CONVERSATIONS

On Decentralized Clocks: Anna Ridler in Conversation

Charlotte Kent speaks to Anna Ridler on the uncanny systems of the blockchain shattering our understanding of time

TEXT **CHARLOTTE KENT**

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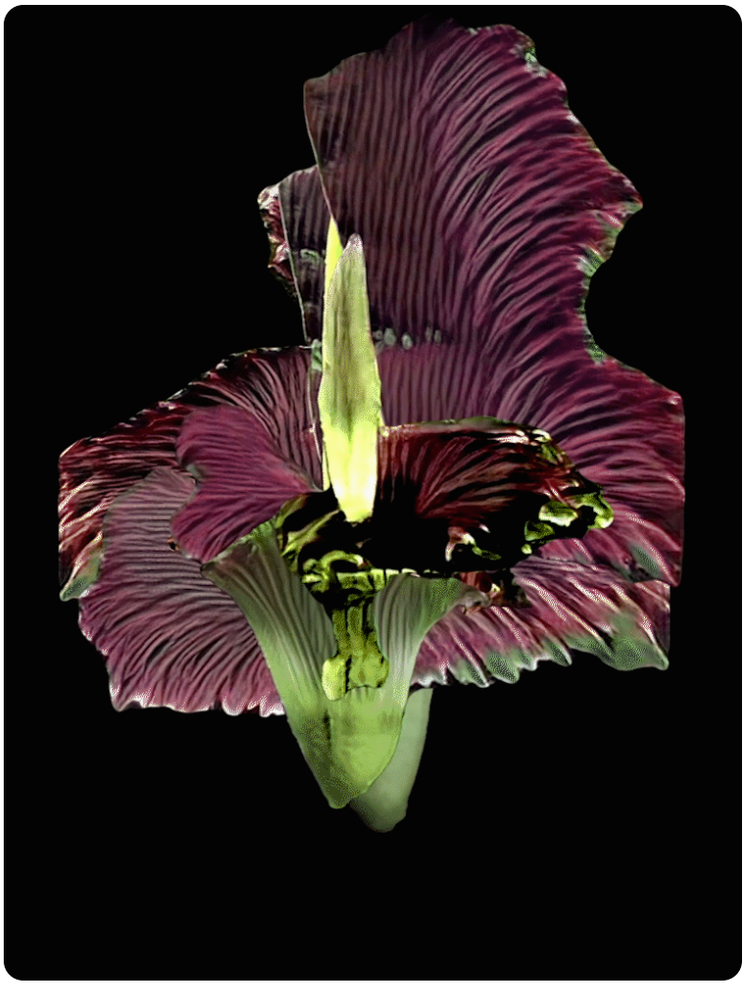
Blockchain's rhetoric of immutability introduces a sense of things unchanging: a fixed past, an enduring present, and a reliable future. But that's not the affective sense of blockchain's temporality. It's exhaustingly fast, excitingly new, and presents an infrastructure completely disconnected from other time systems—calendrical, mechanical, or Unix-based.

Anna Ridler is known for her 2019 NFT projects that compared the speculation surrounding cryptocurrencies with the 17th-century tulip mania, tying our current moment to an early capitalist past, but that was just the beginning of her inquiry into time as it relates to the blockchain. Her practice involves the development of extensive data sets and research into the natural world in order to examine the perceived values and utilities in this emergent technology—in particular, how its operations introduce potential new relations or reiterate established ones. Her background includes an MA in information experience design from the Royal College of Art and a BA in English literature and language from Oxford University, which explains the diversity of references in her work. The frequent focus on finance and flora in her projects belies an underlying interest that we got to discuss when we finally met in person in her hometown of London: time. Launching from the layers of circadian, mechanical, and digital time that influence our busy lives, we began to discuss the impact of blockchain time. The interview that follows is an excerpt of that ongoing shared inquiry.

Charlotte Kent: The economic and social theorist Jeremy Rifkin wrote in *Time Wars*, "All of our perceptions of self and world are mediated by the way we imagine, explain, use and implement time." What in your practice made you start thinking about the blockchain as having a system of time?

Anna Ridler: Unconsciously, time has been part of my projects for many years. Like value or money, it is a human system that has been imposed on the world that really shouldn't make any sense.

Time is inherently difficult to pin down. One of the things that I love is how, scientifically, there is no definition of "now" that everyone can agree on: there can be no objective thing as the present moment. It is beautiful and terrifying all at once. I suppose I do keep coming back to the natural world as a way of understanding time, something that I can see and experience.



Anna Ridler, Corpse Flower 1, 2022

CK: How do you see time presenting itself in your early NFT projects like *Mosaic Virus* (2019) or *Bloemenveiling* (2019)?

AR: In *Mosaic Virus*, time plays out at different levels across the different tulips, similar to how events play out very differently in the stock market depending on whether you are looking at data at the level of seconds, hours, or years. That started my thinking about clock time and its tension with natural cycles in *Bloemenveiling*, a dApp that auctioned off machine-generated tulip videos. Once purchased, the videos would only last a single week before being burned, mimicking the amount of time a cut tulip would last and raising questions about value and art as an asset. This came up again in a recent project, *Corpse Flower 1* (2022), where I tried to get the token to "bloom" again once every 50 years.

CK: Introducing currencies and auctions, art, and assets reminds me of a passage by anthropologist Kevin Birth from his book *Objects of Time*. He discusses how time's mathematical constructs were influenced over centuries by scientific discoveries and developments, but also "power, religion, capitalism and colonialism." Do you see blockchain time producing certain power dynamics?

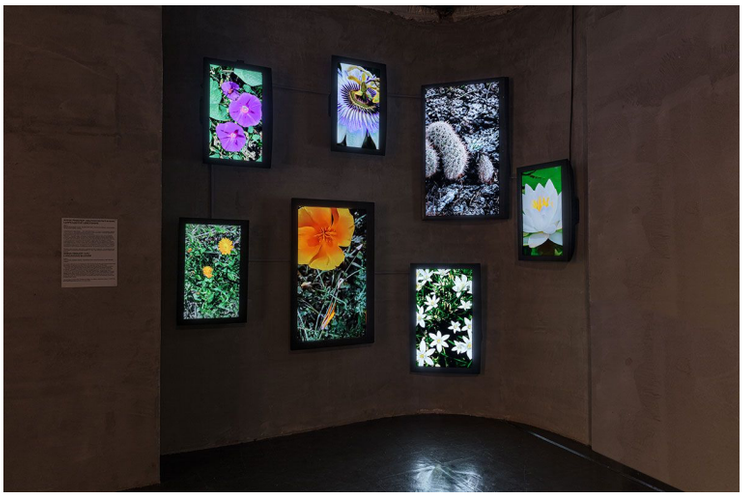
AR: There is a lot here that I haven't properly unpacked myself, but one dynamic that interests me is the interplay between time and the environment; how the system is having an actual physical impact on the world, writing capitalism into the landscape. Much has been written about the energy consumption of the various different chains and although there is a difference between mining and verifying, blockchain is an energy-intensive system that necessarily echoes certain capitalistic and colonial practices.

What is interesting is that, unlike in some other industries, the energy consumption of blockchain can happen anywhere in the world. It does not need to be that close to the end user. A lot of Chinese miners moved to Texas in 2021 after the crackdown by the Chinese government because the energy market is so deregulated and cheap there. Extractive natural processes are becoming obscured and globalized.

CK: That globalization often veils local practices, much like the implementation of universal time did to villages in 1884 when time zones were enforced around the world and everything was set to Greenwich Mean Time.

AR: *Circadian Bloom* (2021) is a project that questions the 24-hour clock. It harks back to an earlier, medieval way of constructing time where the hours of available daylight were divided into 12, so that an hour was dependent on when and where a person was.

That project is partially inspired by Carl Lineaus' concept of a Horologium Florae, or flower clock; he noticed that certain types of flowers have a chronobiological clock, opening and closing their flowers at fixed times of the day. My version is a multi-screen generative installation where each screen is filled with an image of one of these special types of plant. These digital flowers use digital methods to work out dawn and dusk and calculate whether the flower should be open or closed accordingly. It changes in each installation, reflecting the amount of daylight in that location and using that information to drive the blooming of the flowers, ignoring "clock time."



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Anna Ridler, Circadian Bloom, 2021

CK: You kept messing with time in *Anno Oxypetalum* (2022), which condensed a year into three minutes.

AR: Each half-second represents roughly a single day so that, over the course of the piece, it is possible to see the levels of light rise and fall just as they do across the seasons. Constructing the smart contract made me start to think about time in relation to the blockchain: I wanted the work to respond to the equinoxes and solstices, changeable markers of time, encoding the natural flow of seasons and cycles of plant life in the highly artificial media of neural networks and blockchain. I wanted it to connect to the different ways that time has been constructed.

This led to a deeper understanding of how time worked onchain. I've since started to explore how this might be part of a project, so that the blocks themselves are controlling the piece.

CK: What are the features of blockchain's time infrastructure?

AR: Blockchain time is constantly being recalibrated and reset, but its definition is fixed. In contrast, Coordinated Universal Time (UTC) is calculated through the output of around 400 atomic clocks and defined and regulated by the International Telecommunication Union (ITU). To add or subtract a second in order to keep time in sync with the Earth's rotations becomes a long, bureaucratic process that has to be agreed upon by every nation in the world. The opportunity to do this happens once every several years.

CK: In 2023, the ITU World Radiocommunication Conference will decide whether to abolish the leap second, completely unmooring us from our relationship with the sun.

AR: Because the blockchain is a closed system, it has to create its own way of keeping time. The latest block number becomes the way to keep time. The amount of time it takes to mine a block varies across different chains: for Bitcoin it is around 10 minutes on average, for Ethereum it can be between 10-19 seconds. It is irregular. Although it is set to a constant value, things are mined more quickly or more slowly than expected. When this happens, the Proof of Work algorithm changes, becoming easier or harder accordingly. For example, Bitcoin difficulty level is reevaluated after every 2016 blocks, which is roughly every 2 weeks. There is a constant adjustment of how time is created on the blockchain, dependent on all of the people who are interacting with it.

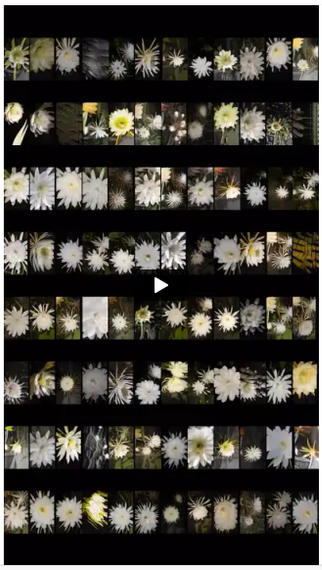
CK: What about Proof of Stake chains? Are there differences in how they change their timekeeping?

AR: Proof of Stake blocks are still being created—validated rather than mined—so the process is a bit different but essentially blocks are being created and time is moving forward.

Blockchain time is much closer to forms of natural timekeeping—particularly deep time—where geological layers tell you where you are but only make sense in relation to what happens before and after. These layers are not uniform, but happen in relation to each other.

CK: Talking about geological layers reminds us that time has this physical embodiment. Blockchain time seems spatialized in a certain way, since its temporality is tied to the block's creation and relation to previous blocks.

AR: Each node on each computer has the same information. They are interconnected, which is also a nice contrast to atomic timekeeping—where everything is insulated and isolated from everything else. Latency—the time between sending and confirming—is where this synchronicity shows up. Latency is really interesting because it is inherently interwoven with finality. Immutability is not instantaneous: it takes a certain number of blocks to be added to the chain before something can really be considered final. In Bitcoin, this is around 6 blocks, or roughly an hour, for Ethereum it's around 30 blocks, where whatever has happened exists in a kind of strange future perfect tense.



CK: How do you see blockchain data connecting to the offchain world? Electrically, it connects through the global infrastructure of wires, and the data can indexically point to offchain objects or events.

AR: I am more interested in how the offchain world is brought onto the chain, or is used to shape or influence the chain.

The language used to talk about clock time onchain is interesting. It has to be called in using something referred to as an oracle, which is a mechanism that bridges systems on the blockchain with systems in the real world. In programming, there is a certain amount of mysticism in some of the terminology used, intentionally or unintentionally.

The other thing that I find interesting about the interplay between the real world and blockchain is that there is always the potential for it to be totally changed. Even though there is the assumption that once on the blockchain something will last forever, this is not the case because it is grounded in the real world. Even though it is highly unlikely, it is still possible if enough nodes agree to change and influence the blockchain itself to completely rewrite things, like the Ethereum hard fork in 2016. Blockchain time is still relational, in dialogue with what has preceded it. It is presented in a list, one on top of another, easy to see.

CK: How is this emergent software's use of time creating something distinct from the atomizing immediacy of digital time?

AR: Digital time is created by calling into atomic time. Computers use UTC as a way of keeping time. Essentially, every computer in the world is attuned to hyper-accurate atomic clocks. Atomic clocks monitor the frequency of atoms to determine a universal, standardized measurement of time but are still subject to phenomena like temperature, humidity, and gravity, all of which affect their accuracy. They are analog clocks that exist in the real world. Scientists talk about the accuracy of this type of time in terms of certainty, or rather uncertainty—it has an uncertainty of 1 second per 300 billion years.

Blockchain time still contains uncertainty but a different kind, not driven by slight reactions to the natural world. Two blocks can be mined simultaneously by different miners. One block will be accepted onto the chain, the other becomes a discarded orphan block. There is a temporary fork, and for a small moment, there is uncertainty. Which of the two ways will it go? (This links to what we were talking about with latency.) Although no matter what the decision is, time keeps going forward.

CK: The block that connects paves the way. Are there peculiarities about time that this infrastructure of blocks highlighted for you?

AR: There seems to be a very human desire to know time in the smallest possible unit—from hours to minutes to seconds. In physics, the smallest possible timescale is basically a thousandth of a thousandth of a thousandth of a thousandth of a second. This is Planck time, which is only useful for checking concepts, a conceptual time. In Hindu units of cosmic time, the largest unit is trillions of years. Even looking at the natural world, different scales of time are apparent. But in blockchain time, the unit of time-keeping is a constant: It cannot be half a block or a milli-block. It is a block. Blockchain forces you to think about time in a different way.

This interview is published in tandem with Charlotte Kent and Alex Estorick's essay "Time on the Blockchain" on *Right Click Save*.

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