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Physics news on the Internet (based on electronic preprints)

1. Life on Mars

American scientists from Johnson Space Centre in Hewston and their colleagues from three universities have made a discovery testifying that a primitive single-cell life have existed on Mars. This conclusion is drawn based on the study of Martian meteorite found in Antarctic ice in 1984. Martian origin of the meteorite does not raise any doubts since its chemical composition corresponds to the data directly collected by american spacecraft 'Viking' during its mission on the red planet surface. It is supposed that the meteorite was knocked from Mars' surface some 15 million years ago as a result of collision of large asteroid with Mars. 13 thousand years ago it landed on Earth. It is only two years back as a rigorous investigation of the meteorite has become possible due to advent of newest electronic microscopes and other scientific instruments. The researches discovered complex organic molecules whose existence, in their opinion, could only be explained by activity of single-cell structures that resemble bacteria on Earth. These substances are classified to be among well-studied class of polycyclic aromatic carbohydrates. Such molecules may arise either at planet formation or in biological processes. The former variant is considered to be improbable in this case. The reason is that the organic traces discovered are nearly one milliard years younger than the meteorite itself. The concentration of organic substances increases to the centre of the meteorite, which, as researchers conclude, excludes its Earth origin. Sizes and the structure of organic inclusions resemble Earth's bacteria very strongly. The organic substances found are estimated to be produced approximately 3.6 milliards years ago. At that time the atmosphere and the surface on Mars were abundant in water and this favoured appearance of the life of the Earth's type based on carbon. The discovery made indicates that life may prove to be disseminated through the Solar system and its origin is a relatively simple process. The conclusions made by scientists demand further investigations.

Source: *NASA Press Releases*
http://www.hq.nasa.gov/office/pao/NewsRoom/releases.htlm

2. Observations of Jupiter's Europe

Liquid water or at least ice at melting stage, may probably exist or have existed on Jupiter's moon Europe. Such preliminary conclusion was drawn by researchers after analysis of new series of images from american spacecraft Galileo. Europe's surface is covered by the icy layer with silicate inclusions. There are no large craters on the icy surface, characteristic of other planet moon. This points to the existence of dynamic processes leading to renewal of the surface. Such a process may be ice melting. The icy surface is covered by multiple long cracks discovered by Voyager back in 1979. The cracks are darker near their ends and lighter to the centres. As new images indicate the dark areas are formed by the mixture of ice and silicate substances rising from beneath. Light stripes are likely to be formed by pure water ice. The researchers do not exclude the possibility for liquid water existence somewhere under the ice Europe's surface, similar to Earth's polar areas. According to one of hypotheses heat sources on Europe may be associated with powerful tidal forces from Jupiter. The energy released due to deformations is perhaps sufficient to warm up or even melt a fraction of ice. For long Europe is considered by scientists as one of a few places in the Solar system (along with Mars and Saturn's moon Titan) which may possess conditions suitable to host some primitive form of life. The observations of Europe from Galileo will be continued; the spacecraft will approach Jupiter's moon Europe most closely in December 1996.

Source: *NASA Press Releases*
http://www.hq.nasa.gov/office/pao/NewsRoom/releases.htlm

3. Solar activity and neutrinos

The experiment Kamiokande II on solar neutrino detection is being carried out in Japan Alps beginning from January 1987. This term embraces almost a complete 11-year cycle of solar activity. Recently the participants of Kamiokande collaboration reported that, as it may be inferred from the data collected, the neutrino flux does not correlate with solar activity phase. The changes in solar activity are seen as variations in the number and intensity of spots, jets or other features on Sun. Whether there is correlation between the neutrino flux and solar activity, has important implications for neutrino physics. Were the correlations discovered, then perhaps their single possible explanation could be the existence of large magnetic moment associated with neutrino which interacts with cyclically varying solar magnetic field. In the Kamiokande experiment, the Cherenkov radiation of electrons scattered by solar neutrinos in the direction of their flight is being detected. In another neutrino experiment — the chlorine experiment — in South Dakota (USA) the question of correlations is still open. The existence of correlations is not unequivocally proved, nor is it rejected. Researchers however believe that the situation will be clarified on completion of one more solar activity cycle.

Source: *Physics News Update*, No. 281
http://www.hep.net/documents/newsletters/newsletters.html

4. Neutron star mass

Beginning from 1930s, scientists strive to answer the question on maximum admissible mass a neutron star may have. The

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main difficulty encountered when dealing with this problem is the lack of information on equation of matter state at superhigh densities achieved in neutron stars. Until recently it was proved that maximum mass does not exceed 3.2 solar masses but, in principle, it may be less. If this upper limit is surpassed, gravitational forces become so strong that a star inescapably collapses into a black hole. American scientists V Kalogera and G Baum used experimental data on properties of light nuclei, in particular, on their scattering, and performed new calculations which resulted in more secure upper bound of 2.9 solar masses. The knowledge of neutron star maximum mass is important to identify the nature of dark invisible companion stars in binary system if one needs learn whether they are neutron stars or black holes. If mass of one component in binary system exceeds that upper bound, it cannot be a neutron star and is most probably a black hole. To date in our Galaxy there are nine candidate to be black holes. With account taken for calculations of V Kalogera and G Braun their quantity may rise.

Source: http://xxx.lanl.gov
astro-ph/9608059

Composed by *Yu. Eroshenko*