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The New COSPAR Panel on Social Sciences and Humanities-A View from the Chair

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The sending of artificial satellites into space is one of the key phenomena of the 20th century. Sixty years later, these satellites are an essential component of human activities and deserve special attention as societies question their development models and the future of the Planet. The creation of the SSH Panel aims to accompany this reflection on the diversity of current and future issues of space occupation by opening up to the humanities and social sciences.

The objective is twofold. First, to strengthen interdisciplinary exchanges in order to better understand the motivations and perspectives of activities in space as an object of scientific study, and second, to provide decision-makers and the general public with elements for reflection that will help them to better understand future choices in terms of space policy and modalities of space occupation.

This paper aims to present elements of a geography of inhabited outer space. The description of the permanence and changes since its beginnings thus provides a framework for current and future questioning.

The control of access to space and the operation of satellites is historically the prerogative of a small number of states. Three main stages can be distinguished in the establishment of the current space club, defined as the group of states able to launch their own satellite into space. For more than 20 years, the Soviet Union and the United States were the only ones to master space technologies and to use them widely for both military and civilian purposes. Europe, Japan, China, India and Israel did not become truly present until the 1980s, when the civilian activities became more important than their military counterparts. It will take another 30 years for three new states: Iran, North Korea and South Korea to gain access to space at the turn of the 2010s. Among these three new comers, two of them follow a logic reminiscent of the 1950s, with a strong connection between space and nuclear ambitions.

The possession of a launcher testifies to a rare technological competence and is a sign of national sovereignty as well as international recognition in a logic sometimes directly derived from that of the Cold War with an insistence on space and nuclear ambitions. The ability to make humans live outside of planet Earth also represents a symbolic marker. Russia, the United States, and finally China are the only ones to have this capability in 2021. Although less publicized, exploration and science are also important criteria in the ranking of space powers. Europe and Japan are back in the forefront. In the end, only the United States controls the whole range of space missions with a particular aura due to the Apollo missions still unequalled 50 years later.

The missions of automatic satellites have rapidly diversified. Technological experimentation and scientific research, the foundations of space activities, paved the way for satellites in charge of specific applications: Earth observation, telecommunications, location. Initially conducted by government agencies, these activities are gradually being taken over by private actors who become

owners of space systems and exploit their capabilities by offering services. This trend also affects the previous international organizations (Intelsat, Inmarsat) due to the deregulation of the telecommunications sector. The space activities acquire an economic value of their own which remains however very limited compared to other sectors. Above all, they are very unequal, with the United States far outstripping all other countries. Europe has historically been in second place, while China, benefiting from a large domestic market related to its development needs, is strengthening its ambitions. For its part, India represents an original model that has long prioritized national development aid through an ubiquitous public sector and an embryonic private industrial sector.

The space world is composed of different groups. Very schematically, we can say that the origin of space exploration with scientific and military objectives has made these two communities the first actors to interact with engineers and industrials. As for the astronauts, they have a particular status due to their experience of life in space and their involvement is particularly evident in the support of companies on the Moon, Mars and the permanency of space bases. At the same time, the economic stakes have opened the game to partners first public and more and more private involved in the management of systems for service purposes such as telecommunications and Earth observation. From now on, a new category of actors takes the forefront, that of the entrepreneurs, leading to the idea of a new paradigm, that of the New Space, or even the Smart Space.

The increase in the number of satellites orbiting in space is indicative of this new dynamic. While from 1957 to 2019, nearly 9,000 satellites were launched, all nationalities included, the numbers are now soaring with more than 2,500 satellites put into orbit in 2020 and 2021. And some constellations claim to have tens of hundreds or even thousands of satellites. The question of space traffic management and the preservation of a sustainable use of orbits, in particular in the most densely used circulation areas in LEO, is thus becoming a major issue.

This increase is the result of a long trend, due to the miniaturization of components, which has accelerated since the mid-2010s. Since then, several factors have come into play, such as the development of small standardized platforms, of which cubesats represent the ultimate expression, with an increasing use of COTS and open source (see the see the chronological graph of research and technology satellite launches) . The growing mastery of electric propulsion has represented a turning point in launch operations while changing the architecture of systems. Similarly, advances in machine learning and deep learning are transforming approaches to space missions. Finally, the development of quantum links represents the next milestone for the future of constellations

It is in this context that private companies have developed their own launchers with the support of the public authorities, in particular via NASA. This phenomenon, which occurred in the United States, further underlines the singularity of this particular model, supported by unparalleled investments aimed at maintaining exceptional skills in a field at the heart of the national interest.

Projects for smaller capacity launchers, known as small launchers, intended for small satellites, are evidence of another change made possible by progress in miniaturization. This field is the prerogative of private actors, very largely start-ups. However, this new sector of activity refers to the particular role of States as responsible under international law. Thus, a cartography of new States soon to be endowed with a national launch capacity is taking shape, as for example New Zealand but also, in Europe, the United Kingdom, Norway, Portugal...

This panorama represents the activity in the suburbs of the earth. It must be completed with another part, that of the exploration (see figure on the Moon, Mars missions). This field of activity is also in transformation. The emergence of new actors such as the UAE through its Mars mission HOPE and its lunar ambitions marks a significant evolution in the perception of space power. The mastery of autonomous access to space no longer seems to be the only way to go. It remains that if for scientific missions, a customer can find - without doubt easily - a launch contract, this kind of space actor corresponds to a second circle that has emerged in recent years. The competitive nature of the launch market represents an additional opportunity but does not give a total guarantee of launch availability. At the same time, the ambitions of commercial exploitation of celestial resources by private entities authorized by the United States at the national level have called into question the hitherto respected consensus of the non-appropriation of celestial bodies. It is thus a new shift that is taking place before our eyes.

Thus, the topics of reflection are numerous and involve researchers from all horizons. The issues involve cross-disciplinary approaches between history, geography, political science, law, sociology, anthropology, literature, philosophy... The relationship with the current members of COSPAR is an essential condition for the success of this project. Some have begun to share their questions. We hope that many of you will be interested in the work of this Panel.