

Extension of Space Activities, Emergence of Space State and Cosmization of Legal Science

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The need for cosmization of legal science and application of interdisciplinary, intersectional approaches for the in-depth study of new space phenomena is expected to grow significantly. This will be caused not only by a new stage in the space human expansion, but also the increasing competition in this area, the start of the emergence of space statehood in developed countries, the complication of law enforcement mechanisms, as well as the threat of space wars. For the first time, due to the development of space activities and the emergence of space statehood we can provide projections for some areas regarding thematic development of the main branches of legal science and its general cosmization. It outlines the perspective problems, which the philosophy of law, the general theory of state and law, the history of state and law, international public and private law, comparative law, constitutional, administrative, civil law and other industries legal science confront with through the emergence of space legal science. It is proved that to study the fundamental problems of the development of the space state and law (national and international), it is necessary to combine the efforts of legal science with other social, humanitarian, and military sciences. A systematic multi-faceted scientific study of the emerging space civilization, its statehood and law, and the risks associated with it in the strategic documents of states, will allow achieving positive results in understanding of the prospects of the modern state and law evolution, in creating a new international security system on Earth and in outer space. General conclusions are drawn about the features and characteristics, possible trends of the cosmization of jurisprudence.

Keywords: space activities, space state, cosmization of legal science, interdisciplinary and intersectional studies of the space state, space jurisprudence

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Introduction

In view of expanding space activity, deploying the emerging space human civilization and its control system in the form of diverse space statehood [Udartsev, 2019b; Udartsev, 2019c; Krichevsky & Udartsev, 2019], two strategic trends in the development of legal science can be distinguished. Firstly, its cosmization is gradually becoming the objective need for the emergence of a diversified space legal science, theoretical and practical space jurisprudence. Secondly, in order to conduct a comprehensive and in-depth study of the evolution of the state and law on Earth into space ones, it is necessary to combine the efforts of all branches of legal science and its interaction with other social, humanitarian and military sciences.

An intersectional approach in science is always applied to varying degree when we speak about synthesizing knowledge and developing new things. In the history of science, the epochs when interdisciplinary and intersectional studies of social phenomena acquire importance are replaced by the time when they are losing their greatness.

The relevance of the intersectional approach increases during historical changes and in the periods immediately preceding them. Under such conditions, new phenomena appear or pre-existing one substantially change that no longer fit into their concept. Previous knowledge and forecasts are insufficient, inaccurate and even erroneous. So one needs a new complex, deep and multi-faceted rethinking of a changed reality. If we do not solve major methodological, philosophical, and general theoretical problems, applied theory and practice are expected to be in an unstable, uncertain state not only with respect to the existing situation, but also to development trends and the near future.

Having found a comprehensive solution to general cognitive problems, science and practice start studying various aspects and elements of new phenomena and processes of reformatted reality in details. At this stage, applications and narrow specialization are again especially in demand, the study of intra-disciplinary and private issues is being updated. Interdisciplinary and intersectional studies are narrowing somewhat and continue carrying out the synthesis, coordination and testing of accumulated knowledge, private sectorial theories and ideas, periodically making breakthroughs for better understanding of the new ones.

Next two decades may slightly change the attitude towards outer space and prospects regarding to the evolution of humanity and the mind in the universe. Apparently, comprehending of the new phenomena in the life of humanity caused by a new surge of space activity and expansion will be marked by appearing both trends.

“Tsunami” of space activity is approaching

After a half-century relative lull, the scientific, technological and technological revolution makes space activity unfold with renewed vigor and on a new scale. The conditions are being created for a new stage of the practical expansion of humanity into space. The emergence of the space civilization of the Earth is global and affects all spheres of life. As rightly noted in the literature that in the 2000s, “under the influence of the global digital revolution, the “old space” (the traditional state space industry of the few pivotal countries) was replaced by the “new space” known as the world of business and technology startups, which was constituted by more than 80 countries” [Yanik, 2019; Pajson, 2013]. Since 2008, the American Furton Corporation began to calculate the annual Space Competitiveness Index on the base of its own methodology, which included 40 indicators (industrial development, human resources, state institutions). The reports about the world space economic performance of the Space

Foundation, which was created in the early 1980s, are published annually [Yanik, 2019; Futron's, 2014; The Space, 2019].

Currently, space activity in the countries throughout the world is growing like an avalanche; by the end of the second decade of the 21st century, all countries are participating in it in this or that way.

Preparation for the space human expansion is becoming a daily challenge in many countries. I will describe some events occurred for the last ten days of August of 2019 in an abridged and systematized form [Dajdzhest, 2019].

The US President issued a Memorandum on the use of spacecraft containing nuclear reactors. A prototype of a space nuclear tugboat, which is being developed in Russia, was shown at the International Aviation and Space Salon (MAKS) — 2019 (intended for the transportation of goods in deep space, including the possibility to use it for creating bases on other planets in the future). By 2030, it is planned to create a complex for producing satellites with such a nuclear tug at “Vostochny” cosmodrome (spaceport). In Russia, the rules for creating and operating a federal fund for remote sensing of Earth from space have been approved.

The Chinese lunar rover “Yutu-2” resumed its work to further examine the far side of the Moon to analyze the structure of the soil for the presence of minerals, to determine the level of neutron radiation emitted by stars. Indian Lunar Station, Chandrayan-2, has been on the orbit approach to the Moon.¹

The participation of the USA, Canada, Japan, Russia and the European Space Agency in the creation and operation of the lunar orbital station is still debated. NASA began accepting applications from national space companies for participating in the supply program regarding the future near-moon orbital station (for which \$ 7 billion is allocated). In 2021, the United States is planning an unmanned Moon overflight. In 2024, they plan to return people to the Moon. The European Space Agency continues investigating the suitability of caves and lava tubes on the Moon to support astronaut life. Roscosmos and the Russian Academy of Sciences are going to complete a program on the study and exploration of the Moon by the end of autumn 2019. Roscosmos announced a tender for examining the Moon on a manned flight. In the early 2030s, flights of people to the Moon are expected to be done annually. Besides, it might be the start of creating a permanent lunar base. China has assembled the first flight model of a promising manned, partially reusable spacecraft. The vessel is designed for flights to space stations and the Moon.²

The spacecraft, “Soyuz MS-14”, with the robot on board known as Fedor, was able to dock with the ISS only at the second attempt. A robotic astronaut's assistant, which was developed in Germany, returned to Earth from the ISS on another spacecraft, so-called “The SpaceX” CRS-18. The said robot allows automating and facilitating a number of astronauts' functions.

¹ On the 6th of September, 2019 the contact with the Indian apparatus was lost two km. before it has achieved the surface of the Moon. Two days later, it was found on the lunar surface, 500 meters from the landing site in an inverted position but it was not destroyed. Attempts have been made to reestablish a contact. In the coming years, India plans to make vigorous efforts to boost space activities and fix a list of in countries leading in this field. According to Indian experts, over the next 10 years, 300 to 1,200 different satellites will be launched into space annually, and starting from 2023 the number of small satellites will be at least 700 [Dronina, 2019].

² The promising space ambitions of China are considered the largest ones. In particular, it is stated that China plans to create the Earth-Moon space economic zone by 2050, which is expected to bring a return amounting to about \$ 10 trillion a year. [Kitaj planiruet, 2019].

In 2019, the first Vietnamese satellite designed to radar observation of the Earth is preparing to launch.³ Iran has denied a Western media report regarding unsuccessful torture launch satellite in the Imam Khomeini Space Center.

NASA announced that the assembly of the new James Webb space telescope had been completed. Its cost is \$ 9.7 billion. The telescope will be launched in March 2021. It will search for traces of life in the atmosphere of other stars' planets, study the emergence of the first stars and galaxies of the Universe. The light coming from starts to Earth was noted up to 13.5 billion years ago.

In 2020, the Japanese vehicle, "Hayabusa-2", will deliver soil samples from the Ryugu asteroid to Earth. NASA completed the installation of a drone helicopter on the Mars 2020 Rover, which is scheduled to land on the surface of Mars in the winter of 2021. In 2025, NASA officially approved a mission to the satellite of Jupiter.

The Agency for Space Research and Technology "Uzbekcosmos" has been created in Uzbekistan, will introduce the law "On Space Activities" into parliament by November 2019 and within a year it plans to prepare a program for the development of the country's space industry for the next 10 years.

The US Space Command officially began to work (the sixth type of US armed forces appeared). In Thailand, the military force launched a new military space center to ensure the country's national security in outer space. NASA published a test report regarding the Indian anti-satellite weapon occurred in the spring of 2019 (about 15% of fragments of the destroyed satellite remain in orbit, creating the threat of accidents in near space) [Dajdzhest, 2019].

This is a brief information about events occurred only for 10 days. Tens of thousands of civil and military organizations of all countries are involved in space activities. It has an increasing impact on the life of humanity, opens up new prospects for statehood.

In the fall of 2019, information regarding the development and approval of the Russian three-stage Lunar program appeared. Earlier, in February, the head Scientific Institute of Central Research Institute "Roscosmos" published a document, which states that the first Russian manned expedition should go to the Moon in 2031, then such flights will become annual. Prior to this, during test launches in 2028 and 2029, it is planned to test the takeoff and landing complex and fly around the Moon on a manned ship [Roskosmos, 2019]. Two agreements were concluded and signed: the first one was related to the cooperation between Russia and China in the exploration of the Moon and the second one is connected with the creation of the Joint Data Center for the exploration of the Moon and deep space [Rossiya, 2019].

In July 2019, another experiment of the Sirius international (Russian-American) project ended, simulating a four-month space flight of six crew members (four Russian astronauts and two American astronauts) to the Moon with landing on the Moon and returning to the Earth [Mezhdunarodnyj, 2019].

Some experts doubt to find the solution to this problem within the specified time due to the lack of a fully-fledged lunar module, funding and some uncertain results of the next US presidential election that could affect the lunar program and its timing [Poceluev, 2019; V NASA sochli, 2019]. Despite these doubts regarding NASA's implementation of a new astronaut landing on the moon in 2024, it seems that US astronauts would be still the first to

³ Currently, autonomous and cheaper types of telecommunications, including television, covering a significant territory of the country, are impossible without satellites. In May 2019, Bangladesh launched its satellite and transferred the broadcasting of several television channels to it. Myanmar and Cambodia is going to launch of satellites too [Verhoturov, 2019].

reach the surface of the Earth's satellite in the 21st century. It became known that the estimated budget of the "Artemis" lunar program, which aims to return to the Moon, will exceed \$ 6-8 billion per year of approved NASA's budget amounting to about \$ 20 billion. They have envisaged to do several manned flights to the Moon and create the lunar station by 2030 [V NASA otmetili, 2019]. The USA continues to expand a number of countries participating in the Lunar Coalition for the study and exploration of the Moon and Mars. Australia will join the lunar program [Avstraliya, 2019; V NASA otmetili, 2019].

There were allegations that the U.S. plans to deploy weapons in outer space, since it is considered that, the activities of all ground troops currently depend largely on satellites and their security. The US Department of Defense has announced a tender for the establishment of a military orbital station. Presumably, it can be used as a space command post and will open up the possibility of deploying the US military in the Earth's orbit and in the space environment between the Earth and the Moon. This will inevitably provoke a response from the Russian Federation and China, especially since the USSR had already had experience in developing military space stations [Bovdunov & Komarova, 2019]. As the international tension is rising, some experts, somewhat exaggerating the threat, report that today the situation in space is similar to "that one occurred in May 1941 on the western border of the USSR" [Pokrovskij, 2019].

Currently, in the context of terminating some strategic international treaties regarding curbing the development of armaments, various types of space weapons, in particular laser ones, are being developed. The placement of weapons of mass destruction in outer space is prohibited by international law (Article IV of the 1967 Outer Space Treaty). However, some varieties of atomic weapon, such as neutron (in particular, neutron guns), are trying to be pushed beyond the established prohibitions by experts of individual countries. Although these weapons are considered as less effective in the Earth's atmosphere, but in the vacuum of space they can become a weapon of mass destruction.

The emergence of space statehood and fundamental importance of this process

In the context of the fourth industrial revolution in technology (especially information), fundamental breakthroughs in the natural and technical sciences, as well as in view of the rising new powerful wave of space activity, globalization processes in the economy, politics, culture, information, law, the state and law are transforming. Their values, historical goals, scale, structure, areas of activity and functioning technologies are changing. New dimensions and prospects of their potential and macrohistorical purpose are revealed.

The space statehood emerged in the second half of the twentieth century has been completed by the early 21st century [For details, see: Udartsev, 2019a; Udartsev, 2019b; Udartsev, 2019c; Krichevsky & Udartsev, 2019].

In the course of historical evolution, states acquired many new features and properties, evolving to larger, stronger, more stable and legal entities. The forms and modes of functioning of states changed under different historical, geographical and cultural conditions — from relatively simple to very complex structures of power, from dictatorships to the most humane and enlightened ones. It occurred that the vast territory on the continents was under a number of states administration. The colonial empires, whose territory extended beyond the continents, sporadically appeared and disintegrated. However, all this happened as part of the development

of the Earth. Only in the second half of the twentieth century, especially at the early 21st century, due to the development of practical cosmonautics, science and technology, new opportunities opened up. They were aimed at expanding initially scientific and then practical human activities beyond the Earth.

For the first time, the opportunities driven by the development of a vast new space, space objects and resources⁴ lead to a significant change in the state and law. Besides, they contribute to provide flexible, smart and clear governance of the ever-growing number of actors in an unlimited extent and physical features of outer space. This will require rethinking and timely reconfiguration of public administration mechanisms and legal regulation.

On the one hand, this learning challenge is considered the very relevant one, especially for a general theoretical and strategic understanding of the nature and prospects of the development of state and law in the context of the current process of human evolution and the emergence of space civilization. On the other hand, this issue has a more applied futurological aspect. It seeks to identify and stimulate the development of advanced technologies and knowledge, which are the most effective when moving towards promising goals. In addition, it focuses on studying the emergence of new components of the economy, ideology, politics and law, as well as developing a global space civilization as a complex system with its member states, taking into account possible risks at the national and international levels.

It requires understanding the problems connected with public administration. They have to be considered with due regard for the development of artificial intelligence (AI), its widespread adoption, autonomous and human-controlled functioning, cloning, genetic improvement and adaptation to different human space conditions, as well as the prospects of a longer life, and in the conditions of growing, transplanting and replacing human organs. In the future, probably in the next century, governance and legal regulation will be predominant. It will be connected with a large-scale industrial development of space resources and the gradual phased creation of stations and settlements, first on the Moon, the nearby planets of the Solar System, and later beyond.

We will highlight two general points related to the emergence of space statehood.

Firstly, the process of transforming modern nations on Earth to space ones of different levels [Krichevsky & Udartsev, 2019], constitutes an early stage of the evolution regarding the system of space civilization governance.

Nevertheless, secondly, this process has already begun and takes into account its emerging new directions of development that is changes occurred in the space state will be accumulated in mechanisms, goals, and means of governance, regulating, planning and control. As it develops further, significant changes are inevitable.

As rightly pointed out in the modern theory of law, development of law is done in two main ways — spontaneously, that is in the process of self-regulation of public life, as well as in the process of targeted law-making and legal regulation (systematic and rational in the legal process) [Pridvorov & Trofimov, 2012: 135-155]. A harmonious combination of these two principles provides the best result. These two principles — spontaneous and purposeful (self-organization, self-government and organization, management in relation to state administration and the political system), obviously, can contribute to develop the diverse social life of space civilization, space government and legal regulation.

⁴ Therefore, an asteroid flying near the Earth in 2015, according to experts, contained 90 million tons of platinum in its core. It is worth \$ 25-50 trillion. 12 of 16,000 asteroids crossing the Earth's orbit have been identified by astronomers as ideal for transferring them to Earth orbit for developing their resources [Kaku, 2019: 92].

Space statehood will exist and evolve in a more diverse space conditions (compared to the one on Earth) acquiring its own spatio-temporal, natural and social features.

The expansion of the space sector in the legal education and legal science

The upcoming competition among world leaders for space, space economy, energy and other fields, primarily for space resources and the exploration of the Moon [Krichevskij, 2019: 16-25], Mars, nearby asteroids, requires to *improve training of lawyers specializing in space law*. Primarily, we need theorists, experts in international and civil laws, etc. Therefore, we have need of both scientists in the field of space law and the space state, as well as lawyers specializing in space law. Following the discussions between the Russian Academy of Sciences and “Roscosmos” concerning the Russian Lunar Program at the end of 2018, they rightly noted: “To consider it necessary ... to develop a plan for the legal support of the interests of the Russian Federation in potential territorial disputes and entrust the preparation of the necessary the number of specialists in space law to specialized universities (Moscow State University, RUDN University, etc.)” [Kucher, 2019]. This task inevitably arises in other countries.

This will require pooling the resources of many countries: scientific, technical, technological, financial, personnel, economic m especially, in case of large space projects. As the Canadian Space Agency astronaut, Robert Brent Tirsik (who got with the Asgardia National Space State Award), correctly observed that “space colonization would not take place if all interested parties did not work together. They shall forget about the borders between countries and the fragmentation of scientific disciplines” [Astronavt, 2019].

The first stage of transforming terrestrial states into space one (primarily this will affect leading states) will be connected with setting fundamental philosophical and general theoretical objectives. Along with that, it will raise sectoral, theoretical and applied, as well as practical issues that will be coordinated, expanded and deepened as the historical process develops and accelerates.

Modern legal science lags behind practical cosmonautics. However, if it is activated and expended in the coming years, this lag can pose many challenges. Sergey Krichevsky is right when he states that “humanity has not agreed yet on how to explore the Moon, but the development is already underway” [Krichevskij, 2019]. Space legal science has to creat may things almost from scratch. In this regard, the head of Asgardia, Igor Ashurbeyli, was not exaggerating, when he responded to the journalist’s question, “what modern laws related to space exploration, in his opinion, were outdated and require serious revision?” as follows: “In general, normal laws never existed in the space. There was one, and even that was not signed by all states. However, after the US President Donald Trump announced that America was going to create an aerospace fleet and would do, as it seemed fit, I believe that henceforth there are no laws in space at all. This is a cosmic jungle. Therefore, we will wait for appearing of cowboys, saloons and the gold rush. There is no law!” [Five, 2019].

As Arkadiy Ursul rightly notes that there is a new global revolution in science, so-called a multi-revolutionary explosion in modern science [Ursul, 2019]. Legal science is on the verge of a global and superglobal transformation. So multi-aspect cosmization of legal science shall be considered as one of the strategic manifestations of this general trend. Legal science has to make planetary jurisprudence be aimed at space. Along with the development of space activities, the scientific and practical sphere of law will inevitably expand. Such conditions

as spatial, resource, temporary, energy, climate and others as well as some characteristics of space, other planets and their satellites will be increasingly taken into account in the legal regulation. The legal doctrine, institutions and norms of international and national law will be gradually supplemented and rebuilt. Although many things will have to be created from scratch or rebuilt at a time as humanity conquers and explore outer space, with its further transformation and gradual occupation by natural and artificial intelligent creatures.

The need for interdisciplinary and intersectional study of space statehood. Cosmization of branches of legal science

a) state legal science

Something appearing in the new areas of legal studies can be noted even today, since the need for this will arise in the near future.

Therefore, *the philosophy of law and the state, as well as the general theory of state and law*, will have to study the main evolutionary trends, models, forms, structure and functions of space states. This also applies to conditions, factors, features and options for the transformation of states on Earth into space ones, as well as their relationships, correlation with other social institutions, individual, group and social consciousness, including artificial intelligence. Space exploration will create many fundamental problems for legal science, which we can only assume.

It can be considered that *the theory of a space state emergence and its further evolution will replace the previously dominant ideas about the future of the state* over time. This will be through cessation of its evolution at the planetary level or appearing left-wing radical ideas about wither or abolition of the state in the near future. The state as a historical phenomenon, with the emergence and development of the space human civilization, has to go a long historical path, while adapting to the changing conditions of the existed human (and possibly posthuman) civilization and the degree of its spread in space, as well as to various cosmic levels of functioning and space civilizations development.

The emergence of space civilization and its statehood will apparently lead to further development of international space cooperation, national and international space law. The basic legal doctrines and trends in legal thought will continue to broaden knowledge of the law. It can be assumed that the emergence of space statehood will also affect the doctrine of legal positivism. It might adopt some cosmic features. Representatives of space legal positivism, apparently, will be inclined to consider law as the legislation of the space state or as acts, norms, precedents that are sanctioned by the laws of the space state. The studies of the cosmic nature of different phenomena will provoke all the basic theories of law and the state to reveal their space potential. New cosmic trends will appear in theories of natural and customary law. It might occur that synthetic, integral theories of law will be the most popular, as far as they will be considered as more complete and comprehensive doctrines even at the level of space philosophy of law.

Theory of legal policy, as a measure of the development and enforcement of law at different levels of legal regulation, has to expand the range of its tasks. These might include the emergence of promising avenues and the harmonization of the legislative system development. In addition, these would entail the improvement of legal education, the lawmaking process and institutions as well as legal examination, taking into account the expanding space law and the activities of the space state, not only within the Earth, but also beyond.

The history of state and law and the history of legal and political thought will have to study leading, lagging and accompanying processes in public consciousness, in legal and political science, as well as in practical institutional development with regard to the emerging transformation of statehood. The same is expected to occur with the background and history of this multi-aspect process in political and legal reality of different countries.

With respect to the science of constitutional law, it will face the challenge of developing constitutional foundations and principles of the space states activity, adapting the basic laws of the state to the process and prospects of space exploration, which will be, firstly, conducted not far from the Earth, then even in longer distance. It will be necessary to develop an adequate model, which, later on, might be embedded in a space state activity. The latter will inevitably expand. It is important to clarify the ratio of the subsystems of its organs (branches of power), to determine the status and procedure for forming new bodies of the space state, as well as the optimal combination of powers of bodies, rights, freedoms and duties (including new ones) of a person and citizen, legal entities, taking into account the new spatio-temporal reality, goals and objectives of development, as well as the technical level of civilization. Obviously, we have to carry out further unification of the constitutional legislation of space states.

The theories of administrative law, public administration (today, about 40 countries have already created various state bodies for organizing and managing space activity) *and public service, customs and tax law* will have to clarify, rethink and expand the conceptual apparatus, as well as theoretical constructions related to ensuring order and effective public administration. Besides, it will lead to retraining of civil servants. Moreover, it will require scientific and legislative elaboration of the legal regulation regarding the use of different vehicles and technologies, which are connected with the deployment of the space industry, the transportation of goods, other scales and levels of risks, as well as the elimination of the latter. A new space customs and sanitary-epidemiological service is expected to be of high quality and high-tech.

There are other challenges. They are connected with scientific understanding of the legal regulation as to the expansion of AI application for working in space. It includes places that are inaccessible to humans, the usage of the most sophisticated space technology, various sectors of the space economy, as well as the harmonization of AI components with government, people and the rule of law. We have few ideas about military (currently six countries have created space troops or space units) and law enforcement service in outer space, as well as space service itself and other security services. They are far from those, which we have on the Earth. The legal regulation of AI will affect all branches of legal science.

International public and private laws might play a significant role in addressing the challenges concerning space statehood and its legal functioning, the peaceful orientation of the space activities of international organizations, space states and private corporations involved in space activities. *The philosophy and general theory of international law* would also change. The current crisis of international law and the international security system can have disastrous consequences. Many things have to be done. They are legal regulation of interstate relations and increase of their role because of UN reform, creation of stronger global governance structures, effective checks and balances, legal regulation and peace at the planetary level. It is obvious that if we fail, the explosive development of space activities can lead not only to increasing the competition, but also to the space wars between states for control of space resources and space itself. The science and practice of international law should contribute to ensuring universal human interests in space activities, the interests of the space civilization of

planet Earth as a whole, as well as preserving a relative balance of forces, rights and obligations of pivotal countries, maintaining the international law and order, international security and peace on Earth and in space. It is necessary to create reliable international legal foundations of international (primarily interstate) mutually beneficial cooperation in the preparation and implementation of super-global projects of humanity with appropriate international control.

b) civil science

The science of civil law will have to develop the possibility of applying the theory and legal structure of property law, its various forms and reasonable restrictions to the multidimensional sphere of space activity, to the space economy, science, technology and culture.

The development of laws relating to space subsoil usage (in international private law and in the law of a particular state), antitrust and corporate law, which will take into account the specificity of various space entities, objects and their keeping conditions, as well as the extracted substances will be of particular importance.

It will be necessary to adapt every possible civil law structure of the rights and obligations of participants of legal relations in different types of agreements to space conditions and various space activities, and if necessary, modify them.

There is the need for developing new concepts and theories of the state and private capital participation in various types of space activity, applying AI and robots in it, public-private partnerships in technical, intellectual, information, transport, banking, insurance and other activities in space (as well as in the study of developing legislation and the practice of its application in countries leading in space activities).

c) criminal science

Previously unknown prohibitions and permissions, new concepts, *corpus delicti* and crimes will appear in *the theory of criminal law*, crime and punishment, and *penal law*. The knowledge about many other legal concepts, norms and institutions will expand somewhat and gradually adjusted with the experience gained by the states regarding maintaining order while carrying out space activities and regulating relations in space industries, bases and settlements outside the Earth, as well as while accumulating and selecting the best practices on relevant legislation.

Expanded studies in *criminology* will be more closely aligned with genetic and medical developments. In case of *forensics*, such studies will be connected with scientific and technical expertise, taking into account different space conditions.

d) procedural branches of legal science

Theories of procedural law (constitutional, administrative, civil, criminal, etc.) will have to develop optimal stand-off procedural forms. These things will be inevitable, if we take into account space distance, peculiarities of the passage of time and the necessity to address many issues without undue and mandatory displacement of people and movement of equipment in outer space.

e) comparative law

Comparative law can play an important additional role in integrating and coordinating the activities of space states, in unitizing their certain state and legal institutions and regulations, as necessary information becomes available.

It might be necessary to study further state and law of the developed foreign countries, which are on the cusp of being a space state and forming national space law (the USA, China, France, Israel, India, Japan, Great Britain, etc.). The countries of catching-up development will try to reproduce legal development in the same way.

Study of challenges arisen during space evolution of state and law in social, humanitarian and military sciences

The transformation of developed states on Earth into space states also requires the participation of other *social and human sciences such as philosophy, political science, economics, ecology, sociology, history, psychology, philology, etc.* They will help to understand this phenomenon and its consequences. Changes occurred in statehood will make each of these sciences adjust and expand overall perceptions about the state and the political system, their nature, purpose, scope, levels, methods of social management and regulation, about nature and historical place of man in the evolution of the mind, etc.

At the same time, the cosmization of the globe's economy and *economic science* is of paramount importance. Recently, people started to pay more attention to the emergence of the space economy, though, yet, insufficient (unlike the space state, until recent years its emergence had been virtually invisible). As Andrey Yanika rightly noted in his article, "the pace of the space economy evolution and its increasing influence on the most diverse spheres of "life on Earth" are currently ahead of the scientific understanding of the processes. However, we should pay more attention to this object because there are some evidence due to which we can state that the space transformation of the world economy at large has already begun [Yanik, 2019; Chernyh, 2016]. It is obvious that economic science and other social and human sciences should keep in mind the strategic trends of the evolution of humanity, the emergence of a space civilization with its space ones — economics, politics, law, culture and science.

The emergence of space civilization will stimulate the development of gradually expanding branches of legal science and other social and human sciences, but with the addition of one word, "space" (*space political science, space economics, space ecology, etc.*).

Military science (the inevitable emergence of space military science), and *theories of national, global and space security* face new challenges: the emergence of the armies of developed states in space, but now this list is limited: Russia, China, the USA, France, Japan, and Great Britain (it will obviously be longer in the coming years), and the threat of spreading the military conflicts and weapons into space, the emergence of competition and struggle among the developed countries for strategically important areas in space, on the Moon and other planets in the near future.

Conclusion

It should not be assumed that the cosmization of legal science is, predominantly, supplementary to the development of human technical civilization and designed to ensure its security and sustainable progressive development. Everything will be in a smooth and sufficient manner. Discussions, struggle between old and new approaches, ideas, theories will occur at all stages of science development. One can expect graceful conservative arguments about the inadmissibility of running ahead (it shall be done in order not to change anything afterward). They might express ideas about how much we expect to spend on astronautics and the exploration of deep space, why these issues are not urgent and there are a lot of other things

that have to be done on Earth (for example, to build and repair roads, finance the modernization of housing and communal services, etc., etc.).

History does not stand still. Technological development is unevenly but fast. It depends on time, countries, certain areas of science and types of technology. The human space expansion leads to the gap between the developed space states that are actively involved in improving the space economy, science and technology and backward countries.

One can also assume that there will be imbalance and uneven development regarding certain branches of legal science. This can have different consequences. They sometimes can be positive, especially, for supporting the sustainable development of key aspects of space statehood and the space economy (for example, advancing in the cosmization of certain sub-sectors and branches, legal institutions. This is possible both, for objective reasons, associated with the uneven development and cosmization of certain areas of public life, and, for subjective reasons, depending on specific leaders, scientists, and training of personnel in a particular branch of legal science. Nevertheless, apparently, the uneven cosmization of some branches of legal science would be more optimal and preferable during the development of space civilization.

Summing up, we can draw the following main conclusions:

1. The need for the development of the space economy, culture, science and technology, for the emergence of space statehood and space law will contribute to the cosmization, firstly, of fragments, parts, and then legal science as a whole — both as Public Affairs and as Jurisprudence. At the same time, it is important that legal science develops in this direction systematically; taking into account trends in the development of public relations, science and technology, and synchronously in responds to the increasing needs of space civilization and the space state.

2. The new scales, goals, values, forms and functions of the space state will require the solution of many general, theoretical and applied, scientific, sectorial, cognitive tasks, taking into account its role, limits and forms of participation in the development of the space economy and its legal regulation. The emergence of a space state requires the combined efforts of different researchers in order to conduct a comprehensive study of the space potential of the state and law, the possibilities and consequences of this process in the context of other global and superglobal processes that humanity has entered into.

3. Legal science based on interdisciplinary studies and in the context of intersectoral studies of other social and human sciences should be more actively involved in the study of the emergence of space statehood and an updated international security system to ensure peace and minimize new emerging risks on Earth and in space.

4. The expanding cosmization of legal science and practice is one of the strategic promising areas of its development during space civilization emergence, competition between pivotal countries regarding space and the general space human expansion. In the longer term, along with the space human expansion, with the development of new forms of organization of space systems of power and law, jurisprudence on Earth will apparently evolve more and more and will become as a part of space jurisprudence. Legal science will become a branch of space civilization science.

5. The emergence of space statehood and its corresponding governing bodies, mechanisms, institutions, principles of legal regulation and administration (as well as self-regulation and self-government) will lead to a significant transformation of legal science, law, and especially legislation. This transformation will take place in several areas:

- adaptation of the legal doctrine of the existing scientific knowledge to a new changing reality and improving the existing legislation in accordance with it; clarification of ideas about the nature and functioning of previous phenomena in new conditions;
- completion, expansion, substantial clarification of the position of legal science on various issues aimed at mainstreaming new features, elements of reality and the process of changes in previous phenomena with their further transformation;
- development of new ideas, concepts, theories, cognitive models, designs to explain a qualitatively new thing in political and legal reality and the trends of its evolution;
- perception of possible new knowledge, theories from the natural and technical sciences, a new methodology and their implementation in legal science and its industry; even more active synthesis of ideas, theories of the humanities, social, natural and, partly, technical sciences in various branches of legal science, especially in forensic science; expanding the scope of application of scientific knowledge, developments in the natural and technical sciences, AI in legal research;
- emerging readiness in the public consciousness and in science to the percept, influence and grasp ideas and concepts (including those in the field of space civilization governance and legal regulation) of hypothetical and other space civilizations (including, possibly, more advanced ones, in comparison with civilization on Earth) in a more distant future; the need for interaction and cooperation⁵ in the activities of space civilizations will inevitably lead to the emergence of the next level of inter-civilizational political and legal development.

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⁵ Tatiana Ursul writes, not without reason, about the inevitability of cooperation between space civilizations as factors in the evolution of the universe [Ursul, 2018: 289].

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