AN ANTHROPIC PROGRAM
FOR THE LONG-TERM SURVIVAL OF HUMANKIND

The anthropic dilemma

Since the Copernican revolution, anthropocentrism has been continuously losing ground. It has been first object of a gradual destitution that corresponded with the "suburbanization" of the Earth – not anymore the pivotal aster of the solar system but just a blue rock overlying at the margin of the Milky Way, in turn, just a galaxy among the hundreds of billions of which consist of the universe – Anthropocentrism then proceeded with a sort of "ordinarization", "commonization" of the mankind as an ordinary kind among the species who developed itself passing through an evolutionary process that in summa looks identical to the one of any other animal species living on Earth. Becoming an axiom with the so called "mediocrity principle" (according to whom, at a cosmological level, the piece of universe we live in has got nothing special), the anti-anthropocentrism is a point of view now shared by the majority of the scientific community. The biologist and thinker Jacques Monod, within his book *Chance and Necessity: An Essay on the Natural Philosophy of Modern Biology*, summarized the concept as the proof of the universe being insensitive to the existence of the humankind, as if our number came out on the cosmic roulette only by chance.

This firm belief has stimulated several schools of thought, such as the ecologist one, whose most radical meaning points to mankind as a cancer to defeat to guarantee the survival of the biosphere. Nevertheless, this conventional wisdom has been attacked recently by certain discoveries and considerations in all biology, physics and cosmology fields. About biology, a constantly growing number of scholars of the evolution and the origin of life shares the belief which considers the existence of living species very uncommon and even less is that peculiarity called intelligence among all of them. So many would be the stumbling blocks against the development of life that probably the case of the Earth is destined to stay unique of its category. At the moment, this hypothesis is supported by the lack of any evidence proving the existence of life on any other planet within our solar system. About physics and cosmology, considerations in favour of the uniqueness of the life on Earth are well resumed under the definition of "anthropic principle". Anthropic principle's supporters, at least the ones who share the most radical meaning, affirm that even the smaller variation in the values of the main assumptions and constant algorithms in nature would render impossible the existence of life in the cosmos, so it seems to exist a sort of "fine tuning" in the structure of the universe able to foster the life.

The latter consideration, afar from favouring the hypothesis of contemplating the abundance of life in the universe, "banalizing" the fact, puts us instead to face a dilemma. If, as Monod supported, the universe is insensitive to our

existence, how is even possible that it does exist such a close relation among the physical constant and the coming to light of life? Examples in our hands are numerous: the relation among the total number of protons and the total number of neutrons present in the universe is the only one supporting life, if the value of this relation would have been just a bit higher all the hydrogen of the universe would be helium and the water never existed, instead if it would have been just a bit lower the helium would burn too fast within the stars and the life on the planets like Earth never developed. If the value of the electromagnetic force or the one of strong interaction – that keeps united the atomic cores – would have been just slightly different, each atom would break into pieces preventing the creation of complex molecules. Furthermore, the existence of chemical elements heavier than helium and hydrogen follows the reactions of the nuclear fusions inside the big stars at the end of their lives. If these stars would not oust any elements as oxygen and carbon – paramount for life – during the *supernova* phase, we could not exist; and *supernovae* are feasible only with a very close relation between gravity (provoking the contraction of the mass of the star) and electroweak interaction whose task is to govern the production of neutrinos necessary to face the gravity attraction, until the explosion of the external layers of the star. All of these – and several others – relationships between the most important physical constant may be enclosed within this consideration: if the fine-structure constant *a*, as the outcome of the relation among electric charge of the electron, Planck's constant, Coulomb's law and the speed of light, were a 4% divergent, the universe would be very different from the one we are used to live in and in any case there would be the slightest chance for life.

The majority of the scientists who keep asking themselves about this dilemma has identified in the theory of Multiverse (or meta-universe) the ideal solution. According to this nowadays mainstream theory, our universe should be only one out of (potentially) infinitive universes. Within every single one of them the physical constants show different values, that said most of them would result inhospitable for life, while only in a bunch of cases – lucky cases from our peculiar point of view – there would be the necessary conditions in order that life could show and grow up until reaching the intelligence stage. The Multiverse theory preserves the mediocrity principle, but it does so against the principle represented by Occam's razor (because of the extreme multiplication of the elements), and the falsifiability criterion (because of the inability to refute empirically). Furthermore, the Multiverse theory, admitting that our universe allows the life to develop itself, does not explain why it is so rare. Even in the most elementary form, life does not seem to exist on the other bodies within the solar system; moreover, at the moment we have no proof about the existence of extra-terrestrial civilizations, although it's proved that other Earth-like planets are not so uncommon around the universe.

This problem is known as "Fermi's paradox" and quoting the Italian physicist Enrico Fermi who posed the question firstly during 1940s, "admitting the existence of intelligent lives as commonly spread, where are all of them?". In fact, considering the age of the universe, it is extremely plausible that more

than one high-tech civilization had already developed itself quite before ours, even finding the way to spill over this galaxy and many others, maybe within a time relatively short on a cosmological scale (few million years), and not even crossing the speed light limit. Therefore, we should have had direct experience of those extra-terrestrial civilizations, instead we haven't figured out anything yet, in spite of the progresses had within the SETI program.

The rare Earth hypothesis, the anthropic principle and Fermi's paradox contribute to shape what we call "anthropic dilemma". This dilemma may be resumed within the following question: if there is no special event with the emergence and evolution of life until reaching complex forms concerning self-conscious intelligence, why the universe seems to be 'just right' to host life and still the intelligent life keeps on being pent-up to humanity? Multiple answers can be presented, from the multiverse speculations to a theory of everything able to keep together the values of the physical constants leaving apart the anthropic principle and all the hypothetical solutions to Fermi's paradox. However, at the moment, the anthropic dilemma still lacks the right answer and, starting from our empirical evidences, it postulates the uniqueness of the Mankind, the sole intelligent form of life able to understand and contemplate the Universe. Such a postulate it's here called "anthropic postulate".

The anthropic imperative

The Mankind exists since at least 200,000 years if we only consider the *Homo Sapiens*, and the human society as a civilization barely since 10,000 years, assuming as a new beginning the moment we discovered writing. The knowledge about the past teaches us that most of the living species has suddenly faced extinction, for all the history of Earth long. Five are the mass extinctions that nearby some other extinctive cycles have continuously transformed the biosphere of the Earth and during the last episode – the extinction that annihilated the dinosaurs' kingdom, some 60 million years ago – allowed the mammals and so the man's ascent. Archaeological reconstructions and genetics analysis have recently revealed that, around 100,000 years ago, the mankind risked to face its own extinction and few thousands of samples survived – whose descendants we all are. We are still unaware about the causes of the previous mass extinctions, but at least two assumptions result given: first of all, sensible threats to life survival on Earth may come from outer space, from asteroids to gamma-ray bursts; secondly, an ongoing mass extinction is actually in place and is human-provoked. Our impact on the biosphere is so invasive that we could cause our own extinction throughout the Earth's climate change fostered by the way of life of our civilization.

Therefore, we have to be aware that the humanity could face a rapid and severe extinctive episode which could erase completely its presence on Earth. Generally, such a situation is accepted with the fatalism that is the natural outcome of the reasoning entrenched on the mediocrity principle and the spread of the ecological thought. The latter, in particular, bases on the

consideration that the biosphere it's a generally harmonious set of lives following some paramount rules and within which the human being is an extraneous and destructive element. The damages to the environment produced by the human civilization in terms of global warming, ozone depletion, ocean acidification, climate change and extinction of numerous living species confirm with no mercy this truth. The destructive tendency of the human society that lately revealed is therefore particularly dangerous for humanity. Self-regulation of the biosphere and the capacity of some other species to re-fill the ecological-niches left empty by the extinction-driven mechanisms, show that the Earth can easily survive to human's transforming impact.

Excessive worrying for the "health of the planet" have already spread around and eradicated within the public opinion the firm belief that the only solution for the Earth survival is the extinction of the mankind. The hypothesis of an extinction in the future is not even considered "such a damage" for the planet, so no pre-emptive moves are contemplated. According to this, the mankind is not so different from the other kinds and, moreover, it would even be preferable to sacrifice the first one for the latter. Moving from the anthropic postulate stated previously, the reaffirmation of the uniqueness of humanity must be seen as an assumption of accountability.

It's assessed that, up-to-date, around 100 billion human beings lived on Earth. It's not possible to enumerate how many will live in the future, but our generation must feel responsible both for the previous generations who preceded and the ones that will come next. This concept has already been made crystal clear some decades ago by the philosopher Hans Jonas throughout the "moral responsibility" towards upcoming generations. It seems that such a principal did not take root within the contemporary society, at least not yet, taking into account how our society is exploiting exhaustible resources and provoking the climate change. We are acting with no consideration for the long-term consequences that these behaviours might mean. The responsibility with regards to other human beings is usually granted to our children and grandchildren, with a timeline that covers two generations, or at maximum a period of 50 years. This subject clarifies why the appraisals about the tragic consequences of the global warming concerning the end of this century aren't producing any impact yet on the public opinion in terms of moral responsibility.

The anthropic postulate imposes that the Hans Jonas' moral responsibility must comprehend the humanity as a whole, present and future generations. The plausible uniqueness, or at least the extreme rarity of the human experience, entails the burden of its preservation from any kind of lethal menace. Given the extremely high vulnerability of our planet, the timeline of such a responsibility should be prolonged 'till the time when humanity will be able to face an exodus towards the outer space, out of the solar system. These arguments aren't new: Stephen Hawking has for a long time exhorted to work with the goal of trespassing the natural and limited borders of the planet Earth and beginning the colonization of the Universe. Now, it is possible to postulate

the anthropic imperative: it's necessary to undertake all the actions to guarantee the undefined survival of the mankind through time. A lapse of time concerning 10,000 years inspired by the Long Now Foundation's one and that in turn hails from the fact that humanity can already count on 10,000 years lived in the past, is considered plausible to develop the interstellar travel and allow the colonization of a planet out of the solar system, in order to guarantee to humanity the necessary safety from whatever catastrophe could happen within the solar system. This final goal must be taken as primary to respect and fulfil the anthropic imperative.

The anthropic program

To reach the goal declared with the anthropic imperative, it is necessary to elaborate a program on the very long term which could foresee and neutralize the threats standing in front of humanity's future progress. Such a program, funded on the prevision and prevention criteria, will inevitably be "in progress", given the inability to extend any forecast over a certain lapse of time. To work out the program, scenario and megatrend analysis, simulations and other methodologies developed within the futures studies field need to be implemented, in order to forecast the problems that could attempt to mankind survival during next 10,000 years. At the same time, a program like this, must route all the forces to reach the goal of elaborating plausible human life prevention strategies and promoting recommendations addressed to the adoption of suitable solutions that would perfectly match with the anthropic program and its goals.

From a different point of view, that could be considered as short term, and enclosing "just" two centuries, the assumptions for the anthropic program are the following:

- *Vulnerability of planet Earth*. The actual situation sees humanity concentrated on one single planet and its consequential exposure to copious risks, among which we number potential asteroid or comet impacts, and catastrophic effects of a relentless climate change.
- *Mortality*. Humanity is still exposed to potential viral pandemics, super-bacteria very resistant to antibiotics, pathogenic agents whose diffusion is favoured by the global interaction. Moreover, the actual life expectancy isn't long enough to afford the development of long term projects.
- *Demographic disequilibrium*. The growth of the world population, especially in the south, obstructs the human society from the enjoyment of our planet's goods, while the fertility rate decreasing in Western countries puts at risk the long-term survival.
- *Resource depletion*. Our society, and the economic structure that represents its basis, seems destined to collapse because of the finite resource supplies in a short term trajectory such as renewable energy resources, marine protected areas, rare earth elements, arable lands and forests.
- *Increase of complexity.* The globalization and the technologic boost need an inevitable increase of the basic knowledge and competences to be acquired

to manage the complexity of the systems that constitute the contemporary society.

- *Systemic fragility*. The increase of the complexity favours a sort of systemic vulnerability of the human civilization: technology, informatics, finance, transportation and supply chains infrastructures fragility jeopardize the medium-term survival.
- *Losing data*. Digitalization of our society puts at risk the preservation of all the produced data, whose volatility in the long-term can conduct to a sort of "black hole" about the knowledge acquired until today.
- *Technology risks*. The upcoming of new technologies and the new scientific discoveries impose constant controls concerning the new potential risks hidden behind that.

Based on these considerations, the graphic 1 resumes the principle intervention areas which should be object of the first phase of the anthropic program. They are as follows:

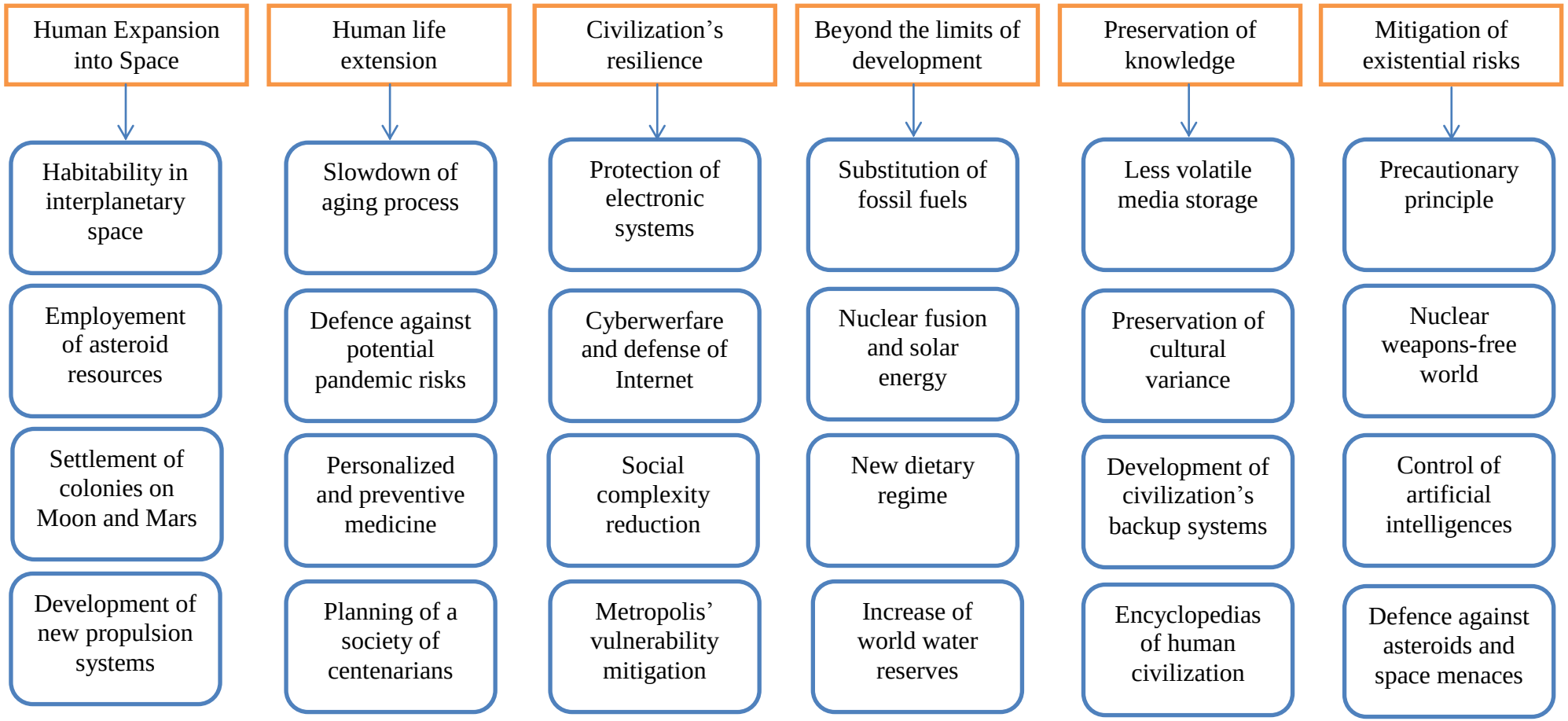
1. Human outer space expansion. Humankind migration out of earth atmosphere requires at first an easier and cheaper access to the space; it means an improvement of the interplanetary conditions so that would be possible to host and develop life away from our native planet. It should be done implementing artificial gravity and the galactic cosmic radiation shield (to reach during next 25 years); to this follows the exploitation of asteroids, the closer at the beginning and then all the one staying around Mars and Jupiter, with the goal of producing *in situ* all the necessary materials to begin the colonization (35 years from now). A permanent colony established on Moon in order to get scientific and economic feedback (40 years by now), should be the "test bed" for Mars colonization on a large scale (50-100 years by now) that could happen even through a terraforming process. The final goal is the development of interstellar propelling systems that could help reaching the closest star systems within one generation life (100-200 years by now).
2. Life expectancy extension. From a biological point of view, the main risks to mankind survival come from potential pandemic menaces, whose mitigation needs: a deeper knowledge concerning new active ingredients in order to develop effective antibiotics; a faster way to analyze the new viruses in order to produce the right vaccines and improve the prevention against pathogenic agents (25 years by now). The true revolution will be a substitution of the actual generic-med and ex-post regime with a preventive and personalized therapeutic regime based on a constant monitoring of the patients' medical situation, in order to recognize the symptomatic conditions preventively and then provide genetically and biologically tailored therapies (50 years by now). Furthermore, paramount it's going to be a wide attack to ageing through the cure of cancer and the inversion, thanks to the stem cells, of the processes whom effect concern the deterioration of organs and tissues in order to enlarge the life expectancy to 200 years (75-100 years by now). The final goal is to predict mechanisms of gene-technology and genetic

engineering who will modify the human being adapting the body to new environmental conditions on Earth as much as on any other planet, developing in so far a more resistant post-humanity (100-200 years by now).

3. Resilience of the technologic civilization. The dependence of the human society on the technology makes extremely vulnerable any future development. A need of keeping the risks under control emerges powerfully and concerns first of all the protection of electronic systems, pivotal frame of the technologic infrastructure. These risks have to be isolated so that a domino effect caused by electromagnetic phenomena or massive blackouts might be more easily avoided (25 years by now). At the same time, it's fundamental to defend internet with cyber-warfare systems from the possibility that cyber-attacks could disconnect primary structures like power generating stations from the Net (25 years by now). The growth of the urbanization process will set up the stage for an increase of the vulnerability of metropolis and megalopolis, even more dependent nowadays from the external supply to survive: it will be necessary to make more sustainable and autonomous about energy and food security and about the climate change adaptability (50-75 years by now). The final goal consists in a reduction of the social complexity, starting from a bureaucratic simplification, de-financialization of the economy and other policies able to make our civilization more resilient (100 years by now).
4. Crossing development limits. Perpetual economic growth presents intrinsic natural limits that since 50 years already resulted well known to the analysts and policy-makers. The resolution of such a problem is possible only through a radical transformation of the actual economic system. Particularly, considered how fast the fossil fuels basins (oil, gas, coal) are running empty, it is necessary to accelerate their substitution with alternative and renewable energy resources and, moreover, that could exclude the nuclear fission (which is still tied to scarce resources such as uranium and plutonium and among whose outcomes must be taken into account radioactive waste, scum, at the end swallowed by the natural environment). This goal could be reached improving and then increasing the exploitation of solar energy even through energy orbit collectors, usage of new materials, simulation of the photosynthesis process and lately through development of the clean nuclear fusion. Combining such renewable resources would permit a complete substitution of fossil fuels within 50-100 years. Regarding food security, water resources the positive outcomes of the green revolution and increased usage of genetic engineering should favour a faster growth of the food resources than a demographic growth but, nevertheless, the unsustainable environmental impact caused by the strong consume of meat needs to be taken into account and this regime changed with another one more vegetarian (75-100 years by now). Instead, regarding the global water resources, they could be increased by producing fresh water throughout the electrolysis of the sea water, realized using a nuclear fusion process (50-100 years by now).

5. Preservation of our knowledge. During its own tumultuous development and expansion, human civilization will likely face sensitive loss of historical memory, a very dangerous risk in the future of humanity. To appease such a risk, it is necessary to support nowadays too volatile digital devices with a new generation of devices able to store the memory, data and knowledge for millennia and that would result easy to access already at basic technological level of development (25 years by now). Furthermore, it's paramount to prevent any kind of lost of cultural diversity directly related to the current homogenization process of the society (25-50 years by now). The next step consists in realizing out-and-out "encyclopaedias of the civilization", which preserve the basic fundamental notions to get easily re-started in case of a permanent lost due to a technological collapse (a sort of backup of our system within next 25-50 years). Indeed, backup systems of the civilization should soon become a core objective; the systems above mentioned should be kept at a basic technology and complexity level (100-200 years by now).
6. Extinctive risks appeasement. An extended set of menaces collected within the ample range of risk-of-extinction cases deserves to be accurately analysed and then, the needed strategies finally tailored. Among the mentioned set of threats, one of the more plausible derives directly by the impetuous technologic development. A wiser regulation of the process, in respect of the precautionary principle, should be implemented in order to avoid that scientific discoveries could lead to risk of extinction scenarios (i.e. like it has already happened developing the nuclear energy). In the field of the artificial made menaces, the nuclear weapon reduction on a global scale (and later their complete destruction), tied up to a strong regulation about armament production in overall, will erase the risk of mutual mass destruction as it has appeared to the whole mankind during the second half of the 20th century (50-100 years by now). Similarly, another strong regulation should be studied and applied to give order within the Artificial Intelligence researches before distortive outcomes will manifest (25-50 years by now). Last but not the least, regarding natural threats, the development of asteroids-impact preventive and defensive systems is impelling (25-50 years by now).

AREAS OF INTERVENTION



Conclusions

To realize a large-scale anthropic program like this should be among the very first goals and interests of a fully mature society whose attention focuses on the fate of next generations and the survival not only of the species, but even of the cultures, of the memories, of the technologies all produced until today. Even in case the anthropic postulate was proved oneself unfounded, thanks to the discovery of other complex living species or extra-terrestrial intelligent civilizations, the preservation of our own specie should anyway be an imperative; moreover, to the above mentioned threats, we should add the eventual menaces that encountering alien civilizations could mean. Furthermore, it's plausible to believe that a non-human intelligent civilization has reached similar conclusions we did during its development process and nowadays has already undertaken the necessary measures for its own survival on a long term perspective. It's clear that as much late we face those problems implementing the anthropic program, so much we are going to put ourselves and the human experience as a whole in a grave, extinctive, danger. Therefore, urgent it becomes to support this program and advocate the global community of decision-makers and policy-makers so that they'll pay the impelling attention such a subject deserves. Considered the global scale of the anthropic program, only a commission at the highest level of knowledge, in a range as the United Nations Organization is, but provided with more comprehensive powers, on the European Union model, so that it could be able to produce laws directly applicable within any national system and set of rules. A Commission for the Anthropic Program should be constituted by the elected representatives of all countries of the international community, in order to guarantee the democratic nature of the assembly, but provided with a long term mandate (short-termism about such problems would affect the success of the mission as it affects the success of most of the western democracies of today). Advised by experts – scientists, technicians, intellectuals – the Commission should be able to deliberate with an absolute majority and to impose its own decisions on every single state. The future evolution of society and politics will demand in prospect many changes and updates of such a mechanism, that anyway could be considered functional in a time frame of at least 50 years.

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