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A scientific session of the Division of General Physics and Astronomy of the USSR Academy of Sciences was held on November 24 and 25, 1976 at the conference hall of the P. N. Lebedev Physics Institute. The following papers were delivered:

1. *M. Ya. Marov*, Venus and Mars (According to Recent Results of Soviet and American Studies).

2. *Yu. I. Gal'perin*, The Magnetospheres of the Earth and the Planets.

3. *V. B. Braginskiĭ*, Quantum Singularities in Macroscopic Measurements.

4. *E. M. Gershenzon*, Spectral and Radiospectroscopic Studies of Semiconductors at Submillimeter Wavelengths.

We publish below brief contents of the papers.

M. Ya. Marov. *Venus and Mars (According to Recent Results of Soviet and American Studies).* Major progress has been made during the past decade in the field of planetary physics, and much of the credit for it is due to the unmanned spaceprobe. The opportunities that have been opened for direct experimentation on the planets and in their immediate surroundings, together with the improvement of methods and techniques for observations from earth, have delivered a wealth of new information of fundamental importance. This permits more definite judgments as to the physical mechanisms basic to the shaping of existing natural complexes, primarily on the planets nearest the earth—Venus and Mars. The paper presents updated conceptions of these planets, though leaving aside the physics of their upper atmospheres and the body-in-flow problem, which are of independent interest.

The Venera-4 through Venera-10 spaceprobes have made a basic contribution to the study of Venus. The first photographic panoramas of the surface were televised to the earth. It was established that the planet has a hot, thick atmosphere composed almost entirely ($97 \pm 3\%$) of carbon dioxide, with surface temperatures and pressures of ~ 740 °K and ~ 90 kG/cm^2. The relative water-vapor content is estimated in the range $10^{-4} - 10^{-1}\%$. Because of the enormous enthalpy, the diurnal temperature variations are negligible at the surface, but they reach 20–30° above approximately 30 km. The main cloud layer of Venus, which is about 20 km thick, appears to consist of a concentrated sulfuric acid solution. Nephelometric measurements indicate that it forms a light haze in which the visibility is 1–3 km and the particles are of approximately micron size. About 4% of the amount of solar energy at the orbit of the planet reaches the surface of Venus; the surface illuminance is 14 klx, the spectral composition is shifted slightly toward the red, and the surface albedo is 0.1–0.2. The "greenhouse" mechanism is a basic factor in maintaining the specific thermal regime of Venus. The screening effect is produced by the opacity of CO_2 with an admixture of $< 0.01\%$ H_2O. The planetary circulation, which is mainly zonal in direction, is of the "carousel" type; the wind velocities are less than 1 m/sec at the surface and reach 50–100 m/sec above ~ 50 km.

Strongly smoothed craters have been detected on the surface of Venus by radar mapping from the earth. The surface relief on the panoramas, the basaltic nature of the rocks indicated by measurements of their U, Th, and K contents, and measurements of the density at the landing sites of Venera 9 and Venera 10 definitely indicate that the planet has been differentiating into shells with separation of an ion–nickel core. However, evidently because of the low velocity of rotation (1/243 of that of the earth), the intensity of the intrinsic magnetic field of Venus is no more than ~ 10^{-4} of that of the earth's.

Global mapping of Mars has significantly changed the earlier picture of a geologically dead planet, an impression obtained from the first photographs of specific small areas of its surface. Along with impact bombardment (which was especially strong during the accretion stage) and wind and dust erosion, the most important factors in shaping the surface of Mars have been its global tectonics and vulcanism, and this also indicates differentiation of the interior of the planet. The core of Mars appears to be relatively small; the magnetic intensity at the equator is about 65 gammas.

Traces of glaciological processes and watercourses, which have left channel-like formations, are clearly visible on the surface. Since liquid water cannot exist on the surface in the present rarefied atmosphere, this leads to interesting conjectures as to features of the Martian paleoclimate; there is reason to believe that the climatic changes took place at least tens of millions of years into the past; it has also been suggested that they occur periodically as a result of tidal perturbations.

Viking spaceprobe measurements confirmed the results of the direct measurements of the atmospheric parameters first made on Mars 6, as well as measurements made from Mars orbiters. The average atmospheric pressure at the surface is ~6 mb, and the average temperature about 230 °K. The carbon dioxide content of the atmosphere is 95%, the nitrogen content about 2–3%, and the water-vapor content $\sim 10^{-4} - 10^{-3}$%. Because of the short thermal relaxation time, the diurnal-seasonal temperature variations range up to 100 °K, and condensation of the atmosphere's main carbon dioxide component is possible at the poles. The caps obviously consist of dry and ordinary ice; it is possible that the atmosphere became denser during the climatic changes and that liquid water may have appeared on the surface, probably released from the caps and from the permafrost layer. According to Viking measurements of the relative contents of ^{40}Ar, ^{36}Ar, and other components in the Martian atmosphere and comparisons with the earth, degassing of the planet was apparently incomplete, and the Martian atmosphere could hardly become 10–15 times denser than it is today. The maximum amount of underground water is estimated as equivalent to no more than a few tens of meters (the depth of a layer poured out uniformly over the surface).

Comparative analysis based on the proportions of the volatile components on the Earth, Venus, and Mars indicates that the geochemical processes that have taken place on the three planets were similar in nature. The basic critical factor has apparently been their positions relative to the sun, which ultimately led to the different existing sets of natural conditions.

The material reflected in the paper has been published in the book by A. D. Kuz'min and M. Ya. Marov, "Fizika planety Venery" (The Physics of the Planet Venus), Nauka, Moscow, 1974, and in the journals: Kosm. issled, 14(5), (1976); Science, 193 (No. 4255), 759 (1976); in the author's papers "The New Face of Mars" (Priroda, No. 8 (1975)) and "Venus: What We Know About It Today" (Zemlya i Vselennaya, No. 3, 3 (1976)); see also the extensive bibliography in the Kuz'min-Marov monograph.