

TOMER STROLIGHT

WHY BITCOIN?



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LEGENDARY TREASURE PRESS

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More from the Author

ESSAYS ON BITCOIN

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BITCOIN FICTION

"Satoshi and Me" at www.Citadel21.com/satoshi-and-me

"The Being That Changed Everything" on *The Bitcoin Times* at www.medium.com/the-bitcoin-times

"Moving Heaven and Earth" at www.medium.com/@TomerStrolight

VIDEO

"Bitcoin Is Generational Wealth" on *Swan Signal* [channel on YouTube](#)

AUDIO PROGRAMS

"Off the Deep End, With Tomer Strolight" on *The Bitcoin Spot* [channel on YouTube](#)



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Preface

Why Bitcoin?

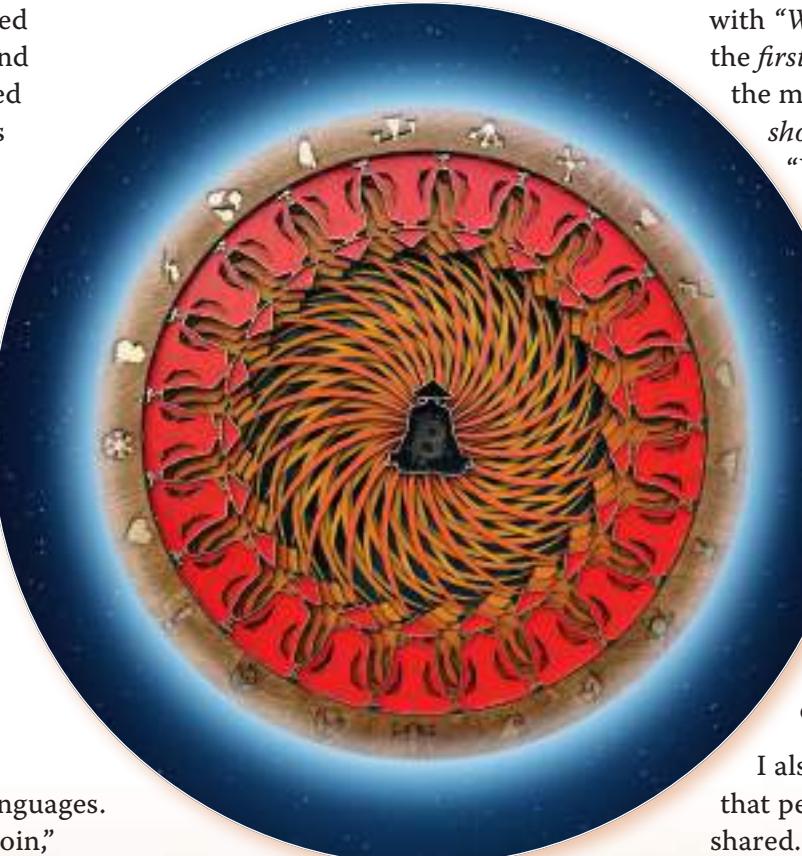
When I wrote these essays, they represented my debut into the Bitcoin content community.

The entire collection was intended to fill a void. There were no short yet insightful reads about Bitcoin suited to both newcomers and experienced Bitcoiners. I wanted to make some of the deepest and most important yet unexplained and poorly understood aspects of Bitcoin accessible to all.

I sought to do this through short sentences, clever analogies, and a bit of whimsy, to keep it all in good fun — even though what I was discussing was very serious.

My goals were largely achieved. Many of these essays were shared widely on social media. The whole collection was turned into an ebook (www.swan.com/whybitcoin).

Volunteers came forward to translate them into many languages. Guy Swann, "The Voice of Bitcoin," released them as an audiobook.



However, there was a weakness with the original collection. I initially published each essay as I wrote it — and I wrote them as they came to me. There was no rhyme or reason behind that order. I simply acted on my inspiration, not according to any plan.

This book remedies that. A book is linear. And its contents have a proper order. So creating this book required that I work out a logical order for the essays.

That is what I have done. The entire collection is now organized. For example, the online series ended with "*Why Bitcoin Exists*." That is now the *first* — because it answers the most basic question anyone *should* have about Bitcoin: "Why does this thing even exist?"

I am delighted with how it turned out. This book takes readers on a journey of *what* Bitcoin is, *how* it works, its impact on the *world*, and the *personal* impact Bitcoin will have on them. It does so without requiring knowledge of economics, math, politics, or computer science. Yet I have not shied away from tackling these areas — nor from topics like ethics and self-actualization.

I also wanted this to be a book that people displayed, read, and shared. I wanted it to be esthetically delightful in ways not possible in blogs.



To that end, I drafted my dear friend and gifted artist, Klaus Nordby, to design the book. He is uncompromising in making readable material beautiful. His work speaks for itself — from the cover design of this book, to the choice of typeface and the layouts throughout.

Klaus also acted as my editor. He ensured that each piece was intellectually precise and honest. We wrestled over the choice of crucial words. We worked together to find

solutions for every challenge we discovered. It was an amazing creative experience for us both, which we both enjoyed and learned from.

Next, I asked another friend, Chiefmonkey, who makes outstanding laser-cut Bitcoin designs, to create a one-of-a-kind custom piece inspired by the book's contents. He and I went back and forth on a variety of ideas and it took us months to arrive at the final work. He outdid

himself with the work he has named "*SHAmanic Universal Consciousness*".

Photos of his work grace the cover and pages of this book. It depicts Chiefmonkey's signature and iconic image of Satoshi in a meditative posture contemplating 21 different mantras — each inspired by these essays. The original work will be sold at auction.

I want to pay special thanks to Cory Klippsten and the whole team at Swan Bitcoin. Cory reached out to me when I was just starting the series and encouraged me to turn it into an ebook — which Swan Bitcoin promoted. They have also provided financial support for this print edition.

I dedicate this book to my beloved wife and lifelong companion, Melissa, and to my two darling children. Their happiness is the reason I devote my time to Bitcoin, because I know it contributes towards creating a brighter, happier future for all of humanity.

— TOMER STROLIGHT

February 14, 2022



1 Why Bitcoin Exists

What is the Purpose of Bitcoin?

WHY DID ANYONE BOTHER to create Bitcoin?

What problems were they trying to solve?

If you are new to the whole idea of a digital asset involving the mysterious field of cryptography, *these* are some questions that probably come to your mind.

Before you get caught up in asking if you can “get rich quick” from Bitcoin, you should be asking if it has a *deeper* purpose.

Bitcoin was *created* to serve a very *specific* purpose. If it did not serve that purpose, it would not be worth anything. Fortunately, it does. And, it was carefully and meticulously *engineered* to serve it *precisely*.

Bitcoin’s purpose is to provide reliable money that will serve all mankind — *forever*. That is a pretty lofty goal: serving all of mankind, forever!

Was There Even a Problem in the First Place?

Is our money *unreliable*? Does it really *fail* to serve all mankind? Are its days numbered?

The sad fact is that the answer to all these questions is “Yes!”

First, our money *is* unreliable: it *loses* its purchasing power through inflation. We also experience *volatile* economic cycles that *destroy* capital, jobs, wealth, and stability.

Next, our money does not serve *all* mankind — many middlemen charge *excessive* fees to store and send our money. It is expensive to use internationally since converting it to other currencies is costly.

Many people in the world lack *any* access to reliable banking.

Our money system serves *elites* far better than it serves *ordinary* people.



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Finally, our money system is *doomed* to collapse. Currencies *world-wide* are rapidly losing purchasing power. In fact, throughout history, paper money *decreed* into existence by governments has failed every time that it has been implemented.

And sadly, we cannot turn back the clock and go back to a time when *gold* was money. Gold is simply not *secure* from seizure, and it is far too *slow*, *difficult* and *expensive* to transport in a global economy.

1

Bitcoin Fixes This

Bitcoin was created through an ingenious and unprecedented combination of technologies. It provides, for the first time ever, money that is *reliable*, that serves *all* mankind, and that will last *forever*.

Nothing like this has *ever* existed before.

Bitcoin is free from inflation — its supply will *never* exceed 21 million coins. Each coin is divisible into 100 million units called satoshis. These will be issued on a fixed, unalterable schedule — taking over 100 years.



3

Bitcoin is for *all* mankind — there are *no* elites who can manipulate it.

Unlike the currencies of our present money, nobody can create bitcoins effortlessly for themselves.

Nobody can be *prevented* from using Bitcoin — it will not *allow* anybody to stop someone else from using it.

Finally, Bitcoin is *forever* — its operation depends solely on the laws of physics and mathematics, and these laws will stay in effect — *unaltered* — for as long as the Universe exists.



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2 Why Bitcoin is Unlike Anything You Have Ever Seen

Nothing Like Bitcoin has Ever Existed

BITCOIN IS SO different from anything ever seen before that it is *necessary* to begin our journey by describing what it is *not*.

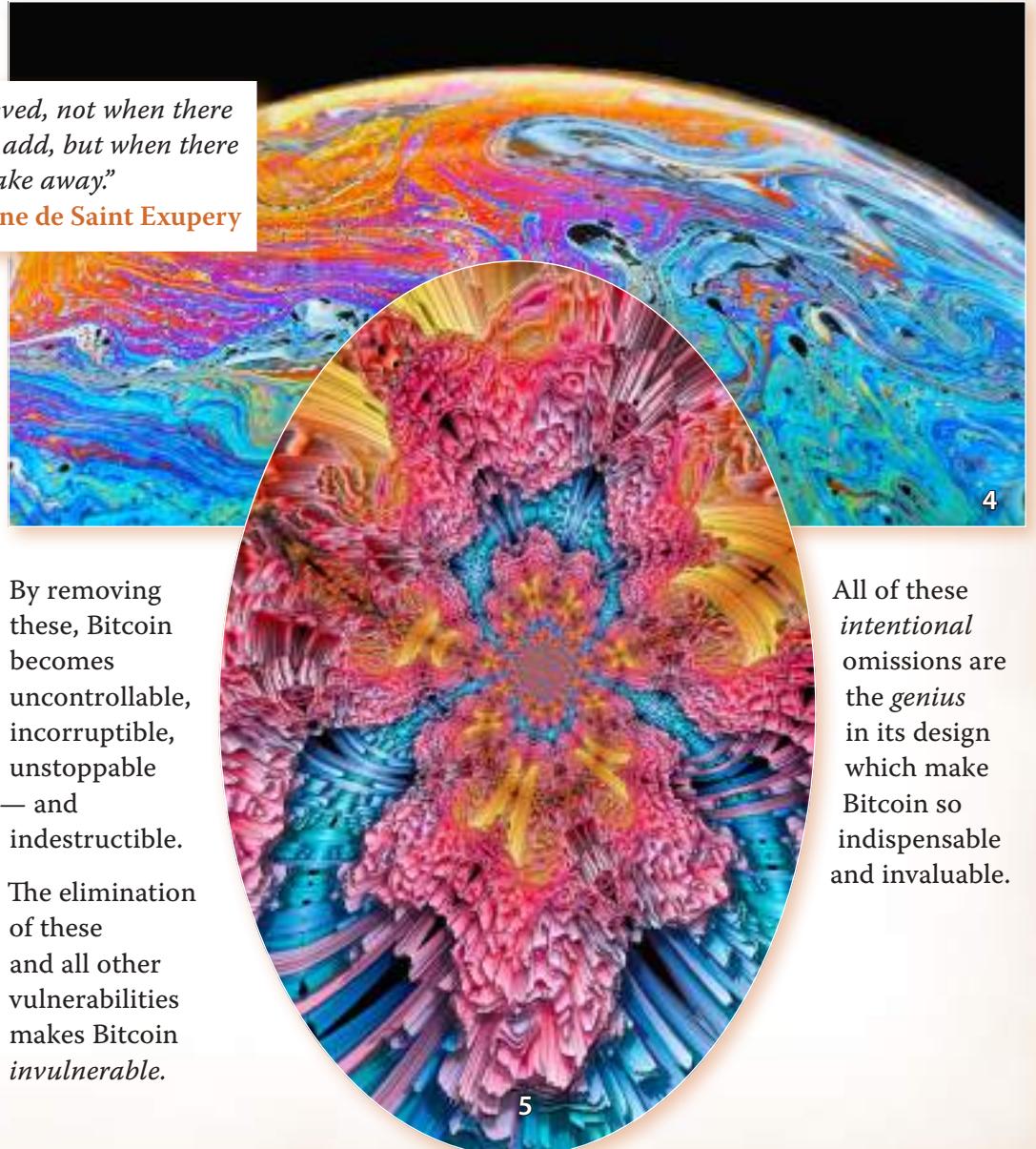
Bitcoin is Unique

Bitcoin has no leaders, no employees, no headquarters, no offices, no government, no elections, no location, no property, no assets — and no money. It is not even incorporated or legally constituted in any place on Earth.

Bitcoin sees *all* of these things not only as unnecessary, but actually as *undesirable*. This is because Bitcoin views all of these things *not* as strengths — but as *vulnerabilities*.

Bitcoin deals with such vulnerabilities in an elegant manner — simply by *eliminating* them. Were any of these features to be *in* Bitcoin they would inevitably lead to the problems we see in all other institutions — such as being taken over, becoming corrupted, or being destroyed.

"Perfection is achieved, not when there is nothing more to add, but when there is nothing left to take away."
— Antoine de Saint Exupery



All of these *intentional* omissions are the *genius* in its design which make Bitcoin so indispensable and invaluable.

By removing these, Bitcoin becomes uncontrollable, incorruptible, unstoppable — and indestructible. The elimination of these and all other vulnerabilities makes Bitcoin *invulnerable*.

Even More Things Bitcoin Does Not Do

Bitcoin does *not* keep track of the identities of the people or machines that use it — making it private.

Bitcoin does *not* force itself on anyone — making it entirely consensual.

Bitcoin does *not* exclude *anyone* from using it — making it universally inclusive.

Bitcoin does *not* increase the supply of currency to meet rising demand — making it extremely precious.

What Bitcoin Is

Bitcoin is *unlike* anything you have ever seen. It needs to be, so it can provide humanity with the most *perfect* money that we will ever see.



3 Why Choose Bitcoin

Why Should You Choose Bitcoin as Money?

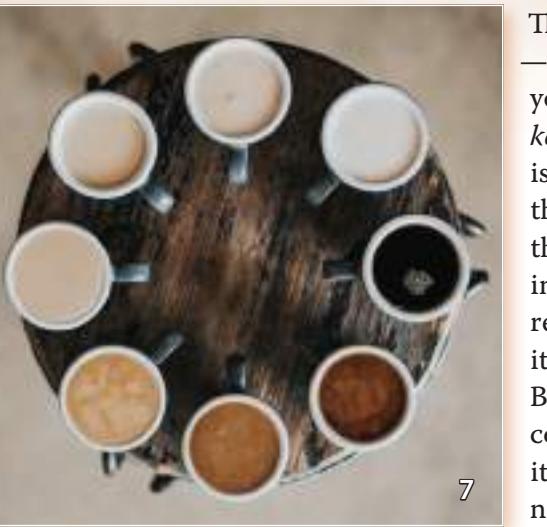
THE ANSWER TO THIS QUESTION lies in the fact that you can even ask it.

Let us recall, you are *not* asked to choose the dollar — nor the euro, the pound, the krone, the lira, the peso, the yen, and so on. You are born into a world where those currencies simply *are* your money and where the law *orders* you to accept them as money — and where everyone around you *blindly* accepts them as money. And so you, too, take it for granted that they *are* money. But if you look closely you'll see that the dollar isn't particularly *fair* money, or very *good* money, or very *reliable* money.

On the other hand, nobody has forced you, or anyone else, to use Bitcoin. And no one ever will. So why *should* you start to think of it as money?

Bitcoin Asks that You Choose It

When it comes to the many *necessary* features of money — durability, divisibility, sendability, storability and many others — Bitcoin is *superior* to either the dollar or to gold.



These two reasons — the need to *earn* your choice and to *keep* on earning it is what *necessitates* that Bitcoin be the best money in the world. And, remarkably, since it is software, Bitcoin can continuously *adapt* itself to provide all we need from our money.

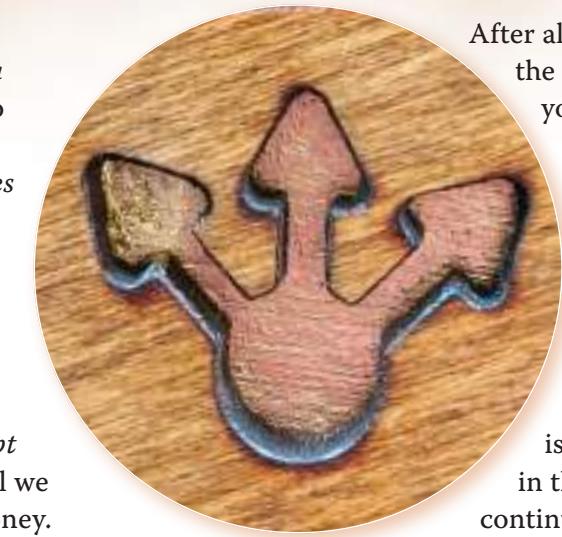
Bitcoin Only Gets Better

These facts demonstrate how Bitcoin is itself the ongoing process of *becoming* and *remaining* the very best, freely chosen money that can ever be.

Bitcoin Strives to Earn Your Choice

To become *your* money Bitcoin needs to *earn* your well-deserved confidence — and the confidence of millions more people all over the world. Think of what *must* be true of Bitcoin for it to become accepted by a hundred million people, and then a billion people — when each and every one must *actually* choose it.

Moreover, to *remain* your choice, Bitcoin must *always* be the best choice — so that *nothing* better comes along to take its place.



After all, how could either the dollar, which *orders* you to use it, or gold, which cannot *improve* itself, compete with Bitcoin? Neither of them *earn* your choice. Whatever it is that people need from money, Bitcoin is the only money in the world that can continuously improve and adapt to best suit those needs.

Bitcoin is Worthy

The very fact that Bitcoin *needs* you to choose it means that it must become and remain *worthy* of your choice.



As a result, Bitcoin continuously improves to become better than any alternative. This creates a *virtuous circle* where Bitcoin just keeps getting better, causing more people to choose it.

And, with more people choosing it, Bitcoin becomes even *better* money — which in turn gets more people to choose it, which makes it *still* better — and so on.



4 Why It Takes Both Time and Effort to Make Bitcoins

You Work Hard for Your Money

TO EARN MONEY YOU HAVE TO PUT in time and effort. So, for the sake of fairness, shouldn't it be the case that the creation of money itself *also* takes time and effort?



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Yet, this is *not* the case with state-issued money. Any arbitrary amount of dollars, euros, pesos, pounds, and so on, can be conjured out of thin air instantly — and *without* effort.



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This method of creating money without doing *work* discourages people from doing work for their money. Instead, it encourages people to seek handouts of this easily-produced money. And, this isn't just welfare for the poor — it is mostly huge handouts for the very rich and politically connected.

Creating Bitcoins Takes Time

Bitcoin guarantees that its currency can only be created over a fixed schedule



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of time. Only a small amount of bitcoin is created, on average, every ten minutes. And that amount gets cut in half every four years. This leads to a maximum supply of 21 million bitcoins — ever.

Creating Bitcoins Takes Effort

Nobody can create bitcoins without *proving* that they worked to create them.

Bitcoins are created through a process named *mining* — because, like the actual mining of minerals, such as nickel, iron, and gold, *real-world* work

must be done. This work is done by computers using electrical energy.

Many people compete to create new bitcoins. The more competitors there are, and the more work they do — the harder it becomes to win this competition. Each competition typically lasts around ten minutes and then restarts when *one* miner succeeds at this task.

Bitcoin is the *only* money that requires work to create and where the supply remains *fixed* no matter how much work goes into making it.



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Fairly Balanced Money

Since you must put in *your* time and *your* effort to earn money, shouldn't you choose a money that also requires those who *create* it to put in *their* time and *their* energy?

That money is Bitcoin.

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5 Why You Do Not Need Permission To Use Bitcoin

Bitcoin is Really for Everyone

Everybody may use Bitcoin. Nobody's approval is needed to use it. And when I say *nobody*, I really mean it — not now, not ever!

Unlike *all* financial institutions, Bitcoin doesn't want to know your name — it *can't*. It also does not want to know your gender, your age, your income, your race, your politics, your driving record, your debts, your kinks — or *any* other single thing at all about *you*.



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If you can produce a large random number, then you can use Bitcoin. Don't worry, you can generate such a number if you have access to a computer or phone — or even just a coin to toss, or some dice to roll.

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Nobody is in Charge of Bitcoin

The reason you do not need anybody's permission to use Bitcoin is because *there is no one to ask*. There is no one and nothing that can grant you permission — or refuse it.

If you have some bitcoin you want to send to somebody else, *they* do not need any permission to use Bitcoin either.

Why is Bitcoin Permission-less?

Bitcoin avoids any permission-granting requirement because it views the *use of money* as a *universal human right*.

As such, Bitcoin does not want to know *who* you are, *what* you are buying, *why* you are sending the coins, *where* the recipient is — or *anything* else.

You are *free* to do as you *wish* with *your* bitcoins!

Now, this idea may initially bother you a little bit. Doesn't this mean criminals can use Bitcoin? Yes. And, it just so happens that criminals can use other forms of money, too. Criminals have existed since long before Bitcoin was invented in the year 2009.



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In many parts of the world, the *real* criminals are the tyrants in charge of the government who treat *innocent* civilians as criminals and *violate* their rights.

Bitcoin can not *judge* anyone or anything and it remains completely *neutral* towards all comers.

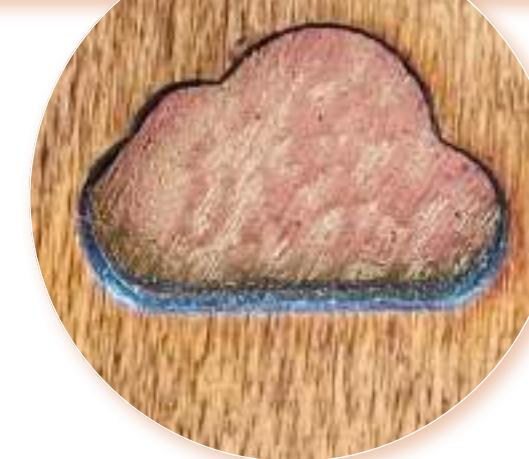
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Everyone, Everywhere — Forever

Bitcoin will work for anyone and everyone. It will work anywhere, wherever. Bitcoin will work anytime, forever.

So if you are a carpenter in Zimbabwe now, you can use it. If you are an archeologist in Antarctica in 200 years, you can too.

Over time, countries will come and go, companies will come and go and rulers will come and go — but Bitcoin will *still* be here, operating independently of whether *any* of these countries, companies, or rulers even exist.



How is Bitcoin Permission-less?

Bitcoin manages to be permission-less by excluding the very notion of *users* in its design.



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6 Why Bitcoin's Rules Are Enforced by Math and Physics

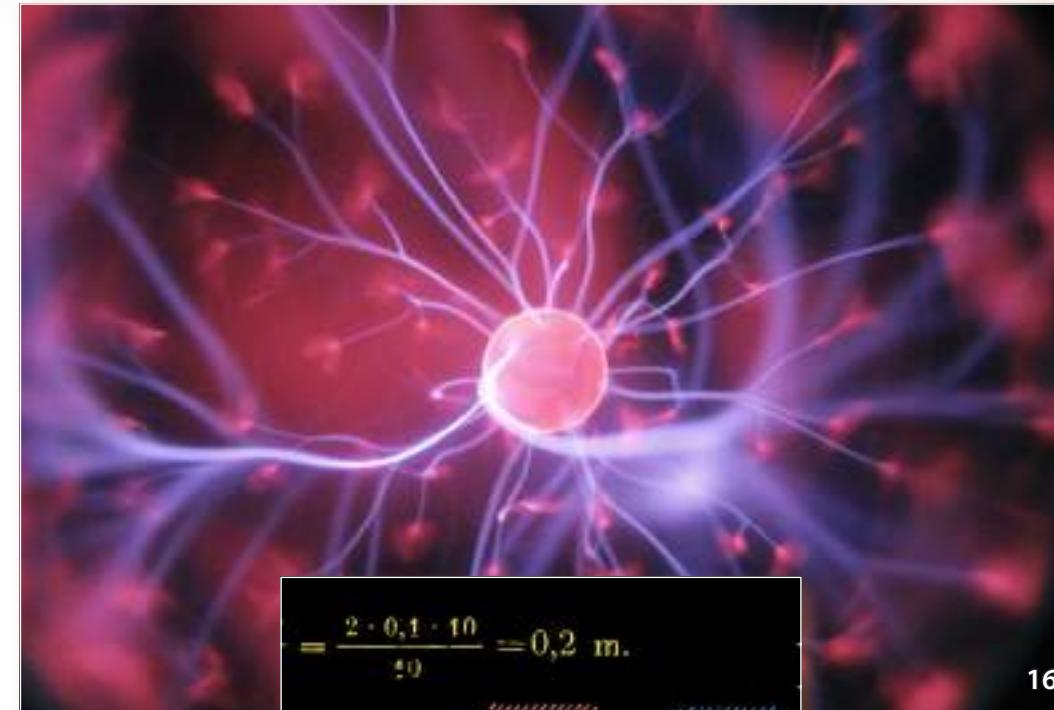
Nature's Laws Versus Man's Laws

THE GERMAN AUTOBAHN highways have *no* legally enforced speed limits. *Only* the laws of physics limit how fast automobiles can go. Consequently, the Germans have figured out how to make particularly fast cars — fast small cars, fast family cars, fast SUVs, fast trucks, and so on. And German cars are also especially *safe* fast cars, because nobody wants to die getting somewhere fast. This *lack* of regulations results in German cars being faster and safer than those made in countries where speed limits are set by government edicts.

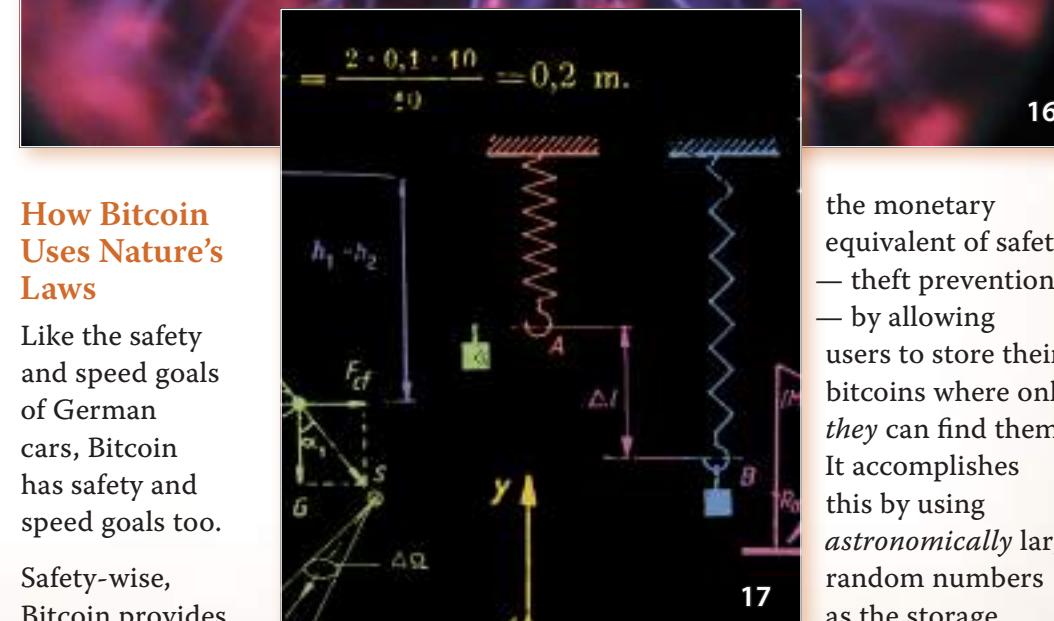
This is also why Bitcoin is the best money the world will ever see — because *no* government tells Bitcoin *what* rules apply or *how* to enforce them.

To enforce *its* rules, Bitcoin relies *only* on the laws of math and physics. These are eternal and unchanging laws. They are *not* made up on a whim. They cannot ever be changed — not by any individual or any group.

This ensures that Bitcoin's promises are as reliable as the laws of nature themselves.



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How Bitcoin Uses Nature's Laws

Like the safety and speed goals of German cars, Bitcoin has safety and speed goals too.

Safety-wise, Bitcoin provides

the monetary equivalent of safety — theft prevention — by allowing users to store their bitcoins where only *they* can find them. It accomplishes this by using *astronomically* large random numbers as the storage

locations, like bank account numbers, but trillions and trillions and trillions times bigger. Physics dictates that *nobody* can guess these numbers even if they turned the whole planet into a giant computer making endless guesses.

As for speed, Bitcoin does not try to *go fast*. Instead, it seeks to maintain a *steady pace*. The pace Bitcoin maintains is that its *miners* discover and add *one* new block of transactions to its ledger — the *blockchain* — every ten minutes on average, forever. Bitcoin enforces this goal, too, using the eternal, unchanging laws of math and physics. If anyone turned all the

world's energy towards *trying* to speed this up, Bitcoin would slam on the brakes at a pre-set and frequently occurring milestone. Conversely, if anyone tried to slow this down, Bitcoin would step on the accelerator and speed it up at that same milestone.

Achieving this average speed target relies on combining "*Proof of Work*," which is based on physical computing work that requires energy be spent in the real world with a few lines of computer code called the "*Difficulty Adjustment*." This is how Bitcoin maintains its pace of block discovery.



Bitcoin Only Obeys Nature's Laws

No government edict can change any of this. Nobody and nothing can *violate* these mechanisms rooted in Nature itself — no protester, no banker, no lawmaker, no hacker, no corporation, no government, no army — no *attacker* of any kind.

With Bitcoin you can count on math and physics — instead of the promises of bureaucrats and politicians — to protect *your* savings.



7 Why Nobody Can Stop Bitcoin

The Genie is Out of the Bottle

JUST ABOUT EVERY MAN-MADE thing can be stopped — *somewhere*. We can slam on a vehicle's brakes. We can cut a machine's power. We can order an organization stopped — by the armed forces, if necessary.

It seems like you can stop anything with some force that counteracts whatever keeps that thing going.

But Bitcoin is unstoppable.

So exactly *how* does Bitcoin manage to be unstoppable?

Bitcoin employs two primary counter measures to ever being stopped.

Flawless Replicas Everywhere

Bitcoin's first defence against being stopped is that you cannot actually *locate* it. It is impossible, after all, to stop something that you cannot find.

Every Bitcoin *node* is an instance of the Bitcoin program running on some computer. And each node is an *exact* replica of every other one. Each node contains *all* the programming necessary to run Bitcoin — along with *all* the addresses of every portion of every bitcoin.

To stop Bitcoin would require stopping each and every node, everywhere in the world, and *keeping* them all stopped — forever.

However, Bitcoin is very easy to run. It can operate on even the most basic of computers available today. So, large numbers of people do run it.

Bitcoin nodes can also hide their location so that nobody can see *where* they are running. Therefore, it is *impossible* to find *all* the computers in the world running Bitcoin.

If anyone, even the government, was *trying* to hunt down all these nodes in an attempt to stop Bitcoin, they would *fail*. They might find some nodes, or



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maybe even a lot of them, but as long as Bitcoin is running *somewhere* on Earth, on some computer — it is still running.

Even if an attacker managed to stop every node for a time, as soon as any node resumed — Bitcoin would continue *exactly* where it left off. In fact, the first thing every node does when it resumes running is to make itself into a precise replica of all the other nodes.

There are tens of thousands of Bitcoin nodes — running everywhere, all over the world, right now. There is *no*

way to know exactly how many. That alone makes it impossible to know how hard a task it is to stop Bitcoin.

Flexible Energy Requirements

Bitcoin's second defense is how it uses energy.

Most things require some *minimum* amount of energy to operate. Bitcoin has



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power from *all* but one of the nodes, eventually, Bitcoin would adapt. Through this mechanism, Bitcoin's energy requirements would simply diminish to the point that just *one* node's power would be all that was needed to keep the network operating. So Bitcoin *cannot* be starved of the energy it needs, because it can operate on just a tiny amount — if that is all it can get.

UnFindable + UnStarvable = UnStopable

Put these two defenses together and what you are left with is *unstoppability*. Since nobody can find all the nodes that exist and nobody can starve it of the energy it needs — *nobody* can stop Bitcoin!



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8 Why Bitcoin is the Path to Economic Stability

There is No Reliable Stability in National Currencies

In 2021, the Venezuelan Bolivar lost 99% of its value against the US dollar. Even the British Pound experienced 17% volatility in ups-and-downs relative to the US dollar in the same period.



Yet, Bitcoin is Accused of Being Unstable

“Bitcoin is extremely volatile” claim journalists, economists and bankers. It is no wonder that they draw these

In fact, when it comes to how they *function*, national currencies offer very little security, usability, predictability, and, indeed, stability:

- ◆ None offer much predictability of their supply — and many, including the dollar, have seen massive supply increases in recent times.
- ◆ None are entirely resistant from theft by crooks or seizure from authorities.
- ◆ None are fully permission-less — regulations exist that require owners to identify themselves and declare their intended uses.
- ◆ All of them operate *only* within specific jurisdictions.
- ◆ And none can have their supply verified independently — it is doubtful if even the authorities in charge of them know what supply exists.

In summary, national currencies are *not* very stable at all.



conclusions when judging Bitcoin by the standard of *unstable* national currencies.

Consider, however, if you were on a boat that was being tossed about by rough seas and were looking at a lighthouse on the shore. That lighthouse’s position would appear “extremely volatile” — despite the fact that the lighthouse was perfectly stable.

Here is why Bitcoin is actually like that lighthouse.

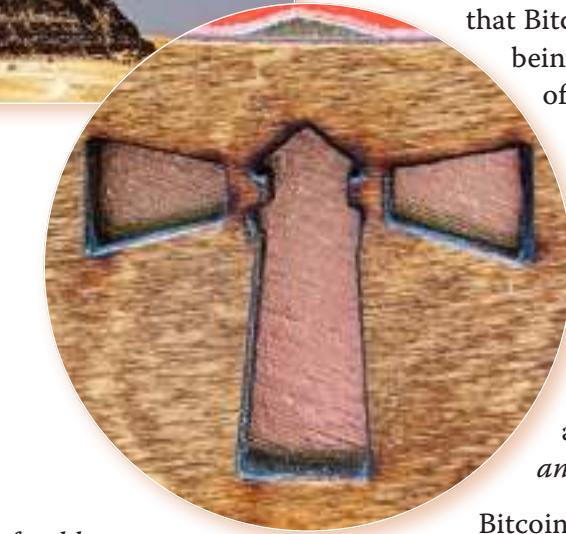


Bitcoin is Profoundly Stable

Every detail in Bitcoin is the very *essence* of stability. No matter what the world has thrown at it, Bitcoin has kept *all* its promises:

- ◆ It has issued a *precisely* predictable supply *exactly* according to schedule.
- ◆ Its security has *never* been breached.
- ◆ It has allowed *anyone* in the world to use Bitcoin.
- ◆ It has allowed owners to spend their coins *without restrictions*.
- ◆ It has allowed anyone in the world with a basic computer to *verify* its supply for *themselves* — without having to trust anybody else.

There have been *no* exceptions. Bitcoin is therefore *extremely* stable.



Bitcoin’s Adoption is a Migration Towards Stability

When critics call Bitcoin volatile, it is *not* meant to be a compliment. They are implying that stability is *preferable* to volatility. This much is correct. They are just *mistaken* about what stability is. Bitcoin’s incredible stability and reliability is *precisely* what is attracting ever-growing numbers of people, corporations, institutions and governments to adopt it to ever-greater degrees.



As Bitcoin’s adoption increases, its value, as measured in dollars, rises profoundly — albeit with wild short-term fluctuations in its dollar-denominated price.

But there is nothing about Bitcoin’s actual *nature* that is fluctuating. Just like a lighthouse, Bitcoin remains perfectly stable.

In light of all this, it is no surprise that Bitcoin is increasingly being chosen in place of national currencies.

Bitcoin’s steady and unbreakable assurances give the world a *standard* upon which we can trade with each other — across *any* distance, in *any* amount, and over *any* period of time.

Bitcoin’s reliability is leading the world on a path towards greater economic stability.

9 Why Bitcoin is *The Way* to Save Money

What Does “Saving Money” Mean?

IS SAVING MONEY PUTTING DOLLARS into a savings account? Let us take a closer look at this familiar two-word phrase, “saving money.”

The word “save” actually has *two* meanings. The first is “to store”. The second is “to rescue”. This second, to rescue, is the one we want to examine.

Next, what about the definition of “money”? Permit me to offer one,



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because dictionaries presume money is “physical coins or banknotes” — and that is outdated even before you consider the existence of Bitcoin.

I propose simply that “*money is an instrument that people use to store and transfer economic value*.”

Now, imagine if this instrument that people used to store and transfer such value was *dying*. We would need to *rescue* this instrument. We would need to *save* this instrument. We would need to *save money*.

So you see, when I talk about saving money, I do *not* mean “putting dollars into a savings account”.

I mean finding a *new instrument* that humankind can *rely* on to store and transfer economic value.

The reason we need this new instrument is because the old one is *failing*. For at least fifty years, government-issued money has been *losing* its ability to store and transfer economic value through inflation.

A can of soup used to cost ten cents — now it costs a dollar. A house has gone up tenfold in price. Everything has gotten more expensive — in dollars.

Inflation occurs when the people who can create money *abuse* that power. Today, that abuse has reached

a boiling point where trillions of dollars are created overnight, multiple times a year. This *destroys* savings held in alleged “savings” accounts.

Inflation is the *money-killer*.

“Whenever destroyers appear among men, they start by destroying money.”

— Ayn Rand

Enter Bitcoin — Saving Money!

Bitcoin is here to rescue the very *idea* of money from destruction. It *eliminates* anyone’s power to inflate away the savings of everyone.

In Bitcoin, there is *no* inflation.

Remember, there will only *ever* be 21 million coins, each divisible into 100 million parts called “satoshis”. These will be released according to an unchangeable schedule over the next 100+ years. This money will *only* be issued to people who put in the hard work to earn it.



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This guaranteed scarcity, combined with the requirement to do work for newly-issued bitcoins, reintroduces *integrity* into the monetary system — thereby saving it from collapse.

However, it does so only for the monetary instrument which has these characteristics — and that instrument is bitcoin.



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So Bitcoin is literally here to save money from destruction. And if you want to *save your* money from destruction you should convert it to bitcoin.

10 Why Bitcoin's Buying Power Keeps Rising

YOU WORK. YOU GET PAID — with money. You trade *your* money for the work that *other* people do. That is how *they* get paid.

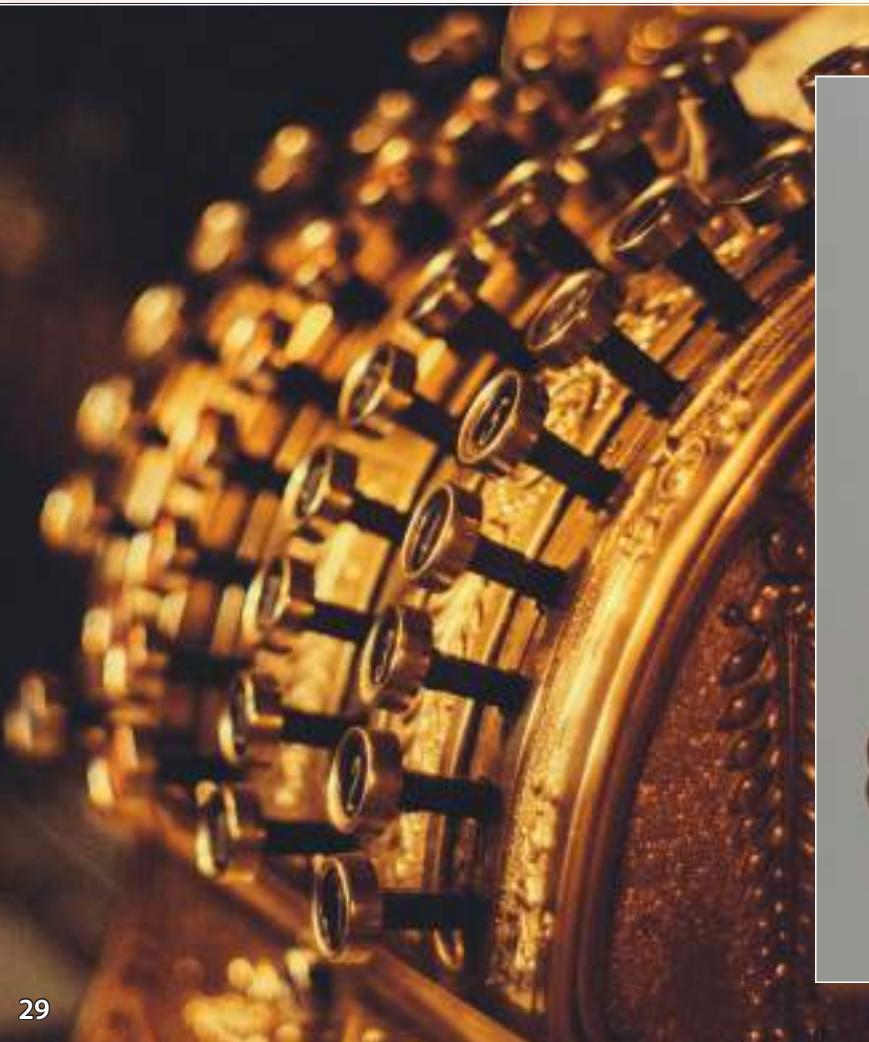
But ask yourself: Over time, does the money you get paid with buy *more* of the work other people do, or does it buy *less*?

If you use your nation's currency, the answer is that inflation *reduces* what your money can buy. The money supply is *growing* more than the amount of work that is being done — so more money buys less work.

Some people try to avoid inflation by choosing to hold precious metals, like gold. The theory behind this is that gold's purchasing power *should* remain stable — since mining it requires work that is, for the most part, steady over time.

However, bitcoin's purchasing power just keeps going up. A lot. *Why?*

Well, imagine if everything about the current process of creating money was flipped upside-down.



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Imagine a system that made it *impossible* to produce money by *decree*.

Imagine a system that required real, *hard* work to create money.

Imagine that no matter how much work was put in, only a *fixed* quantity of money could be created in any given period of time.

Imagine if that fixed quantity kept getting *reduced*.

Surely then, if all these things were true, money thus created would experience

the *opposite* effects than the money that keeps losing purchasing power.

When you use bitcoin, you choose this exact process of money creation — one that does *not* cause purchasing power to *shrink* over time, but rather, one where it *grows*.



All the things this article asked you to imagine are in fact *true* of Bitcoin: it cannot be produced by decree, its creation requires real, hard work, only a preset quantity is produced in any given time, and that quantity keeps getting reduced periodically.

This is why bitcoin's purchasing power keeps rising.

11 Why and How Bitcoin Uses Energy

How Does Bitcoin Use Energy?

Let me count the ways. First, Bitcoin uses energy to prevent anyone from erasing any of its records.

If you own some bitcoin, that is because someone sent it to you. That transaction was recorded in the blockchain — the full history of the *ownership* of all bitcoins. If it were possible to *erase* that record then you would *not* own that bitcoin anymore. However, replacing records requires using *more* energy than has been used since they were created. To erase a transaction created a year ago requires more energy than has been used since. The older a transaction is, the more difficult it is to ever erase it.

Second, Bitcoin uses energy to prevent anyone from passing off *falsified* records. Bitcoin has a way of checking how much energy has been used to create its blockchain at any given point in time. If anyone tries to pass off a *fake* blockchain, they would need to put more energy into it than the true one. The higher the energy requirement, the harder and more expensive this becomes.

Falsified records are easily invalidated by everyone and the one true version of the blockchain remains in place.



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When new blocks are discovered by miners, the highest-proof-of-work test is what *all* Bitcoin nodes use to prove which one is valid. Any disputes between two versions are ultimately settled by which one contains the *most work*. The strongest one wins!

These energy requirements prevent anyone from *re-spending* coins that were previously spent. This is Bitcoin's solution to the infamous "*double-spend problem*" — which had stymied all computer scientists until Satoshi Nakamoto published his Bitcoin Whitepaper in 2008.

Bitcoin's Energy Use Eliminates Dependency on Human Authorities

It does not take much energy to participate in Bitcoin. Anyone in the world can make a copy of the blockchain, keep it up to date, and ensure it is *perfectly* flawless. To verify everything, Bitcoin relies *only* on computations that can run on ordinary computers — so anyone can check everything for themselves.

Because it is practical for anyone to *verify* for themselves, this proof-of-work method of determining validity



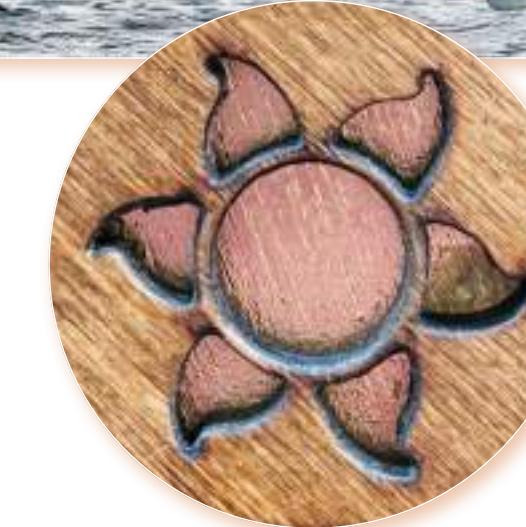
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eliminates needing to put *trust* in any human authority. This is the *only* known method for achieving perfect, world-wide agreement, free from any human authority.

Why Do People Put Energy into Bitcoin?

Bitcoins are very scarce. There will only ever be 21 million. This scarcity makes them increasingly *valuable*. Energy is *not* free. But there are people who choose to use costly energy to create valid, *new* blocks. This is how they earn newly created bitcoins.

Simply put, the Bitcoin system pays people with bitcoins to put energy



into reinforcing the security of Bitcoin's history and adding to it.

How It All Comes Together

Bitcoin pays people with *scarce* money to do work. That work adds

security to the money. Everyone who uses that scarce money benefits from this work — because it makes their scarce money even *more* secure.

This creates a virtuous circle, where work pays for more security, and where more security increases the value of the money that pays for the work, to increase its security.

Bitcoin's energy use is an integral and irreplaceable aspect of its operation. It uses energy to ensure agreement, validity, security, and scarcity to a degree nothing else on Earth provides — leading to the creation of the best money in history.



12 Why Bitcoin's Energy Use Benefits Our Environment

Human Civilization Needs Energy

Harnessing energy is the essence of a flourishing human civilization on Earth. Without abundant energy our lives would be cold, short, and miserable. And, there would be far fewer of us — which would be sad.

Bitcoin Prefers the Cleanest Energy

Bitcoin uses electricity as the energy in its mining process. There are many ways to generate *harmless*, clean electricity,



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including nuclear, hydro, wind, and solar. These sources of electricity are actually *cheaper* on-the-margin than fossil fuels. This is because none of them require costly extraction and transportation of millions of tons of fuel.

Bitcoin mining is a *brutally* competitive business. Thus, out of economic *necessity*, miners *must* use the cheapest sources of electricity available.

And, since the cheapest forms of electricity are also the cleanest, Bitcoin miners are compelled to use these *clean* sources.

Bitcoin is a Worthy Use of Energy

Bitcoin *does* use plenty of energy. And, it is completely transparent about how *much* energy it uses. It does not try to conceal its energy use. This transparency makes it an *easy target* to criticize. Just imagine if *other* institutions, like banking and government, were equally transparent about *their* energy use!

Bitcoin's energy use provides a value that *nothing* else in the world can. It is global, reliable, secure, and sound money. It is *far superior* to our current system of money. And this is *priceless*.



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Bitcoin Encourages Responsible Energy Use

Because Bitcoin increases in value over time it encourages saving and discourages waste. These incentives *reduce* the irresponsible spending that inflationary currencies cause — expenditures which *waste* energy and *pollute* our environment.



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Bitcoin Stabilizes Our Access to Energy

Electric power plants produce a largely steady stream of energy. However, our demand for electricity varies greatly during the day, and throughout the seasons: When we sleep, we turn off the lights, and use *less* electricity. When the weather is extreme, we turn on our heaters and air conditioners, using *more* electricity. This variance is inconsistent with how power plants and grids work.

Now, for the first time in history, there is a *fix* for this imbalance: Bitcoin mining!

Mining allows power plants to operate at peak efficiency — *independently* of our fluctuating demands.

Further, mining pays for power that would be otherwise wasted. This *improves* the economics for both plant operators and their customers — it *stabilizes* supply, demand, and prices.

Bitcoin mining thereby improves the economics of clean energy — which benefits us and our environment.



Bitcoin Grows Our Access to Energy

By improving the economics of clean energy production, Bitcoin actually *encourages* the building of more and larger clean power plants — displacing the use of older, dirtier plants.

In fact, Bitcoin even makes possible the construction of clean power facilities that would otherwise *not* be built, which would leave people to use dirtier substitutes. This is especially true for small, remote populations that must rely on small-scale, dirty sources of electricity — such as diesel generators.

Because Bitcoin mining can pay for *any* amount of electricity production, it now can make sense to build clean plants that otherwise would not have been economical to construct. For example, clean, volcanic geo-thermal energy in El Salvador is being used in Bitcoin mining — well ahead of any of the local population's demand for that electricity.

Bitcoin radically changes our energy landscape for the better.



13 Why Bitcoin is the World's Greatest Gladiator

Bitcoin Confronts Endless Attacks

BITCOIN HAS MANY ENEMIES who would like to put an end to it — and they keep trying. Nations, companies, and hackers have all made attempts at this. Journalists have repeatedly declared Bitcoin dead.

However, the reports of its death have been greatly exaggerated. And, in fact, Bitcoin actually gets *stronger* each time someone tries to kill it. It even benefits from people trying to ban it. And it also welcomes all attempts to replace it with anything *allegedly* better.

When it comes to attacks on Bitcoin, the question is not “what’s going to *kill* Bitcoin?” — rather, it is “how will this make Bitcoin *bigger, stronger, better*, and more *valuable*?“

Bitcoin Thrives When Attacked

Satoshi Nakamoto created Bitcoin with many capabilities that defend it against attacks that would damage or destroy any person, company, or country. And yes, Bitcoin can survive even a *nuclear* attack.

In addition, Bitcoin can also develop new defences that it previously lacked. Because it is software, it can add



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and adopt new capabilities — and it *highly* incentivizes the people who own bitcoins to create and install such defensive capabilities.

Bitcoin is the Greatest Gladiator the World Has Ever Seen

Like the Ancient Roman gladiators who fought publicly and to the death at the Colosseum, all of Bitcoin’s battles take

place out in the *open*. Each time Bitcoin successfully fends off a new attack in the real world, everyone stands witness to its invulnerability from *that* threat.

As a result, all can then see for themselves, and *tell* the tale to others that Bitcoin has, yet again, *proven* itself to be stronger than anything its attackers could come up with.

Bitcoin Grows From Being Attacked

One of the most significant ways Bitcoin actually grows *is* by proving itself capable of adapting to and surviving attacks.

Many corporations and institutions that *once* attacked Bitcoin are now beginning to store their wealth in Bitcoin *precisely* for this reason: they had expected Bitcoin to die, because *they* tried to kill it themselves — but they failed. These former enemies learned a *valuable* lesson: “If you can’t beat them, join them.” In then adopting Bitcoin, they make it even more valuable and widespread.

The same lesson is learned by those who create and invest in competitors they expect will kill Bitcoin. Most of these attempts failed miserably, because they are *inferior* to Bitcoin.

But were they to offer an *actual* improvement, Bitcoin could then be modified to implement *that* improvement. This would *neutralize* any temporary advantage the competitor might have.

Not every attack is *easily* defeated. Bitcoin has been through some very frightening and drawn-out battles. The most severe of these occurred when leading companies in the Bitcoin

ecosystem attempted to seize control of Bitcoin. Yet, even in this worst-case example, Bitcoin, the undefeatable gladiator, was victorious against their attacks. It dealt a harsh and unequivocal lesson to all involved — enemy and ally alike — that absolutely *nobody* can take control of Bitcoin!

Bitcoin Only Defends, it Never Attacks

Even when under attack Bitcoin allows everyone to use it, including those who are attacking it.

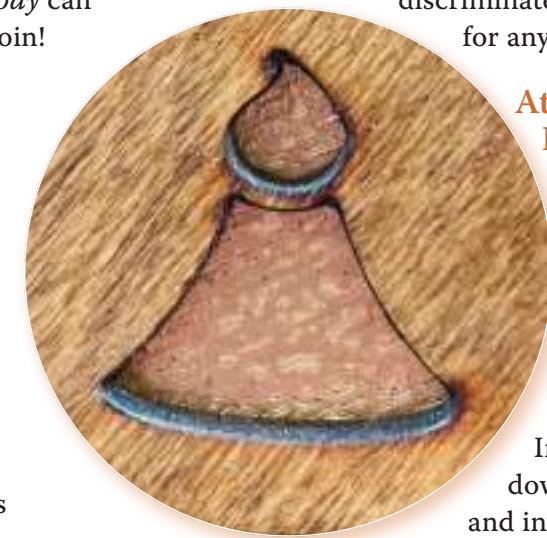
Bitcoin’s means of dealing with attacks is to survive them — without retaliation. It does *not* attempt to harm or kill its enemies.

Every design decision in Bitcoin prioritizes only *survivability*. Any attacker is always welcome to halt their



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attack and, if they so choose, to embrace Bitcoin in peace. Nobody is ever discriminated against by Bitcoin for any past transgression.



Attack Bitcoin, Please!

This article is *not* meant to discourage anyone from attacking Bitcoin if they think they have some clever idea. Instead, it throws down the gauntlet and invites them to do

battle with Bitcoin, the greatest gladiator the world has ever seen.

After all — it will only make Bitcoin stronger.

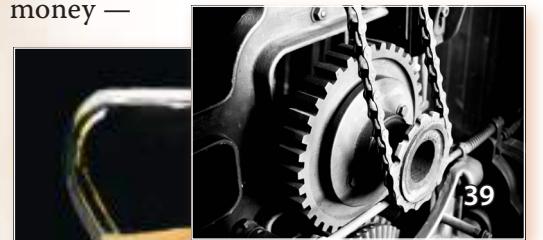


14 Why Bitcoin Will End The Greatest Heist In History

Time-Travelling Thieves

HERE IS A COOL IDEA FOR A MOVIE: Criminals from the past obtain a time machine and travel to the present where they steal money — which they then take back to the past. Their victims are helpless. The criminals cannot be sued by the victims because these thieves exist *only* in the victims' pasts.

Furthermore, the victims cannot remember they ever even *had* that stolen money —



they are just poorer.

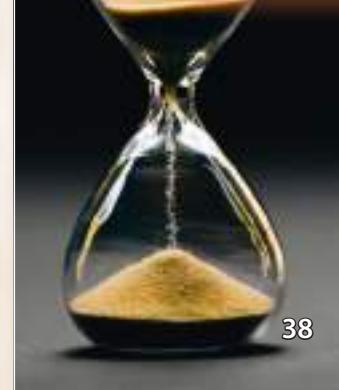
But the victims *do* know they have been robbed because the crooks leave a trail where

the only possible explanation is that *someone* from the past stole this money.

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Everyone can tell they have been robbed because they each owe money for things they *never* bought. They simply find themselves owing money for things that were consumed by someone else — *before* they were even born. It therefore *must* be that someone in the past bought something the victims are now on the hook for.

Ready to have your mind blown? This-money-stealing time machine and the crooks who use it *actually* exist in the real world. The crooks used it in the past to steal from *you* and there are more crooks like them in the present using it right now to steal from people in the future.



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We can see the unmistakeable mark of this crime: *every* person now born owes money for things they never bought and will never get to use.

How Time-Theft Works

This money-stealing time machine is called "government deficits and debt". Each annual theft is called the *deficit*, and the total amount stolen throughout history is called the *debt*.



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Now, there is nothing wrong with borrowing money — *if* you have the intention and the means to pay it back.

However, if you intentionally deceive the lender by spending the borrowings *without* having any intention to pay them back — you are committing *fraud*.

If you act even more outrageously by borrowing money which you say someone *else* will pay back which he does not even *know* you borrowed — you would be committing a *double* fraud.

Yet, this is *precisely what government deficits are*. Politicians keep borrowing but *never* paying back what they borrowed. None of them ever had any intention of paying it back. None of them ever *have* paid it back.

And worse, they do not personally assume *any* responsibility for paying it back, but instead make their debts the obligations of future generations. Clearly, these generations could *not* have agreed to taking on these debts — because they were not even born yet!

Every baby born in the United States today is *immediately* saddled with a debt of over \$80,000 — which they obviously never agreed to.

Somehow, nobody gets arrested for this monstrous fraud. Nobody who commits it is made to repay the money they stole — nor are they jailed for their crimes. *Why?*

Maybe it is because everyone who *should* put a stop to the crime is an accomplice to it. The police are paid with this stolen money. The judges are paid with it. The prosecutors are paid with it. The lawmakers are paid with it. Even the recipients of government benefits are paid with it. So are the banks that loan it — to people who then find themselves even *more* hopelessly in debt.

Our system of money is so *thoroughly* corrupted that *stealing* from *unborn children* has become so commonplace that it is expected at all levels of the government.

Future-Theft of More than Money

In stealing money from our future the thieves are *also* stealing the sustainability of our civilization.

Like a bank robber flush with ill-gotten loot, easy money leads to *irresponsible*, short term consumption — *without* regard for long term consequences.

Our economy thus becomes overheated and exhausted — as we make negligent decisions that we would otherwise *not* have made.

And how do you think one overheats and exhausts an economy? Why, of course, with money *stolen* from the future!



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The Cost of Short-Term Focus

Since 1971, politicians have been hell-bent on maximizing immediate consumption. They have achieved that goal through reckless, fraudulent borrowing from our future.

They panic if even *one* month goes by without "economic growth".

If there are six such consecutive months in a row, they call it a "recession".

They use this to justify *further* theft from the future — without any regard to paying back that money or to the consequences this will have on civilization's long term health.

Why do we steal what we do not need or want?

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Why doesn't the *madness* of stealing from our future and destroying our civilization *stop*?

It is because our money system is *broken*.

It was broken on the day it was created. That day was August 13, 1971. Suddenly then, money all around the world *ceased* being tied to the supply of gold. Instead, it could be printed by bureaucrats and politicians — and imposed as *debts* upon the people of the future.

The US president at the time was Richard M. Nixon — who is best known for saying “I am *not* a crook!”

In fact, however, he was such a grand crook, that even though he disgracefully resigned from office in 1974 — people being born today *still* owe money he *stole* from them before they were even born.

If Nixon had told the truth and *understood* what he had actually done, he would have said, while holding both his hands up in a gesture of victory, “*I am* the greatest crook in history!”

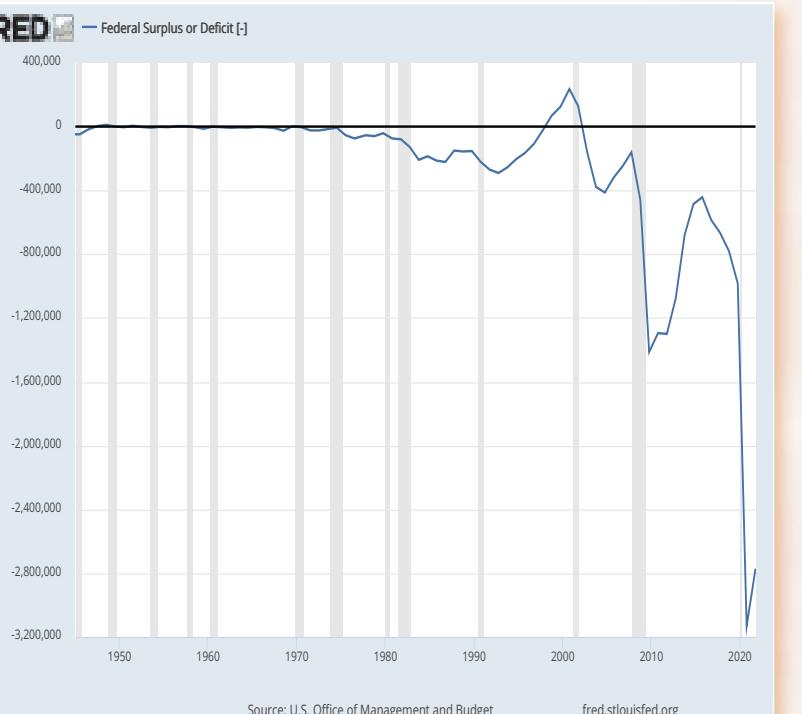
What Do We Need To End This Money-Madness?

Our kleptomaniacal system of money is an existential *threat* to civilization — and an affront to basic *decency* and *justice*.



We cannot go back to the system that existed before. That predecessor was called the “gold standard.” That system failed.

Gold has been used as money throughout much of history, but it has an Achilles heel — a *vulnerability* that has been exploited repeatedly. The weakness of gold is that it can be seized by *physical force*. And this fact *invites* violence and *incentivizes* war.



The evidence: The Federal Deficit per year — also known as the amount stolen from the future — the heist begins in 1971 and reaches over \$3 trillion in 2021 alone.



Consider this brief history of gold recounted by Michael Saylor in his debate on *Bitcoin versus Gold*:

“Gold invites violence. Alexander the Great gallivanted around the world to seize gold. Libby tells the story of a thousand Roman sieges to steal the gold. Caesar sacked Gaul to take their gold. Kublai Khan seized the gold. Pizarra seized the gold from the Incas. Cortez seized gold from the Aztecs. Charles I seized the gold from all the British nobles. The Prussians seized gold from the French in 1871. In World War One everybody seized gold. Lenin seized gold from the church in 1922. Roosevelt seized everybody's gold in 1933. Stalin seized the gold of the Spaniards in 1936. Churchill took everybody's gold in 1940 at the onset of World War Two. In 1944, at Bretton Woods the United States seized the world's gold and then took it hostage.

Finally, Nixon ‘killed’ all the hostages in 1971. Gold is *always* getting seized.”

Despite retaining its value over long periods of time, all too often throughout history, the actual *ownership* of gold changed hands through *physical seizure* — rather than through voluntary exchange.

Bitcoin Disables the Money-Stealing Time Machine — Forever

Finally, there *now* exists a solution to all this. For the first time in history, a system of money has been *engineered* to solve the weaknesses of all previous systems. It solves the problems with gold — which invited violence and war. It solves the problems with debt-based money — which invites time-theft and short-sightedness.

This perfectly-engineered system is Bitcoin. We do not have to let *anyone*

steal from our children's future — or ruin our civilization *any more*, ever again.

Unlike gold, Bitcoin is *unseizable*.

Neither all the military power in the world nor all of its computing power can seize even a *single* bitcoin. Nor can any forces borrow non-existent and never-to-exist bitcoins — claiming future generations will pay off this debt.

When the “Bitcoin standard” replaces debt-based money, all of these destruc-

tive effects will *cease*. We will all then benefit from an economy that is permitted to cool down when overheated. We will benefit from a civilization where new efficiencies are not pilfered away on unnecessary “stimulus”. We will benefit from Bitcoin's incentives to generate abundant, clean energy.

Bitcoin will rid the world of the institutions and practices that *dared* to steal from the helpless, unborn citizens of the future. It will bring about the end of the greatest-heist ever that was foisted upon the whole world on that dark day in August of 1971.

Only one champion can defeat these wicked enemies of humanity perpetrating the greatest heist in all history — the world's greatest gladiator, Bitcoin!



15 Why Civilization Needs Bitcoin

The Magical Miracle of Money

MONEY IS A TOOL UNIQUE TO humans. It coordinates our activities and allows for voluntary co-operation on a vast and global scale. The results are extraordinary.

Think about *any* product that you recently bought. Consider how *many* people worked to get the materials for it, manufacture it, package it, warehouse it, stock it and ship it. Yet *you* didn't have to talk to a single one of them.

You just had to hand

over some money to one business — and you didn't have to worry about *any* of these details.

This complex coordination of activities made *easy* by money is far beyond what *anyone* can plan. When seen in this way, money seems magically miraculous.

Money Creates Civilizations

With *sound* money, humans can create civilizations!

Such societies offer people the means to satisfy their needs,

wants, and

values. Over time, civilizations achieve ever greater accomplishments through money's ongoing, magical-seeming powers of coordination.



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Civilization's Destroyer — Dark Magic Money

Unfortunately, there are people who meddle with money and its magnificent co-ordination properties.

Thieves try to obtain money through physical force. *Frauds* obtain it by promising something but not delivering on the promise. *Politicians* think they can better co-ordinate human action than money by forcing their preferences on others.

And then there are the *central banks*. They monopolize and control money *itself* — distorting and destroying

its magical benefits. Our money has been *completely* under their control since 1971, with devastating consequences. For most people reading this, that means *you* have lived under *their* dark spell your whole life.

They claim that money *should* lose purchasing power over time. If money isn't losing enough purchasing power quickly enough, they act to destroy it *faster*. Their claim is that this will make people consume more quickly — which will be *good* for the economy.

They use their control over money to fuel this unnecessary, unwanted short term consumption by *destroying* people's ability to save for the long term.

The father of their movement, John Maynard Keynes, justified this great evil by saying "*In the long term, we are all dead.*"



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In the Long Term We Can and Should Thrive

However, we are *not* all dead in the long term. First, we each live longer, healthier and happier lives when we are able to focus on and plan for the long term. Eating well, exercising, and developing preventions and cures for diseases all extend our individual lives. Saving sound money for our future lets us live free of anxiety about it.

By moderating short term consumption, we preserve scarce resources and our environment for the future of *all* the people who will *ever* live.



Such long term focus allows us to embark on multi-generational projects. These were common in the age before central banks. But now, the world has been *robbed* of them.

Magic Internet Money to the Rescue

Sound money that allows humanity to co-ordinate its activities peacefully over the long term is desperately needed — it is good for individuals, for humanity, and for our environment.

Bitcoin is *this* money.

Bitcoin is *not* controlled by *anyone* — and it is built to last for the ages. Bitcoin is the invention we need to recover from the self-destructive, short term, and inhuman forces that are casting darkness over our beautiful civilization.



16 Why Bitcoin is Changing the World

Money Sometimes Changes Form

Since the dawn of civilization, money has been essential to society. As civilizations advanced, the instruments people used for money progressed along with it. People once used seashells, then beads, then salt, and then metal coins as money.

Today, the most common instrument used is government-issued paper money and its digital equivalents. Examples include the US dollar, Mexican peso, and the Euro.

Each time the form of money changed, the people who had lots of the old form went from being very wealthy, to having a bunch of worthless seashells, beads, piles of salt, antique coins — or stacks of worthless paper.



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The Next Change is Happening Now

What we currently use as money is losing its integrity and many people are now looking for a better alternative.

In some cases, these national currencies have already failed — or are clearly headed in that direction.

Many people are discovering that Bitcoin *is* the better alternative. More and more people are coming to the conclusion that Bitcoin *is* their preferred money. Some choose it because its rules are incorruptible. Others because it keeps becoming more valuable. Many more because they see it as a path to long term economic stability. And, even more are choosing it because it *cannot* be controlled by *any* government.

Regardless of people's individual reasons, this change is nevertheless happening — and it is happening *now*.

Will You Make The Change?

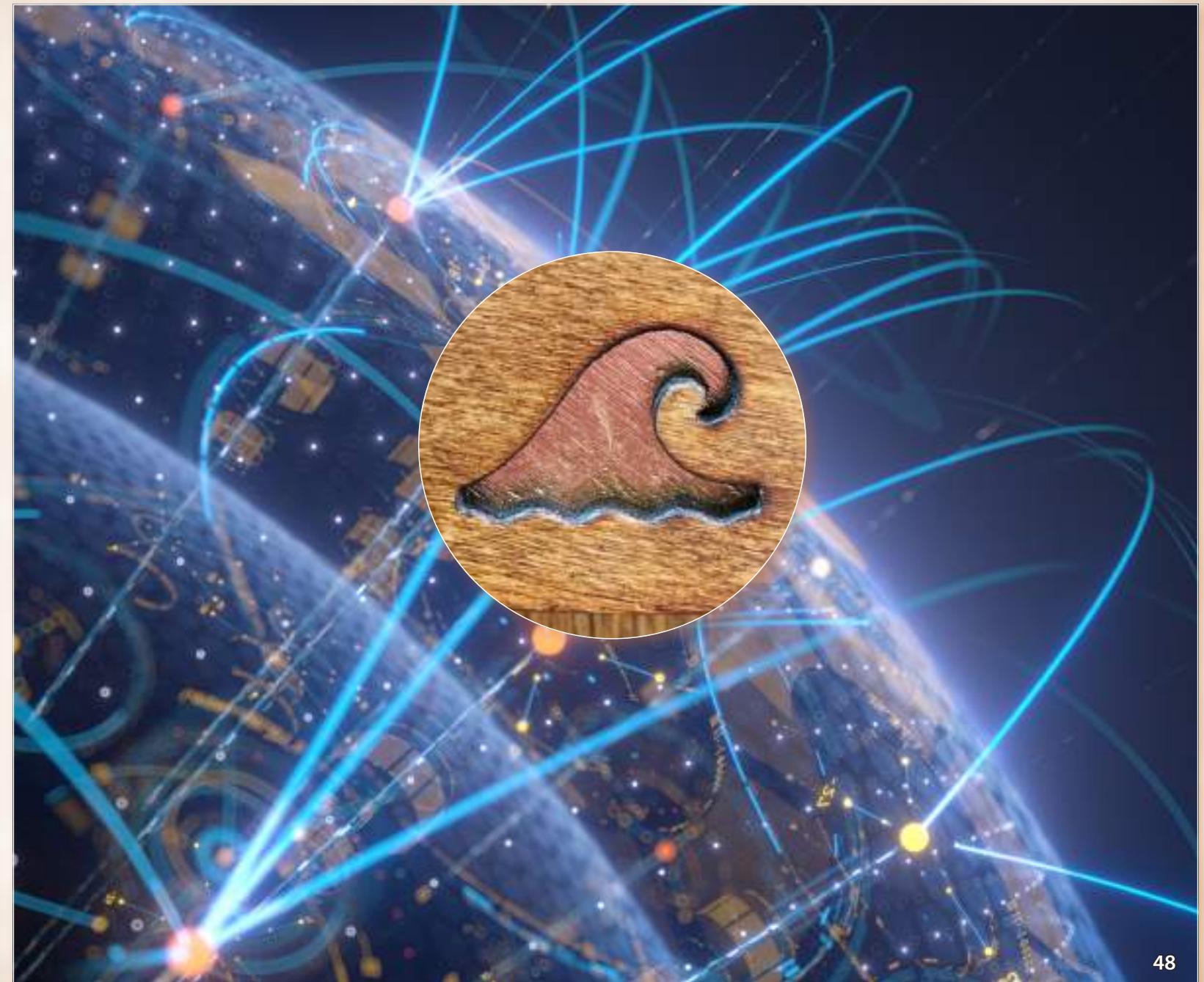
You can disregard the change happening to what we use as money. If you do, you risk being left behind — like those who held on to beads, salt or seashells.

Alternatively, you can *learn* about what is happening and *then* choose accordingly. If you do, *you* will be able to change along with our civilization and its money.

Changing Our Money Will Change the World

When our current form of money took over from gold, it changed the world — mostly, for the worse.

Bitcoin aims to remedy the problems that resulted from that change. It *restores* money's integrity. And, because money is *so* fundamental to a healthy, robust, and vibrant civilization, Bitcoin can transform ours — to one that is sustainable, thriving, peaceful, honorable, productive, and rational.



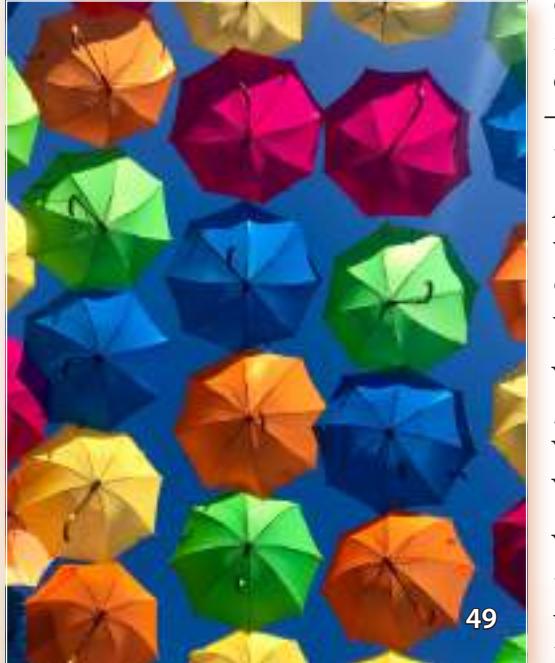
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Why Bitcoin is the World's Most Inclusive Institution

Inclusivity is Good, But Hard

ELIMINATING UNJUST DISCRIMINATION in institutions seems like an *unwinnable* war. We see case after case of powerful decision-makers discriminating on the basis of factors like age, race, and gender. While we all know this is a problem, we do *not* know how to solve it.

We speak out against it, we protest, we pass laws, and we prosecute against it. However, in the end, the possibility of



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human *irrationality* means we can *never* entirely get rid of *prejudice* wherever people are in positions of power.

In Bitcoin Nobody is in Charge

Bitcoin offers a novel solution to the problem of unjust discrimination. Bitcoin's unique design means that *nobody* is in charge of *any* aspect of it — even deciding *who* can use it.

By having no one in *any* role with the power to discriminate, Bitcoin eliminates any and all *possibility* of such moral wickedness. Thus, it follows that *everyone* in the world can use Bitcoin — regardless of anything at all, including their age, their race, and their gender.

No other institution in the world welcomes everybody to this degree. This makes Bitcoin the world's *most* inclusive institution.

You do *not* need an invitation. You do *not* need to live in any particular country. You do *not* need a home address. You do *not* need photo identification.

You can use it without *ever* needing to tell Bitcoin *anything* about yourself. In fact, you *cannot* even tell Bitcoin anything about yourself!



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Bitcoin Unites Us All

By making itself accessible to *everyone* in the world Bitcoin becomes even more widely used every day. In the not-too-distant future, Bitcoin may even become the *most* widely accepted money ever.

As there are no limits on *who* can use it, Bitcoin can bring *everyone* in the world together. It connects those with nice homes to those with no shoes on their feet. It gathers together people of all races, all genders, all religions,



all ideologies, all abilities — from all locations everywhere in the world. Bitcoin unifies all mankind within *one* system — exhibiting incorruptible

integrity, eliminating unjust discrimination, and guaranteeing equal treatment for all.



18 Why Bitcoin Attracts Extraordinary Talent

Imagine If....

IMAGINE IF A COMPANY EXISTED which had great engineers and developers all volunteering to work for it out of their *passion* for its product.

Imagine if they all also *owned* a part of it.

Suppose there were also philosophers, mathematicians, teachers, entrepreneurs, and risk-taking adventurers among all the volunteers.

And, imagine if *nobody* took any salary.

No Bosses, Job Descriptions Or Discrimination

Why stop there? Imagine if this company had no *structure* — nobody hired or fired anybody, people would simply contribute what they could, whenever they could, full-time or part-time, permanently or temporarily. Literally *anyone, anywhere* in the world could join in, *whenever* they wanted — with *no* systemic discrimination of *any* kind.

There would also be *no* strategic plan, *no* job descriptions, *no* CEO — and *no* “Human Resources” department.



The Competition

Imagine if this company had competitors operating *monopolies* in every country on Earth. Each and every person was *forced* to use those competitors' products — which turn out to be nothing less than *money itself!*

But, *their* money is not *good* money. It is not money that *holds* its purchasing power. It is not money that *resists* confiscation. It is not money *immune* to being frozen. It is not money that takes *any* effort to create.

Yet, *you* must work *hard* for that money — while *they* do not.

This is therefore a thoroughly *unjust* system of money. There is a great need for a *just* alternative.

This is why so many people are volunteering to work for our imaginary company.

It is a company rooted in justice, because *its* product is actually *sound money* that holds its purchasing power,



resists confiscation, is immune to being frozen — and does require effort to create.

Would You Join?

Ask yourself: Would you *invest* in this imaginary company? Would you *participate* in it? Would you *use* its product?

Multitudes of people would answer “Yes”. Playing a role in creating *desperately* needed sound money would inspire, motivate and reward legions of diverse, smart and principled people.

You Can Join Us!

Now, of course there *is* no such company. Any *company* that tried to make sound money would

get shut down in a heartbeat by governments, and its employees would be thrown in prison.

However, there *is* Bitcoin.

Bitcoin *cannot* be shut down. It is *not* a company. It has *no* CEO. It has *no* employees. It has *no* location. It has *no* “Compliance Department” to comply with any government’s order to shut it down.



Bitcoin just runs on the efforts of volunteers — and on *their* computers.

However, Bitcoin possesses *all* of the characteristics of our imaginary company that operates a just and desperately needed system of money.

Inspired by the incredible talent of its creator, Satoshi Nakamoto, and following in his footsteps, people from all walks of life and disciplines are drawn towards Bitcoin's shining beacon of justice and freedom — eager to volunteer their unique and exceptional talents to its historic cause.

19 Why You Shouldn't Fear Bitcoin

We Fear What May be Dangerous

THE PURPOSE OF FEAR IS TO KEEP us away from what *might* harm us. However, we have no way of *automatically* knowing what *will* harm us. The unknown may be dangerous — or it may be beneficial. We need to *discover* which it is, and when.

A knife is a good example. It can be quite dangerous. When we learn to wield it properly, it becomes a tool we can use to prepare food, which is beneficial.



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When we are young, we often fear knives, but with experience we come to view them as useful tools — and *not* as objects to fear.

Learning is a Gradual Process

The first time you tried to stand up, you fell down. With practice you got better. The same happened as you learned to walk and eventually to run. Walking was something you *wanted* to do. You could see other people doing it — and you could see the benefit of getting where you wanted.

When it came to learning even more skills, you may have wanted to learn some more than others — and that contributed to *you* becoming your *unique* self.

People Say Frightening Things

Someone could have tried to scare you away from learning to run — maybe someone even did. “It’s bad for your knees!” they might have warned. Some warnings are fair. But *most* are overblown. People *can* learn to run without damaging their knees.



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Why Learn to Use Bitcoin

Bitcoin is a *new* form of something that just about every human being needs to use every day — *money*. Bitcoin is quickly becoming superior to *all*



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previous forms of money, including what we use now. It may already be the best way to *save* money for the future. And it is quickly becoming the most *efficient* and *reliable* way to send and receive money. Perhaps, most strikingly, it is the most *secure* form of money that has ever existed — in that it can never be confiscated or frozen.

You have nothing to fear from Bitcoin. Do not let others scare you into believing that it is a “scheme” to take your money or that it is “dangerous to our environment”. It is neither.

Like all *new* things, Bitcoin takes time to understand. Fearing it before you understand it could lead you to mistakenly think it is dangerous — when it is actually *beneficial*.

Bitcoin is not an all-or-nothing bet. You can learn about it gradually.

You can start with buying just a little.

Then you can learn about it and experiment with it. If you mess up and lose this little bit, it could be like the first time you tried to stand up. Eventually, you will understand more and become more practiced. In time, you will become comfortable with it — just like you have with so many other things you learned.



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20 Why Bitcoin is So Complicated

Do Not Blame Bitcoin for Being Complicated

BITCOIN WAS born in 2009 into a very complicated world. It was a world of central banks — organizations that are not private, but also are not public. It was a world with over one quadrillion dollars of highly complicated financial “derivatives” — which exhibited extreme volatility causing multiple economic crises. It was a world where banks needed multiple “bailouts” — to save them from collapse.

Despite the many flaws of this system, those governments, politicians and bankers in charge are *not* about to let go of their control of money. And these people *also* control the police forces, laws, courts, tanks, drones, jet fighters and aircraft carriers.

For Bitcoin to become the “good money” that Hayek talked about, it necessitated the use of “roundabout ways” which they could not stop.

“I do not believe we shall ever have a good money again before we take the thing out of the hands of government — we can't take it violently — all we can do is by some sly roundabout way introduce something that they can't stop.”

— Friedrich A. Hayek, 1984



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Survival in a Complicated World

Bitcoin is the first and only system of money that *cannot* be stopped, taken over, confiscated, or broken by adversaries like governments, imitators, hackers, banks — or *anything* else.

In this undeniably complicated world, Bitcoin *needed* to be a system that could survive those cruel, challenging, and adversarial conditions.

It needed to be free from any leaders who could be threatened or bribed — so it opted to have *no* leaders. It needed to be free from any corruptible vulnerabilities — so it also left out *anything* that could possibly be compromised.

Bitcoin replaced all these exploitable vulnerabilities with rules based on



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incurruptible mathematics and inviolable laws of physics. Neither math nor physics can be stopped or overcome by man-made laws, by force, or by deception.

This is how Bitcoin survives and defends itself from attacks by governments, hackers, and other opponents. It is the *only* way.

Everything Around Us is Complicated

Bitcoin *is* complicated because it *needs* to be. It relies only on proven principles of math and physics — and assembles them in an ingenious manner to fulfill *all* the requirements of “good money”.

Bitcoin is *not* the only complicated thing we have to deal with. Computers are also very complicated — and few of us understand how *they* work. The same goes for automobiles, refrigerators, and the Internet.



21 Why Bitcoin Can Handle All the Commerce in the World

Sending Money through Banks

YOUR BANK HOLDS YOUR MONEY. They also hold the money of many other people. When you send money to one of those people, the bank takes it out of your account and puts it in the other person's.

But your bank does *not* hold *everyone's* money. To send money to someone who banks elsewhere, your bank itself needs an account at that *other* person's bank. Then, your bank takes the money from *you*, and the other bank takes the same amount of money from *them*. Finally, their bank puts that money in the account of the person you are sending it to.



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For this system to work, everyone needs to open accounts at banks. This business is very lucrative for banks — and makes them very *powerful*. This process can also be time-consuming, expensive — and often unreliable.

Bitcoin Frees Us from Banks

In Bitcoin we *eliminate* the power that institutions have over us. We take back both the power *and* the money. Bitcoin's beauty is that it makes the previously impossible — possible.

We have already seen how it makes possible economic stability, increased purchasing power of savings, and the guaranteeing of equal treatment for everyone.



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Lightning Bestows New Abilities on Bitcoin

The invention of Bitcoin's "Lightning Network," first described in a Whitepaper in 2016, introduces even more new possibilities — *unlimited*, instant, inexpensive transactions.

With Lightning, we do not need the banks anymore. We can send money to one another with *each* of

us playing one of the roles the banks previously played.

If you and I are directly connected on Bitcoin's Lightning Network, we can instantly send money back and forth to each other, at no cost, simply by updating our balances. And if you want to send money to someone only *I* am connected to, you can send it to me, and I will send it along to



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them — without anyone having to trust anyone. This only costs a *tiny* amount.

Lightning allows us to do all this instantly, securely, privately, cheaply — anytime, anywhere, with anyone.

Lightning Can Scale Infinitely

The more people who use Lightning, the more its capacity, speed, and reliability increases.

Just as the Internet scales infinitely when more routers, cables, switches, and servers are added, so too does the Lightning Network — except

it scales through adding nodes, user connections, and bitcoins.

for purchases ranging in size from a cup of coffee, to a basket of groceries — to a mortgage payment.

Lightning's potential is limited only by the imaginations of Bitcoin's brilliant, creative and growing community. As their innovations roll out, Bitcoin's Lightning Network can scale to meet *all* the demands of a thriving and growing global civilization.



22 Why Bitcoin's Imitators Are Scams

The Sincerest Form of Flattery

BITCOIN HAS MANY IMITATORS — *none* as good. The most common mistake newcomers make is falling for the *false* claim that any of these imitators represent an *improvement* on Bitcoin.

However, as we have seen, Bitcoin is complicated. It is also new. And there is much money at stake. These facts attract predators seeking to separate newcomers from their money.



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These scams go by the name of “Crypto”. Bitcoin is an invention of profound ingenuity — providing sound, incorruptible money to everyone in the world.

Since Bitcoin itself is incorruptible, these scammers must *trick* their victims into handing over money for something *other* than bitcoin. These frauds do so by creating imitations of Bitcoin. Sadly, they have gotten away with tricking many would-be bitcoiners into buying these fundamentally *worthless* “alternatives”.

Don't Trust, Verify!

How are *you* to know if these imitators' claims of being better are *valid*? Granted, this is not easy, but there is a credo bitcoiners use that gets to the very core:

“Don't trust. Verify.”

Every single aspect of Bitcoin is *independently verifiable*. You can validate every transaction, every block — even every line of programming. This makes Bitcoin *incorruptible* — and “*trustless*”.

You Can Trust Me

The strategy of “crypto” con-artists is to *obtain* your confidence with bogus or irrelevant claims. They then *betray* that trust by giving you bogus or irrelevant digital tokens in exchange for your hard-earned money. Curiously enough, these scammers will themselves often want bitcoin for their tokens — which, right there, should tell you *everything* you need to know.

The typical “crypto” scam thus almost always has a smooth-talking, charismatic character at its helm. Whether it is a boy genius who speaks in incomprehensible techno-jargon, a libertarian rebel, a guy in a business suit with a nice accent, or someone dressed up like



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a magician — if there is someone in charge who you have to trust, *that* is who is going to take your money. The tokens that they are selling you cost them *nothing* to create.

Trust No One

Any “crypto” which has spokespeople, leaders, or institutes *must* put its trust in these people — and therefore,

so also must *you*. As a result, that “crypto” lacks the *single-most* important feature at the heart of Bitcoin — *incorruptibility*.

Bitcoin Puts no Trust in any Human Beings — “Cryptos” Do.

Anything claiming to be “better” than Bitcoin because it is *newer*, or has allegedly *improved* on some feature of it, seeks to lure you away from what truly matters most.

Bells and whistles are irrelevant — *trustlessness* is

the *only* important and necessary test.

Anything that relies on *trust* in some group of human beings is therefore *not* a step forward from Bitcoin, but rather a step *backwards* that reintroduces the old problems Bitcoin solved.

Bitcoin puts trust in *nobody*. That is the genius of its invention. It is a system *free* from trust in mere



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human beings. You yourself can read Bitcoin's Whitepaper and with a bit of effort understand how Bitcoin works to achieve *trustlessness*. Bitcoin is the *only* trustless-money technology.

But don't take *my* word for it.

Verify!



23 Why Bitcoin is So Much More Than Money

Cars Changed the World

Cars turned out to be so much more than just another way to get around. Automobiles didn't simply *replace* the horse and buggy. Rather, they ushered in a new age — one of massive mobility.

Billions of people could now safely move about at high speeds — and at any time. This led to an explosion in the number of places that people could go.

Cars made it possible for many new things to exist and thrive: shopping malls, movie theaters, theme parks, vacation homes, suburbs, and so much more.



were not faster than horses. They were vastly outnumbered by horses. Roads were not designed for them. No highways existed. In time, all that changed.

Now It is Bitcoin's Turn

This same phenomenon is happening *again* — this time with money.

Bitcoin is a *massive* improvement over all previous forms of money in *every* respect. It is secure, scarce and accessible to everyone in the world. It can be sent anywhere. It lasts forever. It is predictable, auditable, verifiable and divisible. It is, to put it simply, *profoundly* superior.

Bitcoin's buildout will be as profound as was the buildout for cars.



Cars liberated people and the result was profoundly transformational on the lives of everyone. Cars changed the world.

However, in the early days of the automobile it was not obvious that any of this would happen. Back then, cars

Cars led to an abundance of paved roads, highways, gas stations, car makers, the assembly line, and more.

Bitcoin will *also* lead to a transformation of our society. Just as cars are everywhere now, Bitcoin will be everywhere soon. It will be sent *instantly* and *cheaply* to anyone, anywhere. It will enable previously *impossible* trade relationships. It will replace today's *primitive* financial institutions.

As this transformation happens, Bitcoin will liberate people. It will free us to store and transfer money *without* banks. It will free us from inflation that *destroys* our savings — and which forces unhealthy over-consumption. It will free us from the costs of converting money across international



borders. It will free us from *tremendous* debts. It will free us from the countless constraints of today's financial system.

When Bitcoin achieves mass adoption, our civilization will advance as dramatically as it did when automobiles ended the horse and buggy era.

Bitcoin will make possible countless new ideas which were previously *unimaginable*.

Please, do not limit your thinking of Bitcoin *merely* to it being a new type of money.

Instead, recognize and appreciate that it is so much more — an invention that will *change* the world.



24 Why You Need Bitcoin



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You are Truly Magnificent!

YOU ARE A ONCE IN THE HISTORY of the Universe event. *Nothing* quite like you ever existed before. And, when you are gone, nothing *exactly* like you will ever again exist. When you are truly being yourself, nobody else can do what you do in the unique way which only you can. Nobody can appreciate the joy of being you as much as you can. You are special, wonderful, and extraordinary.

You have a *purpose*. Discovering and fulfilling this purpose will give you great joy. There is no other feeling like it.

Please, take ten seconds now to reflect on how much, deep down within, you truly do love yourself.



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Next, please take ten seconds more to consider just how *profoundly* you desire to *fully express* yourself.

The Secret to True Wealth

We now have the resources to build a world in which you can live long enough and with enough wealth to *fulfill* that desire.

This is *not* the kind of wealth that exists for showing off how much money you have. Such displays are mere *pretenses* at wealth — they contribute *nothing* to *you* being yourself.

Our civilization can produce so much wealth that each of us can pursue our true purpose.

This is the real feeling of being wealthy — it is the feeling of *freedom*.



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Claim Your Freedom!

However, there is a problem. Your freedom is restricted by powers that control money and who, through that control, are *your* masters — and you *their* slave.

If masters and rulers preside over you — and if they can seize or negate the results of your efforts — you can *not* exercise your *necessary* freedoms.

Instead, you are forced into anticipating their whims or obeying their orders —

making you *their* puppet. Or, you must plead with them to bestow their favors upon you — making you a beggar.

But you are neither a *puppet* nor a *beggar*.

You are a magnificent, heroic *human being* — and Bitcoin frees you from these tormentors' chains!

Bitcoin is the *key* to you taking back control of your life. It gives you the power to ensure the choices you make about what do with *your* time and energy — will be choices you can *count* on.



25 Why Bitcoin is the New Frontier

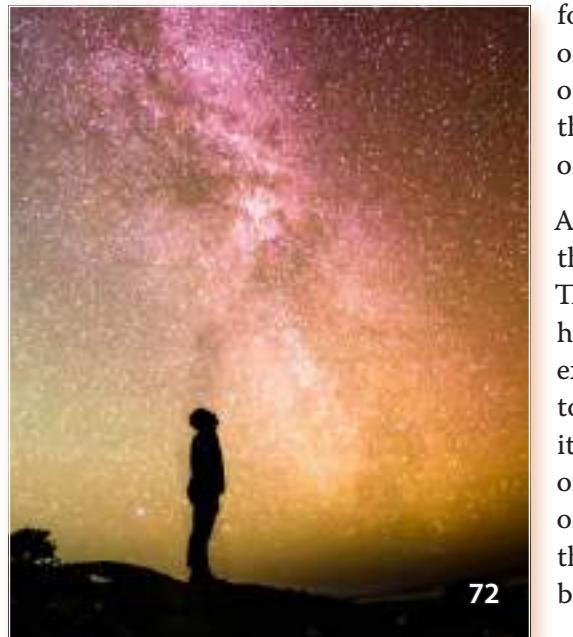
ONCE, IT WAS THE “NEW WORLD” that represented the new frontier. Then, after the Americas were settled, we believed space was the next and *final frontier*.

Now, we have a *radically new* frontier which beckons our attention — Bitcoin.

For those with the curiosity to heed its call, Bitcoin has emerged as a vast and mysterious space to explore — offering us legendary treasures, thrilling adventures, and unlimited potential.



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As promised in the Statue of Liberty’s beautiful — but sadly no longer true invitation — Bitcoin invites those who are tired, poor and yearning to breathe free to enter its realm and bask in the light of its gifts.

The Bitcoin frontier exists throughout the entire Earth. It allows human civilization to surge forward into undeveloped territory.

This new frontier is accessible to anyone, anywhere, anytime. It rewards its explorers

for discovering new sources of energy. It encourages them to focus on long time horizons. It liberates them from the arbitrary decrees of soul-sucking institutions.

As with any new frontier, though, the going is not always easy. The exploration and development involve hard work, difficult challenges, extreme patience, and even danger to life and limb. However, its rewards offer a reclamation of lost liberties, and even a discovery of *new freedoms* essential for human thriving. These values have long been disappearing from our world.

Yet, to those who choose Bitcoin, these freedoms are well worth the efforts and the risks required to reclaim and reconstruct them — this time in an indestructible manner.

Bitcoin gets better with time through effort, and it is open to everyone — whenever they choose.

So, we sojourn forth into this new frontier — bravely, curiously, openly, and transparently — and we invite the world to watch us, and to join us.



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26 Why Bitcoin is Worthy of Your Love

The Love of Money

There is a saying that “the love of money is the root of all evil”. And Bitcoin is money. However, Bitcoin is reliable, sound, honest money — and, as such, it is good for you, for humanity, and for the planet.

What is Love?

How is love earned and sustained?

To be loved, one must offer something of *uniquely* irreplaceable value. One must also *never* taint the love through betraying that value.

One must be honest — allowing oneself to be evaluated without concealment. Anything less than *complete* transparency might be hiding something which undermines that love.

Bitcoin is Worthy

Bitcoin says to every individual on Earth:

“I offer you the *greatest* instrument for money that has ever existed — bitcoin.

“My nature ensures this money’s supply is *limited* and *always* verifiable to you. This money cannot be *taken* from you by force. You can send any of yours to *whomever* you want — for *any* reason. This money can *store* the efforts

of your work for any length of time — including a time *beyond* your own life or the existence of your country.

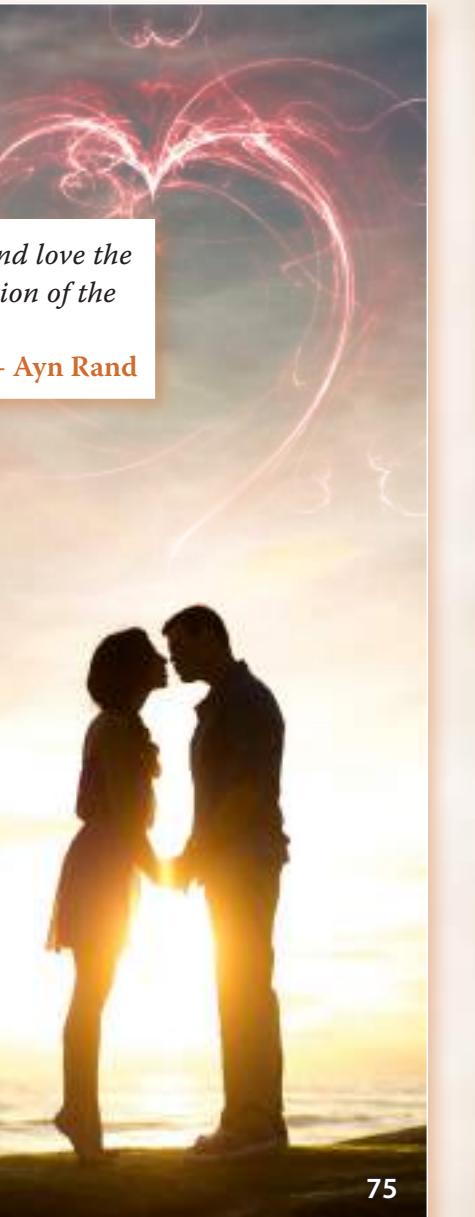
“I am *bound* to keep these assurances by the *inviolable* laws of math and physics.

“Look upon me and you can *verify* all my claims. I do *not* ask for your trust. I *hide* nothing. I stand before you naked, open, and transparent. My programming is open and public. My history is public. You are welcome to keep copies of these and always verify their accuracy.

“If you find any flaw in my claims, you may change me. But the change must truly *correct* me, for I am watched over by millions of others — and they will prevent any change to me that will betray my promises.

“I will *never* reject you, under any circumstances, no matter what actions you have taken before. I am here to *be* judged, but I do *not* judge you.

“I will *never* force you to accept me, let alone to love me. I will always remain here with my offer to you of all this. And, I await, patiently — until *you* are ready.”



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Why Bitcoin is a Movement of Peace

THIS IS A DECLARATION OF PEACE!

I will not fight you.
Because I do not need to.
I do not want to fight you.
One of us might get hurt,
or even killed,
— and it might be me.
But, if I needed to,
I would.

Thankfully, for both our sakes,
I do not.

There is yet a nobler reason
behind my not wanting
to fight you.
I want to work with you.
So that I can show you the best of me,
and you can show me the best of you.
I want to co-exist
in peace with you.
Thanks to Bitcoin,
I can.

Those who do not know Bitcoin,
may wonder why
solely my knowledge of Bitcoin
suffices for me
to declare peace unto them.
Shalom. Salaam.

The reason is that I have a shield.
My wealth can not be stolen.
So I do not view others as a threat.
If they assert themselves as my enemy,
I simply laugh them off.
What can they do to me?
They gain nothing by hurting me.
If they kill me
— they do not get my bitcoin.

And I want nothing from anyone
that they do not freely want
to exchange with me.
That is because I am a bitcoiner
— I embrace Bitcoin, the inviolable
system which only permits
consensual exchange.

Bitcoin is money
that can never be stolen
from one who wields it responsibly.
And I have learned
to wield it responsibly.
It is not a weapon,
but a shield.
I can not use it to hurt you.
And you can not use it to hurt me.

So I declare peace unto you!
Whether or not you are ready
for peace with me.
Mine is a unilateral declaration.
I yearn for the day
when you declare the same.

Will you take my hand
and embrace me in peace?
I would rejoice in it!
But I can wait
— if you are not yet ready.
I have all the time in the world.
I have Bitcoin.

Who else am I declaring
peace upon?
Every single person and nation
in the whole wide world.
And also every government
and every company.

What are my terms?
I have none.
Anyone may turn their back to me.
I will initiate no violence upon them.

So what then? you may object,
“there is nothing in your offer of peace.”

Quite the opposite is true.
Let me tell you what is in my offer.
First, I offer the Shield to everyone.
I need not surrender it.
I will forever have it with me.

But, it is expansive
and can protect countless human lives.
So I give it willingly to you all,
which costs me nothing
— but bestows upon us all
a tremendous value.

So take it.
It is also yours.

I awaits
for whenever you are ready.
I will not force this Shield upon you,
for I come in peace.
No man who attempts
to force you is with me.
It must be your choice.
You raise the Shield
in an act of self-respect
and self-assertion — to say:
“What is mine is mine
and no man may take it from me!”

Ioffer to guide you
on how to wield it
so that it truly works
as I have promised.
I will show you
how to know this for yourself
— without you needing to trust me.

Ialso offer you the very best
I have to give.
That, however, I do not offer for free.
I offer it in trade.
So let us trade.
Let us do so honestly and rationally.
Let us treat each other
with respect and decency.

Let us form a lifelong relationship
for our mutual benefit.
If we can not, that, too, is fine.
We can leave each other in peace,
and find many others
with whom to trade.

Ido not come alone.
With me are all the others
who have taken up the Shield.

We are not perfect.
But we are good.
And we each wish to work
to make this world better
through peaceful trade
of the best we each have to offer.
Haven't you been searching
for us all along?

We are here.
We are ready.
We are ready to think.
We are ready to work.
We are ready to trade.
Honestly and rationally,
together — with you.
We are a multitude,
but not an army.
For we come in peace.
Will you join us?

We are the free and peaceful
people of Earth
and, if you will have us,
we welcome you!
We will respect your decision,
whatever it is,
and be at peace with you
— whatever your choice.

What greater cause
can you think of
than freedom and peace?
And honesty, and respect?
And — perhaps even love?

Ours is not some fanciful,
naive, and feeble-minded movement
of weaknesses and wishes!
We know we have to work.
We know we have to grasp reality
and work in harmony with it.
We do not expect
something for nothing.
But we also do not expect
nothing in exchange
for something.
Those who offer us nothing
in exchange for our effort
— we simply leave in peace.
And we welcome them
at any time
if they wish
to offer us something
instead of nothing.

Our pursuits are happiness,
longevity and love.
Do not laugh at this.
Should that not be
each person's pursuit?
Look deep within yourself.
Is that not what you desire too?
We can find it,
together
— in peace.

— TOMER STROLIGHT



The Bitcoin Whitepaper Made Beautiful

MY BOOK WAS DESIGNED AND typeset by Klaus Nordby.

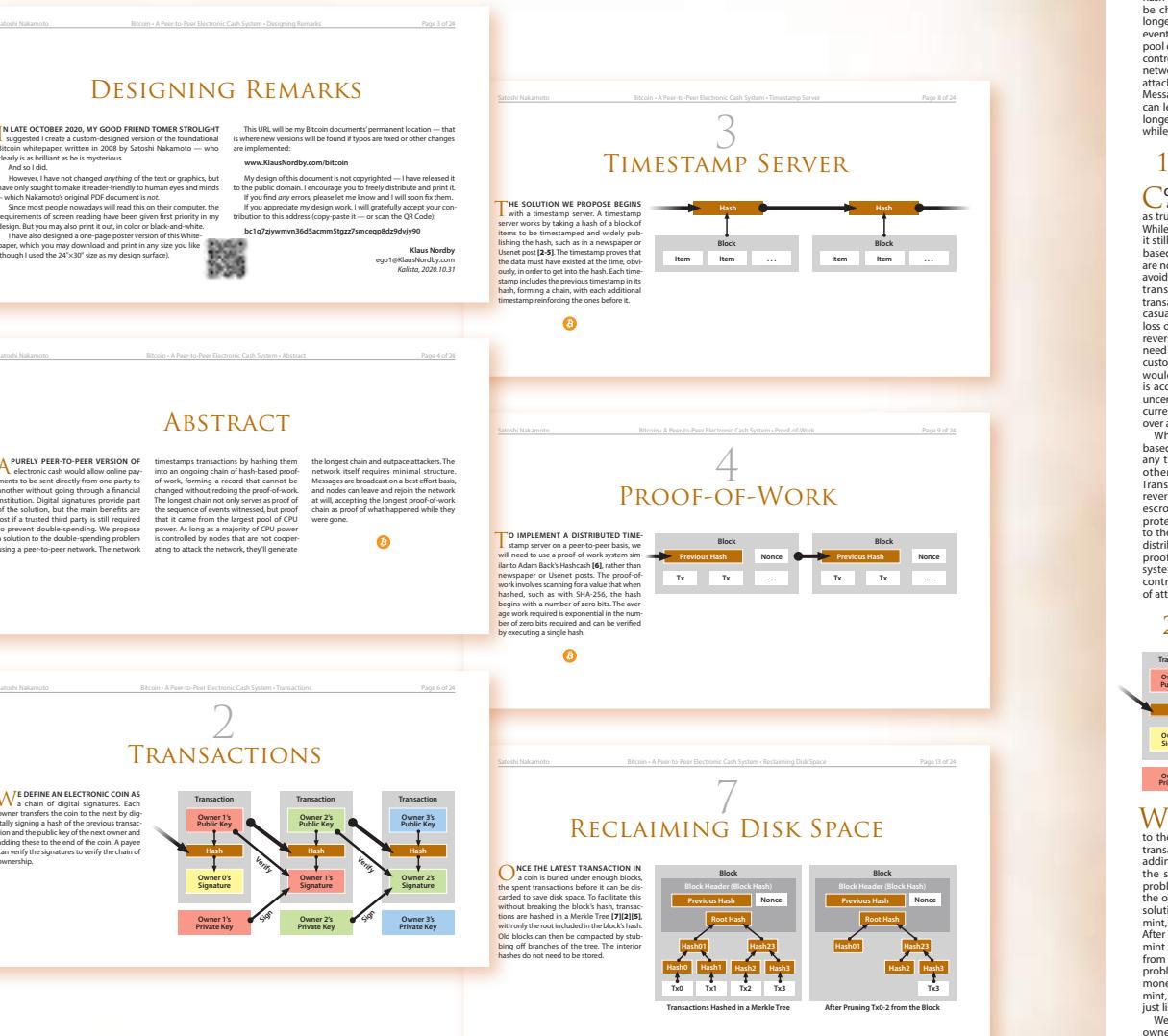
When I first introduced him to Satoshi Nakamoto's Whitepaper he praised its brilliance — but, as a designer, was put off by its "ugly appearance and lousy readability".

Klaus set out to remedy that and redesigned the Whitepaper with vastly improved esthetics. He also redesigned all the diagrams, but took great care to maintain the original information.

He produced two versions of the Whitepaper. One is a 24-page document, seen here, ideal for reading on screens. The other version is a poster, pictured on the right page — for wall display.

PDF documents of both versions can be downloaded from www.KlausNordby.com/bitcoin. They are free — although bitcoin contributions are most welcome.

High-quality posters in various price ranges, sizes and materials can be ordered from Klaus' online store www.Zazzle.com/store/KlausNordby. (But, alas, only dollars work there — for now.)



ABSTRACT

A PURELY PEER-TO-PEER VERSION OF ELECTRONIC cash would allow online payments to be sent directly from one party to another without going through a financial institution. Digital signatures or timestamping can be used to verify the sequence of events, but the main benefits are lost if a trusted third party is still required to prevent double-spending. We propose a solution to the double-spending problem using a peer-to-peer network. The network timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work. The longest chain not only serves as proof of the sequence of events, but it also prevents anyone from changing old transactions in the chain, because this requires redoing the proof-of-work for every transaction that follows it. The network itself requires minimal structure. Messages are broadcast on a best effort basis, and nodes can leave and rejoin the network at will, accepting the longest proof-of-work chain as proof of what happened while they were gone.

3. TIMESTAMP SERVER



THE SOLUTION WE PROPOSE BEGINS WITH a timestamp server. A timestamp server works by taking a hash of a block of items to be timestamped and routing it to the public domain. As long as a majority of CPU power is controlled by honest nodes that accept the longest chain, they'll generate the longest chain and outpace attackers. The network itself requires minimal structure. Messages are broadcast on a best effort basis, and nodes can leave and rejoin the network at will, accepting the longest proof-of-work chain as proof of what happened while they were gone.

4. PROOF-OF-WORK



1. INTRODUCTION

COMMERCE ON THE INTERNET HAS COME TO RELY ALMOST EXCLUSIVELY ON FINANCIAL INSTITUTIONS SERVING AS TRUSTED THIRD PARTIES TO PROCESS ELECTRONIC PAYMENTS.

While the system works well enough for most transactions, it still suffers from the inherent weaknesses of the trust based model. Completely non-reversible transactions are not really possible, since financial institutions cannot avoid mediating disputes. The cost of mediation increases transaction costs, limiting the minimum practical transaction size and cutting off the possibility for small casual transactions, and there is a broader cost in the loss of privacy and the need for users to trust a third party.

To implement a distributed timestamp server on a peer-to-peer basis, we will need to use the proof-of-work system similar to Adam Back's Hashcash [6], rather than newspaper or Usenet posts. The proof-of-work involves scanning for a value that has been added to the timestamp to prove that it has been hashed, such as with SHA-256, the hash begins with a number of zero bits. The average work required is exponential in the number of zero bits required and can be verified by scanning for the value.

For our timestamp network, we implement the proof-of-work by incrementing a nonce in the block until a value is found that gives the block's hash the required zero bits. Once the CPU effort has been expended to make it satisfy the proof-of-work, the block cannot be changed without redoing the work. As later blocks are chained after it, the work to change the block would include redoing all the blocks after it.

The proof-of-work also solves the problem of determining replay attacks from previously spent transactions. If two parties try to spend the same coin in two different blocks, the proof-of-work will be based on different block headers, so it could be subverted by anyone able to allocate many IPs. The proof-of-work is essentially one-CPU-one-vote. The majority decision is represented by the longest chain, which has the greatest proof-of-work effort invested in it. If a majority of CPU power is controlled by honest nodes, the honest chain will grow the fastest and outpace any competing chains. To modify a past block, an attacker would have to redo the proof-of-work of the block and all blocks after it, which requires more work than the attacker has paid for. We will show below that the probability of a slower attacker catching up diminishes exponentially as subsequent blocks are added.

To compensate for increasing hardware speed and varying interest in running nodes over time, the proof-of-work difficulty is determined by a moving average targeting an average number of blocks per hour. If they're generated too fast, the difficulty increases.

2. TRANSACTIONS



THE STEPS TO RUN THE NETWORK ARE AS FOLLOWS:

1. New transactions are broadcast to all nodes.
2. Each node collects new transactions into a block.
3. Each node works on finding a difficult proof-of-work for its block.
4. When a node finds a proof-of-work, it broadcasts the block to all nodes.
5. Nodes accept the block only if all transactions in it are valid and not already spent.
6. Nodes express their acceptance of the block by spending on creating the next block in the chain, using the hash of the accepted block as the previous hash.

Nodes always consider the longest chain to be the correct one and will keep working on extending it. If two nodes broadcast different versions of the block simultaneously, some nodes may receive one or the other first. In that case, they work on the first one they received until it becomes longer, then switch to the second one. A payee can verify the signatures to verify the chain of ownership.

We define an electronic coin as a chain of digital signatures. Each owner transfers the coin to the next by digitally signing a hash of the previous hash and adding these to the end of the coin. A payee can verify the signatures to verify the chain of ownership.

Once the latest transaction in a coin is buried under enough blocks, the spent transaction can be discarded to save disk space. To facilitate this without breaking the block's hash, transactions are hashed into a Merkle tree [7][2][5], with only the root header of the block's hash. Old blocks can then be compacted by stubbing off branches of the tree. The interior hashes do not need to be stored.

3. INCENTIVE

4. PROOF-OF-WORK

BY CONVENTION, THE FIRST TRANSACTION IN A BLOCK IS A SPECIAL TRANSACTION THAT STARTS A NEW COIN OWNED BY THE CREATOR OF THE BLOCK. THIS ADDS AN INCENTIVE FOR NODES TO SUPPORT THE NETWORK, AND FOR COMPUTERS TO SPEND ENERGY ON COMPUTATION.

Businesses that receive frequent payments will probably still want to run their own nodes for more independent security and quicker verification.

The incentive can also be funded with transaction fees. If the output value of a transaction is less than its input value, the difference is a transaction fee that is added to the incentive value of the block containing the transaction. Once a predetermined number of coins have entered circulation, the incentive can transition entirely to transaction fees and be completely inflation-free.

The recipient waits until the transaction has been added to a block and z blocks have been linked after it. He doesn't know the exact amount of progress the attacker has made, but assuming the honest blocks took the average expected time per block, the attacker's potential progress will be a Poisson distribution with expected value:

$$q_z = \begin{cases} 1 & \text{if } p \leq q \\ (q/p)^z & \text{if } p > q \end{cases}$$

To get the probability the attacker could still catch up now, we multiply the Poisson density for each amount of progress he could have made by the probability he could catch up from that point:

$$\sum_{k=0}^z \frac{\lambda^k e^{-\lambda}}{k!} \cdot \begin{cases} (q/p)^{z-k} & \text{if } k \leq z \\ 1 & \text{if } k > z \end{cases}$$

Rearranging to avoid summing the infinite tail of the distribution ...

$$1 - \sum_{k=0}^z \frac{\lambda^k e^{-\lambda}}{k!} (1 - q/p)^{z-k}$$

Converting to C code ...

```
#include <math.h>
double AttackerSuccessProbability(double q, int z)
{
    double p = 1.0 - q;
    double lambda = z * (q / p);
    double sum = 1.0;
    for (int k = 0; k <= z; k++)
    {
        double poison = exp(-lambda);
        for (int i = 1; i <= k; i++)
            poison *= lambda / i;
        sum -= poison * (1 - pow(q / p, z - k));
    }
    return sum;
}
```

Running some results, we can see the probability drop off exponentially with z.

Solving for P less than 0.1% ...

As an additional firewall, a new key pair should be used for each transaction to keep them from being linked to a common owner. Somenlinking is still unavoidable with multi-input transactions, which necessarily reveal that their inputs were owned by the same owner. The risk is that if the owner of a key is revealed, linking could reveal other transactions that belonged to the same owner.

The race between the honest chain and an attacker can be characterized as a Binomial Random Walk. The success event is the honest chain being extended by one block, increasing its lead by +1, and the failure event is the attacker's chain being extended by one block, reducing the gap by -1.

We need a way for the payee to know that the previous owners did not sign any earlier transactions. For our purposes, the earliest transaction is the one that counts, so we don't care about later attempts to double-spend. The only way to confirm the absence of a transaction is to be aware of all transactions. In the mint-based model, the mint was aware of all transactions and decided which ones to publish. This is not the case in the proof-of-work system. It is possible to verify the network node. A user only needs to keep a copy of the block headers of the longest proof-of-work chain, which he can get by querying network nodes until he's convinced he has the longest chain, and obtain the Merkle branch linking the transaction to the block it's timestamped in. He can't check the transaction for himself, but by linking it to a place in the chain, he can see that a network node has accepted it, and blocks added after it further confirm the network has accepted it.

5. NETWORK

It is possible to verify the network node. An attacker can catch up from a given deficit analogous to a gambler's ruin problem. Suppose an attacker has a deficit of d blocks and is trying to catch up. If the network is controlled by honest nodes, it is unreliable without a way to prevent double-spending. If the network is overpowered by an attacker, while network nodes can verify transactions for themselves, the simplified method can be fooled by an attacker's fabricated transactions for as long as the

6. INCENTIVE

an attacker can continue to overpower the network. One strategy to protect against this would be to accept alerts from network nodes when they detect an invalid block, prompting the user's software to download the full block and alerted transactions to confirm the inconsistency.

The incentive can also be funded with transaction fees.

If the output value of a transaction is less than its input value, the difference is a transaction fee that is added to the incentive value of the block containing the transaction.

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—Satoshi Nakamoto

We'll take it from here, Satoshi.

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WHY BITCOIN?

TOMER STROLIGHT

WHY BITCOIN? Nobody will *make* you choose Bitcoin
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Why does it use energy? *Why* can nobody stop it?

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