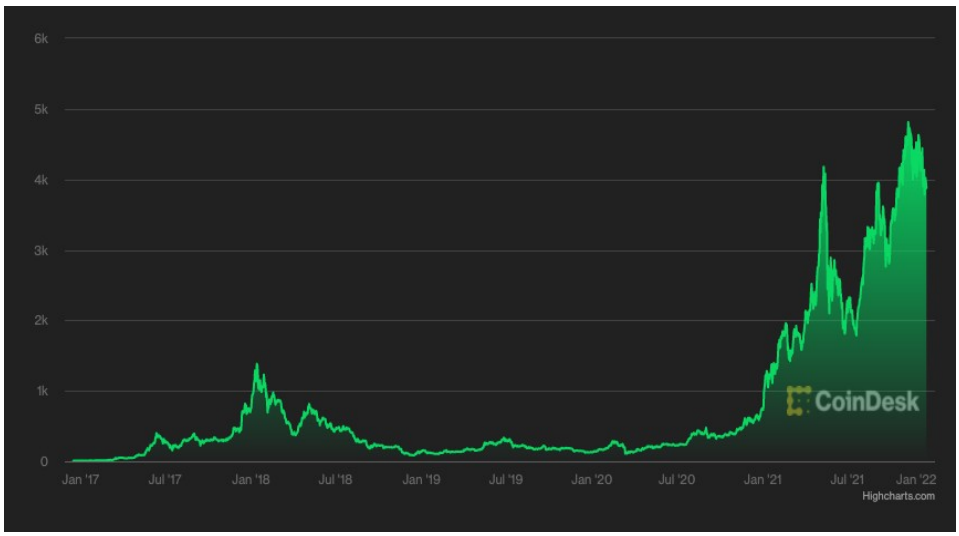
NFT Problems
by Paul Slocum (rev 0.930)

At the beginning of last year, the general public's association with cryptocurrency was with things like the Silk Road drug market, ransomware attacks, sketchy investments, computer nerds playing with fake money. That started to change last February when Elon Musk announced his investment of $1.5b in Bitcoin. To some this still just seemed like video game money, but then the following month the record breaking $69m Beeple sale at Christie's became worldwide news, and since then a large swath of the art world has engaged with NFTs and crypto from artists to galleries to publications to museums, giving cryptocurrency legitimacy and a sense of cultural sophistication. Crypto traders who were previously speculating on the thousands of available crypto coins could now switch to NFTs and designate themselves curators and collectors. There's a significant amount of money and power involved, so I wanted to take a closer look at some of the potential problems with this technology that the art world and others are backing.



Value of Ethereum over the last 5 years

Cryptocurrencies and blockchain technology are at the core of all these related concepts like NFTs, web3, and DAOs. Both the art world and the software world have divided opinions about crypto, but most people agree that blockchain technology is very effective for marketing. Blockchain explanations read like science fiction actualized, and it's compelling and understandable on a high level even without a lot of technical knowledge, conveying a sense of intricate unbreakable security, redundancy, and community action.

However while the claims about blockchain technology itself are generally true, the actual marketing and claims by its proponents often conflate different contexts so that it's no longer quite accurate. And once a person has taken the time to try to understand the blockchain, cryptocurrency, NFTs, and who Beeple is, it's so much information overload that it's easy to miss some potential technical problems and political implications hidden within. Some of the marketing is quite aggressive too, like how "web3" is falsely conveying the idea that it arrived from some consensus in the software industry when it's primarily just a marketing term from the crypto industry.

In this essay, I break down various claims and practical functions of crypto and NFTs, and I examine some of the issues that NFT skeptics are concerned about.

Art Authentication and Decentralization

Suppose somebody downloads an artist's work off their website and sells forgery NFTs. Then later, the artist makes and sells legitimate versions of those NFTs. Using only the blockchain, how do you know which one is authentic? The blockchain in fact cannot know whether any NFT is a forgery or not without referring to some outside trusted service that has authenticated the artist and artworks. This is often referred to as the oracle problem. Artwork is plagiarized and sold as NFTs all the time, and authenticity disputes have arisen over Cryptopunks and over the original NFT created at Rhizome 7x7 in 2014, for which Kevin McCoy is now being sued. Because of these kinds of failures at the indisputable provenance that NFTs were supposed to provide, artists are starting to realize the need for centralized services that properly and consistently validate artists and artworks, and that these services are not just conveniences but integral components of the system. Additionally, without a separate centralized authentication layer on top of the blockchain, there's no mechanism to to solve problems like invalidating NFTs in the case of hacked artist accounts, or officially designating reissued NFTs in the case of theft or faulty minting. And as you add the centralized authentication layer on top that's arguably doing a lot of the heavy lifting, then the blockchain's decentralized part of the solution starts to become less significant, and it brings into question whether one could do art authentication in more simple and robust way without involving the additional complexity and problems of the blockchain at all.

Some would suggest that it might be possible to achieve fully decentralized art authentication with some kind of code-driven organization that uses voting systems to authenticate art. But what about when 4chan hacks the system, or when they brigade the voting to get their counterfeit accounts declared legitimate? Once a decentralized organization works out all these problems and integrates the requisite specialized human expertise, it's likely to arrive at the same structure you'd expect of a normal centralized art authentication service. Not everything is solved efficiently by software and public voting, as anyone who has used moderation bots can attest.

The Sale of Digital Art

It's a common misconception that NFTs solve some technical or legal problem making it possible to sell digital art, but it's really intellectual property law that allows selling art editions with certificates. In addition to artists like Cory Arcangel, Petra Cortright, and JODI who have sold digital editions with traditional certificates for many years, Rafaël Rozendaal and Miltos Manetas have been selling digital art on websites using ICANN's domain name system as an art registry since the early 2000s. And like NFTs, many of those artist's editions are available to view online and do not depend on artificial scarcity.

But NFTs also introduce a new problem, which is that everything is public record and some of the most dedicated and thoughtful art collectors are very private. Even if a collector only uses an alias, in many cases it would be easy to eventually figure out who they are by examining ownership records. To truly hide a collector's identity, it would be necessary to have different wallets tied to different NFTs, which is cumbersome and would once again create the need for centralized structures outside the blockchain.

It's also worth noting that NFTs are not required to sell art with a resale royalties contract. However, as an aside, I've been selling digital and physical art for 15 years, and I'm only aware of one artwork that's actually changed hands, which would have resulted in a relatively small payout for that one artist had I implemented those type of contracts. You can really only make resale money in the near term if work is flipped frequently, which is not easily achievable or generally desirable since the artwork is likely to end up in a random collection of speculative assets. And even in the long term it's often only artists who are already successful that truly benefit from resale royalties because they're the only ones who have

significant second market sales and high enough prices for royalties to make a difference. I'm not against resale royalties, but I think they're overstated as a reliable solution to support artists.

Storage and Digital Art Conservation

It's another common misconception that the blockchain is able to store an artwork's media files in addition to the ownership registry, but this is not practical because it's extremely cost prohibitive to store data on the blockchain unless the data is extremely small. Most NFTs only contain a link to the artwork media, which is stored elsewhere. There are some artists who make artworks with a tiny amount of source data stored directly on the blockchain, but on-chain storage is not feasible for the vast majority of digital artworks. NFT media links typically either point to traditional web hosts, or they use the decentralized IPFS network that has similarities to BitTorrent's file distribution system. However a disadvantage of traditional web storage is that there's no established way to fully validate the NFT's hosted data (what if a domain expires and is purchased by someone else?). IPFS references files by hash, which does make it possible to validate the file's contents using the NFT data, but methods to issue updates for artwork data using IPFS or on-chain data are not widely supported, and many digital artworks need to be updated over time to support new browsers and displays. Then again, for any serious professional art registry, the data should also be backed up on other platforms and offline, so neither IPFS nor traditional web hosting are a complete solution by themselves.

Another problem for conservation is the blockchain itself. The time scale of art ownership and digital conservation is long, and it's uncertain that any particular blockchain is going to still be operational in a few decades. Blockchain data will probably be migrated and archived somehow, but it's unpredictable if there will still be a running blockchain that's accessible as before with the same software. At best, the blockchain certificate will require ongoing maintenance to maintain access and functionality. Part of the reason blockchains may need to be preserved or emulated is for cases where the artwork interacts with the blockchain data. But more importantly, since the data on the blockchain is legally tied to ownership of the edition, the unknown lifespan of a blockchain introduces some complicated questions about how the work may be sold far in the future and how blockchain preservation functions in a legal sense.

As absurd as it may sound in the NFT age, I still believe the best solution is archival paper certificates with a central database, because a good paper certificate can last over a century. And unlike Bored Apes Yacht Club theft victims who have no recouse to recover stolen work, I can simply invalidate the old certificate in my database and mail the collector a new one whenever a paper certificate is lost or stolen. If the certificate eventually disintegrates, then it can be replaced with digital documentation or some other placeholder. I've also considered using thin, engraved steel plates for longevity.

For many experienced digital art collectors who are buying for the long haul, a rapid digital art trading system just isn't that important, and none of the digital art collectors I personally know have interest in NFTs. I plan to eventually pass off my database to an archive or to an organization who can maintain it long-term. But if that doesn't happen and I die, then all the collectors will still have the original maintenance-free physical certificates, records of purchase, and correspondence to prove ownership the old *Antiques Roadshow* way. If somebody someday brings a broken, decades-old laptop to *Antiques Roadshow* that's known to contain the key to a valuable NFT, there's actually some chance that an old photograph of the owner with their NFT and a copy of the current newspaper would be more useful for verification than the computer.

Compatibility with Museum Collections

Buying a movie on DVD doesn't mean you can publicly screen it, because copyright law reserves the right to public performance for the copyright holder. This is enforced strictly by the film and music industries. Consequently, digital artwork certificates should give explicit permission for public exhibition in order to be fully legally compatible with museum collections, because otherwise the museum might end up unable to exhibit a purchased work until copyright expires if the artist happens to be pedantic about copyright laws or just wants to prevent the work from being shown.

United States copyright law includes an exception to public display limitations if somebody actually owns a painting or sculpture. But that doesn't automatically apply to digital media, which makes sense, because it's especially useful for a digital artist to be able to choose whether they are selling editions that are only for private use or editions for public use. There might be some way a museum could win in a lawsuit about publicly displayed digital work if it comes to that, but the museum would be up against the long case history of the film industry enforcing public performance restrictions, so it's ideal to avoid that risk in the first place.

It's also typical for art certificates to include the rights to use images of the work for promotion of exhibitions and the right to loan the work, and ideally NFT certificates should account for the obsolescence of the blockchain by specifying some way that ownership can be conferred if the blockchain no longer exists.

These potential incompatibilities with museum and long-term collections can be probably fixed by improving NFT certificates, and some platforms like Feral File and 1st Dibs already get it right, but many others do not. The recent Andy Warhol NFTs sold by Christie's specifically say that they are only for "personal" display, making them incompatible with museums. There are some generative digital collectible NFT projects like Bored Ape Yacht Club that almost confer full copyright, but that's a special situation made possible by the project's generative nature where each owner effectively has a diluted copyright that only covers a minor variation on a theme, and the project creators can still retain trademarks and copyright of some variations for themselves. But most artists are understandably not going to want to relinquish full rights of their singular artworks because their work could then be used to market questionable products, or the owner could even stop the artist from using images of their own work.

It also is worth mentioning that this all becomes moot once copyright expires, which is typically around 100 years in the United States. A museum could probably legally archive the available torrent that somebody made of "every NFT", store it until the copyright expires, and then exhibit the work freely after that. It would be interesting to peek into the future and see how the expiration of copyright affects the value of NFTs and other digital editions.

Artist Financial Support

A positive for many digital artists is that they're making significantly more money selling their digital work as NFTs than they did selling in the traditional art market. However the NFT market tends to amplify digital artists with large social media followings who were already commercially successful, or those who make work that fits well into crypto's narrow view of digital art, which leaves a lot of other digital art by the wayside. In Artnet's recent debut "NFT" auction that included historic digital artists like JODI, Vuk Ćosić, and Claudia Hart, only about a third of the work sold. JODI's print at $800 (0.2 ETH) went without any bids, Ćosić's NFT print sold for $1000 (0.25 ETH), and Claudia Hart's NFT went unsold

at $15,200 (3.8 ETH), and yet Kevin and Jennifer McCoy's NFT sold for $160,000 (40 ETH). Not that the McCoys don't deserve success, but Kevin's status as the co-creator of one of the first NFTs obviously is playing into this conspicuous price disparity, and throughout this Artnet auction and the NFT marketplace in general, I frequently see signs that the NFT art market values a strong connection to crypto and NFT culture far above any deeper insight or connection to digital art history. It also should be noted that JODI was not involved with this auction.

Additionally, a recent study showed that only the top 1% of NFT sales are bid above $1000, and artists in the lower 34% of sales may actually be losing money on NFT sales because of fees. This suggests that NFTs are reinforcing or even amplifying the same kinds of disparity in the traditional art market. Among digital artists whose sales I follow, NFTs have worsened the revenue gap by a couple orders of magnitude between commercially successful digital artists and those who are "succesful" in terms of press and museum exhibitions but barely able to sell work. While some artists are able to gain significant financial support from NFTs without compromising their art practice, the system still leaves a lot of questions about equity, sustainability, and about where the money ultimately came from if the bubble collapses.

Security

The blockchain database security system that drives cryptocurrencies and NFTs is generally secure; however a significant problem is that the way blockchain security is marketed and deployed creates a sense of overconfidence with developers and users. Last year, there were billions stolen and nearly two crypto thefts per month each totaling over $10m each. Developers and users who are relatively inexperienced with security rely too much on the blockchain without realizing that there are many layers and facets of security of which the core database is only a small part.

Multiple people have been tortured in their homes by criminals to get their cryptocurrency. Previously there generally wasn't a good method for somebody to force a wealthy person to instantly transfer millions of dollars internationally in a way that's almost impossible to trace or reverse, but that is now possible with crypto coin shuffling services and other obfuscation techniques. Once crypto gets its act together in terms of security and consumer protection, those frictionless payments won't be quite as frictionless anymore, and the blockchain will only be a relatively small part of the entire security system.

The Environment

I think the severity of the energy usage problem is debatable and complex, and it varies between blockchains. But something concerning about the larger crypto community is that I see evidence there's not much concern for the environment in general. Improvements in energy usage could be made, but progress seems to be overpowered by financial interests or convenience. You can see this in the slow move from power consuming proof-of-work blockchains to more efficient proof-of-stake blockchains.

I've also seen this pattern elsewhere, like how proof-of-work NFT marketplaces could have saved a massive amount of energy and artists' money just by allowing works to be listed for sale without minting it on the blockchain ("lazy minting"). Implementation is relatively straightforward and simple, and there's no reason lazy minting couldn't have been offered since the beginning. I see people requesting this feature from NFT platforms on social media, but they don't typically get a response. As a result, many artists now unnecessarily have a significant amount of money tied up in crypto that they are not likely to get back, and I find forum posts by artists who are desperate to figure out how to sell and recoup their costs.

Financial Deregulation

Video games and banks have been accomplishing the same kinds of digital transactions for decades without using blockchain technology. Game economies had enough real world value that World of Warcraft gold mining farm operations appeared in China the mid-2000s.

Compared to traditional databases, what's unique to blockchain technology is that it doesn't require a central authority. The mechanism that makes this possible is fascinating. But more than a decade later crypto is still rarely used like actual currency, and many claims about the advantages of blockchains over traditional databases are vague or unfounded. However, the blockchain's one huge undeniable effect is that it creates a liquid asset class that can evade regulation by the Securities and Exchange Commission and other regulating entities, because it's a new type of distributed, autonomous, international machine with no central authority or admin password.

The SEC and FDIC were created in response to the crash of 1929 to avoid market manipulation, speculation, fraud, and other issues that led to events like the Great Depression. They try but do not always succeed at preventing disasters like Enron, the 2008 financial crisis, and Bernie Madoff. One of the most significant accomplishments of the Occupy movement was their 325 page letter to the FDIC containing recommendations of stricter banking regulations, which was cited dozens of times in the actual FDIC ruling for the Volcker Rule that was intended to prevent banks from making speculative investments.

Cryptocurrencies generally have the opposite effect, creating a financial market that's much more difficult for the SEC and other agencies to regulate. Even if you're a Libertarian and a fully deregulated "buyer beware" financial market fits your politics, cryptocurrency still has problems for many usages since it doesn't fit the politics of other countries like China, where crypto is banned. Nine countries have now fully outlawed crypto, which accounts for more than 25% of worldwide internet users combined. This means that web3 and NFTs are mostly off the table in those locations, or at least severely limited and unpredictable. Additionally, 42 other countries have enacted crippling regulations on cryptocurrencies.

Recent regulations on NFTs in China prohibit storing NFTs on a public blockchain, exchanging NFTs for cryptocurrency, or selling NFTs for profit, which is not compatible with the concept of a professional global art ownership registry if strictly enforced. It seems unlikely that China will loosen up the NFT market, considering that they've strictly banned cryptocurrencies, and any lightening of NFT regulations would allow collections of NFTs to be used as makeshift cryptocurrencies since they are almost functionally identical from the perspective of speculators. Some smaller companies in the Chinese NFT art industry were using Ethereum before the crypto ban, and some in the Chinese crypto industry are hopeful that regulations will be lifted; but analysts are skeptical that regulators will allow this to continue. Doing without China and other countries in the crypto space may be acceptable in the context of hyper-competitive business, but it's at odds with some of the idealistic notions being marketed around NFTs, web3, and DAOs. A professional universal art registry that can't reliably include artists or collectors in China, Egypt, Iran, and other countries is a problem.

This new unregulated market of cryptocurrencies makes possible things like frictionless worldwide transfers (except China, etc.), 1-minute loans, and anonymous creation of businesses, with the trade-off of high average energy usage per transaction and a market with more fraud, pump and dump schemes, and evasion of gambling laws. But is crypto trading really gambling and some kind of Ponzi-like scheme or fraud? Can it be both? Cryptocurrency as a whole functions similarly to a Ponzi or pump-and-dump scheme where recruiting more people into the system and building hype makes it seem like everyone's

making money without creating real value. Many reputable computer scientists think that public blockchain technology is not actually that useful. And there are strong indications that if major players cashed out, it would cause a crash and cash-out rush where only a relatively small percentage of investors would actually get compensated, leaving a lot of people holding an empty bag. Stablecoins like Tether whose value are tied to the US dollar account for more than 70% of Bitcoin transactions, and it was originally claimed that Tethers were backed by actual US dollars. However a CFTC investigation forced them to reveal that the majority is backed by what are essentially corporate IOUs for which they refuse to release any details, and 26% isn't backed at all. Additionally, unlike with banks which are insured, a crypto exchange bankruptcy will likely consider you as a secondary creditor where you may not get money back for years, if at all. There are also structural weaknesses, like how Bitcoin miners can no longer cash out without crashing the market and are now using Bitcoin as collateral for loans to pay energy bills, creating a potential house-of-cards situation if Bitcoin falls below a certain price. This precarious and volatile system is now being marketed to everyday people through celebrities, public transit ads, and sports ads, and 64% of those investing in crypto last year used credit to do so. When a system like this crashes, it's not likely to be the casual investors who come out on top, and many crypto skeptics argue that this risk is one of the primary reasons to completely avoid participation in a system like this.

Keep in mind that traditional art collecting frowns upon "flipping" artworks (selling after a short time of ownership) because ideally you want artworks to go to collectors who will live with work, who will support artists in the long term, and who are building serious collections that may someday end up in a museums or archives. However with NFTs, flipping is not only acceptable, but the frequency and prevalence of flipping in the NFT world is on a completely different level. And when you reduce friction, time-compress, and raise the stakes on art trading to where it will inevitably have the same dopamine responses as something like sports betting, then it's not really the same game anymore. Gary Gensler, the chairman of the SEC, agrees and has compared crypto schemes to unlicensed gambling: “We’ve got a lot of casinos here in the Wild West”

Crypto's unregulated, borderless market also makes it conducive to crime. Crime in crypto is sometimes dismissed as a non-issue, but this is partly because the crypto industry has been providing somewhat misleading crime information, and I'm not the only person who noticed this. Many reports and articles about crime are taking data from the same few companies in the crypto industry. Frequently cited is Chainalysis, but looking at their actual report, the methods are primitive and they state that the given crime rate should be considered a "lower bounds" because it's only based on crime they can identify with no real holistic analysis. A deeper academic crypto crime study from 2017 estimated total annual crime-related transactions at $76b, while Chainalysis reported only $8b that year. A thorough analysis of cryptocurrency crime is beyond the scope of this essay, but crime statistics and information from the crypto industry should be taken with a grain of salt. Ultimately, probably few artists or institutions have any cause-effect relationship with crime in the crypto world, but I think it's important to understand the full landscape and potential problems. It's plausible that the art world's high profile involvement in crypto and NFTs could attract hackers and theft.

The degree to which all these risks in crypto will lead to wider problems or economic disasters like 2008 depend on how big crypto gets and how well it can be regulated, but it's already huge and is naturally resistant to regulation. The crypto system is also conducive to inventing new ways to evade the SEC and other regulators and to potentially keep them on a treadmill of regulations. The power of regulators may come down to legal battles over jurisdiction or coin-shuffling services, which could be left up to the unpredictable Supreme Court to decide. Even if the crypto industry can be fully regulated, political-bartering power may need to be spent to get it there, like deregulating the traditional financial markets in exchange for more regulation of crypto. And recently the conservative divide within crypto has become

more pronounced, with involvement and promotion by Donald Trump, Ted Cruz, Ron DeSantis, Greg Abbott, Tucker Carlson, and Jordan Peterson.

Art's Relationship to Crypto

The crypto industry is ridiculously complex, and it's not easy for an artist, curator, or institution to determine their true relationship within it and what effect that has. I don't engage with NFTs, but I didn't write this essay to call out people who have; I just wanted to share additional perspectives.

I see that artists and people in the art world are genuinely concerned about the energy usage issues and the hyper-commercialization of the NFT market, and many were initially wary of a market going from nothing to astounding prices and popularity overnight. But then people understandably came away with differing opinions about the energy usage depending on which sources they read, and that became a divisive issue which may have obscured some of the deeper problems with crypto and NFTs. A lot of the strongest and most vocal criticisms of crypto products are coming from the software developer community and economists, and I've noticed that this wider criticism has been somewhat isolated from the art community. I often see the claim that crypto skepticism is similar to concerns about the early internet, but I was a professional developer in the 90s, and what I saw was that the utility and game-changing potential of the internet were plainly obvious to all engineers in the industry. Nobody was saying we should just stick to Bulletin Board Systems even though the typical BBS was slightly more capable than early websites. The widespread backlash by actual software developers to a new technology like crypto and NFTs is unlike anything I've ever seen in the software industry.

It's worth noting that before NFTs, many digital artists were originally drawn to digital art specifically because it was free from the commercialization of the art world, and a good number of those artists will probably never engage with NFTs, even if blockchain authentication continues to be popular. Additionally, a large portion of digital art just doesn't fit well into the NFT market or format, and I've already noticed how the proliferation of NFTs is starting to narrow the vision of what people even consider digital art to be. I hope curators and writers will continue to remind people that the artwork people currently associate with "NFTs" is only one of a multitude of interesting forms of digital and technological art.

Further Reading

Geraldine Juarez on NFT Ghosts:
https://the-crypto-syllabus.com/geraldine-juarez-on-nfts-ghosts/

Joanie Lemercier on the problems with Nifty Gateway:
https://joanielemercier.com/null-and-void/

Moxie on the problems with web3:
https://moxie.org/2022/01/07/web3-first-impressions.html

Slate article about Stablecoin risks:
https://slate.com/technology/2021/10/tether-crypto-danger-ben-mckenzie.html

Molly White on considering the harm of technology:
https://blog.mollywhite.net/abuse-and-harassment-on-the-blockchain/

Molly White on how it's not still the "early days" of web3:
https://blog.mollywhite.net/its-not-still-the-early-days/

Robert Reich on crypto, congress, and lobbying efforts:
https://robertreich.substack.com/p/crypto

Kimberly Parker on how very few artists are making money off NFTs:
https://thatkimparker.medium.com/most-artists-are-not-making-money-off-nfts-and-here-are-some-graphs-to-prove-it-c65718d4a1b8

Joshua Caleb Weibley on some of NFT's legal issues and relationships to art history:
https://www.x-traonline.org/online/a-non-fungible-treatise

Brad Troemel's NFT Report on various issues with NFTs (video):
https://www.youtube.com/watch?v=PXBxVFsHBJQ

Dan Olson deep dive on the problems with NFTs and crypto (video):
https://www.youtube.com/watch?v=YQ_xWvX1n9g

Matrin Petrov and problems with DAOs:
https://world.hey.com/marin/daos-and-the-nature-of-human-collaboration-be162918

Martin O'Leary on the case against crypto:
https://www.watershed.co.uk/studio/news/2021/12/03/case-against-crypto

Tante on the problems with web3:
https://tante.cc/2021/12/17/the-third-web/

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David Gerard on how Bitcoin miners can no longer cash out without crashing the price:
https://davidgerard.co.uk/blockchain/2022/01/22/bitcoin-goes-down-and-time-bombs-are-waiting-in-the-market/

Reuters article on the problematic history of Tezos:
https://www.reuters.com/investigates/special-report/bitcoin-funding-tezos/

Tomer Strolight on the problematic history of Ethereum:
https://tomerstrolight.medium.com/the-problem-with-ethereum-af9692f4af95