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ЗМІСТ

Kravets R.A., Sinchuk V.O.
ECOLOGY AS A SCIENCE.....
115

Lebedeva N.A., Mikheev A.
SPACE COLONIZATION.....
....**118**

Lebedeva N.A., Chernetska O.
ENVIRONMENTAL PROBLEMS IN VINNYTSIA
REGION.....**121**

Magas L.M., Polyova M.V.
MAJOR ADVANCES OF ARTIFICIAL
INTELLIGENCE.....**124**

Manzhos E.O., Datskov R.A., Korovetska S.G.
HELIANTHUS ANNUUS AND DOWNY MILDEW.....
.....**127**

Manzhos E.O., Kochkina A.O., Brun U.V.
VIRAL DISEASES OF
PLANTS.....**130**

Martschenko I.W.
SEHENSWURDLIGKEITEN DER BUNDESREPUBLIK DEUTSCHLAND.....
133

Matiienko O.S., Bilous E.
GRAIN PROCESSING EQUIPMENT: FROM FIELD TO
BIN.....**137**

Matiienko O.S., Ishchenko O.
ADVANTAGES AND DISADVANTAGES
OF ASSEMBLY LINE
MANUFACTURING.....**140**

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SPACE COLONIZATION

The human race has a long history, during which it has always sought to facilitate working conditions and increase the comfort of life. Due to it, we are seeing a lot of inventions and technologies that formed the modern science and technology. As a result humanity discovered technologies that directly or indirectly can influence whole planet. As we see today, these influences mostly are negative. Environmental problems are known to all, but their solution will take a very long period of time. So, for any way of human development resources of our planet will be depleted. People always thinking about such moment or a global catastrophe happen.

The purpose of my work is to analyze the status of programs of different companies about the use of the resources of different celestial objects and the opportunity of their colonization, to show potential developments in this direction, to talk about the achievements of science in this thread.

So let's submit that happens something similar. It's obviously that humanity will need a new source of resources out of our planet and at worst a new planet home. What kind of planet it should be? It should be maximum similar to Earth in such parameters: atmosphere, size, structure, chemical. Our days it's popular to see

118

at Mars as the planet may be new planet home or colony because it the closest Earth-type planet. Thickness of Mars's atmosphere is about 110 km, the pressure near the surface is 1/160th Earths. It consists for 95% carbon dioxide, the average

temperature around the planet is 63°C degrees below zero. Mars hasn't magnetic field so atmosphere gradually dissipated into space, and the level of radiation on the surface exceeds the permissible limits. Mass of the planet is 0.1 of Earths. Mars has a reddish tint due to the abundance of iron oxides in the surface layer. Because of the distance from the Sun and frequent dust storms, solar energy will not be able to work for months, and the absence of fossil fuels and oxidants makes the only possible only nuclear energetic. There aren't found deposits of strategic resources such as platinum, nonferrous metals, there are small amount of nitrogen and oxygen. All of these factors make the colonization of Mars unprofitable and technically extremely difficult.

But I suggest you to see at another planet, Titan.

Titan is the sixth moon from Saturn. Frequently described as a planet-like moon, Titan's diameter is 50% larger than the Moon, and it is 80% more massive. It is the second-largest moon in the Solar System, after Jupiter's moon Ganymede, and is larger by volume than the smallest planet, Mercury, although only 40% as massive. Discovered in 1655 by the Dutch astronomer Christiaan Huygens, Titan was the first known moon of Saturn, and the fifth known satellite of another planet.

Titan is never visible to the naked eye, but can be observed through small telescopes or strong binoculars. Amateur observation is difficult because of the proximity of Titan to Saturn's brilliant globe and ring system; an occulting bar, covering part of the eyepiece and used to block the bright planet, greatly improves viewing. The first probe to visit the Saturnian system was *Pioneer 11* in 1979, which confirmed that Titan was probably too cold to support life. It took images of Titan, including Titan and Saturn together. The quality was soon surpassed by the two Voyagers, but Pioneer 11 provided data for everyone to prepare with.

The most valuable for science was the expedition of *Cassini–Huygens* spacecraft (“Cassini” is orbital station and “Huygens” is lander) reached Saturn and began the process of mapping Titan's surface by radar. A European Space Agency (ESA) and NASA, recognized *Cassini–Huygens* a very successful mission. The *Cassini* probe took the highest-resolution images ever of Titan's surface, discerning patches of light and dark that would be invisible to the human eye. *Huygens* landed on Titan discovering that many of its surface features seem to have been formed by fluids at some point in the past. There were a huge amount of scientific discoveries by *Huygens*.

There have been several conceptual missions proposed in recent years for returning a robotic space probe to Titan. The most interesting of them is envisions a hot-air balloon floating in Titan's atmosphere for six month; and submarine with high-tech Stirling engine. By the way, it will be the first probe such type outside the Earth.

Why this planet is so interesting? **First of all** it's the only object other than Earth where clear evidence of stable bodies of surface liquid has been found. That's not water. That's seas of hydrocarbons. Understandable language, it is seas that

consist of natural gas. Sounds good, isn't it? It's impossible to use those hydrocarbons as fuel, because there aren't oxygen in Titan's atmosphere, but we can

use it as raw material for different polymers. **Secondly**, Saturn is protecting Titan from deadly radiation and meteorites. Titan's atmosphere consist of Nitrogen, methane, ethane and some other gases and it's thickness is about 400 km. Titan's atmosphere has analogue of Earth's ozone layer. It's one planet in Solar system with such feature

There is some bad factors: temperature near the surface is about 170 degrees below zero and gravity is 1/7 of the earth's.

The main factor for existence of human colony is availability of energy. Energy can be produced through the cryovolcano locating special power station in a crater. The second way is harvesting (mining) of helium-3 for using it as fuel for thermonuclear reactors. By the way, thermonuclear reactors are developing for now by scientists of different countries and helium-3 is perspective fuel for them. Development of reserves of helium-3 allows to solve an energy problems of humanity forever. In that case, perspective of colonization of Titan becomes actual in this century.

Humans need air for breathe. Air consists of two general parts nitrogen and oxygen. Nitrogen is the main part of Titan's atmosphere. Oxygen can be taken by electrolysis of water. Water can be taken from cryovolcano, where water consists in solution with ammonia. Further ammonia with oxides of Nitrogen and water can be used in production of fertilizers. Plants are necessary part because they take part in regeneration of oxygen and use and a food. And the last required part of existence human colony is construction materials. As it was mention earlier, there are a lot of liquid hydrocarbons at the surface which can be used for producing different plastics. Such metals as an iron, aluminum, magnesium are in the planet crust. The main part of planet crust is different silicates which can be used as construction materials too. Quarters and technical spaces will be in thickness of crust because of extremely low temperature so will not require a lot of construction materials.

Therefore, Titan is one of the largest satellite in the solar system. It's unique planet because of liquid on the surface and the presence of analogue terrestrial ozone layer, it has a thick atmosphere. Titan is Saturn moon, so it can be used as a source of raw materials for the extraction of resources from Saturn or its rings.

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