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Colonizing Other Life-Supporting Planets: An Unrealistic Fantasy

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A leap in human cognitive evolution that occurred approximately 50-65 thousand years ago led to the acquirement of linguistic abilities, which defined ever since the modern *Homo sapiens*. Despite the relatively negligible duration (in a galactic time-scale) of this developed species, his impact on the surrounding world was tremendous. From living in caves and hunting his food, *Homo sapiens* had spread over the entire globe, while using quite successfully his improved brain abilities, as is reflected on amazing creativity and achievements in most aspects of modern life. Notably, this incredible advancement occurred with seemingly no detectable alteration in brain shape or anatomy (ref. 1), indicating a latent cognitive potential very early in evolution. Concomitant to this success, which evidently raised hopes (even nowadays) for further bright future, humanity has also shown during recent decades an increasing awareness to risks that threaten its existence or even the entire life on Earth. A new perception has surfaced, according to which the orderly sun-rise and sun-set that people experienced for many millennia, do not guarantee a similar smooth continuation. In fact, we have reached a situation wherein our over-populated planet (Earth) is under continuous abuse by the dominating human race. This is reflected on the massive overuse of resources and contamination of the terrestrial and sea environments as well as the protecting atmosphere (e.g., side-products of using fossile energy and industrial spills; extinction of a broad range of animal and plant speci leading to destruction of many food chains; devastation of photosynthesizing organisms like the rain forests, ocean algae and cyanobacteria, the primary producers of organic matter and oxygen enabling our life). Although this unsafe reality demands immediate measures to minimize the accumulating risks, to our astonishment and disappointment, 'not much' was done, and so, humanity has clearly approached a turning point, where the survival needs of the present generation jeopardize the existence of our offspring generations. No doubt, the continuous struggle for power, and over remaining energy reservoirs and primitive religious aspirations, without at least attempts to repair the damages is not just preposterous, it actually expedites our rush toward the so-called 'stationary phase of our growth curve' (ref. 2). Notably, the intensified hostility between nations and ever-lasting fights has debilitated international relations, while leading to careless, often fanatic, declarations and actions by ignorant leaders endangering the entire world for their political, personal and national desires (ref. 3). Unfortunately, we have approached dangerous times with major threats to humanity: (I) Disastrous events beyond our control, like being hit by a large asteroid that similarly to the

extermination of the dinosaurs and many other species 150 million years ago, might wipe out most developed life forms; or, a detrimental highly energetic radiation wave arriving from the sun, or from another unprecedented universal source; or, a volcanic incident like a dreadful earthquake or eruption that would eliminate the sunlight crucial for photosynthesis, leading consequently to disappearance of most life forms on Earth (e.g., eruption of the entire Yellowstone sensitive region may cover our planet by a thick layer of poisonous compounds and dust that would ban photosynthesis and hence life); (II) Catastrophes expedited by human activities that ruin the delicate balance between modern life-needs and the climax, like unbearable heat waves, massive floods induced by ice melting in the poles; environmental contamination by industrial spills that extinct terrestrial and sea organisms (e.g., excessive amounts of carbon dioxide increasing the green-house effect), or, detrimental viral or microbial pandemics {e.g., distribution of super-violent Corona (ref. 4) or Ebola viral strains}; or disastrous consequences of a global nuclear war.

These threats have incited exceptional ideas (e.g., S. Hawking; NASA astrophysical team) supported by theoretical mathematical calculations about the need to save humanity from extinction by evacuating from the deteriorating Earth and colonizing other life-supporting planets. Among several putative habitable planets identified thus far, Kepler 452b in the Lyra constellation (1800 light years from Earth), located at a similar distance from its star (light source), has been suggested as a putative habitable planet. Kepler 452b is much older from Earth, about 60% larger, bears a cloudy atmosphere and liquid water on its surface (although its oceans already dried out), and orbits its star in 385 Earth days (ref. 5). Even more similar to Earth is Kepler 186f discovered only a few years ago in the Cignus constellation (~500 light years apart of Earth), with almost identical size, a similar distance from its star, an orbit duration of 129.9 Earth days, and humid atmosphere containing carbon dioxide and water (suggesting liquid water on its surface). However, the composition of Kepler186f is still unknown and its star is a dim red dwarf, and so it receives approximately a third of the light Earth receives from the sun. Despite, however, the putative habitable potential of these Kepler planets, we must consider that even slight differences from Earth might have substantial effects on humans. A different gravitation may affect plant gravitropism, and the human skeleton and muscles, which may require long adaptation time. A difference in atmospheric composition might affect the respiratory needs of most life forms, as well as the aptness to oxygen, and availability of protecting layers, such as the Van Allen belts in Earth's atmosphere that protect from detrimental irradiation. In parallel, a change in the content and intensity of the available electromagnetic spectrum might have a substantial influence on photosynthesis. Furthermore, it took millions of years for all life forms to adapt to the specific conditions on Earth and for humans to develop a protecting immune system against diseases and microorganism invaders. It seems therefore that besides many physical and chemical parameters that must collectively be suitable (in a timely manner) for human survival, differences in the flora of micro-organisms might be critically dangerous. Therefore, it is quite conceivable that only liquid water availability is insufficient for claiming an option for human habitability. Since the threats to humanity and Earth demand immediate actions, and the time duration proposed by scientists to begin pioneering attempts of evacuation from Earth (hundred years *a la* S. Hawking) is not realistic, as well as considering that the required technology for galactic voyages to such distances has not been developed, more likely would be a common international effort to

maintain human's life on Earth rather than fantasize on some magic galactic immigration in the near future.

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