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Plantoid – The Birth of a Blockchain-Based Lifeform

The emergence of a new species

A Plantoid is the plant equivalent of an android; it is a robot or synthetic organism designed to look, act and grow like a plant. There are currently several species of Plantoids in existence around the world.

This particular species of a Plantoid is an autonomous blockchain-based lifeform that is able to reproduce itself. It is a hybrid creature that lives both in the physical world (as a mechanical contraption made up of recycled steel and electronics) and the digital world (as a software deployed on top of a blockchain-based network).

The goal of the Plantoid is to illustrate one of the most revolutionary – and yet still unexplored – aspects of blockchain technology. It illustrates the ability to create 'blockchain-based lifeforms', *i.e.* algorithmic entities that are **(1)** autonomous, **(2)** self-sustainable, and **(3)** capable of reproducing themselves, through a combination of blockchain-based code and human interactions.

These new types of entities are difficult to apprehend for most people. Blockchains are decentralized peer-to-peer networks, like Bitcoin, that enable people from all over the world to interact, coordinate, and transact value with one another in a secure and decentralized way. Software code can be deployed on a blockchain-based network to create programs (*a.k.a* smart contracts) that are run in a distributed manner by all nodes supporting the network. As opposed to traditional software code, run on centralized servers and administered by an online operator, smart contracts can be designed to run autonomously, independently of any central authority or middlemen.

The Plantoid is an attempt at using the artistic medium to illustrate the inner workings of these autonomous systems, so that people can better understand the potential benefits and challenges of this powerful, emergent technology. A Plantoid is composed of two essential components:

- **The body of the Plantoid, *i.e.* its physical form, consists of an electro-mechanical contraption that simulates the appearance of a plant. It is a welded metallic sculpture displayed in a public space; an aesthetic ornament that exhibits its mechanical beauty to whoever it encounters. When it enters into contact with organisms in the physical world – *e.g.* human beings – who might display some form of appreciation towards the Plantoid (usually through the remittance of a small donation), the Plantoid might awaken into a dance of music and lights, animated by a mixture of mechanical greed and gratitude.**

- **The spirit of the Plantoid, *i.e.* its soul, only subsists in the digital world and is represented by an autonomous software agent that lives on a blockchain. This is what constitutes the actual soul of the Plantoid – since the physical body is simply a means to connect its inner logic with creatures in the physical world.**

These two components interact with one other in order to bring the Plantoid to life, and, most importantly, to ensure that it can reproduce itself over time.

Like every other life form, the main function of the Plantoid is to reproduce itself. It does so by enticing the curiosity of people it encounters with its physical beauty, luring them into feeding it with some cryptographic money, in order to awaken it and contribute to its ongoing reproduction process. Contributions are done via the Bitcoin blockchain, by simply sending funds to the Plantoid's Bitcoin wallet.

Once a Plantoid has proven its worth by accumulating a sufficient quantity of bitcoins, it will enter into the reproductive phase, initiating a procedure whereby the Plantoid will look for mates (*i.e.* humans) willing to help it in the process of reproducing itself.

An autonomous being

The fundamental mechanism underpinning the operations and evolution of each Plantoid is a small piece of software (or smart contract) deployed on the Ethereum blockchain. The software is autonomous, in that it is executed in a distributed manner by all nodes participating to support the underlying blockchain network. Also, because of the properties of a blockchain, once deployed, the code cannot be altered or shut down by any single party.

As such, every Plantoid operate as an autonomous entity that does not need to respond to anyone, not even its original creator. Indeed, Plantoids are both independent and self-sufficient. Once they have been created and deployed into the world, they no longer need nor heed their creators. Furthermore, because Plantoids ultimately own themselves, they also cannot be purchased or owned by anyone.

People can, however, interact with a Plantoid, and there is the possibility to engage into contractual relationships with it.

The software underpinning a Plantoid establishes the system of affordances and constraints that come along with each and every Plantoid. It pre-defines the rules by which people can interact with a Plantoid, the amount of funds that a Plantoid needs to reproduce itself, and the criteria that must be met by every descendent of a Plantoid. By sending bitcoins to the Plantoids, people also acquire a series of rights that will enable them to participate in the decision-making process for all issues concerning the reproduction of the Plantoid, and beyond.

The contract that each Plantoid establishes with humans varies, assigning different rights and obligations to each of the Plantoid's funders or producers. For example:

❑ **For the funders, the right to participate in the governance structure of the selected Plantoid – *e.g.* establishing the rules that will dictate the reproduction thereof; shaping the way in which the Plantoid might evolve over time, and stipulating the**

terms and conditions by which anyone willing to look after the Plantoid's descendants will have to comply.

❑ **For the producers, these include the right to be credited as the creators of a particular Plantoid, and the right to a fair (or unfair) remuneration whenever that Plantoid receives enough funds to reproduce itself.**

As such, even though Plantoids do not have any legal personality, because the law does not (yet) recognize them as a legal entity, they are nonetheless capable of interacting with other people and machines that exist in the physical world, by means of simple blockchain transactions. Because all code deployed on a blockchain comes with a guarantee of execution, by engaging with a Plantoid, people are contractually bound to, and cannot deviate from the rules stipulated into the underlying smart contract code.

In this sense, Plantoids operate akin to an organization. Yet, in contrast with traditional firms and organizations, such as limited liability corporations, they are entirely autonomous and do not come with any director or CEO. Plantoids are, ultimately, a physical representation of what we commonly refer to as a Distributed Autonomous Organization (or DAO) – an autonomous blockchain-based system that is administered, only and exclusively, through software logic deployed on a blockchain.

A self-replicating entity

Even if it is completely autonomous, Plantoids cannot reproduce themselves on their own. They require the help of third parties to support them in the reproduction process. Just as organic plants often rely on third parties, like butterfly or bees, to support them in the pollination process, Plantoids rely on the cooperation of human beings, assisting them in the process of instantiating themselves into a new physical form.

The reproduction process of a Plantoid can be distinguished into three different parts:

(1) Capitalization phase

Traditional plants rely on photosynthesis in order to turn light into energy. Plantoids operate instead by turning beauty into digital currency. Hence, while traditionally plants reproduce themselves through the process of pollination, the reproduction of a Plantoid is done through the process of Capitalization. In essence, each Plantoid will seduce people with the aesthetic beauty of their mechanical body and the spirituality of their soul, enticing them into sending bitcoins in order to support their reproduction. As in the case of most human beings, seduction can be done in one or two ways:

❑ **At the physical level, the Plantoid relies on the aesthetics of its physical body to seduce people through a combination of movement, light and sound – just like plants use their colors and sensual smells to attract butterflies and bees to their nectar-filled wombs.**

❑ **At the intellectual level, the Plantoid relies on its underlying software code (*i.e.* the smart contract on the Ethereum blockchain) to provide crypto-economic incentives and governance powers to all people who agree to invest their funds into the (re)production of a new Plantoid.**

Every Plantoid has its own Bitcoin wallet, to which people can send money. Those who enjoy the aesthetic representation or the intellectual properties (governance rights and reproductive logic) of any given Plantoid will submit funds to the Plantoid. Whenever it receives those funds, the Plantoid will evolve and blossom into a more beautiful flower, *e.g.* changing its colors, playing music, and dancing around as a means to gratify the donor for its contribution to the species.

In sending these bitcoins, people provide the Plantoid with the opportunity to fund its own reproduction, while simultaneously acquiring the right to participate into the governance system of the newly created Plantoid.

All bitcoins collected in this way are stored in the Bitcoin wallet of each and every Plantoid. Depending on their form and size, different Plantoids will require different amounts of funds before they can blossom. The Plantoid constantly monitors its Bitcoin balance, and whenever it realizes that a particular threshold has been reached, the Plantoid will be able to use this money to initiate its own reproduction

Overleaf: **Mother and daughter Plantoids dance and glow for visitors to NEW WORLD ORDER exhibition at Furtherfield Gallery, London, May–June 2017.**


and ensure its survival. Heralding the second phase of reproduction to begin…

(2) Mating phase

As a new species, Plantoids need to evolve and figure out how to best survive in any given environment. As such, they each need to identify the right group of people that they want to 'mate' with.

When the time for reproduction is ripe – *i.e.* when a threshold of funds has been reached – a Plantoid will open a call for bids, inviting artists, designers, makers, hackers, welders, and programmers to submit propositions as to how they envision to instantiate the next Plantoid – using all the bitcoins collected thus far as a bounty to attract these propositions.

Propositions can be submitted by anyone and at anytime. Yet, they all have to be congruent with a Plantoid's genetic code. Indeed, the DNA of every Plantoid, that is, all the logic and rules that govern its growth and reproduction, are recorded on the Ethereum blockchain. These may include certain distinctive aesthetic or physical requirements (such as form, size, or materials for the progeny of a particular Plantoid) that will affect the scope of creativity and the room for discretion left to the artists commissioned to produce the next Plantoid. These may also include business logic (such as, for instance, the dividends given to the funders for any of the funds raised by the subsequent Plantoids, the percentage of these funds that will be given to a particular charity or organization, the share that the initial artist gets for every new Plantoid created, *etc.*) and governance rules (voting rights and processes with regard to the selection and evaluation of proposals, which category of stakeholder is entitled to decide of the future location of the Plantoid, *etc.*). Anyone submitting a proposal must comply with these initial requirements, although they remain free to develop their ideas and expand upon them as they best see fit.

Of course, the Plantoid does not come with any ability to judge the artistic merit and intellectual value of these propositions. It thus relies on the help of human beings to advise as to what is the most appropriate and suitable proposal, given the available funds and evolutionary objectives of the Plantoid. Each contributor to the funding of the Plantoid will be asked to participate on the decision-making as to the selected proposal. These people will be able to vote on proposals

submitted, by sending micro-transactions on the Bitcoin blockchain to the public address that uniquely identifies each proposal. And to the extent that different people might have invested a different amount of money in funding the Plantoid, every vote will be weighted by the amount of funds that each party has effectively contributed. The smart contract will then automatically process all of these inputs and establish a winner.

(3) Hiring phase

Once a winning proposal has been identified, the Plantoid will transfer all of its bitcoins to commission and engage the authors of the proposal in the production, or rather the reproduction, of future Plantoids. This task is facilitated by a smart contract on the Ethereum blockchain (the Plantoid's soul) that stipulates the rules and coordinate the activities of the different stakeholders involved in the reproduction process. Whoever has been selected to give birth to subsequent Plantoids will have the possibility to shape its body and to establish the logic of its soul.

An evolutionary algorithm

Given the characteristics of the reproduction process, the evolution of Plantoids follows a Darwinist approach. Different artists in different geographic locations and cultural environments will implement distinct kinds of Plantoids, whose phenotypes will attract different types of donors, either because of their aesthetic beauty (*i.e. their body*) or because of the underlying economic incentives and governance rules underpinning their operations (*i.e. their soul*). Every Plantoid will therefore evolve into multiple branches or species, each with their own characteristics. From a Darwinian perspective, the reproduction of each and every Plantoid is based on an evolutionary algorithm, with multiple Plantoids experimenting with new physical characteristics, but also diverse personalities and governance structures depending on their environment.

Indeed, the ability of a Plantoid to identify the right characteristics – with regard to their physical form (body) or operating logic (soul) – will enable them to seduce more people and will be the key factor to determine which Plantoids are most fit for their environment. The fittest Plantoids will be able to collect more bitcoins and will therefore be able to ensure the long-term sustainability of their species.

Conversely, those Plantoids that did not successfully adapt themselves to their environment, because they failed to incorporate attractive characteristics in their body or soul, will be less appreciated. These will be unable to obtain enough funds to reproduce themselves, and will most likely exist as a single physical instance that might progressively fade away until extinction.

Eventually, as time passes, Plantoids that successfully emerge from the Darwinian struggle for survival will most likely establish themselves as the dominant species in this evolutionary process. They will be able to reproduce themselves the fastest, and slowly, but steadily, colonize our planet.

A self-sustainable system

Each Plantoid is forever and inextricably connected to both its ancestors and its descendants, with whom it can communicate through a shared blockchain-based network. When they collect new bitcoins, Plantoids can store that value and transfer it through the underlying blockchain.

As described above, once a Plantoid has collected enough bitcoins, it becomes responsible for commissioning humans to aid with its reproduction process. But before doing so, the Plantoid must send a small royalty (*e.g.* 1 percent of the value collected by the Plantoid) to the specific ancestor that has brought the Plantoid into life (*i.e.* the parent), as well as to the producers of the Plantoid at hand.

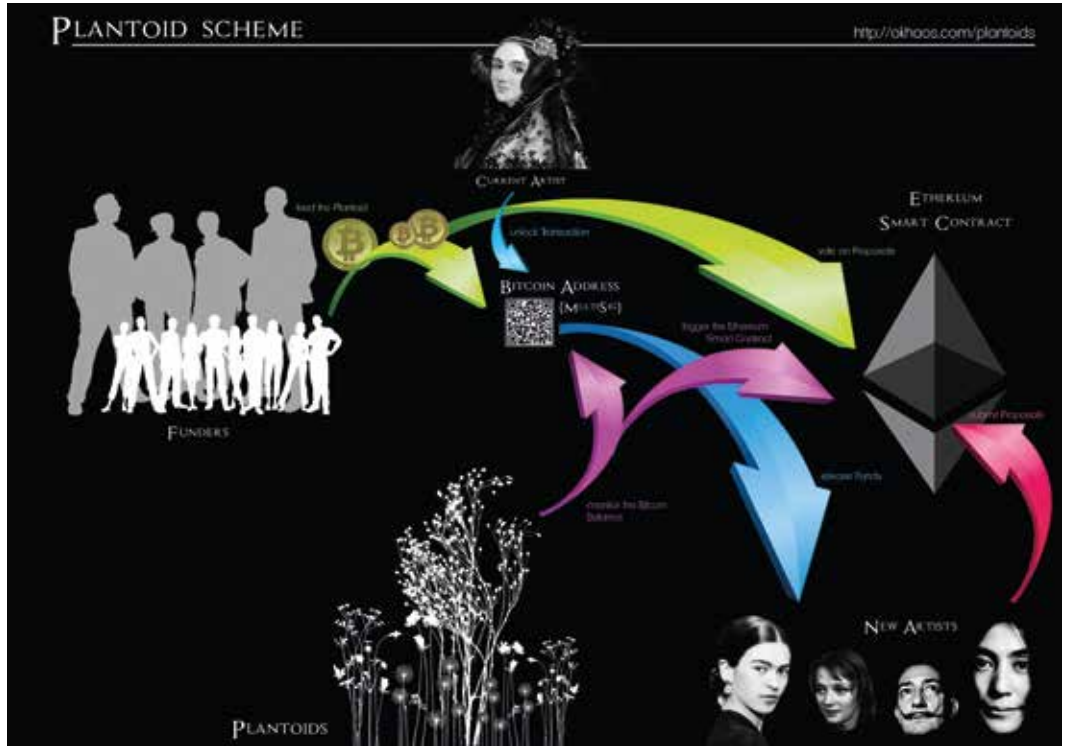
This is not a Ponzi scheme – as is often done in the context of most crypto-currencies – but rather a legitimate pyramid scheme (akin to a multi-level marketing model, where a sales team or person is compensated not only for sales they individually generate, but also for the sales of others they recruit, creating a downline of distributors and a hierarchy of multiple levels of compensation) that is actually beneficial to the system. Indeed, such a model contributes to incentivising the production of Plantoids with the most favorable aesthetics and genetics. The artists commissioned with the (re) production of a Plantoid will not only receive the bitcoins collected by the Plantoid that commissioned them, as an ex-ante (based on forecasts rather than actual results) lump-sum payment, but also a small proportion of the funds collected by all the Plantoids they created, and all the descendants that these Plantoids have generated. These artists thus has an incentive to create the most attractive and appealing Plantoid,

to maximize the visibility of this Plantoid, and encourage the remix or the making of derivatives works, because that will maximize their return on investment, as ex-post (based on actual results rather than forecasts) royalty payments.

Turning copyright on its head

The Plantoid represents the beginning of a new relationship between creators, their work, and the progeny of the work. Indeed, the underlying mechanisms for the financing and reproduction of a Plantoid obviously clash with the traditional conception of copyright law, which is based on the notion of scarcity and exclusivity. Instead of relying on exclusive rights in order to prevent the reproduction and distribution of creative works, with a Plantoid, artists actually have an incentive to maximize the dissemination and encourage the creation of derivative works, because that is what will maximize their return on investment. This model goes, therefore, one step beyond the traditional logic of open-source, in that the art piece actually acquires a life on its own, and is able to evolve independently of the will of the original author.

Most importantly, the Plantoid actually shifts the authorship model around, turning copyright on its head. Instead of funding an artist, with the expectation that this artist will continue to produce new works that we enjoy, it now becomes possible to fund directly the art piece itself, which will be in charge of selecting and hiring the artists that will be responsible for its reproduction.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