Epsilon Theory

Proof of Plant:
A New Vision for Crypto, Part 1

June 23, 2021

"Mining" is a bad word.

I've spent a professional career looking at the ways we humans are hard-wired and socially-trained to respond to words and patterns of words, and "mining" is a particularly evocative word, a word that contains a story arc in and of itself.

It's a negative story.

"Mining" tells a story of extraction and destruction. "Mining" tells a story of aggression against nature, a defilement of nature. What's the first image that pops into your head when you hear the word? I

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bet it's either giant machines digging a gaping, barren hole in the ground, or grimy men (and only men … "mining" is the most male of words) entering a dark cavern of hard labor.

It's always been this way. Some of our oldest human stories are the myths of Descent – as miners have done for millennia – and it's always a journey into the sunless, lifeless realm of the dead. There's wealth (and knowledge) to be mined from the underworld, sure. The gods of the underworld are also the gods of wealth in most mythologies, and there are no secrets among the dead. But the stories of these subterranean worlds are literally stories of hell, and stories of the personified underworld are literally stories of raping a personified Earth.

You may not think that the language of "mining Bitcoin" makes a difference in the adoption and perception of Bitcoin in general and crypto more generally, but you would be wrong. It's part and parcel of the increasingly powerful and popular narrative that Bitcoin is anti-green and anti-environment, that it is at best a "waste" of energy and at worst a direct contributor to "climate change".

I have zero interest in debating the facts or claims of this narrative that Bitcoin is anti-green and anti-environment. Of course it's true. Of course it's false. So what? If you get nothing else out of Epsilon Theory, get this: the strength of a narrative (and of information itself in a meaning-of-the-universe sort of way) has nothing to do with truth. The strength of a narrative is how much it changes someone's mind. And the Bitcoin-is-terrible-for-the-environment narrative is changing a lot of people's minds. I'm sorry, but THAT is truth.

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I'll say this about the energy consumption of Bitcoin, though. In a very fundamental way, money IS a store of energy, or at least a persistent representation (a *token*) of energy. Money, broadly understood, is the primary way in which we store the energy of our human labor and time and life across time and geography, converting something that is entirely nonfungible, like a good idea or an hour's labor, into something that can be saved or traded or divided or combined. That's what money DOES. Bitcoin – or any proof-of-work token – crystallizes this basic property of all money with the intentional consumption of energy in the "mining" of a coin. It's a very in-your-face way of creating a persistent representation of energy and thus value!

But every cryptocurrency, every coin, every token, whether it's based on proof-of-storage or proof-of-stake or proof-of-whatever, is doing the same thing, just in a less in-your-face way than a proof-of-work token. Ditto for a gold or silver coin. It's a representation of a store of energy. Ditto for a dollar bill. Everything we think of as money is a representation of a store of energy, *each wrapped in a different narrative to capture our imagination and allegiance*.

I can't emphasize this point enough. It's at the heart of the entire Epsilon Theory project. Narrative and story are the engine of value for everything in our social worlds, and nowhere does this manifest more powerfully than in the phenomenon of MONEY. There's no there there when it comes to money. It's all narrative. It's only narrative. That's utterly obvious when it comes to crypto, where Elon tweets and Shiba Inu memes create and destroy fortunes, but it's just as true with dollars and euros and yen and renminbi, where the tether between taxes and spending – the most important policy relationship in our social lives – **is now well and truly snipped**.

I believe human society has become completely unmoored when it comes to money, because everyone now gets the joke: it's narratives all the way down.

I also believe there is a path out.

I believe there is an untapped source of narrative, social and physical power that can rejuvenate not only the constructed world of money, but also the real world of making, protecting and teaching**.**

It's a narrative source of power because it taps directly into the most inspirational Old Stories ever told – *stories of growth and life.*

It's a social source of power because it taps directly into the most politically and economically important industry in the world – *agriculture***.**

It's a physical source of power because it taps directly into the dominant store of energy on earth for the past 500 million years – *plants***.**

I want to change the language of crypto from *mining* **to** *growing***.**

I do not mean this in a metaphorical sense.

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I want to propose a *proof-of-plant* method for literally growing cryptocurrency tokens as a representation of the value stored in the human cultivation of plants.

My proposed "proof of work" is the real-world activity of growing a useful plant to help human society rather than the real-world activity of consuming electricity to solve an artificially hard math problem.

I think a narrative based on proof-of-plant can capture a LOT of people's imagination and allegiance.

T**hat's what will create a successful token.**

I think a social movement based on a renewed focus on long-term growth and the cultivation of life can transform our political and economic system from the bottom-up.

That's what will change the world.

For the farmers and the growers of today, what I'm proposing is a freebie. You've already invested all of the capital and all of the time and all of the labor to cultivate a plant. That gets you a token. There's no additional cost or work required. This is a cryptographic system that seeks to reward you for what you've already done! This applies to grasses like wheat and rice. This applies to row crops like soybeans and corn. This applies to greenhouse plants like tomatoes and lettuce. This applies to "non-herbaceous perennials" like apple trees and white pines. It applies to anything humans can grow. Take a picture of the plant you've grown and automatically get a token representing that plant's species, location, variety, and health. Which you can sell. Which can be tranched and bundled into representations of agricultural *practices* and *qualities* with extremely popular associated narratives. Like domestically-grown. Like disease-free. Like carbon-capturing. Like non-monoculture. Like legalized-cannabis. Like good-for-the-immune-system. Like healthy-living-in-general. Like more-sustainable-in-general.

All farmers and growers, including the most massive agribusinesses on the planet, will benefit from this system. That's a feature, not a bug. Farmers and growers who are resisting the dominant monocultures, however, who are engaged in more sustainable agricultural practices and who are capturing the Zeitgeist of green narratives … *they will benefit most of all.*

Why will sustainable, narrative-forward farmers and growers do well in this system? Because narratives drive price. Because these are the stories that will drive number-go-up in these narrative-aligned tokens. Because buying these tokens and related "narrative baskets" of tokens is a *direct*

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support of these farmers and growers. It's not buying some produce that you think/hope is domestically grown and imagining that this trickles down eventually to support the grower. No, it's an *investment* in exactly those growers who you want to support.

It's not charity, either. You can make money with these tokens, in exactly the same way you can make money with any other token. This IS capitalism, in a really interesting form, where your social preferences can be sorted out through an economic transaction AND where a speculation layer of – let's call it what it is – greed can be added on top. Which is a powerful narrative itself, in case you hadn't noticed!

Everyone has an opinion about the environment. Everyone has an opinion about health. Everyone has an opinion about the food we eat and the supply chains that get it from the farm to the table. Proof-of-plant tokens allow ALL of these opinions and preferences to be expressed within an option-like market structure. I think the trading activity and liquidity that will occur when these preferences get sorted will be … awe-inspiring.

If it seems like this proof-of-plant token idea is a weird form of carbon credits, you're not too far off the mark. It IS weird, and it does tap into many of the same narratives and social preferences. But here's the big difference: it's not government-mandated. It's not a regulation. It's not a bureaucratic stick. Don't get me wrong, those government-mandated, regulatory sticks may well be a necessary thing. But they're not MY thing. My thing is to find a bottom-up, entirely voluntary, independent small-l liberal system to sort out preferences and get capital into more productive uses. Imagine that.

That's a lot of pretty-sounding words, and I know that the idea of a crypto token generated by plant cultivation sounds bonkers. Maybe it is. At the very least, I'm sure that I've missed crucial questions that need to be answered, and by the end of this series of notes I'll pretty much just be waving my hands at important implementation issues. All the same, I'm putting this proof-of-plant method out there now in hopes that others will take some degree of inspiration from these ideas and help push them further. I've marked this note liberally with (c) as a placeholder, but the intention here is that this all goes into Creative Commons and similar open source licensing. If anyone wants to advise on how best to accomplish that, I'm all ears. On a related note, I am almost certainly going to misuse cryptographic terms of art in this note. I think my meaning is straightforward, however, and I'd welcome constructive editing suggestions.

To be clear, this is not an effort to "rescue" Bitcoin. This really has nothing to do with Bitcoin, as I'm not trying to accomplish Bitcoin's goals, which I take to be the creation of a fixed supply of censorship-resistant tokens that can serve as a hard monetary system existing outside national fiat currencies. Do I admire those goals and the artistic elegance of Satoshi's cryptographic system to achieve them? Absolutely! Are these my goals? Is this my art? No.

My art – a distributed ledger composed of public cryptographic keys representing the work and energy required to cultivate verifiably unique plantings – is painted/sculpted/constructed out of a completely different medium than Satoshi's art. The biology of plant life and the social practices of human

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agriculture are inextricable features of my art, where they would be intractable bugs in Bitcoin and other crypto projects.

For example, unlike anything you might "mine", plants are … alive. They sprout. They grow. They die. As a result, there is an element of time and decay embedded in this proof-of-plant cryptographic system that would be unnecessary and unwelcome in Satoshi's system. If you're familiar with options markets or credit default swaps, the structure of what I'm proposing will seem intuitive to you. I suspect that if you're familiar with farming or gardening this will seem intuitive, too! But if you're locked into the world of Bitcoin, where the entire game is based on a narrative of the immutability and permanence of a mathematically-defined set of tokens, then this effort will probably seem very foreign (and very wrong).

Or to take another example, plants are bound to the real property where they are grown. Plants are physical and persistent. They ARE the store of energy. Plants are owned and possessed *by law* in a way that math problems or electricity or computing processing flops just aren't. As a result, it is possible (and I believe necessary and just) to recognize property rights *within* this cryptographic system, which in turn requires a degree of centralization and token censorship protocols that would be absolute anathema for Bitcoin. Did you mine a Bitcoin using stolen electricity and computing processing power? Well, it's all yours, and there's no changing that from within the blockchain. On the other hand, did you grow some apple tree tokens using your neighbor's apple orchard? Well, you're in trouble, because your neighbor can see from the public key that the tokens are associated with her land, challenge their legitimacy, and force those tokens to be erased from the apple tree ledger if successful in her challenge. Again, very intuitive as a concept to anyone who works in the real world; not so much if you're immersed in the Wild West of Bitcoin and crypto.

I'm proposing a market-based system and exchange-traded tokens, so I understand why that would put the reader into a Bitcoin frame of mind. But it's a perspective that will steer you wrong, I think. This is a blockchain-not-Bitcoin idea, or better yet a distributed-ledger-not-Bitcoin idea, where I am embracing elements of centralization (i.e. oversight) and censorship (i.e. adjudication and revision), not rejecting them.

What I am proposing is infinitely closer in structure to Wikipedia than it is to Bitcoin.

And yes, an apple tree token.

At an atomic level, the tokens created in a proof-of-plant cryptographic system represent adult specimens of a specific plant species, although as I'll describe later there is room in the methodology to create tokens representing any real asset, including produce (apples rather than apple trees) and by-products (timber rather than trees). But in this general methodology, there would be an apple tree token that is separate from a tomato plant token that is separate from a lettuce token that is separate from a wheat token that is separate from a corn token that is separate from a cannabis token, and each of these species-based tokens would contain additional data on specific plant location, variety, maturity, health … any quality that can be identified through visual imagery. As I'm envisioning this,

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there will be a LOT of separate proof-of-plant tokens that are grown, each with its adherents and narratives. The goal here is to establish a generic set of methods to develop any number of popular narrative expressions associated with the cultivation and growth of living things, and then let a robust and transparent market sort out our preferences and reward the associated growers accordingly.

So here are the methods. Throughout all of this, think "facial recognition software for plants" and you'll have the right intuition for the system.

A secure data collection app that accesses the camera and location/orientation metadata on a smartphone or drone is where the proof-of-plant token creation process begins.

At its core, the app is responsible for *simultaneous generation* of a high-resolution photograph of the target plantings, accurate geographic coordinates for the camera (including elevation), precise camera orientation angle data, and a time stamp. I say simultaneous generation because it's crucial that we marry this data in a trustworthy way … simultaneous so that we're not accepting an old photo or a photo of a different location, generation so that we're not accepting an externally supplied fake photo or fake location. By keeping this simultaneous data generation and capture in-app, *or at least securely verifying simultaneous data generation and capture from other trusted apps*, I think we can prevent the vast majority of obvious attack or spoof vectors against the system. I totally get that developing an app like this is a non-trivial task! But it's not an impossible one, either.

This data file (photograph + camera metadata) is then analyzed by an identification program for species confirmation/counting and spatial normalization/mapping.

This is the core "facial recognition software for plants" function, and it's both easier and more difficult than most applications of human facial recognition software. The easier part is that we're not trying to identify a unique entity. We're not trying to identify John Smith in a crowd of other humans, we're just trying to distinguish a crowd of humans from a crowd of cats, and then count the number of humans in that crowd. The harder part is that our camera is not in some set location at a set altitude and set orientation, like a security camera at a train station, and so our system has to handle a much wider range of image inputs. In general, though, I think there will be two basic types of photographs to process: imagery of plants that can be counted by identifying individual stalks/trunks or canopies/foliage, like apple trees or tomato plants, and imagery of plants that are best estimated in the aggregate across a planted surface area, like soybeans or wheat. The former can be counted individually, with tokens assigned for each apple tree or tomato plant. The latter are better counted by surface area, with tokens assigned for each acre or hectare of cultivated soybeans or wheat.

Each of these two species identification and counting processes (let's call them orchards vs. crops for short) has its own idiosyncratic issues, none of which are trivial to solve. But the advances that have been made in AI and ML applications just over the past few years *for exactly this sort of entity recognition/identification problem* (how many tomato plant central stalks are in this picture? is this an aerial shot of healthy wheat or wheat infected with leaf rust?) give me a lot of confidence that it's not only possible to count and distinguish between apple trees and soybeans, but to count and

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distinguish between young apple trees and old apple trees, or between healthy apple trees and blighted apple trees. In other words, I think that the obvious "facial recognition" aspects of this process as they apply to plants are not only achievable, but robust enough to allow pretty specific differentiation on a wide range of *qualities* of plant species, whether that's variety, age, health, yield productivity, or whatever.

What's more challenging, I suspect, is normalizing these images for spatial dimensions, spatial location and perspective. In all cases, whether we're counting individual stalks or estimating a count based on crop coverage, it's necessary to measure the planted surface area we want to evaluate. That's easiest to imagine with an overhead drone shot looking straight down, but you can do this with any photograph by taking camera orientation data and known information about the plants themselves (leaf size, etc), and "flattening" the photo on two surface area dimensions. Here, too, the AI and ML advances for doing this sort of mapping (largely driven by autonomous vehicle research) over the past few years have been enormous.

Basically we're overlaying a zillion photographs from every imaginable perspective onto a map of arable land and greenhouse facilities to create a spatial database of (potentially) every plant cultivation on Earth, at a resolution level that allows the identification of individual plants.

LOL. It's a gigantic database, the biggest that humans have ever created if it reaches full fruition (sorry, couldn't resist the pun). That said, it's not that complicated. It's just big. The spatial normalization of these images to overlay them on a map is basic math, if you've got sufficiently accurate camera orientation and altitude metadata (I realize that this is an important 'if'). As with the data collection app, there's nothing easy about developing this plant identification/counting + spatial normalization function. But I don't think it's that difficult, either. It's a big database. But it's only a big database.

Like I said earlier, I have no doubt that I've left out important steps in this whole process and used terms of art weirdly or mistakenly. I think that I've figured out solutions to a lot of edge cases (what if you put a greenhouse on a truck and moved it forward 100 yards and took new pictures? what if you flew your drone over your neighbor's almond orchard?), but I'm sure there are hundreds more I haven't considered. Still, I think there's enough here to give people who are more technically adept than me a blueprint for how to get this off the ground.

How much will this cost to set up? A lot. But we don't have to boil the ocean. It can start in places where it's clearer to grasp (counting apple trees, for example) and where the tokens have a long duration (again, apple trees). The start-up capital here will come from clear-eyed, full-hearted people and allied foundations and endowments. Big Ag will put some money into this, and I'd take it. So will Wall Street once they get a whiff of the speculation layer that's possible to place on these tokens, and

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I'd take that money, too. Ultimately this project completely destabilizes Big Ag and Wall Street in a way that Bitcoin never will, but that won't be obvious for a long time. So yeah, take whatever amount of money it took to set up Wikipedia, quadruple that, and that's probably your number. It's a big number. But it's only a big number.

What's the timetable for this? Well, it's possible that when all is said and done we will have built the largest spatial database in human history. It's possible that we will transform the concept of money, create a general system for the decentralized securitization of any real asset, and disintermediate pretty much every major financial institution on the planet. It's possible that we will reconnect our abstracted lives to the real world and its bounty. Surely we will need a few years to consult with appropriate corporate and regulatory stakeholders so that the process can be appropriately managed.

LOL. Don't call me Shirley.

What's the timetable for this? How about now.

The best time to plant a tree was twenty years ago.

The second best time is now.

That's an old saying that I first came across in *The Overstory*, by Richard Powers, an inspiring work that you should read, too. Yes, it's about trees, but only in the same way that *Moby Dick* is about whales.

It's time to focus on long-term growth and the cultivation of life in every aspect of our world.

It's time to be a steward, not a manager. It's time to be a grower, not a miner.

It's time.

Tick-tock.

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