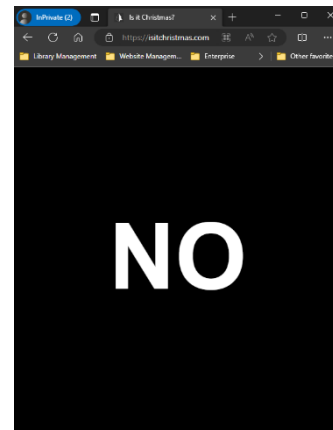


## WHAT IS WEB 3.0

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In the announcement trailer for Meta's (formerly Facebook) foray into the Metaverse, Mark Zuckerberg described the evolution of the internet as going from being able to post text to being able to post images to being able to post videos. If you do a search online you'll likely find most people defining the next phase of the internet as blockchain with one hand while trying to sell you Bitcoin, Ether, or some other cryptocurrency with the other. I believe that defining the evolution in anything by specific products is usually done insincerely, as there is no better sales pitch than convincing someone that you're selling the future. Trends are difficult to identify as they are happening, and tend to be subtler in nature. I believe that the evolution of the web is better articulated by the relationship between the internet and the end user rather than any one product.

Web 1.0 is best described as a one-way relationship between the internet and the end user. A Web 1.0 website presents information to the end user, and the end user does not contribute any information of their own. It is read only. My personal favorite example of a Web 1.0 website is <https://isitchristmas.com/>, which will display either a YES or NO depending on the date. The end user plays no role other than observing the information. Web 2.0 is best described as a two-way relationship between the end user and the website, where an end user is not in full control of the information on a website, but able to contribute information of their own. Facebook is a great example of a Web 2.0 website.



**<https://isitchristmas.com/>**

Both Web 1.0 and Web 2.0 have a demarcation with the internet and end user separated and communicating via the computer. Web 3.0 is still taking shape, but I think it is accurate to say that Web 3.0 aims to eliminate that separation by integrating the internet in so much of our everyday lives that the two become one in the same. An internet that is not confined to the computer. The paradigm shifts of Web 1.0 and Web 2.0 would pale in comparison to Web 3.0 if it becomes a reality. Web 3.0 has great promise, but can also be of great consequence if not developed carefully. There is a great risk for the allure of progress to obfuscate inefficient, abusive, and/or exploitative systems.

This lesson will introduce a few frontiers of Web 3.0 with the objective of assisting you in making an informed decision as to if you want to engage with what is being presented as Web 3.0, or if it has even been achieved yet.

## THE METAVERSE

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In 1992 science fiction author Neil Stephenson published *Snow Crash*, a novel depicting a digital landscape called "The Metaverse." The Metaverse is an immersive 3D environment that users explore via personal character models called "avatars." Avatars are piloted with a computer that projects the Metaverse into a user's eyes, allowing for an immersive virtual reality experience. Avatars can be anything from a realistic depiction of a user to simple black and white geometric facsimile of a human. The Metaverse is governed by rules and programming, for instance, Avatars do not spawn into the

Metaverse fully clothed, so the need for personal and private spawn points creates a thriving digital real estate market. A user can spawn into the Metaverse and walk their avatar over to the local pub, enjoy a digital brew and then engage in a sword fight against an avatar dressed like a pirate on the way back. Personally, I think this is a pastiche of how technology could evolve if it were guided only by how cool it could be. The main character named himself “Hiro Protagonist” and delivers pizzas for the mafia, calling himself “the Deliverator.” He carries a set of samurai swords everywhere he goes, both in and out of the Metaverse... I think that says everything right there, however, *Snow Crash* captured the imaginations of many figures who would prove influential on the digital landscape, including Mark Zuckerberg who renamed his company after Neil Stephenson’s work.

Effectively *Snow Crash*’s Metaverse is the internet rendered in an immersive 3D environment. Realizing the Metaverse has been attempted several times in the past, perhaps most notably with *Second Life*, released in 2003. In *Second Life* players create an avatar and navigate to different user generated locations, most of which were modeled after, or analogous to, real world locations, like malls, parks, schools, and libraries. You could navigate your avatar to a theatre in *Second Life*, meet with your friends and watch a movie together, or attend class in a digital class room, or ask about a book in a digital library with an avatar piloted by a real librarian.



***A presentation delivered in Second Life***

*Second Life* still has a loyal following to this day, but failed to be the catalyst of a Web 3.0 paradigm shift for a few reasons. First, it can’t be considered Web 3.0 because the separation between man and machine is still very clear and present to the end user. You interact with *Second Life* as you would any other computer game, observing a screen while using a mouse and keyboard. A Metaverse must be a VR experience as the only alternative for the level of immersion Web 3.0 demands is a physical digital landscape, which for all intents and purposes is impossible. Second, it is wanting in practicality. You can visit a library in *Second Life* and ask the librarian at the reference desk (if that librarian happens to be manning the avatar at the time) for a copy of *Snow Crash*, but the most that librarian can do is either send you a link to borrow an eBook copy of *Snow Crash*, or tell you to visit the library and check a copy out... so why bother with *Second Life* at all? It’s a middle man at best. If you visit a restaurant in *Second Life* and devour a prime rib, you’ll still be hungry behind the keyboard.

I believe it is worth considering how Stephenson addressed the practicality of his Metaverse in *Snow Crash*. *Snow Crash* takes place in a world that is broken. Hiro Protagonist lives with a few other people in a storage unit, and considers himself fortunate to be able to afford such luxuries in an

economy destroyed by hyperinflation. In the Metaverse Hiro lives in an impressive home because he got in on the Metaverse land rush (digital land being finite in the Metaverse because it is modeled after reality) early. Libraries aren't a place you go to borrow books or learn new skills, because no one really bothers with those things anymore, instead libraries are places where people buy and sell information stolen off the Metaverse. That's how he earns money once his pizza delivering venture goes belly up. The protagonist in *Ready Player One*, which borrow heavily from *Snow Crash*, lives in a world that may as well be a trash heap and likewise relies on his Metaverse, the Oasis, both as a means of escapism and as a means of earning a living. This isn't a coincidence. In order for these authors to have it make sense for people to use their Metaverse as intended, as a digital substitution for reality, they need to break their environments outside of the Metaverse.



***The Stacks, the home of the protagonist in Ready Player One, from the film adaptation.***

This isn't to say that Metaverse advocates want a broken world to make their product useful, but to posit the question how a digital reality could make an analog reality obsolete given the limitations of a digital medium. You can't eat a digital burger, and you can't sleep in a digital bed, however, you can meet in a digital place with people from around the world that you otherwise cannot meet in an analog space. Popular modern iteration's of the Metaverse like *VR Chat* and Meta's *Horizon Worlds* focus on this aspect by providing what are essentially enhanced chatrooms. Users use VR headsets to join, which can in some cases, pending on factors like the headset rig and avatar, enhance discourse by allowing end-users to express themselves via body language.

At the moment *Horizon Worlds* is failing to meet Meta's expectations for adoption. The principle reason for this is the steep price of admission, as their product requires both a VR headset and a computer powerful enough to use said headset (though there do exist stand-alone headsets). Another reason is that other means of collaboration like phone calls or emails are simply a more efficient means of communication. Meta staff infamously would not use *Horizon Worlds* for work even though the company encouraged them to use the platform for collaboration (eventually they were required to instead).



***Horizon Worlds***

For the Metaverse to catch on it, like any successful technology, will need to perform a task more efficiently than the tools we currently have at hand. The one exception to this are games. In Jane McGonigal's book *Reality is Broken*, she defines a game as an unnecessary obstacle between the user and their goal. Walking down your driveway to your car is a task, but if you add a numbered jumping path (as in hopscotch) that task becomes a game. Every take on a Metaverse, starting with *Snow Crash*, is articulated through the language of games. What is having to walk your digital avatar over to a pub when you could just teleport there like you would by following a hyperlink on a website if not an unnecessary obstacle? We tend to tolerate the language of games more when we are engaging in an activity for entertainment or relaxation. We do not tend to tolerate the language of games when we are trying to be productive, where efficiency will produce a better outcome while reducing the amount of effort we need to invest. You're less likely to be willing to play hopscotch down your driveway to your car if you're late for work. This may explain why *VR Chat* is considered successful whereas *Horizon Worlds* is not. One platform is purely a digital hangout spot and the other is intended to be a digital office among other things.

## CRYPTOCURRENCY

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If you've heard of anything Web 3.0, it is likely cryptocurrency. Crypto was pushed hard a few years ago, dominating the advertising space of the 2022 Super Bowl at its peak, and continues to be inescapable today. However, you may be uncertain as to what crypto actually is, and in a way this is intentional. You may presume that crypto currency is digital money but that isn't quite right.

### BITCOIN

Brainstorms that would lead to the development of cryptocurrencies began in the late 1980's and early 1990's. Much of the discourse was among technology enthusiasts and libertarians, with the goal of creating a currency untethered to analog objects of value like gold, and decentralized so as to take the power of the purse away from the government. Neil Stephenson has relevance to this discourse yet again with his novel *Cryptonomicon* in 1999, but not to the same degree as he did with the Metaverse. A few attempts were made at actualizing crypto but the first to show real promise was Bitcoin, developed in 2008 by a person going by the pseudonym Satoshi Nakamoto (there have been several people who have come forward claiming to be Nakamoto, but no one has been proven to definitively be this person. It also is not clear as to whether or not this person is still alive), by the incorporation of a blockchain.

A blockchain is an amend only (data can only be added, not removed or edited) ledger separated into blocks that are designated by a larger hash number (like a serial number but larger than what you're likely picturing). When you have a Bitcoin you do not have a physical token or digital file, but an address and a key for that Bitcoin (like a bank account and pin number but for each individual note). Bitcoin transactions are recorded in blocks on the blockchain with Bitcoins designated by address. The blockchain is public, immutable, and pseudonymous (users are identified by a hash address, if you know what person uses what hash then you can identify them) so any transaction since the beginning of the blockchain can be tracked. Possession of the key is what makes the Bitcoin yours. If you lose the key or give it to someone else (or have it stolen) there is no way to retrieve the key. Possession is ownership in crypto. Keys are either stored in a hot wallet (storage connected to the internet) or a cold wallet (storage connected to the internet). Wallets also have an address, which is how the blockchain records where any given token is located.

The blockchain is designed in a way where it is exceptionally difficult to intercept and insert bad data and thus steal or counterfeit tokens. This is called a “man in the middle attack” and it is how you’ll often see hacking depicted in television or movies, but in practice real hacking is much simpler. Most hacking is done by gaining access by guessing passwords or by tricking a user into yielding information that allows the attacker access. An example of this is phishing, where an attacker imitates an authority and asks a victim to provide them their password or other sensitive information. If a hacker stole your credit card information and started spending your money you can thwart them by calling your bank and they may rectify the issue by canceling the card, crediting your account, and issuing you a new card. There is no way to do such a thing in crypto (for most people) since blockchains are immutable, and decentralized so there is no authority to appeal to. Crypto is designed to prevent a scenario like a thief breaking into a bank database to move credit to different accounts, but a thief is far more likely just to steal your card info. It is far easier, faster, less risky, and carries less consequence.

Bitcoin can be earned through trading, like buying Bitcoin from someone who already has some, or by generating it by writing transaction blocks to the blockchain, which is called mining. To do this, users compete to have their computer systems solve a cryptographic sequence, essentially an extremely hard math problem, with the winner earning some Bitcoin for their trouble. This effort demands a high level of processing power, which is where one of the major arguments against Bitcoin stems from. David Gerard provides a shocking anecdote in his book *Attack of the 50 Foot Blockchain* of one such Bitcoin miner who developed a computer rig optimized for mining Bitcoin via a series of GPU cards, processors used to enhance video game graphics. This isn’t uncommon, as since mining Bitcoin is a winner take all endeavor the only way to be competitive is to build rigs that consume an industrial level of power. This Bitcoin miner set their computer to start mining and went to sleep, and as he slept the room heated up so much that he suffered heatstroke and brain damage (no, the hospital did not accept payment in Bitcoin). Even this intense of a setup fails to put up much of a fight anymore most Bitcoins today are mined in warehouses full of machines mining Bitcoins, called Bitcoin farms. On average Bitcoin uses about the annual power consumption of Thailand, and most of that power is wasted because only one miner can win the contest to write that blockchain transaction block. This waste is by design, it is called “proof of work” and is intended to instill Bitcoins with value by making them difficult to obtain.

Another element that gives Bitcoin value is the fact that it is finite. Rewards for mining halve every 4 years with a cap set at 21 million Bitcoins (at the time of this writing 19.5 million Bitcoins have been mined), which should happen around 2140. When Bitcoin first launched in 2009 a miner could earn about 50 Bitcoins whenever they won the chance to write a new block, now they can earn about 6.25. Right now about 1% of all Bitcoin accounts own over 90% of all Bitcoins in existence. Nakamoto owns the most Bitcoin at about 1 million (remember that the blockchain is public so this isn’t difficult to figure out), which isn’t surprising since when he created Bitcoin he gave himself and his associates a large share of coin in an act called pre-mining. Both this practice and trend is very typical in crypto.





***A chart mapping the fluctuating value of Bitcoin over 12 hours***

So how much is a Bitcoin worth? At the time of this writing 1 Bitcoin is worth about \$25,866, but that is certain to change by time you read this, possibly even by time I finish typing this sentence (I checked and it did, \$25,949, and since I wrote that figure it dropped down to \$25,892). Because Bitcoin is not based on anything tangible and not regulated, it is influenced only by market forces. One of the first cases in which Bitcoin became valuable was in the emergence of a website called the Silk Road, which allowed users to trade their Bitcoins for illegal products like drugs, prostitution, and assassinations. Silk Road launched in January 2011 at a time when Bitcoin was worth less than \$1 and within a month it reached parity with the dollar and was worth \$10 by May (diving in value momentarily when Silk Road was down for a few hours for an upgrade). The FBI managed to shut down Silk Road in 2013 at a time when 1 Bitcoin was worth \$145, dropping the value down to \$109.76. Imagine the dollar in your pocket dropping in value to 75 cents in value just because a drug bust went down in another state. Crypto currencies tend to see a good deal of market manipulation as their lack of regulation, the immutability of the blockchain, and pseudonymous nature make this very easy and low risk. In fact, it is expected in certain cases, like with wash trading, where an individual will swap a token between two wallets that they own in order to make it appear like the token is being traded normally, increasing its market value. Another common practice is pump and dump schemes, where founders of a token will pre-mine a sizeable amount of tokens and promote the token to others (celebrities and influencers are used towards this end quite a lot), allowing the value of the token to rise and then selling their stock off and causing the value of the token to crash in their wake.

The Bitcoin blockchain can process 7 transactions per second. For comparison, Visa can process 24,000 transactions per second. That means it would take almost an hour for Bitcoin to process the number of transactions Visa can process in a single second. Bitcoin transactions can be incredibly slow, which is a major issue when you factor in how rapidly its value can fluctuate. This makes Bitcoin very impractical as traditional currency. Imagine paying for a burger with a note that you believe is worth \$5, and as you hand over that note to the cashier it fluctuates to \$500, and as the cashier is attempting to give you your change it fluctuates again down to \$0.05. It is a nightmare for both the buyer and seller. So how do you spend your Bitcoin? In practice you don't, not really, because Bitcoin isn't a currency as much as it is an investment. It is more analogous to a stock, although not tethered in valuable to

anything tangible like a business. The most obvious way to turn your Bitcoin into USD is to sell it to someone who wants to buy your Bitcoin. The most profitable way to do this is by acquiring a Bitcoin early and selling it later for reasons illustrated earlier, leading many to call Bitcoin a “bigger fool’s game.” If you buy Bitcoin for \$25,000 from someone who got it for \$250, and can’t really spend it otherwise, you’re the bigger fool. Still, even if you find someone how is interested this is challenging to handle peer to peer. Most trading happens on platforms called exchanges.

An exchange is a website that allows you to store cryptocurrencies and dollars on their platform in order to expedite the trade of crypto. Often users are incentivized to leave their currencies on these exchanges. One of the first successful exchanges was Mt.Gox (which stood for “Magic the Gathering Online Exchange”, as the website was originally an exchange for trading cards, but they kept the name) which rose to prominence in 2011, along with Silk Road. When Mt.Gox was transferred from founder Jeb McCaleb to Mark Karpeles that year 80,000 Bitcoins (\$62,400) was already missing. Remember, possession of Bitcoin keys is ownership, there is no credit like with a bank, so those coins were just gone. Be it through hacks, theft, or other forms of fraud this is quite common with exchanges, like Bitconnect, Luna, and FTX to name a few. Many exchanges offer perks to users that are too good to be true, like Bitconnect’s guaranteed 0.1%-0.25% **daily** interest rate, and use the funds invested from newer users to pay the accounts of older users, identical in structure to a Ponzi scheme.

The only way to recover cryptocurrencies is to do something called forking the blockchain. This is when a blockchain is copied up to a point and is used instead of the original blockchain, negating transactions after a certain point. It is like ripping out pages of a ledger and resuming like nothing happened, but on a global scale. This has happened quite a bit, for instance there have been 100 forks in Bitcoin alone. If the 1% that own over 90% of Bitcoin suffer a hack that costs them a sizable portion of their Bitcoin, it is entirely in their power to fork the system because as illustrated that 1% includes people who run the show like Nakamoto.

One can argue that Bitcoin and all other cryptocurrencies (where this is almost always the case, usually the only thing different among them is the name or an extra feature here and there) are centralized, except instead of centralized by a government it is centralized by its wealthiest individuals, techno oligarchs, and by an unregulated industry that has a level of control over the generation and value of the currencies they trade in, and that has no obligation in protecting the end user. Whether or not that is an improvement to government and banks regulated and backed by things like FDIC is up to you. Bitcoin is said to have been developed in response to the Great Recession of 2008, which was caused by banks issuing bonds backed by mortgages and selling homes to people who could not pay those mortgages because generating the bond was more valuable at the time, creating a bubble that burst and took down the economy along with it, while the players responsible for creating the problem escaped on golden parachutes. Is crypto a way to avoid history repeating itself, or is it a means to be on the winning side when history repeats itself? A Metaverse version of Wall street?

## ETHEREUM

As mentioned previously, Bitcoin is not the only game in town when it comes to crypto but alternate cryptocurrencies are very similar in structure. Probably the most significant alternative to Bitcoin is called Ethereum (Ethereum’s currency is called Ether, and is worth \$1,632 as of this writing, or \$15 on the Ethereum Classic blockchain as Ethereum has been forked to protect investor funds), introduced by Vitalik Buterin in 2015. Buterin’s motivation behind Ethereum came from an update to

the massively multiplayer online role playing game World of Warcraft that reduced the efficiency of his chosen character class. Updates like this are common in these kinds of games, and are usually done to correct bugs or ensure that the game is balanced and enjoyable for most players. Buterin said that this opened his eyes to how evil a centralized system can be. Ethereum's chief difference with Bitcoin is its blockchain, which can incorporate small programs in its blocks that automatically run under certain conditions, called smart contracts. Transactions and smart contracts both require a fee called gas, which pays some ether to the block miner whenever a transaction or smart contract runs. Ethereum also changed from proof of work to proof of stake in 2022, in which the winner of mining is decided by a lottery based on tokens. The more tokens an owner possesses the higher chance they'll have to win (about 80% of the Ether in existence are owned by 0.01% of all accounts).

Smart contracts were first pitched in 1994 as an automated alternative to our current legal system. Instead of relying on juries, lawyers, or judges, a system could be set up with rules that would automatically and impartially render a verdict based on whether or not anticipated parameters were met. Furthermore, that system would be immutable once deployed, so as to protect it from human influence. Hopefully the issues here should be obvious, but law is something that needs a lot of deliberation by humans to parse, be it interpreting the law or by agreeing on the circumstances by which a case is judged. Almost any legal disagreement between two parties will have both sides disagreeing on the details of a case to some degree. A smart contract would also need to be programmed with any and all cases and laws anticipated, since it is immutable. Considering that smart contracts have been written to manage the structure of organizations without mortality having been anticipated, this should be very concerning. The ultimate aspiration here is to put all information related to law on the blockchain, such as medical records, identification, deeds, and tokenize them. Yes, I have read articles pitching the idea of moving library cards to the blockchain (I think libraries value privacy too much for this notion to gain much momentum).

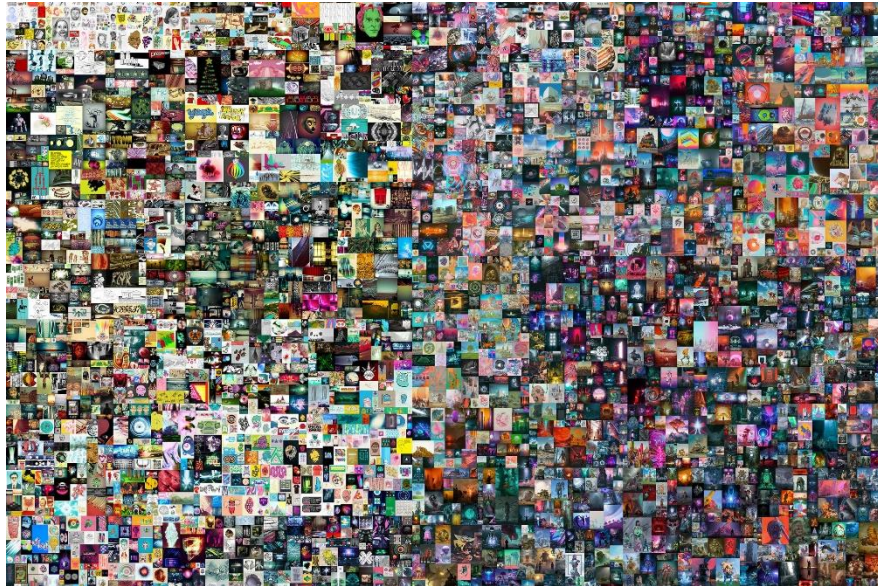
## NFTS

Fortunately, replacing our legal system was not the first thing that people did with Ethereum's smart contracts. Instead, one of the first things people used Ethereum for was to create their own cryptocurrencies. Ethereum's smart contracts effectively allow developers to offload the expense of developing their own blockchain onto Ethereum, and as a result the crypto market has exploded with a plethora of coins named after memes, cartoons, and people almost all of which are done without license or permission (eschewing responsibility because the blockchain is immutable, so wrong doing cannot be undone). An even easier avenue to this end are NFTs.

An NFT, or Non Fungible Token, is a token that refers to a block on the Ethereum blockchain, similar to a coin. This block can be anything (including viruses, there exist NFTs that can rob a crypto wallet of all its contents if interacted with thanks to smart contracts), but it usually refers to a web address that refers to a picture (Ethereum blocks do not have enough storage space for most images). Tokens don't need to be mined, you just need to pay the gas fees to create them (called "minting"). The object becomes tokenized on the blockchain which then can refer to the wallet that is considered to own the token. NFTs are often compared to trading cards, but it is more accurate to refer to an NFT as a receipt to a trading card. You don't actually own the object referred to in the block, or have any special rights to it, you just own a token saying that you own it. It is like owning a certificate that says you own a



star, it isn't very official or enforceable, doesn't give you any rights to the star, and doesn't stop anyone from enjoying it in the night sky... but you may find someone who would buy it off you.



***The First 5,000 Days by Beeple***

In March of 2021 digital artist Beeple made headlines by selling a collage of his work as an NFT called "The First 5,000 Days" in an auction for \$69.3 million... in crypto currency (this part was not often mentioned in the headlines). The NFT was purchased by Vignesh Sundaresan, a crypto entrepreneur and cofounder of crypto investment firm Metapurse. Vignesh had already purchased \$2.2 million dollars (again in crypto) worth of Beeple's artwork months before this with intent to lock them in a digital gallery accessible only to those who own a crypto token they would create called B.20, tying the value of B.20 to Beeple. B.20 was pre-mined to give Sundaresan 59% of the tokens and Beeple 2% of them. This is the reason that Sundaresan paid as much as he did for "The First 5,000 Days", a piece of artwork easily accessible to anyone online for free. It was to make headlines that NFTs and Beeple were valuable, having already been invested in both NFTs and Beeple. The value of B.20 rose from \$0.50 in February to \$23 in March and then back down to \$1 by May (it is currently worth about \$0.04).

NFTs became a gold rush soon thereafter with almost every meme and element of internet history, like the first tweet, were minted into NFTs. One does not need to own the rights to a work to have mint them into NFTs. Some artists were contracted into creating works to be minted into NFTs or to pay gas fees themselves to mint their own work, but plenty of work was simply stolen or minted without the consent of the artist (for instance, the work of the recently deceased). Because the blockchain is immutable, there was little if not any consequence for such actions. The law has not caught up to the implications of minting NFTs in regards to things like copyright, which is compounded by how crypto is pseudonymous. At the time it was difficult to avoid headlines about people minting NFTs for millions of dollars, but it is worth remembering that this is all in crypto, not in USD.

Within months the well for pre-existing work had run dry. A solution soon emerged where a computer program would spit out a series of images comprised from a pool of premade components, not unlike a paper doll. This allowed project leaders to mint a large collection of NFTs and sell them off in a collective set, or mint them on demand. These are what comes to mind to most people when they think of NFTs, projects like the Bored Ape Yacht Club (example on the right). NFT projects often come with roadmaps for extra perks for token holders with various levels of plausibility. Examples include comic books, television shows, video games, casinos, and island societies in international waters called sea steads.



NFTs often form communities around their projects encouraging people to invest and not sell their NFTs, thus increasing their value. NFT projects see just as many wash trading, pump and dump, and other scam behavior covered previously as other crypto currency projects. This includes pre-mining tokens to distribute to influential people in order to encourage them to promote the tokens so that the tokens they were given increase in value.



***Paris Hilton and Jimmy Fallon are currently being sued, along with other celebrities, for promoting the Bored Ape Yacht Club without disclosing that they were compensated to do so.***

The NFT market peaked in 2022 and has since calmed down considerably. For instance, the Bored Ape Yacht Club was among the most successful NFT projects, peaking in value in April 2022 at \$429,000. They are now currently worth around \$41,738 as of the time of this writing, almost a 90% drop in value. There are several reasons that this could have happened, but one of the most likely explanations is that bubble popped. It is estimated that there are over 50 thousand different NFT projects in the market today (not NFTs, NFT projects) and of those projects about one in three fail, be it because it failed to attract investors or because it was a scam. Keep in mind that these projects are only a few years old if that. There are projections out there that 99% of NFT projects will fail long term.

Crypto may very well prove to be very lucrative for you, but the odds are not in your favor, there is a large cost to the environment, and you may be putting a lot of yourself at risk in order to take that gamble. It aims to address some genuine issues of economic oppression in our society, but by most measures it only really succeeds in giving a small group of people a means of being a new oppressor in a new market.