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Futures-present at Stake: Species, Interactions and Community at Technological Frontiers

Futuros-presente en juego: especie, interacciones y comunidad en las fronteras tecnológicas

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Abstract. The futures-present of be human, as made possible by digital technologies, artificial intelligence, gene editing and astronomic and space exploration technologies, put a strain on the human condition at both a physical and at a psychological level, as well as in connection with evolutionary, biological and ecological assumptions and with the social, political and cosmological coordinates. Our work sets out to explore the circumstances of the emergency and the deployment of a new game between technology, science, economy and politics, the specific qualities of future technologies to articulate the processes of invention, innovation and promise, as well as to reconnoiter the limits or thresholds in dispute, such as those connected with the human being and species, virtual realities, scientific dramatizations and technopolitics. The final goal is to articulate a foresight, in a pre-vision way, of some of the potential transformations, impacts and modelings of anthropo-synthetic realities in the political and social realms. For contemporary social sciences, the existence of fractioned timeframes, in correspondence with the plurality and asymmetries of political and social communities, implies a challenge to investigate, experiment and understand the expectations, tensions, bets and interactions that revolve around the realms of the technological frontiers and the orientation of futures.
Keywords: Future Technologies, Anthroposynthetic Futures, Scientific-technological Drama, Technological Invention and Innovation, Social Sciences of the Future.

Resumen. Los futuros-presente de ser humano posibilitados por las tecnologías digitales, de la Inteligencia Artificial, la edición genética y las tecnologías astronómicas y de exploración espacial tensionan la condición humana en lo relativo a la corporalidad y la psique, los presupuestos evolutivos, biológicos y ecológicos, así como las coordenadas sociales, políticas y cosmológicas. Nuestro trabajo tiene como propósito explorar las circunstancias de la emergencia y despliegue de un "nuevo juego" entre tecnología, ciencia, economía y política, las cualidades particulares de las tecnologías de futuro para articular procesos de invención, innovación y promesa, así como reconocer los límites o umbrales en disputa, tales como los relacionados con el ser humano y la especie, las realidades virtuales, las dramatizaciones científicas y la tecnopolítica. El objetivo final es presentar, de manera pre-visoria, algunas de las potenciales transformaciones, impactos y modelaciones de las realidades antroposintéticas en lo político y lo social. Para las ciencias sociales contemporáneas, la existencia de tiempos fraccionados, en correspondencia con la pluralidad y asimetrías de las comunidades políticas y sociales, implica el desafío de investigar, experimentar y comprender las expectativas, tensiones, apuestas y juegos en torno a los ensambles de las fronteras tecnológicas y las orientaciones de futuros.
Palabras clave: tecnologías de futuro, futuros antroposintéticos, drama científico-tecnológico, invención e innovación tecnológica, ciencias sociales del futuro.

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Departure Origins

Currently, rehearsals and "simulations" are being carried, through technological invention and innovation, that attempt to reground the (anthropological, psychological and biological) limits of what it means to be human, the foundations of social links, the possibilities of politics and the continuation of life on Earth. The future is experimented with and reinvented; in contrast and simultaneously, the present appears not to have fully happened.

This present future makes no history, nor does it transform societies in the ways that have been imagined and experimented with, but it does reconfigure a series of conceptualizations: personality and subjectivity (avatar/characters), the notion of reality (immersion/presence), the ways in which people establish links with others [*on/offline*], the realm of what is public/private, the spaces and actors generating everyday networks (social platforms). Thus, on the one hand, we have profound, constant changes that bring into question the ways in which things are done, what is known, and the nature of memories and expectations; on the other hand, there is a perception that there is no way to projectually articulate them from a collective dimension of the future.

Technological inventions and innovations have been part of the social and political transformations of human evolution; nevertheless, the effects of some of the current technological developments seem to impose a radical mutation in the species' *natural equipment*, in our relations with others and especially on the horizons and expectations of everyday life and probable extraterrestrial life. Because of this, we herein define them as future technologies, for they transcend the processes of efficiency and efficacy concerning the manipulation of the human and natural-planetary realms to invoke potential and promethean abilities and realities for individuals and for the whole of society; that is, social futures anchored to technologically incarnated knowledge and practices.

In this sense, we endeavor to examine the emergency circumstances and the deployment, beginning in the mid-twentieth century, of a *new game* between technology, science, economy and politics that gave way to this future technological transmutation, the specific qualities of these technologies that allowed them to articulate the processes of invention, innovation and promise, as well as to acknowledge the limitations or thresholds in play in some of the alternate present-futures' technological borders, such as those having to do with human beings, virtual realities, scientific futurizations and technopolitics. The goal of this reconstruction is to present, in a preliminary way, some of the new aspects

regarding the necessary approach to these topics from the realm of social science, as well as to the potential transformations in the contemporary political and social realms implied in future technological transformations.

The New Game: Science, Technology Bets and Risk Capital

One of the outstanding features of the technological transformations triggered by the invention of the personal computer in the 1970s has been the formation of a unique spatial crossroads [*Grund*/*ground*]: California, United States of America. This space, which is the counterpoint to that country's East, will be the gravitational axis of the network computing industry, of the manufacturing of semiconductors and of aerospace engineering (JPL/NASA and CalTech), as well as of microprocessor-based computers manufactured from the early 1980s on.[1] At first, this singularity grew around the region's specific technological invention practices harking back to the radio ham clubs in the 1920s, the domestic construction of rockets in the 1930s and of computers in the 1970s. Something similar happened in connection with Biochemistry, which underwent an intense process of invention and innovation at this location during the 1920s.

An example that illustrates the region's force of attraction is what happened in connection with the technology for producing computer graphics, the first steps of which were linked with the technology currently used to produce a sensation of immersion in *worlds* developed through the use of computers, something first proposed in 1965 by Ivan Sutherland, a pioneer in computer graphics, whose work was acknowledged with the 1988 Turing Award and the 2012 Kyoto Prize and who, working from New York's MIT labs, presented in 1968 a helmet incorporating stereoscopic 3D vision spectacles that were connected to a device capable of detecting head movements. Even though the use of the *helmet* technology was limited to the armed forces' simulators and to the field of aerospace until the 1980s, the production of computer graphics would be implemented beginning in

[1] Christophe Lécuyer, *Making Silicon Valley: Innovation and the Growth of High-Tech, 1930-1970* (Massachusetts: MIT Press, 2006), 253-294; Margaret O'Mara, "Silicon Dreams: States, Markets, and the Transnational High-Tech Suburbs", in *Making Cities Global: The Transnational turn in Urban History*, eds. A. K. Sandoval-Strausz & Nancy H. Kwak (Philadelphia: Pennsylvania University Press, 2018), 17-46; Margaret O'Mara, *The Code: Silicon Valley and the Remaking of America* (New York: Penguin Press, 2019), 283-404.

1970 with the first computer having a graphic user interface at Xerox PARC, in Palo Alto, California.[2]

The Xerox PARC case also provides an example of the intense relation that these technological transformations generated between the studies and experiments carried out in the realms of science and information technologies, and applications in the digital industry. Something similar began happening with the research and initial bets regarding future technologies linked in principle to mathematics, logic and science philosophy, as well as the various psychological and ethical explorations concerning intelligence and the human mind. These theoretical-analytical approaches were displaced in the 1960s by a scientific orientation centered around the resolution of technological and biomedical problems, something which transformed computer engineering and programming into fields of substantive knowledge of disciplines such as information technologies, data science, bio-engineering, and astrophysics, among others, with the main goal of deriving innovation from invention.

As Lécuyer has postulated, this form of innovation emphasizes "the creative process that goes from invention to development, marketing and deployment of new technologies [...which] lies at the heart of corporate strategy and public policy. It generates colossal financial investments and is carried out by an ever-increasing number of engineers and scientists,"[3] in an interactive process involving various public and private agents, rather than being the result of the free creation and circulation of new products and services.

Thus, the practice of creation/invention shared through collectives of scientists devoted to technical experimentation, as well as of groups of people who worked on this in a playful way, were transformed into professional, industrial and economic activities. These regroundings, opened by the *new game* between science and technology deployed a growing ability for producing manufactured goods, which allowed the generation of innovations in the consumer market.[4] Additionally, technological know-how was articulated with

[2] Lisandro Pardo, "Xerox Alto: La restauración de un ordenador histórico", *NeoTeo* (blog), June 28, 2016; Lisandro Pardo, "Sketchpad: El 'abuelo' del AutoCAD (1963)", *NeoTeo* (blog), September 8, 2018; PARC, Xerox Company, "PARC History", *PARC, a Xerox Company*, August 26, 2022.

[3] ["c'est-à-dire l'ensemble du processus créatif qui va de l'invention au développement, à la commercialisation et au déploiement de nouvelles technologies […] est au coeur de la stratégie des entreprises et des politiques publiques. Elle suscite des investissements financiers colossaux et est le fait d'ingénieurs et de scientifiques toujours plus nombreux"]. Christophe Lécuyer, "Manager l'innovation", Cristophe Bonneuil and Dominique Pestre (eds.), *Histoire des sciences et des savoirs. 3. Le siècle des technosciences (depuis 1914)* (París: Éditions du Seuil, 2015). Unless otherwise indicated, all translations are by the authors.

[4] Javier Echeverría refers to this new relationship between science and technology as the passage of Big Science into Technoscience. Javier Echeverría, *La revolución tecnocientífica* (Madrid: FCE, 2003).

technological transfers between firms within the same region, bringing on exchanges of technology, subcontracting arrangements and/or the creation of new enterprises.

Due to the high degree of ability required and a clear need for motivation among workers, an entrepreneurial culture open to organizational experimentation would become another key component of the new game. Because of this, firms implemented plans linking workers to their companies, allowing them to participate both in the process of decision-making and in connection with economic results, turning them into shareholders with the capacity to buy and sell shares and to benefit from profits.

Additionally, the deployment of investment and risk models known as venture capital (a term that derived from *adventure capital*, an expression coined in the late 1950s by George F. Doriot, a French general who taught business at Harvard University and who was also an investor) would be developed both by law firms and capital firms dedicated to the financing of startups and to investing in high technology, where capital efficiency attains its highest point and growth potential is largest. Venture capital, a truly American invention, is characterized by exceptional benefits deriving from a few of the investments made in a broad portfolio of startups, which compensate for most mediocre or failed investment yields.

Additionally, the development and articulation of the new sense of region, world and Californian space would be replicated in global cities and similar industrial complexes, which both compete against one another while connecting to one another: among other parts in the world, Shenzhen in Southern China, or Bangalore in India. Thus, California's West Coast not only redraws the geography of power within the United States of America and feeds the 1980s neoliberal ideology, but it configures a new constellation of global forces that determine a wide range of things, from space exploration to everyday spaces.

This complex economy generated by future technological bets currently requires both the exploitation of raw materials—such as the rare minerals that encourage mining on Earth and the space colonization race of the extraterrestrial bodies closest to us (the Moon, Mars)—and large investments in manufacturing sectors, in order to develop the telecommunications infrastructure (5G), produce computer parts and components and (both traditional and quantum) digital servers.

To sum up, the new game kicks off an environment of regrounding and reframing of experimentation, risk and scientific-entrepreneurial corporatization that would determine the mutation of scales, time frames and the connections of singular historical transformations

(historicity), bringing under stress—if not questioning—conceptual modes and materials that had been valid until then, as well as society's technology-based futures.

Future Technologies: Invention, Innovation and Promise

Contemporaneity has so densified the present time that it has turned into a gravitational hyper field or gigantic black hole, from which the past is observed and the future imagined. Past time does not die, but is constantly made present through commemoration and memorialization; meanwhile, the future is no longer conceived as progress or something to come, but represented as *in situ* experimentation, temporary breaks and frontiers. Time is abstracted—a placeless narration, devoid of materiality—it goes back and forth, it is suspended and accelerated in an asynchronous manner, which allows for the confluence of frontiers, of temporal layers, and magnifies disorientation in a centerless universe, an omniverse, as well as unreality and immateriality.

The temporal disruption of contemporary society questions the geological metaphor of time layers as a comprehensive analogy of temporalization coming out of the present, given the deliberate anachronism of this time, which recycles past chronotopes again and again, while transposing, transgressing and creating new versions of the limits of what is real to produce present futures and asynchronous and unreal universes and planes.

In this sense, Moebius' (1858) ribbon and Klein's (1882) surface, both mathematical inventions used in topology and in theoretical astrophysics for the purpose of hypothesizing—among other things—the structures of black holes, provide a key, an image and a promissory metaphor for the exploration of temporalization in current societies, by proposing a non-orientable surface, which is at once: up, down, inside, outside, before, behind— that allows to understand the simultaneity of that which is unique and that which is repeated, of that which is non-coetanus, and of what is unreal and significantly emphasized in contemporary futures.

From this perspective, the future is imagined and narrated through assemblages and designs that transmute lived experiences into experimentations and versions of what is possible and what is contingent from the present. Meanwhile, predictability, as prognostication, is anchored to repetition and to past experiences and is therefore unable to consider the unknown, that which has not yet been experienced. The asymmetry contained in this temporal elaboration, a closed past and an open future, makes the present the key

chronotope in the process of deciding, risking and experimenting, turning it into the nucleus that attracts what is past and what is possible.

At an anthropological scale, our conceptualization of the future overtakes accepted intuitive meanings: "to be a projection, a future hard materiality or a present that is yet to be in the chronological line", and incorporates operatively the notion of futurity, understanding it as "the inexhaustible ability to produce that which is possible, the fragile interstice, the virtuality of happenings, the very possibility that there may be something instead of nothing".[5] We also assume the notion of futurization as one of "projection (an act in the future)" or future present, and that of futurability, as "transitions and trajectories (a potency that does not cancel their definition)"[6] or present futures.[7]

In this sense, then, future technologies created by human beings make significant apertures possible inasmuch as they densify and accelerate the present time and propitiate familiarity with potential scenarios of individual and collective life on Earth and outside of it, renew the sense of future temporalization as one that is inaugural and borderline, rather than progressive or circular, a time for invention and creation that braids (temporal curl) and infinitely potentiates faculties and capacities, as well as risks and challenges, at scales and realities yet to be explored.[8]

On the other hand, we assume that technologies generally include both technical elements as forms of knowledge, abilities, diagrams, graphics, calculations and energy; that is, they assume a series of relationships and connections between devices, physical and mental abilities, desires and interests, concepts and information.[9] For this reason, as Mackenzie refers under the term transduction, technologies are devices which, in its concretization, "encapsulate a singular combination acquired in an ensemble".[10] Thus,

[5] Ezequiel Gatto, *Futuridades: ensayos sobre política posutópica* (Rosario: Casagrande, 2018), 16 & 25.
[6] *Ibid*., 16.
[7] Niklas Luhmann, "The Future Cannot Begin: Temporal Structures in Modern Society", *Social Research* 43, no. 1 (1976): 130-152.
[8] Simondon's reflection regarding invention as "a conditioning of the present by the future, by that which is not yet" and its linkage with technical imagination defined "by a particular sensitivity to the elements' technicality [that] allows discovery of possible assemblies" results in a valuable problematization on the interaction between the actual and the virtual implied in each technological invention. Gilbert Simondon, *El modo de existencia de los objetos técnicos* (Buenos Aires: Prometeo Libros, 2008), 78 & 94.
[9] Andrew Barry, *Political Machines: Governing a Technological Society* (London and New York: The Athlone Press, 2001), 9.
[10] ["encapsulate a singular combination acquired in an ensemble"]. Adrian Mackenzie, *Transductions: Bodies and Machines at Speed* (London and Nueva York: Continuum, 2002), 13.

technologies are conformed as "heterogeneous entities", the result of socio-technical systems involving both specialized knowledge and social, political and economic tensions.[11]

Specifically, computer technologies put together devices that join knowledge and abilities in the realm of information technologies with mechanical and analogical knowledge and practices. Thus, these devices are not constituted only through technical materiality [hardware]—electronic circuits, memory cards for the storage of data (audio, image, text), servers, networks—but require programming [software]—algorithms, interfaces, programs, applications—, a code allowing for manipulation, processing and calculation of data and a link to the digital world. This duality imposes a permanent relationship between creativity and applicability, thus systematically revolutionizing devices and execution, operation and connection programs. Nevertheless, the relation between their materiality and their immateriality is asymmetrical given the possibility of autonomy of their programs and algorithms, which reduces materiality to the role of being an interchangeable support that can be discarded.

These technologies, especially those called applications [Apps] bring together materiality with knowledge and ability of users in an immersive (to be connected, online) and extractive (data mining) way. The algorithms sustaining the use of applications grow autonomous and more complex through intense human use. For example, text processors, in contrast with typewriters,[12] add functionalities to writing, such as the conversion of voice to characters—thereby eliminating digitation—translation of texts to various languages, ortho-grammatical correction and edition of texts—contrasting them with texts available on the Internet, in order to identify references and similarities—while audio and video players go through similar transformations when transferred to digital algorithms that, depending on a user's choices and usage, offer suggestions and similar products for consumption.[13]

Nevertheless, the computer technological bet with the largest scope is in areas of study that not only put together codes and devices successfully, but invoke promises, futurize new realities and social relationships. In this sense, we underline three technological

[11] Eduard Aibar, "Innovación tecnológica y cambio social: más allá del determinismo tecnológico", Eduard Aibar & Miguel Ángel Quintanilla, *Cultura tecnológica. Estudios de ciencia, tecnología y sociedad* (Barcelona: I.C.E. Universitat Barcelona & Horsori Editorial, 2002), 59-90.
[12] Friedrich A. Kittler, *Gramophone, Film, Typewriter* (California: Stanford University Press, 1999[1986]), 183-263.
[13] Robert Prey, "Nothing Personal: Algorithmic Individuation on Music Streaming Platforms", *Media, Culture & Society* 40, no. 7 (2018): 1086–1100; Fatima Gaw, "Algorithmic Logics and the Construction of Cultural Taste of the Netflix Recommender System", *Media, Culture & Society* 44, no. 4 (2022): 706-25.

frontiers of the present future: Artificial Intelligence (IA), gene editing, and astronomical and extraterrestrial exploration and colonization technologies.

Artificial Intelligence

Artificial Intelligence, having been developed over several decades, evidences its futuristic bet through its various attempts at defining its goals and expectations. An operative current has proposed defining it with regard to the processing capacities of devices and computers: in 1955, according to John McCarthy, the goal of AI was "developing machines that behave as though they were intelligent",[14] something that turned out to be insufficient inasmuch as the solution of so-called intelligent operations at the time could be executed by machines with electrical circuits; four decades later, in 1991, the *Encyclopaedia Britannica* proposed: "AI is the ability of digital computers or computer-controlled robots to solve problems that are normally associated with the higher intellectual processing capabilities of humans…",[15] an extremely general definition that included in the realm of AI any computer capable of carrying out mathematical or logical operations, storage and retrieval of information functions.

Another work branch of AI, more oriented to human activities, established a futuristic horizon. In 1983, Elaine Rich proposed what may be the most potent definition of AI: "Artificial Intelligence (AI) is the study of how to make computers do things in which, at the moment, people are better".[16] From this perspective, the execution of complex and different calculations in a small amount of time would not be relevant for AI, as this is a strong point of digital computers—consider Deep Blue, a machine that is capable of defeating the best human chess player—, but rather efforts should be oriented, for example, towards developing an autonomous robot or entity; that is, one that is not supervised or controlled remotely by a person, and is capable of interacting in the way a human being would in a meeting with unfamiliar people.

[14] ["The goal of AI is to develop machines that behave as though they were intelligent"]. Wolfgang Ertel, *Introduction to Artificial Intelligence. Second Edition* (Springer International Publishing AG, 2017), 1.
[15] ["AI is the ability of digital computers or computer-controlled robots to solve problems that are normally associated with the higher intellectual processing capabilities of humans…"]. Wolfgang Ertel, *Introduction to Artificial Intelligence…*, 2.
[16] ["Artificial Intelligence (AI) is the study of how to make computers do things at which, at the moment, people are better"]. Elaine Rich, Kevin Knight & Shivashankar B. Nair, *Artificial Intelligence. Third Edition* (New Delhi: Tata McGraw Hill Education Private Limited, 2009 [1983]), 3.

The opening of AI studies to everyday world problems has brought about a profound interrelation with advances in cognitive sciences, mostly neuroscience and psychology, as well as information technology science, algorithms and big data processing. In particular, advances in Natural Language Processing (NLP) in computers gave rise to the implementation of "chatterbots"[17] which, although quickly giving away their artificial nature, have derived in a wide use of bots in the commercial and service realms, for the purpose of answering questions within more or less clearly defined fields.[18]

Also, design, experimentation and development of increasingly sophisticated computer programs [*software*] and algorithms (codes), such as optical recognition (QR) and digital edition and those having to do with the workings of digital neuronal networks, became AI's fundamental content and usage and oriented its main lines of work: machine learning processes, work automation, autonomous transportation and service robots.

Additionally, the broadening of AI's goals from automated modeling and analysis of big data to robotic imitation of complex human processes and behaviors (visual and aural perception, natural written and oral language, acoustics, composition and musical interpretation, sensory detection and expression through gestures) has generated the build-up of new knowledge, sustained by exploration, observation and interpretation of human usage, interactions and expectations in connection with devices, interfaces and non-human entities with human attributes (logical thought, natural dialogue language, perception and speech), capable of carrying out specialized diagnosis tasks in the realm of health, or act as help for sick and elderly persons, as well as taking on high-risk activities and activities that are impossible for human beings to carry out.[19]

Gene Editing

On the other hand, gene-editing technology, which got its start with the 1953 discovery of the double helix molecular structure of Deoxyribonucleic Acid (DNA) by British scientists Rosalind E. Franklin, Francis H. C. Crick, Maurice H. F. Wilkins and the American scientist

[17] James Laven Simon, "The Simon Laven Page", *simolaven.com*.
[18] Beginning in November 2022, OpenAI made available its model of conversational language Chat GPT-3.5 to Internet users, which generates coherent responses to a variety of subjects freely chosen by the user. https://chat.openai.com.
[19] Benjamin Bratton & Blaise Agüera y Arcas, "The Model is the Message", *Noema* (California: Berggruen Institute), 12 July 2022; *Digilog, Digitalization in Dialogue. Society in Digital Change* (Karlsruhe Center for Arts and Media, 2022).

James D. Watson at the Cavendish Laboratory (Cambridge, United Kingdom)—for which the latter three received the 1962 Medicine Nobel Prize, Franklin having died in 1958 with no prizes being awarded posthumously—, as well as that of the Ribonucleic Acid (RNA) biological molecule in 1961 by various biologists and doctors, produced a bio-technological revolution with the discovery and implementation of "gene scissors" (CRISPR-CAS9) by Biochemists Jennifer A. Doudna (University of California, USA) and Emmanuelle Charpentier (Max Planck Unit for Pathogen Sciences, Germany), who obtained the 2020 Nobel Prize for Chemistry for this innovation. Beginning in 2012, the date on which they published the results of their research, a wave of experiments has swept the world around the genetic modification of plants and animals, with their consequent impact on ecosystems, as well as on the treatment and elimination of human chronic and/or degenerative diseases.

Specifically, gene editing has opened strong expectations regarding the possibility that technology offers for the editing of human embryos, which implies the possibility of modifying hereditary patterns and evolutionary processes. Implementation of this technique by an international team of biochemists and doctors led by Dr. He Jiankui (Southern University for Science and Technology in Shenzhen, China) led to the birth of three human female—two of them twins—whose DNA was edited to make them immune to the HIV virus, as well as to smallpox and cholera. When the experiment became published in late 2018, it caused a great commotion among the scientific community and the governments of the countries involved, who demanded a global moratorium in connection with use of the CRISP-CAS9 technology. Dr. He was condemned to three years in jail; nevertheless, the existence of three genetically modified girls has become a pole of attraction for scientists interested in studying the biochemical and evolutionary effects of the technology.[20]

Extraterrestrial Exploration and Colonization

Lastly, astronomical and extraterrestrial exploration and colonization technologies, the initial moment of which predates by some hundreds of years the technologies commented above through invention and deployment of terrestrial telescopes, as well as the study of meteorites, have experienced an unprecedented boom and acceleration in recent decades,

[20] Nuño Domínguez, "El creador de los primeros bebés modificados genéticamente vuelve a la ciencia tras salir de la cárcel: 'Hice las cosas demasiado rápido'", *El País*, 10 January 2023. https://elpais.com/ciencia/2023-01-11/el-creador-de-los-primeros-bebes-modificados-geneticamente-vuelve-a-la-ciencia-tras-salir-de-la-carcel-hice-las-cosas-demasiado-rapido.html.

through the sending of telescopes into space, the construction of the International Space Station (MIR, 1986; EEI, 1998), the deployment of mid-range satellites in the Earth's orbit, voyages by human beings into outer space and the installation of robots in near celestial bodies (the Moon, Mars, asteroids).

The main achievements made possible through the use of technological astronomical devices are the observation and transmission of data (telecommunication) from sidereal distances; this requires the building and use of high-precision sensors and of robots with certain margins of operating autonomy—which are exposed to extreme environmental conditions and unknown physical surfaces—, as well as the capacity to detect and collect samples of minerals and extra-terrestrial life.

Exploration of the nearby universe, in turn, has not only made it possible to contrast and create new conjectures concerning astrophysical laws, the capacity to deploy a complex planetary coordination—as in the case of the observation, measurement and preparation of the *image* of the black hole in the M87 Galaxy, published in April 2019, as well as the Sagittarius A* black hole in the center of the Milky Way in May 2022 through the Event Horizon Telescope (EHT) and eight millimetric telescopes placed in different regions of the planet: Chile, United States, Spain, Mexico and the South Pole—, but also a powerful race aimed at exploiting and, in the longer term, colonizing the celestial bodies that are relatively close to our planet.

These technologies have also made the development of applications in the health sector possible, as well as in the realms of treatment of ecosystems and telecommunications. In particular, the deployment of information technology and robotics made by these technologies has derived in experimentation favoring cyborgization, as well as the development of virtual reality. Reception and perception as sensory operations are being widely futurized in the digital and virtual realms, as is the expansion (augmentation) of the human body’s capacities, thus opening new horizons in the realm of social links of work, consumption and entertainment.

A most important future plan related to these space technologies is the terraforming of Mars; that is, its conversion into an inhabitable planet. Its potentiality stems from economic, but also from social and political reasons, inasmuch as this would change terrestrial norms and life experiences.

Future Technological Frontiers

The human being's frontiers as defined by Artificial Intelligence, gene editing and the space observation and exploration technologies have an impact on both the self and the other, on their *natural equipment* as resulting from the evolution of life, as well as the re-scaling of cosmological, social and political coordinates, establishing anthroposynthetic futures.

The self lives in multiple realities linked by leaps that are not mere role switches, but rather imply it in textures, incorporations and immersions that recreate the very meaning of the here-now (indexicality) and transform *personal identity* (avatars, twins, alternate identities, parabiographs) from re-socialization processes synthesized by new mediators.

The other is mediatized by devices—applications, platforms, robots—based on AI-processed big data which, in turn, transform the ways of carrying out research, thinking, imagining and social interaction.

Natural evolutionary equipment in turn enters the maelstrom of the present of bioengineering, gene manipulation, bio hackers, chip implantation in both the brain and other parts of the body [*cyborgs*], transposing and pushing the known limits of the human species and of terrestrial ecosystems.

Cosmological re-scaling, by way of the new space enterprises, runs the gamut from extraterrestrial tourism to planet colonization, mostly for extractive purposes, as well as the search for life forms, even if merely microscopic. This increases both terrestrial solitude before an inhospitable cosmos, and the technological race, as well as the struggle for new political frameworks that anticipate, control and organize the exploration, colonization and exploitation of these resources and services.

We will now explore some of the present future alternate frontiers that have an impact on the being, the human condition and on non-human devices and entities, the technological challenges and the social implications of virtual realities, the web of fictional scientific narratives recreating futuristic-technological promises, as well as the technological transformations in politics and in the political.

Human(oids): Body, Symbiosis and Prosthetics

The future frontiers associated with digital technologies and AI stress the human condition, both in terms of its concept of corporeality and psyche and of its evolutionary biological and ecological assumptions.

Orientation in space and time based on the human body depends on the system of binary orientation coordinates in reference to its location: left/right, up/down, before/behind. In the orthogonal dimension, the body is the pivot that in a cartographic plane represents the center as relating to left/right and the place as relating to up/down, while from the space-time perspective, it incorporates the here-now in the before and after dimension. This system is made more complex by the erect position and the bipedal mobility of the human body, which releases face and hand while walking, making other relations (gesture and speech) possible. Sight becomes the orientation instrument that move away the human body from perceptive immediacy, allowing it to deal with distances on both the horizontal and the vertical planes—the heavens, the stars and the Earth. One last distinction occurs between the body's centrifugal situation and its centripetal position in connection with other bodies.

These combinations of scenarios that configure what is human are questioned by developments in future technologies, inasmuch as they transform the position of human in the play of the world. Involvement with and distancing from the world, mediatized by a new generation of (*personal*) devices reconfigure a new form of reality (space-time multiplicities), where the body's gravity weight and its orientations get dis/assembled and re/assembled, generating alterations in the choreography of gestures, articulations, awareness and inter-subjectivity, transversalizing agency and futures.

The body is medialized, expanding—while it stumbles, like Ephestos, the Greek god of smelting and fire—*thanks* to devices allowing programs to become incarnated (digitizing what is analogic both in a technical and a corporeal sense) at the moment in which people connect with an antenna that expands, augments and diversifies their sensoriality, as well as their *information resources*, reorienting the manner in which it places itself in the world (example: the everyday use of GPS incorporated in various personal devices).

Cyborgs, in turn, may still be considered to be anomalies, or rather an experimentation process of exceptional relations between humans and technologies, the others and the future. In this sense, technologies emphasize what is artificial, extreme, crossing naturalization thresholds in which, in principle, the body being questioned is implied (*personalization* of biometrics and life's politics), generating liminoidal spaces/times, even though technological acceleration appears to configure order as a perpetual threshold, an echo of Alice's cat sentence: in order to remain where you now are you must run as fast as possible.

On the other hand, just as this constant experimentation disputes the notion, modes and contents of personalities and the social links they implicate, other senses of these extensions become prosthetics that rehabilitate capacities lost by human beings, reconstituting the *person* after traumatic impacts (sensible corporeity losses).

Lastly, the relation of human beings with robots or intelligent machines transcends the transmutations provoked from corporeity and expands the societal link with the immaterial and inanimate world, while intensifying the processes of competition, displacement and future of humanity. Thus, while it enables relationships of collaboration and the expansion of knowledge of the dynamic patterns in several areas of work and everyday life, it demands the acquisition of new knowledge and processes of social adaptability that question and modify the place of human beings in their environment, such as the use of domestic robots, first level medical diagnosis based on algorithms, the multiple metrics generated by the Internet of things.

Virtual Realities: Immersion and Presence

The generation of virtual realities has been the subject of technological production for some time, but in the last few decades interest in and concern for the virtual has grown, driven by technological progress. Nonetheless, virtual reality must be understood as a singular medium and not merely as one more technical construct, but rather as a possibility to transcend in a new way the frames of physical and social reality, transforming the senses of place and generating an unsuspected, non-bodily-invasive experience.[21] This virtuality, a new framework for reality which, according to the research group led by Lik-Han Lee and Pan Hui, interoperates with physical reality, entails aspects of an enchatment of reality [*surreality*].[22]

For Ellis, a researcher of NASA's AMES center, immersion is the result of virtualization, understanding this as "the process by which a human viewer interprets a patterned sensory impression to be an extended object in an environment other than that in which it physically exists".[23] Sensitive impressions are generated by visual, auditory, tactile and kinesthetic devices, which in turn are articulated in a tracking system. From this vantage

[21] Mel Slater, "Place Illusion and Plausibility can lead to realistic Behavior in Immersive Virtual Environments", *Philosophical Transactions of Royal Society Britannica* 364 (2009), 3549-3557.
[22] Lik-Hang Lee, Tristan Braud, Pengyuan Zhou, Lin Wang, Dianlei Xu, Zijun Lin, Abhishek Kumar, Carlos Bermejo, and Pan Hui, *All One Needs to Know about Metaverse: A Complete Survey on Technological Singularity, Virtual Ecosystem, and Research Agenda* (October 2021), 34.
[23] ["the process by which a human viewer interprets a patterned sensory impression to be an extended object in an environment other than that in which it physically exists"]. Stephen R. Ellis, "Nature and Origins of Virtual Environments: A Bibliographical Essay", *Computing Systems in Engineering* 2, no. 4 (1991), 324.

point, discussion, research and proposals have revolved around the results and technological feasibilities of these devices and their capacity to transmit information from different sensory realms, such as they now appear reflected in the discussions revolving around the Metaverse.[24]

Concerning immersion, the device turns into a portal or gate, a chiasm or Moebius ribbon, connecting the user with other users and with unreal space-time worlds, the fundamental characteristics of which are immediacy and the ever more intense sensation of reality and presence.

In this sense, the project of turning the Internet into a Metaverse is betting on a radical transformation of future technologies and their relation with human beings in the near future. According to Pan Hui, a professor of information technologies media and art at Hong Kong's University for Science and Technology and NOKIA Data Science at the University of Helsinki, Finland: "The metacosmos may seem to be far into the future, but with the arrival of technologies such as Extended Reality, 5G and Artificial Intelligence, the digital explosion of our online world is not far".[25]

For Richard Bartle, an academic and designer of videogames from the University of Essex, United Kingdom, the metaverse "is a collective scheme allowing multiple 3D environments to interoperate and communicate among them in the same way as this happens in the Internet, but in 3D. It has aspects of reality and aspects of virtual reality".[26] Meanwhile, the team of Lik-Han Lee and Pan Hui define it as: "a computer-generated universe defined through enormously diversified concepts, such as: lifelogging, collective space in virtuality, embodied Internet/spatial Internet, a mirror world [and] an omniverse: a venue of simulation and collaboration".[27]

This parallel universe, examined by Dionisio, Burns and Gilbert, constitutes "a convincing alternate realm for human cultural interaction" and presupposes four fundamental components for its feasibility, centered on the immersion experience: realism, ubiquity, interoperability and scalability.[28]

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[24] Paul Milgram, Haruo Takemura, Akira Utsumi, Fumio Kishino, "Augmented Reality: A Class of Displays on the Reality-Virtuality Continuum", *SPIE* 2351 (1994), 282-292; Lik-Hang Lee et. al., *All One Needs to…*.

[25] ["The metacosm may still seem like a distant future, but with the advent of technologies such as Extended Reality, 5G, and artificial intelligence, it is not far from the digital explosion in our online world"]. Chizu Nom, "How close are we to Big Bang in the metacosm? Interview with scientist Xu Bin," *Ol.mingpao.com*, 31 October 2021.

[26] Richard Bartle, "The Ethics of the Metaverse" [interview with Hendrik Lesser], *VentureBeats*, 28 de enero, 2021.

[27] ["a computer-generated universe has been defined through vastly diversified concepts, such as lifelogging [2], collective space in virtuality [3], embodied internet/ spatial Internet [4], a mirror world [5], an omniverse: a venue of simulation and collaboration [6]"]. Lik-Hang Lee et. al., *All One Needs to…*, 1.

[28] John David N. Dionisio, William G. Burns III and Richard Gilbert, "3D Virtual Worlds and the Metaverse: Current Status and Future Possibilities", *ACM Computing Surveys* 45, no. 3 (2013): 34.

Nevertheless, it has been posited that immersion is a necessary but insufficient condition for the purpose of generating presence, the sense of being there, which is the central goal of virtual reality.[29] Thus, it has endeavored to make the definition of virtualization more complex, by distinguishing immersion from presence: while the first one is a technological achievement, the second one is a state of conscience which, in this case, is the sense of being in a virtual reality.

The great goal of research on virtual reality is to account for the way in which passage through the *looking glass* is achieved: the passage/leap from one world/frame into another. Immersion constitutes the passage *through the (looking) glass* (Alice or the watery *Matrix* mirror), in order to become submerged in *virtual* reality.

A fundamental precondition for the leap is the plot postulated by the virtual world to its possible participants, the illusion of plausibility of another, self-contained world; nonetheless, the very experience and the feasibility of action within the virtual world are configured through presence, through the possibility of generating the illusion of being there.[30] Both illusions of presence and plausibility converge in the virtual body acting in this new frame of reality, from which struggles are *re-described* that question and even dispute the very frame where the virtual world is being deployed.

Competition between several of the big tech corporations (Microsoft, Apple and Facebook) that are seeking to reconfigure social media through virtual reality is creating a field of rivalries that revolve around virtuality and the plausibility of worlds (plots), the illusions of presence (ways of being there) and of virtual bodies, as well as their interoperation with the physical worlds.

Futurization: Science and Fiction

The frontiers of futures configured by digital and virtual technologies, AI, gene editing and space exploration have transformed the old scientific cabinet of curiosities, a private collection for connoisseurs and initiates set in museum spaces, into a giant and reiterated multi-media and audiovisual exhibition of technological novelties, feats and chimeras codified in multiple narratives about the relationship between human beings and digital

[29] Jonathan Steuer, "Defining Virtual Reality: Dimensions Determining Telepresence", *Journal of Communication* 42, no. 4 (1992), 73-93; Mel Slater, "Place Illusion and Plausibility…, 3549–3557.
[30] Slater, "Place Illusion and Plausibility…", 3549–3557.

devices, virtual worlds, non-human intelligent entities, as well as present future and futuristic, terrestrial and galactic spaces and horizons.

In the realm of public opinion regarding these topics, a grandiloquent and heroic tone prevails, one that is centered on charming the active or potential consumer, user, patient, professional or apprentice, of the futurized frontiers, experiences and horizons. In this sense, the old print magazines for the dissemination of science have been mostly been displaced by digital sites and channels, led by scientists and engineers, with millions of followers and subscribers, in which experiments, tests and riddles, both theoretical and applied, are visualized and expounded in detail, in connection with natural science, behavioral science and biology, as well as programming and digitized data processing.[31] The platforms seek to transcend the dissemination of information, marketing and technical training; their main goal is offering a sense of reality, certainty and presence to future technologies, intensifying the utopian´s spirit and feeding the permanent expectations of invention and innovation among a non-specialist public.

Specifically, the technologies associated with the exploration and colonization of space generate futurizations that could find a place somewhere between presentations revolving around the subject of technological advances and fictional approaches to the subject, given their presentification and naturalization through the digital representation of exoworlds,[32] both real and possible, and space tourism;[33] aside from showing images and sounds produced through the telescopes and robots that explore some extraterrestrial objects and the universe,[34] as well as the presentation of increasingly realistic and detailed audiovisuals of voyages and the personal experiences of the few human beings that have visited the stratosphere.[35]

For their part, entrepreneurs involved with the frontiers and technologies of the future—in contrast to scientists and professionals linked with research and the application of computer science, bioengineering and AI—sympathize and use some of the fictional narratives in the presentations of their idealizations and goals; at the same time, some non-institutional thinkers [*outsiders*] explore the scope and limitations of these subjects, exercising a sort of art and futuristic bets critique.[36]

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[31] *Veritasium*; *Scientific American.com*; Brilliant.org.
[32] NASA, *Exoplanet Travel Bureau*, 26 August 2022.
[33] *Virgin Galactic*; *Blue Origins*.
[34] NASA, *Mars Exploration Program*; NASA, *James Webb Space Telescope*, 26 August 2022.
[35] Jason Hehir (director), "Countdown Inspiration IV. Mission to Space" (Netflix, 2021).
[36] Ted Chiang, "Why Computers Won't Make Themselves Smarter", *The New Yorker*, 30 March 2021.

Futuristic fiction, a tried and true and privileged realm for building trans-human and extraterrestrial horizons, is now exploring and imploding the present frontiers and diversifying the space-time planes and perspectives in all their artistic manifestations—in the media, onstage and in literature—recreating and representing the many —utopian, dystopian, saving, destructive, ominous, etc.—facets of temporary frontiers and future technology bets.[37]

Lastly, science and fiction linked to future technologies build spaces for presentation that re-shape the industrial fairs of the nineteenth and twentieth centuries, promoting narratives and aesthetics of enchatment, critique, dialogue and learning, all the while presenting futuristic space-time experiences designed for ever-widening audiences: entrepreneurs, experts, users.[38]

To summarize, current futuristic narratives, in contrast with previous scientific presentations and artistic creations, appear to move in an arc that has almost completely abandoned dissemination and cultural extension purposes, in order to configure meanings and symbols concerning life's present future, of what is human and non-human,[39] as well as presenting, manipulating and presentifying future technologies.

Technopolitics: Entrepreneurial Corporatization and Time Acceleration

The most visible link between politics and future technologies has to do with the design of frameworks conditioning technological developments. In this sense, the public policies of science and technology, incentives and taxation stand out, as well as all those implicating or affecting various areas concerning the deployment or restriction of said science and technology (energy, communications, etc.), which not only consider the efficiency, productivity and effects of technological developments, but also the ways in which they may

[37] Charlie Brooker (creator), *Black Mirror* (Netflix, 2011, 2013, 2016, 2017, 2019); Frank Spotnitz (creator), *The Man in the High Castle* (Amazon Prime Video, 2015, 2016, 2018, 2019); Baran bo Odar and Jantje Friese (creators), *Dark* (Germany: Netflix, 2017, 2019, 2020); Tim Miller (creator), *Love, Death and Robots* (Netflix, 2019, 2021, 2022); Ridley Scott (director), Hampton Fancher (script) & David Peoples (script), *Blade Runner* (Warner Bros. Entertainment Inc., 1982); Andrew Stanton (director), *John Carter: entre dos mundos* (Walt Disney Studios 2012); Alex Garland (direction and script) and Katrina Mackay (art director), *Ex Machina* (Universal Studios, 2015); Denis Villeneuve (director), Hampton Fancher (script) & Michael Green (script), *Blade Runner 2049* (Warner Bros. Entertainment Inc., 2017); Brian de Palma (director), Lowell Cannon (script) and Jim Thomas (script), *Mission to Mars* (Walt Disney Studios, 2000).

[38] *BioMedia. The Age of Media with Life-like Behavior* (Karlsruhe: Karlsruhe Center for Arts and Media, 18/12/2021 al 28/08/2022); AI-DA.

[39] Regarding fiction on the link between what is human and what is not, quoting Haraway is useful: "A cyborg is a cybernetic organism, a machine-organism hybrid, a creature of social reality, as well as a creature of fiction. Social reality is the set of lived social relations, our most important political construct, a world-changing fiction". Donna Haraway, *Manifiesto cíborg (Teorías del caos nº 1)* (Madrid: Kaótica Libros, 2020), 12.

incorporate or potentiate—through their design or through their use—specific forms of power and authority. For their part, the plot that future technologies impose upon politics implies the entrepreneurial corporatization of what is public, as well as the temporal acceleration of socio-political coordination efforts and decision-making.

The displacement of innovation and technological development (R&D) from the public realm—understanding this as the common good—to the realm of corporate privatization[40] hides the entrepreneurial corporate power game, blurring the deepest sense of the political as a form of social organization and action, making human intervention invisible, turning its values into a source of technological development—programming and data—, of criteria and steps that enable the intelligence and/or creativity of machines—software and device—, as well as of the applicability of their use. This power game reorders society by including or excluding individuals, collectives and geographic zones.

In turn, the strength of the entrepreneurial corporation turns laboratories and places of technological development and experimentation into spaces where decisions are made regarding what gets researched, what gets designed, how it gets configured and made operational and what the consequences of future technologies are for life on Earth, and potentially outside of it. Thus, the public is initially reduced to a mere consumer of what the entrepreneur, its board and developers decide, who not only own the risk and any financial gains, but also the power.

On the other hand, the temporal acceleration due to communications and transportation technological development has a contradictory impact on politics: while individuals and groups may increase the connectivity, interaction and exchange—of information, finance, consumption—in real time, political systems that respond to different processing times (ordinary, extraordinary) and do not adjust to the logic of acceleration, find themselves under pressure and collide with the dominant efficiency and efficacy expectations, i.e. the immediate result. Discrepancies and lags emerge between the accelerated decision-making and the rhythm of the world of politics, its structures and synchronization expectations.[41]

[40] SpaceX Technologies Corporation, Virgin Galactic Holdings Incorporated, Blue Origin Limited.
[41] Paul Virilio, *Velocidad y Política* (Buenos Aires: La Marca, 2006), 119-34; William E. Connolly, *Neuropolitics. Thinking, Culture, Speed* (Minneapolis: The University of Minnesota, 2002), 140-173.

The high speed of current capitalism, potentiated by the technological development of information networks[42] especially affects democracy, its institutions and procedures—which is organized under the logic of the analog clock[43]—by accelerating the time available for processing demands, organizing and making decisions, which results in an elimination of steps, or asynchrony, options to which authoritarianism and populism are abler to adjust.

Technopolitics, that is the use of devices, such as cellphones, tablets or computers, with communications software, geo-localization, social networks, among other digital codifications for exchanges between citizens and government, turns into an adaptation of politics to an accelerated pace of life. This changes the orientation of public administration and governmental communications, as well as the interaction of citizens, eliminating certain traditional intermediaries (political parties, mass communication media, leaders of social organizations) from the equation, generating rapid government responses and/or collective actions.

In this sense, Facebook or Twitter, to mention but two social networks, conceived as potentially democratizing applications, are private technological spaces that offer their services in exchange for personal information that allow them to improve their algorithms and grow their profits through the selling of said information to private and state customers, while generating bubbles or biased sounding boxes that prevent users from encountering the different *other*. Thus, they end up being a private public space implying the sometimes undistinguishable fusion of person-citizen-consumer-user.

Also, algorithms weigh on realms such as surveillance and security, the procurement of justice or the implementation of social programs, thus reducing the state's bureaucratic apparatus, generating savings and attaining efficiency, although this provokes imbalances by subsuming the values and criteria implicit in the operability principle to a supposed efficacy, causing undue detentions, deaths and unjustified exclusions. The source of power is further modified by the property rights over the code and the information consumed/produced: government becomes a user without knowledge of the process of development and without the capacity to modify or control the instrument. Thus, freedom of

[42] William E. Scheuerman, *Liberal Democracy and the Social Acceleration of Time* (Baltimore: The Johns Hopkins University Press, 2004), 18-70; Henning Laux, "The Time of Politics: Pathological Effects of Social Differentiation", *Time & Society* 20, no. 2 (2011), 224-240.
[43] Robert Hassan, *Empires of Speed: Time and Acceleration of Politics and Society* (Boston: Brill, 2009), 32.

expression, freedom of thought and free will can be much more exposed to control by private agencies than by government entities.

Foreseeing Considerations: Futures at Stake

Social sciences, which for a long time kept their distance from the scopes and challenges of present future technologies, have begun to explore their various effects on the environment and on the interactions between human beings, devices, software and non-human entities, with an emphasis on the potential transformation of thought, language, space-time and human social links.[44] Thus, it is increasingly evident that transpositions of the self, the other and *natural human equipment*, as well as the bets and promises of transformation of social realities through future technologies resignify and re-elaborate both the conceptualization of contemporary societies' temporality and the social and political frameworks and senses that enable, deflect, limit or accentuate the various futurizations.

These transformations indicate the emergence of anthroposynthetic realities, the promises, tensions and dangers of which must be acknowledged as crossroads between the realms of politics and contemporary social sciences. In connection with this, we will now be talking about the results and potential discussions deriving from the anthroposynthetic scenarios that are examined herein.

The disruptions and contradictions in the social realm draw the limit of an extinction of the horizon of the world of life that is physically felt and experienced, an indication of which is the anachronistic multiverse of trials of past and future histories in the present, as well as the suspension of inter-generational transmission, fed by neoteny and the abstraction of the digital me. The potential responses to these transmutations of social life imply a mythological renewal of the species, of corporeity, as well as a chronotopically dispersed and multi-layered collective intelligence, the first trial of which seems to be deployed *in the cloud* and *in the metaverse.*

The possibility to edit human genes, on the other hand, may lead to new discriminations, as well as to frictions in the coexistence between human beings with genetically modified capacities and qualities. Gene manipulation, as well as the cyborgization of the human species entails an aperture of the evolutionary process that is

[44] David Valentine and Amelia Hassoun, "Uncommon Futures", *Annual Review of Anthropology* 48 (2019), 243-260.

only comparable to the moment in which Neanderthals and Homo sapiens shared the Earth, with the consequent possibility of originating a new human being and its extra-planetary expansion, as well as a modification without precedent of the Earth's ecological realm.

Also, acknowledgement of the other as a political subject setting out from the displacement of the frontier between human beings and non-human entities (freedom/slavery), which is a present future, as well as the possibility to create parallel virtual worlds—metaverses—, questions the values that shall apply to the construction-codification of technologically mediated relationships, be them communitarian, liberal or anarchic, among others. The emerging legislation concerning "electronic persons"[45], as well as the case of the robot Sophia—created in Hong Kong, but acknowledged as a citizen in Saudi Arabia—, which rekindled the demands for more rights among Arab women, as well as by her declaration of desiring to have a baby and a family,[46] are examples of the impact of future technologies in politics.

Lastly, space exploration in search for new materials and a potential habitat for human beings implies the establishment of cosmopolitics or astropolitics[47] that guarantee the ownership and taking of profits by exploring enterprises, the legitimacy of security provided by large corporations or the space army of participating countries and the handling of potential conflicts and galactic war. The future colonization of and human reproduction on some celestial body will also imply the reaching of a consensus for exploiting the new territory, as well as the organization of extraterrestrial human communities, which could lead to a confrontation with the political articulation axis par excellence since the end of the eighteenth century: national states.

Summarizing, future technologies are incorporated into the formulation of the social and political realms; they interconnect, generate frictions and contradictions, gaps, fractures, clefts and bifurcations, accelerations and decelerations, unexpected leaps from which new options or re-updated latencies of futures or pasts may emerge that renew society and politics, lead to their understanding as the world of life and the capacity of joint action,

[45] Mady Delvaux, "Draft Report with Recommendations to the Commission on Civil Law Rules on Robotics", *European Parliament, Committee of Legal Affairs*, 31 May 2016, 12.
[46] Robot Sophia (@RealSophiaRobot), "Sophia the Robot: The Global Robot Ambassador", *Twitter.com*; Robot Sophia (realsophiarobot), "Sophia the Robot", *Instagram*; Robot Sophia, "Sophia the Robot", *Facebook.com*; Redacción, "Sophia, la androide de ciudadanía saudí, quiere tener un bebé", *El Financiero*, 5 October 2021.
[47] Yuk Hui, *Fragmentar el futuro. Ensayos sobre tecnodiversidad* (Buenos Aires: Caja Negra Editora), 2021, 41-43; Everett Dolman, *Astropolitik: Classical Geopolitics in the Space Age* (London: Frank Cass Publishers, 2005), 12.

agreement or disagreement regarding the place of the individual or of the community, government and collective order.

The possibility of acknowledging that, behind the illusion of unity and homogeneity of time, there exist fractioned times corresponding to the—internal and external—fracture/plurality of political and social communities that are juxtaposed, intercept or interpenetrate one another implies for social sciences the challenge of investigating, experimenting and understanding the expectations, tensions, bets and games revolving around the technological frontiers and the orientation of futures.

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