E)

SAHA, Meghnad (1893-1956), Indian astrophysicist; Prof., Calcutta U.; founder, Inst. Nuclear Physics, Calcutta; developed physical theory of stellar spectra, the Saha ionization equation relating temperature, electron pressure & level of ionization; research on solar corona; theory of spectra.(W) (2S, 103E)

ST. JOHN, Charles E. (1857-1935), USA solar physicist, astronomer, Mt. Wilson Obs.; revised Rowland's Preliminary Table of Solar Spectrum Wavelengths; research on motion & circulation in sunspots & solar atmosphere; measured solar rotation period spectroscopically; relativity displacement of wavelengths. (W) (10N, 150E)

SANFORD, Roscoe F. (1883-1958), USA astronomer, Mt. Wilson Obs.; research in astrophysics, spectroscopic binaries, Cepheid variables, interstellar lines & velocities, carbon isotopes in stars. (A)(32N, 139W)

SARTON, George (A.L.) (1884-1956), Belgian-USA science historian; Prof., Harvard U.; author of numerous books on science history from ancient times.(W) (49N, 121W)

SCALIGER, Joseph J. (1540-1609), scholar (b. Agen, France); Prof., Leiden; laid foundations for modern chronology; devised 1st completely scientific time system, based on cycle of 7980 yrs. (Julian period). (W) 27S, 109E)

SCHAEBERLE, John M. (1853-1924), USA astronomer, Lick Obs.; directed several solar eclipse expeditions; discovered 3 comets; constructed long-focus telescope camera. (W)(26S, 117E)

SCHJELLERUP, H.C. (1827-1887), Danish astronomer, Copenhagen U. Obs.; catalog of red stars; catalog of 10,000 stars observed by meridian circle; transl. of catalog of Al Sufi. (M) (69N, 157E)

SCHLESINGER, Frank (1871-1943), USA astronomer; Dir., Yale Obs.; author of catalog of 4000 stellar distances; research on stellar photography, parallaxes, spectroscopic binaries, radial velocities, solar rotation. (W) (47N, 138W)

SCHLIEMANN, Heinrich (1822-1890), German archeologist, founder of archeology of Greek Bronze Age, inspired by faith in historicity of Homer's Iliad; excavated Hissarlik (Troy), Mycenae, Tiryns, proving that civilization described by Homer was more than myth. (W) (2S, 155E)

SCHNELLER, Herbert (1901-1967), German astronomer, Berlin-Babelsberg, Sonnenburg, Potsdam; variable stars; ζ Aurigae. (M) (42N, 164W)

SCHÖNFELD, Eduard (1828-1891), German astronomer; Prof., Bonn; cataloged 133,659 stars from 2° to 23°S, & 489 nebulae; assisted Argelander in cataloging northern stars to 9-10th mag. (W)(45N, 98W)

SCHORR, Richard (1867-1951), German astronomer; Prof., Dir., Hamburg Obs., Bergedorf; second AG-catalogs; eclipse expeditions. (Mz) (19S, 90E)

SCHRÖDINGER, Erwin (1887-1961), Austrian physicist; Dir., Sch. Theoretical Phys., Inst. Adv. Study, Dublin; Nobel prize for physics 1933; discovered Schrödinger wave equation; founded wave mechanics, placing quantum theory on new basis; research on specific heats of solids, statistical thermodynamics. (W) (75S, 133E)

SCHUSTER, Sir Arthur (1851-1934), British mathematician, physicist, Germany & England; research in spectroscopy, electricity, magnetism, cathode rays, Zeeman effect; made 1st photograph of spectrum of solar corona,1882.(W) (4N, 147E)

SCHWARZSCHILD, Karl (1873-1916), German astronomer; Prof., Gottingen, Dir., Potsdam Obs.; research on comets, preferential stellar motions; theory of stellar atmospheres, of very massive bodies; geometrical optics. (W) (71N, 120E)

SEARES, Frederick H. (1873-1964), USA astronomer, Mt. Wilson Obs.; research on theory of orbits, perturbations, general magnetic field of sun; distribution of stars; stellar photometry. (W) (74N, 145E)

SECHENOV, Ivan M. (1829-1905), Russian physiologist; Prof., U. St. Petersburg; pioneer physiology & neurology in Russia; research on central nervous system & reflexes; localized reflex inhibitory centers in spinal cord & oblongata. (W) (7S, 143W)

SEGERS, Carlos (1900-1967), Argentine variable star observer & organizer of amateur astronomers in So. America; author of many popular articles & lectures. (M,Mz) (47N, 128E)

SEIDEL, Ludwig P. von (1821-1896), German astronomer, mathematician; Prof., Munich; refraction & dispersion, aberrations of optical systems; pioneer in stellar photometry. (W) (33S, 152E)

SEYFERT, Carl K. (1911-1960), USA astronomer; Prof., Vanderbilt; Dir., A.J. Dyer Obs.; spectrophotometry of stars & galaxies; structure of Milky Way; photoelectric photometry of eclipsing stars; "Seyfert galaxies". (A) (29N, 114E)

SHAJN, Grigori A. (1892-1956), USSR astrophysicist; Dir., Crimean Ap. Obs.; physics of stars & of interstellar space; stellar rotation; gaseous nebulae; iostopes of C,N in stars. (Mz) (33N, 172E)

SHARONOV, Vsevolod V. (1901-1964), USSR astronomer; Prof., Leningrad U., Dir., Leningrad Obs.; research on planets, atmospheric optics, surface photometry, absolute brightness measurements. (W)(13N, 173E)

SHI SHEN (Shih Shen)(4th cent. BC), Chinese astronomer, Shantung; compiled 1st star catalog (809 stars); recognized connection of solar eclipses with moon. (M,L) (76N, 105E)

SHTERNBERG, Pavel K. (1865-1920), Russian astronomer; Prof., Dir., Moscow Obs.; photographic astrometry & gravimetry; latitude determination. (L) (19N, 117W)

SIEDENTOPF, H. (1906-1963), German astronomer; Prof., Dir. of Obs. Tübingen; scintillation; zodiacal light; interplanetary matter. (M)(22N, 135E)

SIERPINSKI, Waclaw (1882-1969), Polish mathematician; Prof., U. Warsaw; research on logical foundations of math. & topology; theory of numbers. (W) (27S, 155E)

SISAKYAN, Norair M. (1907-1966), USSR biochemist, USSR Acad. Sci.; biochemical properties of protoplasm, effect of enzymes on metabolic processes; biol. effects of high-energy radiation; bioastronautics. (L) (41N, 109E)

SLIPHER, Earl C. (1883-1964), USA astronomer, Lowell Obs.; planetary investigations. (A) (49N, 160E)

———, Vesto M. (1875-1969), USA astronomer; Dir., Lowell Obs.; astronomical spectroscopy; planetary atmospheres; discovered high space velocities of galaxies, basic to theory of expanding universe; velocity of star clusters; comets; radiations of night sky. (W) (49N, 160E)

SMOLUCHOWSKI, Marian (1872-1917), Polish physicist; fluctuation theory, second law of thermodynamics, theory of Brownian movement; critical opalescence; kinetic theory of colloids. (L) (60N, 97W)

SNIADECKI, Jan (1756-1830), Polish astronomer & mathematician; Prof., Krakow U., founder, Krakow Obs., Dir., Vilna Obs.; systematic observation of newly discovered asteroids; history of astronomy. (L) (22S, 169W)

SOMMERFELD, Arnold J.W. (1868-1951), German physicist; Prof., Munich U.; atomic structure; quantum theory of spectral lines; wave mechanics & application to Bohr atom model. (W) (65N, 161W)

SPENCER JONES, Sir Harold (1890-1960), English astronomer; Dir., Greenwich Obs.; Astornomer Royal; research on latitude variation, irregularities of earth's movement; calc'n of masses of planets; value of solar parallax. (W) (13N, 166E)

SPIRU HARET (1851-1912), Rumanian astronomer; celestial mechanics; secular terms in planetary perturbations. (M)(59S, 176W)

STARK, Johannes (1874-1957), German physicist; Prof., U. Würzburg; Nobel prize 1919; radiation & atomic theory; 1st to split spectral lines with electric field (Stark effect). (W) (25S, 134E)

STEBBINS, Joel (1878-1966), USA astronomer; Prof., U. Wisconsin; Dir. Washburn Obs.; pioneer in photoelectric stellar photometry. (W)(65N, 143W)

STEFAN, Joseph (1835-1893), Austrian physicist; Prof., U. Vienna; originated law that total radiation from black body is proportional to T^4. (W) (46N, 109W)

STEIN, J.W. (1871-1951), Dutch astronomer; Dir., Castel Gandolfo Obs.; variable stars. (M) (7N, 179E)

STEKLOV, Vladimir (1864-1926), USSR mathematician; founder, Inst. Physics & Math. of USSR Acad. Sci.; mathematical physics, hydro-mechanics; theory of elasticity. (L) (37S, 105W)

STENO, Nicolaus (1638-1686), anatomist, geologist (b. Denmark, worked mainly in Italy & Germany) pioneered in geology, paleontology, crystallography, argued that sedimentary deposits were originally horizontal; discussed formation of mountains, crystal growth, organic origin of fossils; also by his skill in dissection signif'ly advanced knowledge of anatomy. (W) (33N, 162E)

STETSON, Harlan T. (1885-1964), USA astronomer, geophysicist; Dir., lab., M.I.T.; cosmic-terr. res.; correlation of sunspots with radio reception; lunar effect on ionization of upper atmosphere. (A) (40S, 119W)

STOLETOV, Alexander G.(1839-1896)Russian physicist; Prof., Moscow U.; studies of photoeffect, electric discharges in gases (Stoletov effect); electromagnetism & ferromagnetism. (L) (45N, 155W)

STONEY, George J. (1826-1911), Irish mathematician, physicist; Prof., Queen's Coll., Galway; introduced term electron & calc'd approx. value of its charge 1874; research on wave motion & optics, atomic structure & theory of spectra, kinetic theory of gases; planetary atmospheres. (W) (56S, 156W)

STÖRMER, F. Carl M. (1874-1957), Norwegian mathematician, astronomer; Prof., U. Oslo; invented apparatus for photographing aurora borealis; research on motion of charged particles in earth's magnetic field; predicted existence of Van Allen belts. (W) (57N, 145E)

STRATTON, Frederick J.M. (1881-1960), English astronomer, astrophysicist; Prof., Cambridge U., Dir., Solar Phys. Obs.; solar eclipses, astrophysics.(W) (6S, 165E)

STRÖMGREN, Elis (1870-1947), Danish astronomer; Prof., Copenhagen; research on motions of double stars, comets; periodic orbits. (W)(22S, 133W)

SUBBOTIN, Mikhail F. (1893-1966), USSR astronomer; Prof., Leningrad U.; Dir., Inst. Theoret. Astr.; research in celestial mechanics, orbits of comets & planets. (29S, 135E)

SUMNER, Captain Thomas H. (1807-1876), USA; determination of geographical position by "Sumner Circles". (M) (37N, 109E)

SUNDMAN, K.F. (1873-1949), Finnish astronomer; Prof., Helsinki; three-body problem. (M) (11N, 91W)

SWANN, William F.G. (1884-1962), physicist (b. England); Dir., Franklin Inst.; contributed to study of cosmic rays, atomic structure, relativity & atmospheric electricity. (W)(52N, 112E)

SZILARD, Leo (1898-1964), Hungarian-American physicist; Prof., U. Chicago; directed 1st nuclear chain reaction (with Fermi); research in molecular biology; with W. Zinn proved possibility of self-sustaining nuclear-fission, 1939. (W) (34N, 106E)

TEISSERENC de Bort, Leon P. (1855-1913), French meteorologist; founder of "Observ. de Meteorologie Dynamique", Trappes; pioneered use of unmanned high-flying instrumented balloons to systematically investigate upper atmosphere; discovered isothermal layer later called stratosphere. (W) (32N, 137W)

TEN BRUGGENCATE, P. (1901-1961), German astronomer; Dir., Göttingen Obs.; star clusters; solar spectrum (M)(9S, 134E)

TESLA, Nikola (1856-1943), USA electrician, inventor (b. Croatia); many inventions & discoveries in transmission of AC current, wireless transmission, generation of electrical oscillations. (W)(38N, 125E)

THIEL, Walter (1910-1943), German rocket scientist; in charge of development of the A4(V2) engine, a pump-fed, liquid-cooled double-walled rocket motor of 56,000 pounds thrust, & its production after 1st successful test in 1940; killed Aug. 1943 in bombing of Peenemuende. (Mz)(40N, 134W)

THIESSEN, E. (1914-1961), German astronomer, Hamburg Obs.; solar magnetic fields. (M) (75N, 169W)

THOMSON, Sir Joseph J. (1856-1940), English physicist; Prof., Cambridge U.; Nobel prize 1906; electricity, magnetism, atomic structure; measured ratio of charge to mass of cathode rays, discovered the electron thereby. (W) (33S, 166E)

TIKHOMIROV, Nikolai I. (1860-1930), USSR chemical engineer; organizer & chief of the Lab. of Gas Dynamics; founder of the Soviet design of rockets using smokeless pot powder; supervised development of smokeless powder using solid solvent, successful launching of 1st rockets. (L) (25N, 162E)

TIKHOV, Gavriil A. (1875-1960), Russian-Soviet astronomer, Pulkovo Obs., Inst. Astrobotanics, Kazakhstan; detailed comparison of spectrophotometric properties of surface of Mars with those of terrestrial vegetation in various climate zones. (M,L) (62N, 172E)

TILING, Reinhold (1890-1933), German rocket scientist; built several solid-propellant rockets in early 30's, with aim of using them as mail carriers across the English Channel, one reached 32,500 ft. altitude; killed in explosion of his laboratory. (Mz) (52S, 132W)

TIMIRYAZEV, Kliment A. (1843-1920), Russian botanist, physiologist; Prof., Moscow U.; studies of photosynthesis; development of Darwinism. (L) (5S, 147W)

TITIUS, Johann D. (1729-1796), German astronomer; Prof., Wittenberg; ratios of planetary distances. (M) (27S, 101E)

TRUMPLER, Robert J. (1886-1956), USA astronomer, Lick Obs.; star clusters; photographic magnitudes, radial velocities; stellar statistics; interstellar absorption (A) (28N, 168E)

TSANDER, Friedrich A. (1887-1933), USSR rocket scientist, inventor; rocket engines using compressed air & gasoline, using liquid nitrogen & gasoline; active member of GIRD. (L) (5N, 149W)

TYNDALL, John (1820-1893), British physicist; Prof. natural philos., Roy. Inst. Gt. Britain; studied absorption & radiation of heat by gases & vapors, with applications to meteorology; explained blueness & polarization of sky-light; presented experimental disproof of theory of spontaneous generation; scattering of light. (W) (35S, 117E)

VALIER, Max (1895-1930), German rocket scientist, pioneer in rocket technology; author of "The Advance into Space" (1924); research on solid & liquid propellant rockets; killed in explosion of a test-rocket. (Mz) (7N, 174E)

VAN DE GRAAFF, Robert J. (1901-1967), USA physicist, MIT; High Voltage Eng. Corp.; developed high-voltage electrostatic generator; research in nuclear physics. (W) (27S, 172E)

VAN DEN BERGH, G. (1890-1966), Prof. of civil law, Amsterdam; periodicities in eclipses; 2 books in which he was able to check & to correct the tables of Oppolzer. (M) (31N, 159W)

VAN DER WAALS, Johannes D. (1837-1923), Dutch physicist; Prof., U. Amsterdam; Nobel prize in physics, 1910, for equation of state for gases & liquids; continuity of gaseous & liquid states. (W) (44S, 119E)

VAN GENT, H. (1900-1947), Dutch astronomer, Leiden, Johannesburg; southern variable stars. (M)10N, 160E)

VAN MAANEN, Adriaan (1884-1946), Dutch & American astronomer, Mt. Wilson Obs.; research on parallaxes & proper motions of stars, motions of galactic clusters & variable stars. (W) (36N, 127E)

VAN RHIJN, Pieter J. (1886-1960), Dutch astronomer; Dir. Lab., Prof., U. Gröningen; (with Kapteyn) determined the number of stars in galaxy as 30 x 10^9; modernized work of Kapteyn in stellar statistics. (W) (53N, 145E)

VAN'T HOFF, Jacobus H. (1852-1911), Dutch-German chemist; Amsterdam U., Liepzig, Berlin; a father of physical chemistry; developed law relating chem. equilibrium to temperature; partial pressure of dissolved substances, electrolytic dissociation; stereochemistry of carbon atom; Nobel prize, 1901. (W) (62N, 132W)

VAN WIJK, Uco (1924-1966), Dutch-American astronomer; Princeton, U. Maryland; dynamics of galactic clusters, stellar motions, high velocity stars; photoelectric photometry. (Mz) (63S, 119E)

VASHAKIDZE, M.H. (1909-1956), USSR astronomer, Abastumani Obs.; solar corona; distribution of stars in space (Vashakidge-Oort method); discovered polarization of light from Crab Nebula. (M) (44N, 93E)

VAVILOV, Nikolai (1887-1943), USSR botanist; Dir., Inst. Genetics of USSR Acad. Sci.; genetics & immunology of plants. (L) (1S, 139W)

———, Sergei I. (1891-1951), USSR physicist, Moscow; research on optics, esp. photoluminescent phenomena, relation of light to vision & optical physiology, luminescence. (W,L) (1S, 139W)

VENING MEINESZ, Felix A. (1887-1966), Dutch geophysicist, geodesist; Prof. U. Utrecht; research on earth's crust & mantle, gravity field; determinations of gravity at sea; shape of earth. (W) (0, 163E)

VENTRIS, Michael G.F. (1922-1956), English architect; deciphered Minoan-Mycenean Linear B script, important in establishing that 16th to 12th cent. BC peoples of Aegean spoke an early form of Greek, contrary to prevalent opinion; thus established that Homer's Mycenaeans were Greeks. (W) (5S, 158E)

VERNADSKY, Vladimir I. (1863-1945), Russian mineralogist; Prof., U. Moscow, Dir., State Radium Inst., Leningrad, founder, Biogeochem. Lab.; research on geochemistry, isomorphism of chem. elements, meteorites, microorganisms in biogeochem. of earth's crust. (W) (23N, 130E)

VESALIUS, Andreas (1514-1564), Flemish anatomist; physician to Charles V; founder of modern anatomy, based on own dissection of human cadavers; standardized form & meaning of anatomical nomenclature; invented forceps. (W) (3S, 115E)

VESTINE, Ernest H. (1906-1968), USA physicist; Phys., Carnegie Inst.; research on geomagnetism, its origin & disturbance; upper atmosphere; earth's crust. (A) (34N, 94E)

VETCHINKIN, Vladimir P. (1888-1950), USSR physicist, engineer; aerodynamics, theory of rocket flight; aircraft stress analysis; theory of ship's screw ("Vetchinkin's vorticity surface"). (L) (10N, 131E)

VIL'EV, Mikhail A. (1893-1919), Russian astronomer; celestial mechanics-theory of lunar motion, perturbed motion of planets & comets. (L) (6S, 144E)

VOLTERRA, Vito (1860-1940), Italian mathematician, physicist; Prof., U. Rome; developed theory of integro-differential equations; theory of functional analysis; imaginary variables. (W) (57N, 131E)

VON DER PAHLEN, Emanuel (1882-1952), German astronomer, Potsdam Obs.; stellar statistics. (M) (25S, 133W)

VON KÁRMÁN, Theodore (1881-1963), USA aeronautical engineer; Dir., Guggenheim Aero. Labs.; Dir., Jet Propulsion Lab.; founder, Aerojet Engineering Corp.; pioneer in devel. high speed aircraft & missiles, devel. 1st theory of supersonic drag; designed supersonic wind tunnel; initiated research that developed 1st supersonic airplane; research in math., analysis thermodynamics, aerodynamics, hydrodynamics. (W) (45S, 176E)

VON NEUMANN, John (1903-1957), USA mathematician; Prof., Inst. Advanced Study; developed game theory; showed math. equivalence of wave mechanics & matrix mechanics; consultant to various committees of U.S. govt., Army, Navy, AEC. (W) (40N, 153E)

VON ZEIPEL, E.H. (1873-1959), Swedish astronomer; Prof., Uppsala; stellar interiors; masses of stars in clusters; motions of asteroids. (M) (42N, 142W)

VOSKRESENSKY, Leonid A. (1913-1965), USSR rocket scientist; developed methods of rocket testing, directed tests & launches of geophysical rockets, first artificial earth-satellite, first lunar probes & Vostok spaceships. (L) (28N, 88W)

WALKER, Joseph A. (1921-1966), USA, Chief Research Pilot, NASA; Project pilot on X-1 and D-558 rocket-powered aircraft & 1st pilot of NASA's Lunar Landing Research Vehicle, Project pilot on X-15 rocket aircraft which he flew to 354,300 ft. altitude & to 4,104 mph; killed in aircraft collision. (Mz) (26S, 162W)

WAN-HOO, (c.1500), Chinese inventor; according to legend he constructed a manned rocket of 2 box-like kites & a seat, & 47 solid-propellant rockets; perished in trying to take off. (L) (11S, 139W)

WATERMAN, Alan T. (1892-1967), USA physicist; Dir., Nat. Sci. Found'n.; electrical properties of solids, electron theory of conduction; best known for long career of distinguished service to the U.S. Gov't. in science. (W) (26S, 128E)

WATSON, James C. (1838-1880), USA astronomer; Prof., Dir. Obs., U. Michigan; discovered a number of comets & asteroids, wrote on theory of their motion; observed solar eclipses, transit of Venus of 1874. (W)(63S, 124W)

WEBER, Wilhelm E. (1804-1891), German physicist; Prof., Göttingen; established (with Gauss) measuring system of electricity; research in magnetism & electricity & relation between them; acoustic phenomena; wave motion. (W) (50N, 124W)

WEGENER, Alfred L. (1880-1930), German geophysicist, meteorologist; Prof., Hamburg, Graz; originated the hypothesis of continental drift. (W) (45N, 113W)

H.G. WELLS, (Herbert George)(1866-1946), English novelist, journalist; a major writer of science-fiction, often highly prophetic. (Mz) (41N, 122E)

WEXLER, Harry (1911-1962), USA meteorologist & space scientist; Dir., meteorol. res., U.S. Weather Bureau; conceived the program of weather satellites; research on atmospheric & solar radiation; storms in upper atmosphere; research on Antarctic atmosphere in I.G.Y. (W, Mz) (69S, 90E)

WEYL, Hermann (1885-1955), German-American mathematician; Prof., Zurich, Inst. Advanced Study; research in differential equations, topology, relativity, group theory. (W) (16N, 120W)

WHITE, Edward H., II (1930-1967), USA astronaut, Lt. Col., USAF.; U.S. Mil. Acad., 1952; M. Sci., U. Michigan in aeronautical engineering; first American to walk in space, during flight of Gemini 4, June 1965; killed in ground-fire of Apollo testcraft, 27 Jan 67. (45S, 160W)

WIECHERT, E. (1861-1928), German geophysicist; Prof., Göttingen; founder of Geophysical Inst.; seismology. (M) (84S, 165E)

WIENER, Norbert (1894-1964), USA mathematician; Prof., M.I.T.; theories of probability & potential, relativity & quantum theory; founder of cybernetics (sci. of communication & control); contributed to devel. of modern computers. (W) (41N, 146E)

WILSING, J. (1856-1943), German astronomer, Potsdam Obs.; visual spectrophotometry of sun & stars. (M) (22S, 155W)

WINKLER, Johannes (1897-1947), German rocket scientist; in 1931 he launched the first successful European liquid-fuel rocket, burning oxygen & methane & attaining an alt. of 1000 ft.; in 1927 founded "Verein für Raumschiffahrt" (Society for Space Travel). (Mz)(42N, 179W)

WINLOCK, Joseph (1826-1875), USA astronomer; Prof., Dir., Harvard Obs.; obtained 1st photograph of eclipsed corona; 1st to adapt long-focus telescope to photography. (W) (35N, 106W)

WOLTJER, Jan (1891-1946), Dutch astronomer, Leiden Obs.; celestial mechanics; stellar atmospheres, Cepheid pulsation, solar chromosphere. (Mz) (45N, 160W)

WOOD, Robert W. (1868-1955), USA physicist; Prof., Johns Hopkins U.; experimental research in physical optics; modification of diffraction gratings; made 1st infrared & ultraviolet photographs of moon. (W)(44N, 121W)

WYLD, James H. (1913-1953), USA rocket scientist; early member & experimenter in Amer. Rocket Soc.; in 1938 designed, built, & tested 1st successful U.S. regeneratively cooled rocket motor, design was basis of formation of Reaction Motors, Inc., & concept was widely used. (Mz)(1S, 98E)

YABLOCHKOV, Pavel N. (1847-1894), Russian electric engineer; inventor of arc lamp; research on generation & distribution of electric current. (L) (61N, 127E)

YAMAMOTO, I. (1889-1959), Japanese astronomer; Dir., Kwasan Obs.; variable stars, comets, zodiacal light. (59N, 161E)

ZEEMAN, Pieter (1865-1943), Dutch physicist; Prof., Amsterdam, Dir., Phys. Inst., Amsterdam; Nobel prize 1902; discovered Zeeman effect, behavior of spectral lines in a magnetic field. (W) (75S, 135W)

ZELINSKY, Nikolai D. (1861-1953), USSR chemist; Prof., Moscow U.; catalysis of organic compounds; synthesis of oil & caoutchouc; research on origin of oil; organic chemistry. (L) (29S, 167E)

ZERNIKE, Fritz (1888-1966), Dutch physicist; Prof., Groningen; Nobel prize for physics 1953; developed phase-contrast microscope, for examination of internal structure of living tissue without stain. (W) (18N, 168E)

ZHIRITSKY, Georgy S. (1893-1966), USSR rocket scientist; designer of gas turbines & rocket engines; research on rocket heat engineering, construction & stress analysis. (L) (25S, 120E)

ZHUKOVSKY, Nikolai Y. (1847-1921), Russian physicist; Prof., Polytech. Inst. & U. Moscow; founder of Central Inst. of Aerohydrodynamics; "Father of Russian aviation", research aerodynamics, hydrodynamics. (L) (8N, 167W)

ZINGER, Nikolai J. (1842-1918), Russian astronomer; specialist in geodesy; invented method of astronomical determination of time, still widely used today. (L) (57N, 176E)

ZSIGMONDY, Richard A. (1865-1929), Austrian chemist; Prof., Göttingen; Nobel prize 1925; research on colloids; co-inventor of ultramicroscope. (W) (59N, 105W)

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Biographical data: persons proposed to be added to Names already on Moon (B&M, 1935 list)

ADAMS, John C. (1819-1892), British astronomer; motion of Moon, planets, & comets; co-discovery of Neptune. (B&M) (W) (32S, 68E)

———, Charles H. (1868-1951), USA amateur astronomer; active in business & chemistry; for 25 yrs secretary & treasurer of Astron.Soc. of Pacific, active in promotion of both amateur & professional astronomy. (Mz) (32S, 68E)

———, Walter S. (1876-1956), USA astronomer; Dir., Mt. Wilson Obs.; stellar spectra & luminosity; Sirius B a white dwarf; CO_2 on Venus; differential solar rotation from spectra; sunspot spectra. (W) (32S, 68E)

CASSINI, Giovanni D. (1625-1712), Italian/French astronomer; Dir., Paris Obs.; motions of comets, planets & satellites; Saturn's rings; solar parallax. (B&M) (W) (40N, 5E)

———, Jacques (1677-1756), French astronomer; Dir., Paris Obs.; figure of earth; astronomical tables. (W) (40N, 5E)

HAHN, Graf Friedrich von (1741-1805) German astronomer. (B&M) 31N, 74E)

———, Otto (1879-1968), German physical chemist; Prof., U.Berlin; Dir., Kaiser Wilhelm Inst.Chemistry; Nobel prize in chemistry, 1944, for splitting uranium atom & discoveries in chain reaction prin.; nuclear fission; discovered transuranium elements. (W) (31N, 74E)

HALE, George Ellery (1868-1938), USA astronomer. (Arthur, 1964, see below, p. 41) (74S, 90E)

———, William (1797-1870), British rocket scientist; significantly advanced rocket technology after death of Congreve; conceived of stickless, jetspun, military & life-saving rockets, widely used in Great Britain, Austria, and USA. (Mz) (74S, 90E)

HENRY, FRÈRES (Paul, 1848-1905; Prosper, 1849-1903), French astrons. (B&M) (24S, 59W)

———, Joseph (1797-1878), USA physicist; Dir., Smithsonian Inst.; conducted research in electromagnets, invented electromagnetic motor, electric relay; initiated system of basing weather forecasts on weather reports received by telegraph; an organizer of AAAS. (W) (24S, 59W)

MARKOV, Andrei A. (1856-1922), Russian mathematician. (1964 list, see p.42) (53N, 63W)

———, Alexander V. (1897-1968), USSR astrophysicist, Pulkovo Obs.; lunar photometry. (L) (53N, 63W)

MAURY, Matthew F. (1806-1873), USA oceanographer. (B&M) (W) (37N, 40E)

———, Antonia C. (1866-1952), USA astronomer; res.assoc., Harvard Obs.; pioneer in classification of stellar spectra; spectroscopic binaries. (Mz) (37N, 40E)

POPOV, Alexander S. (1859-1905), Russian physicist. (1961 list,see p.38) (17N, 99E)

———, C. (1880-1966), Bulgarian astronomer; celestial mechanics. (17N, 99E)

RITTER, Karl (1779-1859), German geographer. (B&M) (W) (2N, 19E)

———, A. (-), German astrophysicist, research on gaseous spheres, c.1878-1890. (M) (2N, 19E)

ROSS, Sir James C. (1800-1862), British polar explorer. (B&M) (W) (12N,22E)

———, Frank E. (1874-1966), USA astronomer; Prof., Yerkes Obs.; research on physics of the photographic plate, planetary & stellar photography; development of wide-angle, high-speed lenses. (W) (12N, 22E)

SCHMIDT, Johann F.J. (1825-1884), German astronomer; edited map of Moon, 1878; first to observe changes in crater Linne & other areas. (B&M) (W) (1N, 19E)

———, Bernhard (1879-1935), German lens designer; collaborator, Obs. Hamburg-Bergedorf; wide-angle optics; "Schmidt camera." (M) (1N, 19E)

———, Otto Y. (1891-1956), USSR math'n, astronomer, geophysicist, polar explorer; Dir., Inst. of Geophys. of USSR Acad.Sci.; hypothesis of origin of planetary system from gas-and-dust cloud. (L) (1N, 19E)

STRUVE, Freidrich von (1783-1864), German-Russian astronomer; Dir.,Pulkovo Obs.; double stars; stellar parallaxes; geodetic surveys.(B&M) (24N, 77W)

———, Otto von (1819-1905), German-Russian astronomer; Dir.,Pulkovo Obs.; double stars; satellites of Uranus; rings of Saturn. (B&M) (24N, 77W)

———, Otto (1897-1963), Russian-USA astrophysicist; Dir., Yerkes & McDonald Obs., National Radio Astronomy Obs.;Prof. U. Chicago, U. Calif. Berkeley; stellar spectroscopy; stellar rotation; discov. interstellar hydrogen. (W) (24N, 77W)

WILSON, Alexander (1714-1786), Scottish astronomer. (B&M) (W) (69S, 42W)

———, Charles T.R. (1869-1959), Scottish physicist, Cavandish Lab., Cambridge; Nobel prize in physics, 1927; invented Wilson cloud chamber for detection of ionized particles. (W) (69S, 42W)

———, Ralph E. (1886-1960), USA astronomer, Mt. Wilson Obs.; measurement of proper & radial motions; statistical studies of solar motion; galactic rotation; space absorption; absolute magnitudes of special classes of stars.(W) (69S, 42W)

WRIGHT, Frederick E. (1878-1953), USA astronomer. (Arthur, 1964,see p.43) (31S, 87W)

———, Thomas (1711-1786), British natural philosopher; suggested grindstone model of galaxy; predicted resolution of rings of Saturn into congeries of small satellites. (W) (31S, 87W)

———, William H. (1871-1959), USA astronomer; Dir., Lick Obs.; photographic study of Mars, showing the disk to be larger in ultraviolet than in infrared light, attributed to scattering of uv light by atmosphere. (W) (31S, 87W)

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Names proposed for Lunar Craters: living astronauts and cosmonauts

First Circumnavigation of the Moon

ANDERS, William A. (1933-), USA astronaut; lunar module pilot for Apollo 8, man's first voyage to the Moon, Dec 1968; B.S., U.S.Naval Acad.; M.S., nuclear engineering, Air Force Inst.Tech. (Mz) (42S, 144W)

BORMAN, Frank (1928-), USA astronaut; Deputy Dir. of Flight Operations, Manned Spacecraft Center, Houston; command pilot of Gemini VII, record orbital flight of 330.58 hrs, Dec 65; spacecraft commander of Apollo 8 flight to Moon, Dec 68; B.S., U.S.Mil.Acad.; M.S., aeronautical engr., Cal. Tech. (Mz) (37S, 143W)

LOVELL, James A. Jr. (1928-), USA astronaut; pilot of Gemini VII, Dec 65; command pilot of Gemini XII, Nov 66; command module pilot for Apollo 8; commander of Apollo 13 flight, Apr 70; B.S., U.S.Naval Academy; navy test pilot. (Mz) (39S, 149W)

First Landing on the Moon

ALDRIN, Edwin E. Jr. (1930-), USA astronaut; pilot of Gemini XII, spent over 5.5 hrs outside spacecraft, Nov 66; pilot of lunar module of Apollo 11, 2nd man to set foot on Moon, Jul 69; B.S., U.S.Mil.Acad.; D.Sci. in astronautics, MIT. (Mz) (1.4N, 22.1E)

ARMSTRONG, Neil A. (1930-), USA astronaut; command pilot of Gemini VII, first docking of two vehicles in space, Mar 66; commander of Apollo 11, first man to set foot on Moon, 20 Jul 69; B.S., aeronautical engr., Purdue Univ.; research test pilot for rocket aircraft. (Mz) (1.5N, 25E)

COLLINS, Michael (1930-), USA astronaut; pilot of Gemini X, 3 periods of extra-vehicular activity, Jul 66; command module pilot of Apollo 11 Moon-landing mission, Jul 69; B.S., U.S. Mil. Acad. (Mz) (1.3N, 23.7E).

USSR Cosmonauts

LEONEV, Alexsei A. (1934-) USSR pilot-cosmonaut; first man to walk in space, during 26 hr flight of Voshod-2, Mar 65. (L) (19N, 148E)

TERESHKOVA, Valentina (Nicolaeva-Tereshkova) (1937-) USSR pilot-cosmonaut; piloted Vostok-6, made 48 revolutions about earth, Jun 63. (L) (28N, 145E)

TITOV, German S. (1935-), USSR pilot-cosmonaut; pilot of Vostok-2, made first day-long flight in space, with 17 revolutions, Aug 61. (L) (28N, 151E)

SHATALOV, Vladimir A. (1927-), USSR pilot-cosmonaut; took part in docking the first experimental orbital station, Jan 69; directed group flight of 3 space-ships Soyuz, Oct 69. (L) (24N, 140E)

NIKOLAEV, Andriyan G. (1929-), USSR pilot-cosmonaut; took part in first group flight, Aug 62; commander of Soyuz-9, which carried out record-long orbital flight, Jun 70. (L) (35N, 151E)

FEOKTISTOV, Konstantin P. (1926-), USSR cosmonaut; Dr. Tech.Sci., the first scientist-cosmonaut, carried out experiments in spaceship Voshod, Oct 64. (L) (31N, 140E)

Additional names proposed for commemoration

APOLLO (35S, 155W), USA manned landing program; Greek god.

SINUS LUNICUS (32N, 1.5W), site of 1st USSR hard landing.

PLANITIA DESCENSUS (7N, 64W), site of 1st USSR soft landing.

STATIO TRANQUILLITATIS (0.8N, 23.7E), site of 1st USA manned landing.

Checked positions of craters on Soviet IAU list, 1961

EDISON	25N, 99E	MAXWELL	30N, 98E
GIORDANO BRUNO	36N, 103E	MENDELEEV	6N, 141E
HERTZ	13N, 104E	PASTEUR	12S, 105E
JOLIOT	26N, 94E	POPOV	17N, 99E
(formerly Joliot-Curie)		SKLODOWSKA	18S, 96E
JULES VERNE	36S, 146E	(formerly Sklodowska-Curie)	
KURCHATOV	38N, 142E	TSIOLKOVSKY	21S, 129E
LOBACHEVSKY	9N, 113E	TSU CHUNG-CHI	17N, 144E
LOMONOSOV	27N, 98E	MARE INGENII	34S, 163E
MARE MOSCOVIENSE	27N, 147E	MONTES SOVIETICI, deleted	

Biographical data for names on Soviet IAU list of 1961

EDISON, Thomas A. (1847-1931), USA inventor; invented many important electrical devices; organizer of Edison Electric Co. (W)

GIORDANO BRUNO (1548-1600), philosopher, cosmologist (b.Italy); cosmology, conceived of earth as revolving round a moving sun, believed stars were centers of other planetary systems, moving in an infinite space; rejected reliance on Authority; burned at stake for heresy. (W)

HERTZ, Heinrich R. (1857-1894), German physicist; Prof., U.Bonn; research on discharge of electricity in rarified gases; 1st to observe electromagnetic waves (Hertzian, or radio waves), c.1886, study of their properties. (W)

JOLIOT, Frederic (1900-1958), French physicist; Prof., U.Paris; discovery of artificial radioactivity; nuclear physics; structure of atom; neutron emission in nuclear fission; Fr.high comm. for atomic energy. (W)

JULES VERNE, (1828-1905), French writer of science fiction, remarkably prophetic. (Mz)

KURCHATOV, Igor V. (1903-1960), USSR nuclear physicist; dir. nuclear physics lab. Physico-Technical Inst.; supervised building of cyclotrons; research in nuclear fission produced by neutron bombardment & in spontaneous fission. (W)

LOBACHEVSKY, Nikolai I. (1793-1856), Russian math'n; Prof., U.Kazan; non-Euclidean geometry, later related to Einstein theory of relativity. (W)

LOMONOSOV, Mikhail V. (1711-1765), Russian scientist, scholar; Prof., U. of Imperial Academy Sci.,St.Petersburg; researches in chemistry, astronomy, metallurgy, geology, meteorology, cartography; also a grammarian, poet, historian. (W)

MAXWELL, James C. (1831-1879), British physicist; Prof., Cambridge U.; fund'l research in electricity & magnetism, Maxwell's equations. (W)

MENDELEEV, Dmitri I. (1834-1907), Russian chemist; Prof., U.St.Petersburg; developed periodic classification of elements (using only 63) according to atomic weight; discovered periodicity of physical & chem. properties of elements, predicted properties of other elements, discovered several elements, & corrected atomic wt. of others. (W)

PASTEUR, Louis (1822-1895), French chemist, microbiologist; Prof., Sorbonne; Dir., Pasteur Inst.,Paris; founder of microbiological sciences, germ theory of disease & science of immunity; developed effective treatment for rabies. (W)

POPOV, Alexander S. (1859-1905), Russian physicist; naval engr., Kronstadt; reasearch on use of electromagnetic waves to receive signals; atmospheric electricity; X-rays. (W)

SKLODOWSKA, Marie (Mme Curie) (1867-1934), Polish-French physicist & chemist; Prof., Sorbonne; Dir., Radium Inst.; Nobel prize in physics, 1903 (jointly with P.Curie, & Becquerel); Nobel prize in chemistry, 1911 (only person to receive prize twice); pioneer work in radioactivity. (W)

TSIOLKOVSKY, Konstantin E. (1857-1935), Russian-Soviet physicist; research in theory of rocketry; multistage rocket; first to suggest possibility of space station. (W)

TSU CHUNG-CHI (430-501), Chinese mathematician; determined value of pi (π) accurate to 6 decimal places. (W)

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New positions proposed for names adopted in 1964:

FERMI	20S, 122E	PLANCK	58S, 135E

Biographical data for names adopted in 1964: data supplied by D.W.G.Arthur & E.A.Whitaker (A&W), edited by B.Bell to conform to style of other sections, with some additions from (W).

ABEL, Niels H. (1802-1829), Norwegian mathematician; responsible for vast development of algebraic geometry; discovered several types of eqns, later called Abelian functions, integrals, groups; theory of elliptic integrals. (A&W) (W) (34S, 85E)

AMUNDSEN, Roald E. (1872-1928), Norwegian explorer; first to sail NW passage E to W, 1903; located N Magnetic Pole, 1904; led first expedition to reach S Pole, 1911. (A&W) (W) (85S, 86E)

ASTON, Francis W. (1877-1945), British chemist, physicist; Cavendish Lab.; Nobel prize, chemistry, 1922; introduced mass-spectrograph, discovered 212 isotopes, established isotopy as basic phenom.of nature; made mass analysis of metallic elements. (A&W) (W)(33N, 88W)

BAADE, Walter (1893-1960), German astronomer, Mt. Wilson & Palomar Obs.; discovered planetoids Hidalgo & Icarus; made many important contributions to galactic & extragalactic research; devel.theory for Population I and Pop. II stars; research on cosmic distance scales; size of galaxies; age of universe; identified (with Minkowski) Cygnus radio source as 2 galaxies colliding. (A&W) (W) (44S, 82W)

BALBOA, Vasco N. de (c.1475-1517), Spanish explorer & conquistador; first European to see & reach Pacific Ocean, 1513. (A&W) (W)(19N, 83W)

BALMER, Johann J. (1825-1898) Swiss math'n, physicist; pioneer research on structure of atom, spectrum analysis; formulated rule for the wavelengths of visible lines in hydrogen spectrum (Balmer series). (A&W) (W)(20S, 70E)

BANACHIEWICZ, Tadeusz (1882-1954), Polish astronomer, math'n; Dir., Cracov Obs; founded Cracov school of selenodesy; developed new methods of determining & correcting orbits (Cracovian calculus). (A&W)(5N, 80E)

BARNARD, Edward E. (1857-1923), USA astronomer, Lick, Yerkes Obs; pioneer in applic. of photography to astronomy; discovered 5th satellite of Jupiter, Barnard's Runaway Star; cataloged 182 dark nebulae. (A&W) (W)(29S, 86E)

BELKOVICH, Igor V. (1904-1949), USSR astronomer, selenodetic specialist, observed & reduced a heliometer series; introduced new technique for determination of the moon's mechanical ellipticity in the solution for the elements of rotation. (A&W) (61N, 90E)

BOHR, Niels H.D. (1885-1962), Danish physicist; Prof.,U.Copenhagen; Dir., (& a founder) Inst. for Theoretical Physics; adapted Planck's quantum theory to Rutherford's model of atomic structure, thus devising Bohr's theory of the atom; Nobel prize in physics, 1922. (A&W) (W) (13N, 87W)

BOLTZMANN, Ludwig E. (1844-1906), Austrian physicist; Prof.,U. Vienna; demonstrated Stefan-Boltzmann law on radiation from black body; research on electromagnetic theory; statistical dynamics. (A&W) (W) (75S, 90W)

BOOLE, George (1815-1864), English logician & math'n; best known for math. analysis of logic, fund'l work in symbolic logic. (A&W) (W) (64N, 87W)

BOSS, Lewis (1846-1912), USA astronomer; best known for catalogs of star positions; analysis of solar motion. (A&W) (W) (46N, 88E)

BRIANCHON, Charles J. (1783-1864), French mathematician; made notable contributions to projective geometry; theorem on conics. (A&W) (W)(75N, 87W)

BUNSEN, Robert W. (1811-1899), German chemist; pioneer in spectrum analysis; chemical analysis by spectral methods; designed new type calorimeters & other lab.equip. (A&W) (W) (42N, 86W)

BYRD, Richard E. (1888-1957), USA pioneer aviator, navigator, polar explorer; flew over N (1926) & S (1929) poles; explored extensively in Antarctic, discovering many previously unknown topographic features; spent 5 months of winter night alone at scientific work near S pole. (A&W) (W)(85N, 10E)

CANNON, Annie J. (1863-1941), USA astronomer, Harvard Obs.; pioneer specialist in classification of stellar spectra; completed Henry Draper Catalog of Stellar Spectra, of nearly 300,000 stars. (A&W) (W) (20N, 81E)

CREMONA, Luigi (1830-1903), Italian mathematician, educator; best known for work in synthetic geometry. (A&W) (W) (67N, 90W)

DALTON, John (1766-1844), English chemist, physicist; discovered laws of gas behavior: partial pressures, expansion by heat, diffusion; formulated an atomic theory of matter, table of rel.atomic wts; developed system of chem. symbols; electric theory of aurora. (A&W) (W) (17N, 84W)

DESARGUES, Gerard (1593-1662), French mathematician, engineer; basic research in projective geometry. (A&W) (W) (70N, 74W)

DE SITTER, Willem (1872-1934), Dutch astronomer; Dir. Leiden Obs.; research in cosmology, expanding universe; application of Theory of Relativity to astronomy, cosmology. (A&W) (W) (80N, 38E)

DRYGALSKI, Erich D. von (1865-1949),German geographer, geophysicist; Prof., U.Munich; pioneer in polar research & exploration; political geogr. (A&W) (W) (80S, 80W)

DUBIAGO, Dmitri I. (1850-1918), Russian astronomer; 1st Dir.,Engelhardt Obs., Kazan; founder of Russian school of selenodesy. (A&W) (5N, 70E)

————, Alexander D. (1903-1959), USSR astronomer, U.Kazan; orbits of comets. (L) (5N, 70E)

EDDINGTON, Sir Arthur S. (1882-1944), English astrophysicist, math'n; Prof.,Cambridge U.; Dir.,Cambridge Obs.; theoretical investigations of internal structure, motion & evolution of stars. (A&W) (W) (22N, 72W)

EINSTEIN, Albert (1879-1955), German/Swiss/USA physicist; originator of special & general theories of relativity; made fund'l contributions in statistical mechanics, quantum theory, interrelation of mass & energy. (A&W) (W) (17N, 88W)

FERMI, Enrico (1901-1954), Italian/USA physicist; Prof.,Inst. for Nuclear Studies, U.Chicago; Nobel prize, 1938; research in nuclear physics, on neutron bombardment of heavy elements, thermal neutrons; supervised construction of first atomic pile, first self-sustaining chain reaction; statistical model of atom; neutrino theory; cosmic rays. (A&W) (W) (20S, 122E)

GIBBS, Josiah W. (1839-1903), USA math'l physicist; Prof., Yale Univ.; application of thermodynamics to chemistry; developed 'phase law' for equilibrium of mixed systems; began devel. of vector analysis for computation of planetary & cometary orbits. (A&W) (W) (18S, 84E)

GILBERT, Grove K. (1843-1918), USA geologist; research on intrusive igneous features; introduced ideas of erosion, glaciation & river devel. to geomorphology; concept of glaciation in formation of Great Lakes. (A&W) (W) (3S, 76E)

GILL, Sir David (1843-1914), British astronomer; Roy.Astron., Cape of Good Hope; "The Cape Photographic Durchmusterung"; cataloged some 400,000 stars, and accurately determined the distances of 22 stars; improved method of measuring solar parallax. (A&W) (W) (64S, 77E)

GODDARD, Robert H. (1882-1945), USA physicist; Prof., Clark U.; pioneer in rocket research & development; holder of 214 patents in rocketry. (A&W) (W) (15N, 89E)

HALE, George Ellery (1868-1938), USA astronomer; organizer & Dir., Mt. Wilson Obs.; ed., Ap.J.; invented spectroheliograph (indep'ly of Deslandres); pioneer research in solar physics, sunspots. (A&W) (W) (74S, 90E)

HAMILTON, Sir William R. (1805-1865), Irish mathematician; developed principle of least action; invented theory of quaterions (3-dim.alg.).(A&W) (W) (43S, 84E)

HARTWIG, Carl E. (1851-1923), German astronomer; specialist in moon's rotation theory; made numerous heliometer measures to determine moon's physical librations. (A&W) (6S, 80W)

HAYN, Friedrich (1863-1928), German astronomer, selenodogist; introduced important refinements into explicit theory of moon's rotation; pioneered mapping of lunar limb regions. (A&W) (65N, 83E)

HEDIN, Sven A. (1865-1952), Swedish explorer of little-known areas; led several expeditions to central Asia, gathering meteorol.,geol., zool., paleontol., & archeol. data. (A&W) (W) (3N, 76W)

HERMITE, Charles (1822-1901), French mathematician; Prof., Sorbonne; theory of algebraic forms; 1st to solve 5th degree eqn; proved that base of natural log (e) is not an algebraic number. (A&W) (W) (86N, 88W)

HUBBLE, Edwin P. (1889-1953), USA astronomer, Mt. Wilson Obs.; pioneer research on extragalactic systems; discovered that radial velocities of receding galaxies are proportional to their distance (Hubble's law), which led to estimation of size of universe. (A&W) (W) (22N, 87E)

JANSKY, Karl (1905-1950), USA radio engineer, Bell Tel.Labs.; discovered constellation of Sagittarius to be source of weak radio static, thus beginning the science of radio astronomy. (A&W) (W) (9N, 89E)

JEANS, Sir James H. (1877-1946), English math'l physicist; made many important contributions in dynamical theory of gases, cosmogony, & stellar dynamics; expert popularizer of difficult scientific concepts. (A&W) (W) (56S, 91E)

KAPTEYN, Jacobus C. (1851-1922), Dutch astronomer; Prof., U.Groningen; from studies of stellar proper motions & parallaxes, discovered 2 streams of stars moving in opposite directions in plane of Milky Way; developed model of Milky Way (Kapteyn's universe). (A&W) (W) (11S, 71E)

KRASNOV, Alexander V. (1866-1907), Russian astronomer; 1st Russian heliometer specialist; author of 1st Kazan heliometer series for the lunar librations. (A&W) (30S, 80W)

LAMARCK, Jean B.P.A.de M. (1744-1829), French naturalist; pioneer in bringing concept of evolution to biology; considered founder of modern invertebrate zoology; 1st to distinguish between vertebrates & invertebrates on basis of vertebral column. (A&W) (W) (22S, 70W)

LAMÉ, Gabriel (1795-1870), French mathematician; introduced new math fcns named after him to solve problems of temperature equilibrium in ellipsoids. (A&W) (W) (14S, 64E)

LANGLEY, Samuel P. (1834-1906), USA astronomer, physicist; devised bolometer for measuring distbn of heat in spectrum of sun; determined transparency of atmosphere to different solar wavelengths; established solar constant & discovered unsuspected extension of invisible solar spectrum; research on aerodynamics & mechanics of flight. (A&W) (W) (52N, 87W)

LIAPUNOV, Aleksandr M. (1857-1918), Russian mathematician, engineer; developed the theory & created methods of solving problems in stability & equilibrium in mechanical systems;figures & stability of rotating fluid mass.(A&W)(W,L) (27N, 89E)

LYOT, Bernard F. (1897-1952), French astronomer; inventor of solar coronagraph, & of monochromatic polarizing filter (Lyot filter); noted for originality & elegance of his observational techniques; research on solar corona, polarization of light from planets. (A&W) (W) (51N, 85E)

MARKOV, Andrei A. (1856-1922),Russian mathematician, probability specialist; fund'l work in stochastic theory; 'Markov Chains' named after him. (A&W) (53N, 62W)

MOSELEY, Henry G.J. (1887-1915), English physicist; research on radioactivity, X-ray spectra, discovered that spectra depend not on atomic wt, but on a whole number defining its nuclear charge, leading to concept of atomic number, a landmark discovery in spectrum analysis. (A&W) (W) (21N, 90W)

NANSEN, Fridtjof (1861-1930), Norwegian arctic explorer, scientist, statesman, humanitarian; made 1st crossing of Greenland, 1888. (A&W) (W)(81N, 85E)

PASCAL, Blaise (1623-1662), French math'n(child prodigy), physicist, natural philosopher; made important contributions in math, probability theory, hydrostatics & atmospheric pressure; invented a calculating machine. (A&W) (W) (74N, 70W)

PEARY, Robert E. (1856-1920), USA arctic explorer, organized 1st expedition to reach N pole, 1909; determined insularity of Greenland. (A&W) (W) (88N, 30E)

PLANCK, Max K.E.L. (1858-1947), German physicist; Prof., U.Berlin; originated & helped develop quantum theory; Planck's constant, h, the quantum of energy, named for him; Nobel prize, 1918; research in black-body radiation; thermodynamics, theory of entropy. (A&W) (W) (58S, 135E)

PONCELET, Jean V. (1788-1867), French math'n, engineer; first systematic treatment of projective geometry, laying foundations for modern projective geometry. (A&W) (W) (76N, 53W)

RAYLEIGH, Lord (=Strutt, John W.) (1842-1919), British physicist; Nobel prize, 1904; research in theory of sound, light & color; physical optics & color vision; discovered argon; studied optical scattering, showing why sky is blue. (A&W) (W) (29S, 90E)

RIEMANN, Georg F.B. (1826-1866), German mathematician; developed new non-Euclidean system of geometry (Riemannian geometry) & a theory of space which provided a geometric found. for modern physical theory (e.g., Einstein's work); introd.idea of finite but unbounded space. (A&W) (W) (40N, 88E)

RÖNTGEN, Wilhelm C. (1845-1923), German physicist; 1st Nobel prize in physics, 1901; best known for discovery of & research on X-rays. (A&W (W) (33N, 92W)

RUSSELL, Henry Norris (1877-1957), USA astronomer; Prof., Dir., Princeton U. Obs.; pioneer determination of abundance of elements in sun; orbits of double stars; co-inventor of Hertzsprung-Russell diagram, relating luminosity & spectral type of stars. (A&W) (W) (27N, 75W)

————, John (1745-1806), British portrait painter & amateur astronomer; published two excellent Moon maps & the first lunar globe to be produced in quantity, each based on his own micrometric measures of position. (A&W)(27N,75W)

SCHLÜTER, Heinrich (1815-1844), German astronomer, assistant to Bessel at Königsberg; made 1st heliometer series for study of moon's librations, later used by Franz. (A&W) (6S, 83W)

SCOTT, Robert F. (1868-1912), British explorer of Antarctic; died leading second expedition to reach South Pole. (A&W) (W) (82S, 47E)

SHALER, Nathaniel S. (1841-1906), USA geologist, palaeontologist; Prof., Harvard U.; 1st geologist to attempt geological interpretation of lunar photographs. (A&W) (W) (33S, 85W)

STOKES, Sir George G. (1819-1903), British math'n, physicist; Prof., Cambridge U.; created modern theory of viscosity fluids, fund'l to hydrodynamics; pioneer in spectrum analysis, chemical composition of sun & stars; fluorescence; earth's figure & gravity. (W) (52N, 88W)

SYLVESTER, James J. (1814-1897), British mathematician; contbd to number theory, theory of eqns; pure & analytic geometry; founded (with Cayley) theory of algebraic invariants (essential to theory of relativity). (W) (83N, 80W)

VOLTA, Count Allessandro G.A.A. (1745-1827), Italian physicist; built Voltaic pile (1st electric battery), 1800, making it possible to decompose water by electrolysis, to electroplate precious metals, to form electromagnet; developed idea of electrochem. series; research on atmospheric electricity, marsh gas, heat. (W) (54N, 85W)

WRIGHT, Frederick E. (1878-1953), USA astronomer; Geophys.Lab., Carnegie Inst'n, chairman of committee on study of surface of moon; measured polarization of light from moon; lunar activity. (Mz) (32S, 87W)