

CARTOGRAPHIC SUPPORT FOR SCHOOL COURSE ON GEOGRAPHY OF EXTRATERRESTRIAL TERRITORIES

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Abstract: This textbook is prepared on the base of the faculty course program “Geography of Extraterrestrial Territories”, which was included in some collection of programs and methodic material on geography for school in Russia. Taking into account that this textbook will keep questions and practical homework for each theme of the program, it is necessary to create corresponding additional materials and especially cartographic ones.

We understand under extraterrestrial territories such territories as surfaces of planets, their moons, asteroids and comets cores. That is why it needs to have maps of these celestial bodies, both geographic and thematic, outline maps and choropleths. In this connection the atlas “Solar System” was compiled. It is oriented in the whole on the new textbook. There are such chapters as the composition and the structure of Solar System, the main body of the System, the characteristics of the Earth and Space observations with help of terrestrial and outer space methods, the main results of space explorations during last 50 years, maps of inner and outer planets and their moons using shaded relief representation and space images, asteroids and comets and perspectives of study on extraterrestrial territories. The most interesting positions of Atlas will be demonstrated.

The textbook “Geography of extraterrestrial territories” is prepared on the base of the faculty course program “Geography of Extraterrestrial Territories”, which was included in some collection of programs and methodic material on geography for school in Russia /1/. Taking into account that this textbook will keep questions and practical homework for each theme of the program, it was necessary to create corresponding additional materials and especially cartographic ones.

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In order to illustrate more visually the distances in Solar System the diagram of the planets middle distances from the Sun was drawn in the form of a big spiral. One astronomical unit (the distance from the Sun to the Earth, e.g. 1AU= 149 000 000 km) was chosen as a scale unity. In this scale the Jupiter distance is equal to 5AU., but Pluto is between 39 and 40AU (Figure 1). The method of distance definition in Solar System is also explained.

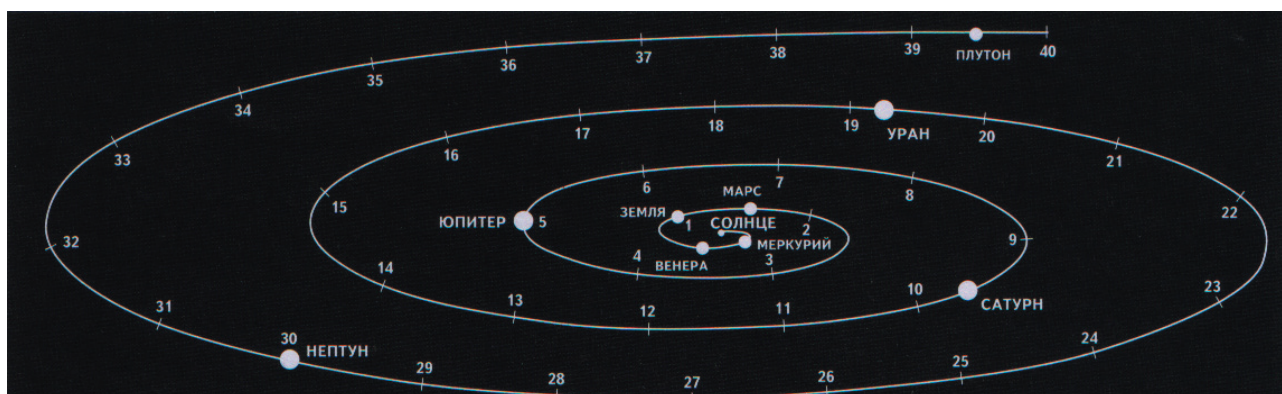


Figure 1: The diagram of the planets middle distances from the Sun



Fig.2 Helios on his chariot.

The inner structure of the Sun, the role of solar spectral lightning is underlined together with the role of the Sun in the everyday life of the mankind. In this part and in the other parts too there are some connections with Roman and Greece mythology concerning names and meanings with some pictures. For example, you can see the Sun God Helios on his chariot (Figure 2).

The Solar System celestial bodies moons are shown on their dimensions collected in 7 groups according their radii, namely 2700-2400 km, 1850-1350 km, 800-700 km, 600-500 km, 300-100 km, 100-50 km and 50-5 km. The most number of moons have Jupiter (63), Saturn (31) and Uranus (27). The different colors were used for every planet membership. There were given the dimensions of the largest asteroids, the moon of the asteroid Ida and the Halley comet (Figure 3).

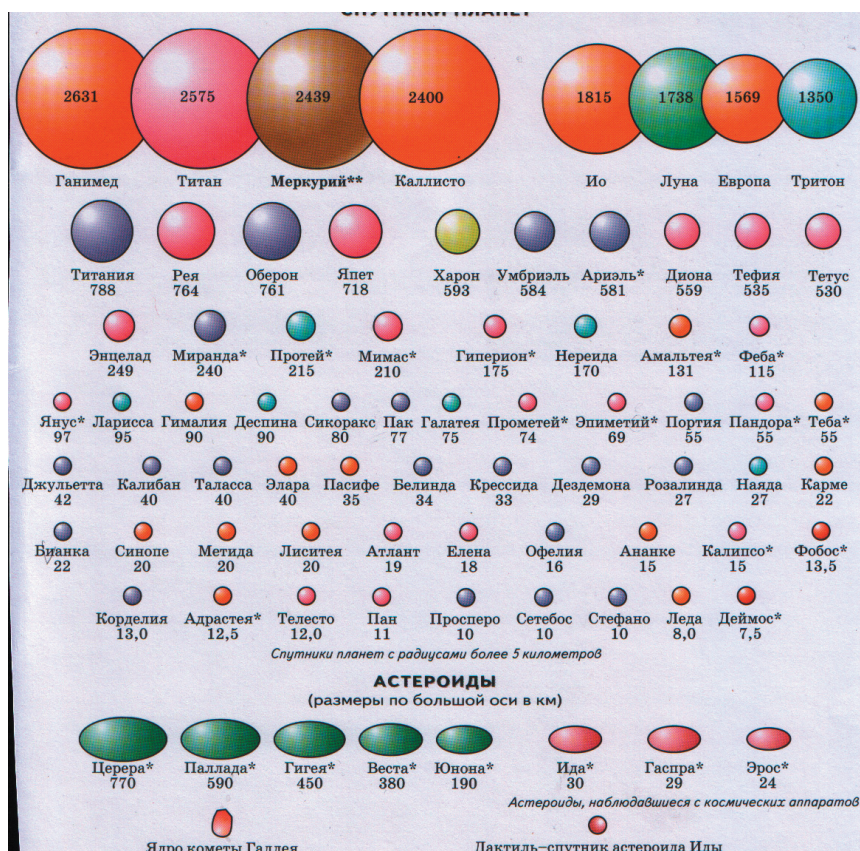


Fig.3. The relative dimension of Solar System moons and asteroids.

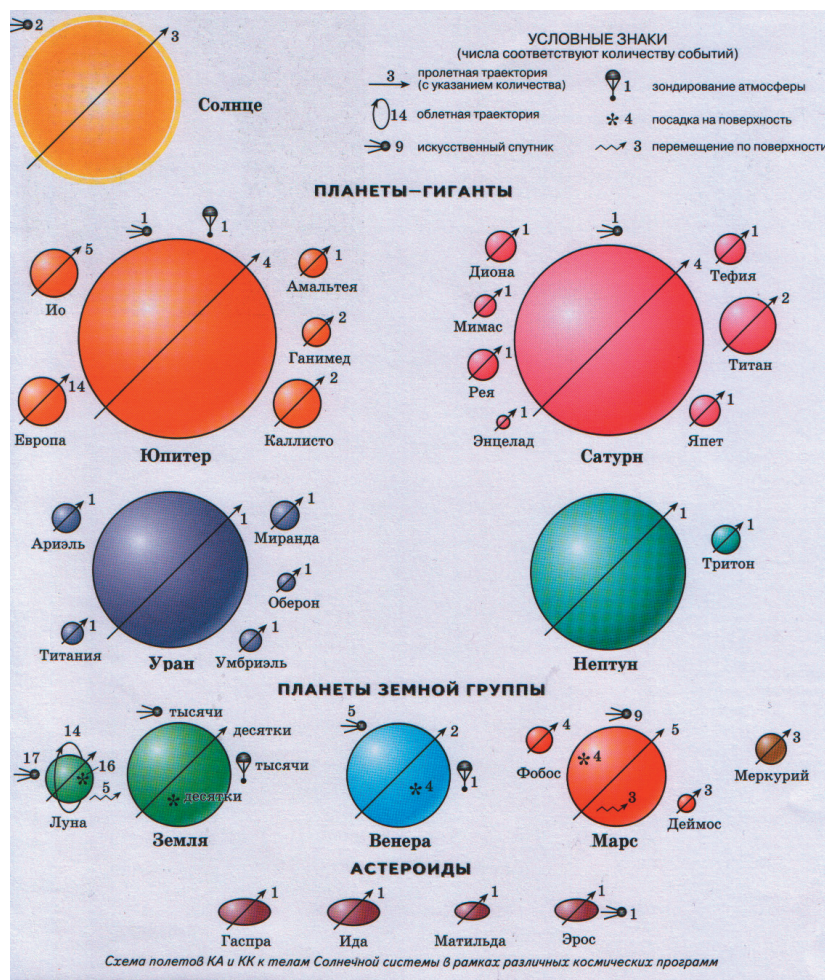


Figure 4: Trajectories relatively to definite celestial body

The possibilities of ground base and space observations were illustrated too. The space exploration is introduced by various kinds of trajectories: flyby, satellites, sonde, landing, movement on the surface connected to definite celestial body. (Fig.4)

There are two maps of Mercury, every is represented by two hemispheres: albedo map and relief map. The albedo map is compiled on the whole surface of this planet with exception of Polar Regions. The relief map exists only for 40% of the surface because of lack of surface images taking from space. Mercury features become names of famous writers, painters, composers, poets etc. from all over the world. You can see the craters named by Cervantes, Goya, Velazquez etc. on the Mercury map. (Figure 5).

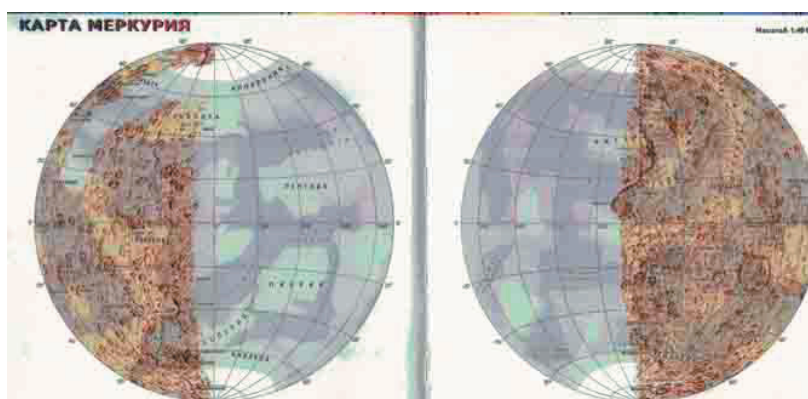


Figure 5: Mercury map

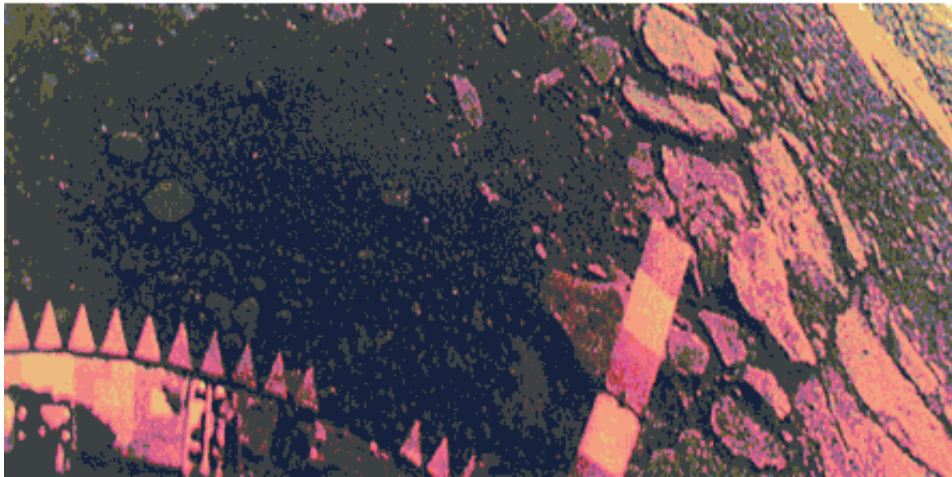


Figure 6: Color panorama of Venus surface transmitted by Venera-14

Venus is reproduced by shaded relief map too. It became possible thanks the radiolocation survey especially by Magellan mission. There is some information about the structure and chemical compound of Venus atmosphere, about winds and lightning on Venus. Besides we have the panoramas of Venus surface thanks Venera space stations (Figure 6).

The Moon is the first celestial body visited from the Earth. There were 12 astronauts there. They brought about 400 kg of lunar rocks to the Earth. There were two Lunokhods and 3 rovers on its surface moving as automatically as by driver.

Mars was interested the people because of the idea to find there the human being. Although today it is clear that there is no organic life on Mars its exploration continues with great pleasure. Now two Marsokhods are busy on it. We have a lot of information from series of Mars satellites especially about its climate. The micro relief of Mars was investigated by mini rover Sejourner (Figure 7).

The shaded relief maps of the Moon and Mars represent the main formation on these celestial bodies and their distribution. Mars moons Phobos and Deimos both have enough irregular form. That is why for the first time the triaxial ellipsoid was used for their cartographic representation (Figure 8).

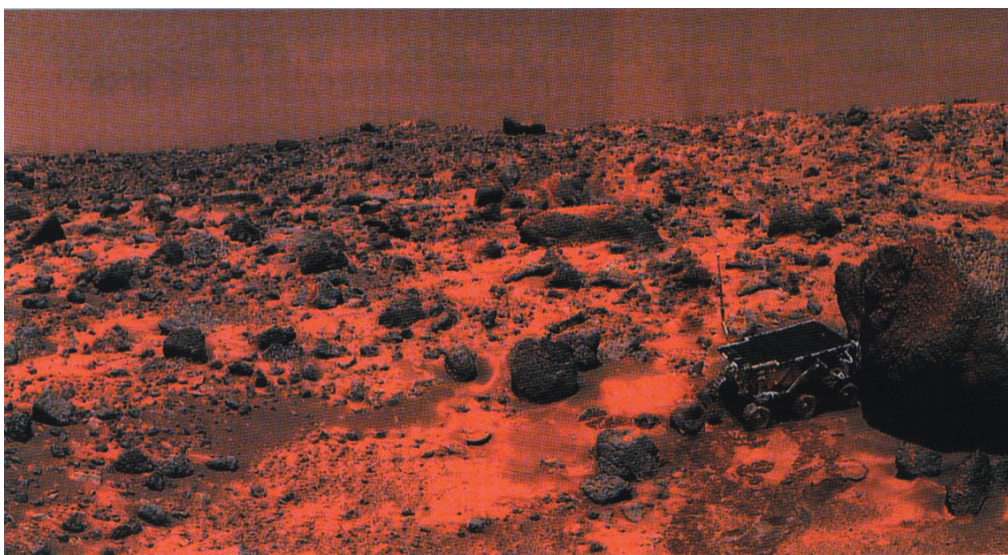


Figure 7: Mini rover Sejourner on Mars

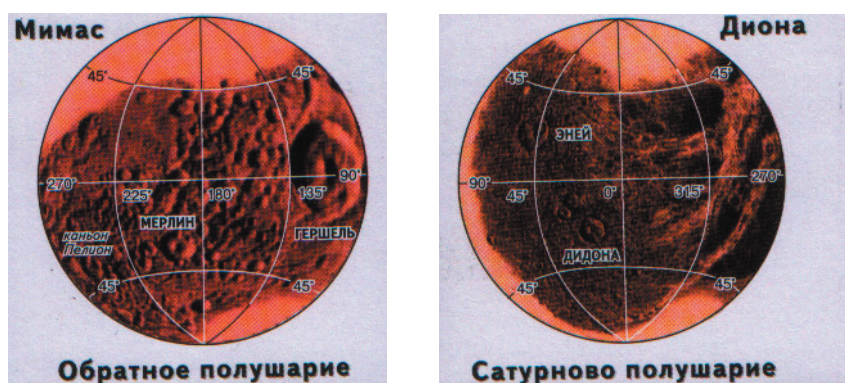


Figure 10: Mimas and Diona maps

Some of space missions are already out of the Solar System. They have on board the gold plates with the most important symbols describing the Earth and the Solar System in a whole. So there are man and woman figures with the schema of their spacecraft behind them. It is possible to see the schema of Solar System and the space mission trajectory too (Figure 11).

In conclusion it is necessary to underline that for the first time the astronomical Atlas contains a lot of geographical elements giving some information concerning celestial body specific peculiarities, the main relief features, the climate peculiarities, the structure of atmospheres etc. Other words we made the first attempt to speak about the geography of extraterrestrial territories.

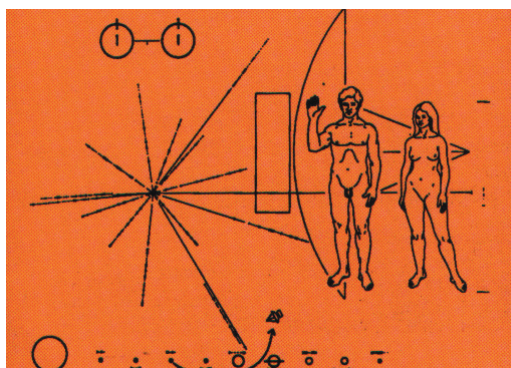


Figure 11: The gold plate placed on board of outer space missions such as Pioneer and Voyager

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1. Shingareva, K.B. (2001): Geography of Extraterrestrial Territories. Program in "Program-Methodic Materials for 6-9 grades, Geography". M. Drofa. Russia.
2. Shingareva, K.B. and Krasnopevtseva, B.V. (2005): Atlas. Solnechnaya Systema. Astronomiya a. Geografia. M. Dick, Drofa. Russia.