

## РАЗДЕЛ II

### ЖИВАЯ МАТЕРИЯ

### LIVING MATTER

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*Живая материя – это материальная субстанция, характеризующаяся процессами формирования, развития и взаимодействия живых организмов в масштабах космоса. Живая материя – это вторичное состояние вещества и поля, определяемое: углеродорганической белково-нуклеиноводной основой; диссимметричностью внутренней материально-энергетической среды; необратимостью; неравновесностью и направленностью физико-химических процессов; избирательной способностью организмов в отношении к изотопам химических элементов; самовоспроизведением: самообновлением белковых тел, в основе которого лежит саморепликация<sup>1</sup>, а также двухуровневой (белково-нуклеиновой) атомистической организацией. Данные характеристики в комплексе формируют новое качественное свойство материи – сложнофункциональность, позволяющее выделить живую материю в самостоятельное космологическое явление.*

#### SPACE COLONIZATION: PROBLEMS AND PROSPECTS

**S. V. KRICHEVSKIY** is a Doctor of Philosophy, professor  
Institute for the History of Science and Technology named after S.I. Vavilov  
(Moscow, Russian)

E-mail: svkrich@mail.ru

*Space colonization is the top priority of mankind and the strategic target of manned cosmonautics. It is necessary to comprehend the outcome of human space flights and to give a new impulse to space expansion, scientific and practical solving the problem of space colonization by human beings. The attention is also paid to key issues, potentials, restrictions, forecasts, and prospects of space colonization as well as to the transfor-*

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<sup>1</sup> Саморепликация – это удвоение молекулы ДНК с передачей рождающейся клетке генетической информации.

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mation of a man into "a man of the future", "homo cosmicus", and "a universal man", to the formation of "space mankind".

*Key words:* infrastructure, "space mankind", cosmonaut, technologies, forecasting, space colonization, cosmonaut community, strategy, homo cosmicus, expansion.

## РАССЕЛЕНИЕ ЧЕЛОВЕЧЕСТВА ВНЕ ЗЕМЛИ: ПРОБЛЕМЫ И ПЕРСПЕКТИВЫ

**С. В. КРИЧЕВСКИЙ** – д. филос. н., проф.,  
Институт истории естествознания и техники им. С.И. Вавилова  
(г. Москва, Россия)

*Расселение вне Земли представляется как сверхзадача человечества и стратегическая цель пилотируемой космонавтики. Необходимо осмыслить итоги полётов людей в космос и дать новый импульс процессу космической экспансии, научному и практическому решению проблемы расселения человечества вне Земли. Рассмотрены основные проблемы, возможности, ограничения, прогнозы и перспективы расселения человечества вне Земли, трансформации человека в "человека будущего", "человека космического" и "универсального", создания "космического человечества".*

*Ключевые слова:* инфраструктура, "космическое человечество", космонавт, технологии, прогнозирование, расселение человечества вне Земли, сообщество космонавтов, стратегия, "человек космический", экспансия.

The first manned flight into the space taken place in April 12, 1961 was the beginning of the process of real accommodation – space colonization.

"Everybody into the Space" was the encouraging slogan at the spontaneous meeting held in Moscow in the Red Square after Yuriy Gagarin's flight, which reflected not only the euphoria of the holiday spirit, moods and the dreams of people in connection with an outstanding achievement and the event for the Soviet Union and the whole mankind, but also the essence of the space expansion process.

Half a century later, it is time to consider the results of human space flights and to give a new impulse to the expansion of space, scientific and practical solution of the problem of space colonization.

The article refers to a number of sources on the subject matter, contains the results of initiative interdisciplinary researches carried out in 2007 through 2011, includes materials of author's reports made at two international conferences: 1) Space Forum – 2011, dedicated to the 50th

anniversary of Yuriy Gagarin's space flight, Star City, 18–21 October 2011 [*Krichevskiy, 2011*], 2) International Congress "Global Future – 2045", Moscow, 17–21 February 2012 [*Globalnoe budushee, 2012*].

**Why is space colonization needed?** Unfortunately, our home, the beautiful Earth planet, is not eternal, and even if we take care of it by preserving and restoring the environment, we will inevitably lose it one day anyway. Perhaps, as a result of unfavorable "internal" and "external" natural and anthropogenic, man-driven processes, it will happen within the next few centuries.

Mankind should be ready that the problem of survival will inevitably emerge, and if the Earth keeps degrading and destroying as well as becomes unfit for human life due to catastrophic processes, space expansion will become the only possible saving scenario.

Therefore, space colonization shall be viewed as the top priority of mankind and the strategic target of manned cosmonautics.

However, the possibility of and rationale for space colonization process, no matter how paradoxically it might sound, at the beginning of the XXI century is seen by the majority as no less utopian than in the beginning of the XX century, when ideas, projects and strategies of space colonization were introduced by K. Tsiolkovsky [*Tsiolkovsky, 1920; Tsiolkovsky, 1961; Tsiolkovsky, 1964*], who was considered to be mad by many people in Kaluga at that time.

**These are the logical questions that are arising:**

1. Was Mr. Tsiolkovsky wrong and/or hurried over?
2. Space colonization is:
  - 2.1. Utopia, delusions, false start, death, the way to degeneration?
  - 2.2. Hope and a chance for survival, development, eternal life = immortality?
  - 2.3. A chance for the super-rich and the super-elite only?
  - 2.4. The way to create a "man of the future" = post-human?
  - 2.5. The most important task of manned space flight or the way to a dead end?

In the Soviet Union after the flight of Yuriy Gagarin, G. S. Titov and other cosmonauts in 1961–1963, when negative consequences caused by exposure to weightlessness and other adverse factors of space flights became obvious, many cosmonauts of the 1st cosmonaut corps opposed to rapid increase in the space flights duration (see N. P. Kamanin's diaries [*Kamanin, 1995–2001*] and the book by K. P. Feoktistov [*Feoktistov, 2000*]), which was absolutely reasonable taking into account the uncertainty of the consequences for human life and health due to the lack of

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scientific knowledge, lack of effective life supporting and protecting technologies as well as lack of required practical experience.

First cosmonauts strived to travel into space as often as possible, but the task of space colonization was neither set nor solved to make the space a permanent place of residence for a specific person, group of people.

However, even half a century later, cosmonauts (in Russia, USA and other countries respectively) are not ready for space colonization in spite of all outstanding achievements in the duration and number of flights and constant presence in the Earth orbit on the International Space Station. People are selected by other criteria and for other tasks. They are willing and preparing to fly to the Moon, Mars, asteroids, etc., even to the satellites of Jupiter in the future, to work in space on a long-term "shift" basis at research stations and bases, and then to come back.

But to depart for permanent residence, forever, to become a "man of the space" [Lebedev, 2010], i.e "homo cosmicus", to create the "future space mankind" [Krichevskiy, 2012] out of current community of cosmonauts [Krichevskiy, Ivanova, 2011] – for that purpose the trainings are provided neither in Yuriy Gagarin Cosmonaut Training Center in Russia nor elsewhere in the world.

**Now, real space expansion is actively supported by individual enthusiasts only** – writers, scientists (Stephen Hawking is one of the most persistent ones), cosmonauts, i.e small social groups [Zolotuhin, 1997; Kosmonavtika, 2010; Krichevskiy, 2012; Roskosmos, 2011; Hoking, 2010].

Meanwhile, the official strategies and programs on space activities of space countries and national space agencies contain no information on space colonization as the top priority of space activities and manned space flights.

***Until now, mankind, the international community, the UN have no strategy and program of space expansion.***

The paradigm of manned space flights and interplanetary flights prevails in public mind, scientific researches, official space programs and projects, [Gazenko, 2006; Zolotuhin, 1997; Kosmonavtika, 2010; Krichevskiy, 2012], but this is in essence a technology of movement, space travel along the Earth-Space Earth trajectory only.

**Due to the lack of the reasonable strategic goal, very critical and actually anti-space – calls** has emerged, for example: "**50-years since a man has been in space. Isn't it time to come back?**" (the topic of the lecture, delivered by V. G. Surdin, Associate in Physical and Mathematical Sciences, Senior Research Associate at the P. K. Shternberg

State Astronomic Institute of the Moscow State University, on October 13, 2011 in Moscow [*Surdin, 2011*]).

I believe that we have no right to take a single step back ***in the formulation and solution of the problem of the space colonization.***

50 years after the flight of Yuriy Gagarin, three directions are clear and obvious – three streams of people striving to go beyond the limits of the Earth:

1. Professional cosmonauts (pilots, flight engineers, researchers, payload specialists, etc.).

2. Space tourists (it is expected that this stream will become the most turbulent flow in the next few years).

3. Cosmonauts – "expanders" (those who will go to space for a permanent residence) – to live outside the Earth till the end of their lives (or to live forever if one could solve the problem of radical life extension and immortality [*Neochelovechestvo–2045; Rossia 2045; Vzgliad, 2012*]).

Notably, the third direction has just started developing (bases and settlements on the Moon, Mars, etc., including the upcoming colonization of the solar system and the creation of a "space mankind", are in perspective).

**Opportunities, risks and limitations of the process of the space colonization:**

1. Implementation of the process of the space colonization is determined by socio-political, ecological and economic situation on the Earth, its development.

2. With the general growth of population on the Earth (~ 7 billion people in 2012), growth rates are falling; in the middle of the XXI century it is expected to have ~ 9 billion people; at the end of the century, stabilization at the level of ~12-15 billion people is expected (forecasts by the United Nations, S. P. Kapitsa (1999) and others [*Krichevskiy, 2012: p. 278*]), i. e. the problem of involuntary resettlement of population surplus into space is erased.

3. The burning necessity, effective technologies, social agreement, political will and resources for the mass space colonization are absent now.

4. The most difficult problem is a problem of physical and social survival of a person outside the Earth, in the dangerous surroundings of space, i.e. the problem of a "man of the future", "homo cosmicus".

**Modern forecasts and scenarios of space colonization are contradictory.** Targeted mass space colonization is connected with the creation of constant bases and settlements on celestial bodies of the solar system and, first of all, on the Moon, which has become possible since the

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30-s of the XXI century with the gradual colonization of the Moon. Establishment of bases and settlements on Mars is possible from the middle of the XXI century with further colonization of Mars as a reserve planet, etc.

**The structure of space colonization in the XXI–XXII centuries:** complex mega-network, coverage of all levels of space, infrastructure variants starting from the interplanetary (near-Earth) environment, on the Moon, in the libration (Lagrangian) points of Earth-Moon systems, on the heliocentric orbit of the Earth, on Mars and other orbits of the solar system.

**It is reasonable to include the following issues into the scientific and practical "Space agenda" for the XXI century for discussion and solution for the global community:**

1. Space expansion/colonization means settlement of people outside the Earth, formation of a "homo cosmicus" and "space mankind".

2. Interaction between an "earth man" and a "space man", earth mankind and space mankind for the stable social and natural development on the Earth and in space.

3. Opportunities, limitations and perspectives of the human evolution of an "earth man" into a "homo cosmicus" and a "universal man" capable of living on and outside the Earth, as well as conversion of mankind to the new outer social structures.

**Required aspects:**

1) public agreement and political will for the commencement of space colonization under the guidance of the United Nations;

2) reasonable "rules" – laws and regulations both on the international and local (national) levels;

3) significant resources (material, etc.) for space expansion;

4) radically new technologies: transportation; human life support and prolongation in case of permanent residence outside the Earth (including for creation of a "man of the future", "homo cosmicus", "universal man", "immortal man"); infrastructural; ecological; social, etc. (as early as 1993, the author offered and published the social project called "Space Volunteers: Integration of People Motivated to Live in Space" [Krichevskiy, 2012: p. 230–236], which has not been implemented yet).

In case of colonization, it is expected to ensure human survival in the humanitarian paradigm (**to become homo cosmicus and remain oneself**), integration of "earth" mankind and "space" mankind (all "neo-mankind" [Neochelovechestvo–2045]), security and development in balance with the environment of the Earth and space [Krichevskiy, 2012; Vzgliad, 2012].

**The most difficult issue is reproduction of people in space** ("with full life cycle"), safety of their development as living beings, availability of dignified and fully functional life, including solution of bio-ethical, medical, biological, gender and other issues.

Real mass human space colonization is impossible without the solution of this problem.

"When did a mankind become cosmic? – When the first child was born in space", – this has been the plot of one of the scientific fantastic books in the second half of the XX century, which reflects the essence and a required condition for space colonization.

It is worth recognizing that we have advanced little in the solution of this problem, and it is understandable what it means to conceive, bear, give birth to and bring up a child in the hostile space environment. At this stage, serious pathologies with the extremely high death risks are inevitable, and the problem is unmanageable yet. How to manage it? It appears that people grown and matured on the Earth should go to space for permanent living. And if we unable to ensure natural reproduction of people outside the Earth, it will be necessary to pursue some sophisticated technologies progressively transforming ourselves into the artificial cybernetic people, cyborgs etc. Or will we be able to cognize, understand and overcome this barrier, and in the process of development any capabilities of living will "unpack", and people will be able to live and reproduce themselves in space environment? But what shall we do for this to happen? To discover a "life code"? To reproduce earth conditions in space, to create other environment, to copy-"clone" or find the "new Earth", similar to ours to the maximum extent?

What are the options for solution of this problem? It seems that it is reasonable to start creation of a "homo cosmicus" on the Earth as a part of the "man of the future" project within the framework of the Plan of the Strategic Social Movement "Russia–2045" [Rossia 2045]. For instance, from creation of bio-robots – technological "clones" of real cosmonauts: a couple "real man –cosmonaut" + "clone" (his/her technological copy, i. e. artificial body–avatar and other structures) should evolve and act mutually. However, it is a cosmonaut's "clone" who should be sent to the insecure space conditions for a long term. At the same time, ultimate similarity and interaction in a pair should be achieved. Eventually, the "clone" should ultimately become a full copy of the human cosmonaut, including consciousness and other personal attributes.

A favorable "window of opportunities" for preparation and commencement of the targeted mass human space colonization exists in the XXI century, which we are able and have to use for survival, security and

development of mankind. But this "window" may close due to the growing earth-related problems.

I believe that Russia as one of the leading space countries should initiate space expansion – human space colonization – by officially submitting this offer to the United Nations as well as to the leaders of other leading space countries, to space agencies and corporations, to scientific and business communities, and to all people of the Earth.

It does not mean at all that all of us will "take off running" into space tomorrow. Nevertheless, the space colonization strategy should be developed and accepted on the political, scientific and social levels, in the national and global scopes for the purpose of commencing general targeted movement.

In this case, a person and a mankind will get the integrating grand-purpose (top priority), a real chance for survival and a firm development in space dimension, whereas space activities and manned space navigation will receive new values, mission and a reasonable strategic objective.



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