ELON TOKEN
TRUSTLESS-LEDGER
TECHNOLOGY IMPLICATIONS
FOR A FUTURISTIC HUMAN CIVILIZATION

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THE FUTURE OF THE HUMANITY

Sustainability generally refers to systems, behaviors and activities aimed at helping to preserve a particular entity or resource. Human sustainability is one category, which involves specific goals, strategies and methods implemented to preserve and improve the quality of human life. Sociological, environmental and resource-based factors contribute to human sustainability.

Population growth is a major concern in the area of human sustainability. The Center for Sustainability at Aquinas College noted that the world population grows by around 200,000 per day. In general, Earth contains limited land space for people to live in a healthy, comfortable way. As populations grow, the amount of space and natural resources available to supply them wanes in comparison. Pushes for environmental resource preservation and responsible usage of resources are also important to meeting needs of growing populations. The Aquinas center advocates limits on childbirth of two children per woman to moderate world population growth.

Another area closely tied to preserving resources for populations is consumption. Emphasis on wellness and recreation is partly driven by the desire to sustain a healthy population. Another reason nutritionists and government entities push for more natural, unprocessed foods is to sustain farms and producers that provide them. Without demand for healthy goods, the companies that produce them won't have the financial resources to sustain agriculture and production. Additionally, environmental experts advise against excessive consumption of products like plastics and aerosols, which contribute to toxic air and full landfills.

Society, civilization and globalization, along with physical sustainability, world leaders have to weigh economic and functional sustainability when making domestic and foreign policy decisions. For example, when a country maintains a high gross domestic product, it benefits populations domestically and globally. Globalization allows countries to collaborate on human sustainability goals. Promoting civilized behaviors and minimizing criminal activities also contribute to sustainability through reduced instances of wars and other massive tragedies. Studies on famine, infant mortality, life spans and extraterrestrial life also contribute to sustainability of civilizations.

Social justice and societal values also fit in the discussion of human sustainability.Social justice is the pursuit of fairness and equality for all people, reg ardless of ethnicity, race, gender, age, religion and other demographic factors. Shared values within population groups help shape communities and cultures. Social injustice and discrimination in a population contribute to cultural and environmental degradation. These problems also lead to wars, which typically cost thousands of lives and lots of money, while ultimately damaging the environment.

HUMAN ASTROBIOLOGY IN THE SOLAR SYSTEM

The past half-century of solar system exploration has reinforced the lesson that no arbitrary division should be placed between life on Earth and astrobiology. Consider what has been learned about Earth's Moon. It may be true that the primary drivers for lunar exploration were political rather than scientific, but the scientific payoff of lunar samples returned to Earth primarily by the Apollo missions but also by Soviet robotic Luna missions has been huge. Much of what we now understand about early solar system history, and therefore early Earth history, begins with the Moon missions. This is because the surface of Earth is young, even though Earth is not. Earth is 4.6 billion years old, but there are nearly no rocks left on its surface due to destruction by plate tectonics and erosion to tell the tale of early conditions on our own planet. Yet the ancient sedimentary rocks we do have hint that life was established very early on, probably by 3.5 billions years ago, and possibly by 3.8 billion years ago. The Moon, however, died geologically billions of years ago, so preserves much of its record from these early dates. This history, built upon the dating of lunar samples correlated with crater counts on the lunar surface, reveals that the Moon was once subject to an intense bombardment of comets and asteroids a bombardment exponentially higher prior to 3.8 billion years ago than is the case today. Comparison of the lunar cratering record to that of Mercury and ancient Mars suggests that the entire inner solar system was subject to this same bombardment. Therefore the origin of life on Earth must have taken place in the midst of this bombardment, with important implications both for destruction and delivery of carbon-bearing (so-called organic) molecules of use for the origin of life. To learn this about the conditions for early life on Earth, we had to visit the Moon and planets.

Casting our view farther out from the Sun, the planet Mars is one of the most intriguing possible venues for ancient or even extant life in the solar system. Among such venues, it is also most easily accessible from Earth, with spacecraft travel times that are less than one year. Spacecraft flybys, orbiters, landers and rovers have made it clear than ancient Mars once had abundant liquid water at its surface, and there is strong evidence that, in specific locations at specific times today or in the geologically very recent past, liquid water still reaches and flows at the surface. The surface itself is now a freeze-dried desert where liquid water must either freeze or evaporate. But given what we've learned abo ut the deep biosphere on Earth, the possibility that life on Mars exists in subsurface liquid water environments,environments that may occasionally reach the surface, must be taken seriously. Because of their proximity, Mars and Earth may exchange meteorites that are created as ejecta from large impacts, and it is not out of the question that whichever planet first originated life could than have inoculated the other. Only discovering and examining possible martian life could answer this question with certainty.

Beyond Mars, in orbit around the planet Jupiter, lies the moon Europa, just a bit smaller in size than Earth's Moon. There is now strong evidence that Europa harbors an ocean of liquid water beneath its extremely cold outermost layer of ice. The volume of this ocean is about twice that of Earth's oceans. At the floor of Europa's ocean, as on Earth, liquid water is in contact with rock, raising the possibility of important water-mineral interactions in the presence of hydrothermal energy. Data from the magnetometer on the *Galileo* spacecraft not only supports the existence of the ocean, but suggests that it is very salty and that the overlying ice may be only 10 kilometers thick, or even thinner. Could there be life in this ocean? Speculative studies suggest that the energy sources needed to support life should be present. But whether the origin of life could have occurred in an ocean that was beneath kilometers of ice so likely cutoff from sunlight is an open question. It is much harder for Earth and Europa to successfully exchange microorganisms via meteorites than is the case for Earth and Mars, so if there is life on Europa, it is likely due to a separate origin from life on Earth. But because of the liquid water ocean, Europa may be the most intriguing site for extraterrestrial life in our solar system. It appears that Jupiter's Mercury-sized moons, Ganymede and Callisto, harbor deeper subsurface liquid water oceans as well.

Still farther out from the Sun, the planet Saturn hosts at least two intriguing worlds. The Cassini spacecraft has revealed that tiny Enceladus has active geysers of ice crystals that may originate in a subsurface sea of liquid water, though the exact mechanism for the geysers and whether there is enough energy to sustain liquid water in Enceladus' subsurface remains to be convincingly argued. Farther out from Saturn lies the Mercur-sized world Titan, with its dense atmosphere of nitrogen and methane. There is some evidence that Titan, too, may harbor a subsurface liquid water ocean. All of these worlds need much more exploration and should receive it later this century. Missions to the outer solar system take time (the travel time to Jupiter is 3 years from Earth) and are expensive. But a balanced program of solar system exploration, especially one emphasizing astrobiology, must systematically explore the Jovian and Saturnian systems as well as Mars.

ASTROBIOLOGY AND THE HUMAN FUTURE

Fermi posed his famous question Dont you ever wonder where everybody is? to three colleagues at Los Alamos National Laboratory in 1950. In its modern version, the Fermi paradox maintains that if other civilizations exist in the Milky Way galaxy, some must be much older, perhaps billions of years older than ours; that such civilizations would long ago have developed interstellar travel; that they would then have explored or colonized the galaxy on a timescale that is short compared with the galaxy's lifetime; and that they would therefore be here. But since they are not here, they must not exist! The paradox obviously does not hold in a strict logical sense, since each of its assertions is at best a claim of probability, but it has been a powerful force on thinking about the prospects for extraterrestrial intelligence.

Whatever the rigor of the Fermi paradox, there have been many solutions proposed for it. The challenge to most of these solutions is the large-number assertion: while this or that explanation might explain the failure of some, even most, civilizations to colonize the galaxy, the timescale for colonization is putatively so short that unless the total number of civilizations in galactic history were quite small, the galaxy would indeed have been colonized. These colonization scenarios have posited exponential reproduction and paid little attention to ecological factors, such as the evolution of predation or other behavior that could have the effect of reducing the rate of expansion of a space-faring population. What parameters does one choose in predator-prey modeling to depict accurately the expansion timescales of competing technical civilizations? It is hard to make such parameter choices with a feeling of confidence. And it is close to impossible to know whether such simple analogies from life on Earth are or are not applicable.

Various practical arguments against galactic spaceflight being commonplace have been countered by invoking either genetic engineering or artificial intelligence in the form of self-replicating and evolving machines. We should not exaggerate the ease or casualness with which substantial genetic manipulation of human beings will be done, but as Robert Carlson has shown, basic measures of human bioengineering power, such as the time or cost required to sequence or synthesize short sequences of DNA, show that biotechnology is exponentially advancing at a rate even faster than that of Moore's law in computing. It is hard to know what comes after this exponential lift-off. It may prove generally true that there is only a brief interval during which a species is technically intelligent yet still retains its biologically evolved form. If so, we should expect that any civilization with which we make contact through SETI or otherwise is unlikely to resemble its biological predecessor species. If the question is what will they look like?

the answer may be whatever they want to.

But well before biotechnology permits the reengineering of the human species, it will put great power for extremely dangerous manipulations of microorganisms into the hands of small groups of the technically competent. Indeed, it is doing so already. (The National Academies has already convened two committees to examine this issue.) We do not have adequate models from Cold War arms control or nuclear nonproliferation for how to manage this new world, gaining the benefits of biotechnology for public health and food security while preventing disaster. The same technological expertise that makes possible our increasingly sophisticated searches for life brings with it powerful new opportunities, if mishandled, for destruction. Astrobiology is defined as the study of the living universe. If so, then the discipline must also speak to the future of human civilization, a thing uniquely precious regardless of whether it is entirely alone or one of many in the galaxy.

FUTURE OF MARS EXPLORATION

Once every 26 months, Earth and Mars are aligned in a way that minimizes travel times and expense, enabling spacecraft to make the interplanetary journey in roughly half a year. Earth's space agencies tend to launch probes during these conjunctions, the most recent of which happens in the summer of 2020. Three countries are sending spacecraft to Mars during this window: The United Arab Emirates, which launched its Hope spacecraft on July 20 and will orbit Mars to study its atmosphere and weather patterns; China, which launched its Tianwen-1 on July 23, and the United States, currently targeting July 30 for the launch of its Perseverance rover.

Perseverance is a large, six-wheeled rover equipped with a suite of sophisticated instruments. Its target is Jezero Crater, site of an ancient river delta, and a likely location for ancient life-forms to have thrived. Once on the surface, Perseverance will study Martian climate and weather, test technologies that could help humans survive on Mars, and collect samples from dozens of rocks that will eventually be brought to Earth. Among its goals is helping to determine whether Mars was or is inhabited, making it a true life-finding Mars mission.

All of the robotic activity is, of course, laying the groundwork for sending humans to the next world over. NASA is targeting the 2030s as a reasonable timeframe for setting the first boots on Mars, and is developing a space capsule, Orion, that will be able to ferry humans to the moon and beyond.

Private spaceflight companies such as SpaceX are also getting into the Mars game. SpaceX CEO Elon Musk has repeatedly said that humanity must become a multiplanetary species if we are to survive, and he is working on a plan that could see a million people living on Mars before the end of this century.

Soon, in one way or another, humanity may finally know whether our neighboring planet ever hosted life and whether there's a future for our species on another world.

HOW AI AND BLOCKCHAIN WILL IMPACT THE HUMAN LABOR FUTURE

A new approach for workers, As these technologies become more advanced and adept at supply chain roles, some tasks performed by human workers will be taken over by autonomous systems. But this doesn't have to result in the loss of meaningful employment.

The actions Gartner identified as likely to be automated and digitized are vast but not all-encompassing, from analyzing large data sets and predicting maintenance, to eliminating keying errors and assisting workers. In fact, the firm predicted that 50% of large companies will have humans and virtual assistants collaborating by 2022. So while AI and blockchain will certainly replace humans in situations that they're inefficient or inconsistent, there will be new ways for humans to work alongside this technology.

With the enormous amounts of data being analyzed by AI, for example, there will be an increased need for humans who can interpret the data and use it to inform business decisions. For every autonomous system, humans will be needed to assess their output and provide tweaks or repairs for optimum performance. It's why some experts are suggesting that the biggest utility of new technology is in augmenting human capabilities.

AI and blockchain are already transforming the supply chains of companies around the world, and the changes will only become more significant in the coming years. But human staff aren't going anywhere, with the technologies providing new opportunities for workers.

DECENTRALIZED FINANCE (DeFi) THE FUTURE OF FINANCE

The first cryptocurrency, Bitcoin, is still the most well-known application of blockchain. However, this technology has since rapidly evolved and expanded in many other areas. The initial hope with Bitcoin was to make both money and payments decentralized and universally accessible. Although Bitcoin failed to live up to this promise, decentralized finance based on blockchain (DeFi), also called op en finance, is a fledgling technology with potential.

DeFi operates via decentralized, permisionless (without any central authority) applications, called DApps, built on a blockchain network, most commonly Etherum. Visionaries see this as an open-source alternative to every financial service we use today. Picture savings, loans, and trades, to insurance and even more, as all globally accessible.

In theory, it is possible to adopt every financial service currently offered by financial institutions to the crypto-sphere through DeFi. This will thus replace (even if only partly) centralized financial infrastructures and shift power to individual users and investors.

Defi Common uses:

- Borrowing and lending lending cryptocurrency and earning interest on it, depositing crypto as collateral and borrowing against it. Smart contracts determine the loan terms, connect lenders to borrowers, and oversee the distribution of interest.
- Decentralized marketplaces and exchanges, trading digital assets directly without the need for a centralized exchange due to the use of smart contracts.
- Creating monetary banking services, e.g., stablecoin mortgages and stablecoin insurances, including the benefits of cryptocurrency without the volatility.

Innovative and revolutionary, the current financial system allows for the exchange of value easily through debit and credit cards, and the exchange of currencies for goods and services through digital banking. It also allows individuals to store wealth, save money, and earn interest on those savings.

Lastly, banks and other lenders provide individuals and businesses access to capital (through loans).

Despite the services mentioned above, current financial systems have significant issues:

- Unequal access to financial services, according to the World Bank, about 1.7 billion people worldwide do not have access to financial services.
- Censorship, in countries that suffer from poor governance and corruption, people are sometimes unable to protect their wealth. Intervention comes in the form of governments, central banks, and big corporations.
- Counter-party risk, in financial transactions, such as loan transactions, there is a risk the other party will not meet the payments.

- Lack of transparency, there is room to improve transparency in financial corporations, especially since the financial sector's duty to transparency contributes to the stability of the system. Lack of transparency and access to information was one of the causes of most global economic crises.

Addressing many of the shortcomings of the current financial system, DeFi challenges the old order by offering new possibilities:

- Globally available and transparent.
- Removes the need for reliance on central banks and governments.
- Allows increased access to financial services to those currently excluded from the financial system, due to physical location or resources.
- Does not rely on third-person intermediaries, such as banks and arbitrators, since users interact on peer-to-peer (P2P) networks.
- No company or employees manage it. DeFi runs based on smart contracts deployed on the Blockchain. Designed to be self-executing, they require minimal to no human intervention.
- Some DApps are interoperable with other DApps, much like piecing Lego sets.
- All you need to participate is an internet connection, a device, and a cryptocurrency wallet.

A VIRTUOUS CYCLE

Incentivized The utility of digital ledger technology in new space colonies and in particular on humankind's first step into becoming a multi-planetary species cannot be overestimated. The range of applications that span from basic IoT devices measuring a colony's output to trade interactions across the solar system point to an ample field of applications in which transparent yet immutable accounting between individuals and spacefaring groups will become an indispensable tool of self-organization.