CRYPTO-ECONOMICS: INFRASTRUCTURES AND ARTEFACTS

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“With e-currency based on cryptographic proof, without the need to trust a third party middleman, money can be secure and transactions effortless.”

Satoshi Nakamoto

INTRODUCTION

Research Institute for Arts and Technology

In the 1970s, three different developments (the ciphers DES and RSA, as well as the Diffie-Hellman key exchange) came about, allowing individuals with modest computing resources to encrypt communication. “These developments came on the eve of the microcomputing revolution, and computers were gradually coming to be seen as tools of empowerment and autonomy rather than instruments of the state. These were the seeds of the crypto dream.” (Narayanan, 2013).

Our contemporary “cryptosphere” is dominated by novel socio-political experiments based on previously unavailable technological parameters which are embedded in distributed ledger technologies, “Smart Contracts” (Szabo, 1994) and “Algocratic Governance” (Aneesh, 2009).

The blockchain (through Bitcoin) is unarguably the key invention of the 21st century. The accelerating forces of decentralization change not only how we think about electronic cash, but also changed our perception of organizations,trust and non-human agency through the introduction of immutable and unstoppable code on the blockchain.

This booklet offers a brief overview of the “crypto-economic condition”. Additionally, it gives insights into crypto- and blockchain-related activities within Austria from 2011-2017. By collecting these occurrences, it aims to offer outlooks and perspectives that illuminate our technological future to come.

A CALL FOR CRYPTO-LITERACY: INTERDISCIPLINARY CRYPTO-ECONOMIC RESEARCH AS STRATEGY FOR EXPERIMENTAL INNOVATION MANAGEMENT

Matthias Tarasiewicz

Bitcoin’s introduction in 2009 resulted in the iterative development of various *altcoins*. These alternative cryptocurrencies, which can be seen as 'distributed community experiments', introduced new algorithms while also tackling social and other evolving crypto-economic “problems” that emerged throughout the various phases of adaptation and collective learning processes about incentive-design and community mechanisms in zero-trust environments. Often introduced through self-published “whitepapers” or online announcements, these alternative coins represent hypotheses by the respective creators until they can show a significant user-base and are accepted in online exchanges. In 2014 (Tarasiewicz & Newman, 2014) we examined the most important experiments and alternative

approaches to specific issues of the Bitcoin design and described differences in coins that have been launched. We not only discussed successful experiments, but also showed attempts that failed in the short but eventful past of cryptocurrency. We demonstrated how the initial design of Bitcoin had been extended and improved by *next generation cryptocurrencies*, while the two main aspects (blockchain ledger and strong cryptography) remain key elements to all these new systems. Finally we outlined possible future problems and developments around the “blockchain”, which still remains the most challenging part with no long-term scaling strategy yet.

The question of scaling however is not the only pressing issue. Vitalik Buterin’s description of *Crypto 1.0*

(pre-blockchain) to *2.0* (currency aspects) to the coming Crypto 3.0 age to “actually achieve the scale needed to support mainstream adoption“ (Mougayar, 2016) might not be realized by technological developments which solve the limitations of the scalability of blockchains. This is evident by the multitude of cultural battles in the ‘cryptosphere’ demonstrated by Ethereum vs. Ethereum Classic, Bitcoin Core vs. Bitcoin Cash and many other disputes, which happen in the shadows of the crypto-economy, barely visible to non-technologists. In order to render the underlying technologies and motivations visible, ongoing discourse and cultural observation is a necessity.

In the current hype of Bitcoin, the Blockchain and Cryptocurrency (not to mention the ICO ‘gold-rush’), we have to understand the social mechanics of crypto-economics - and we have to foster crypto-literacy in order to be able to better identify key technologies which can potentially transform the society (again).

Only through an ongoing and continuous process of interdisciplinary research intertwined with practice we can ensure an understanding of the technological, crypto-centered future. A possible (and necessary) start is to better value research and knowledge-generation outside of traditional institutions. Since the microcomputing revolution in the 1970s we live in the age of permanent disruptions, but institutional and educational

practices remain unchanged, as I already noted in my 2017 paper “Forking as cultural practice: Institutional governance after the DAO” (Tarasiewicz, 2017). As also noted by Michael Flavin, “technologies come and go but the university remains, in a recognizable and largely unchanged form” (Flavin, 2017). For ‘new’ and ‘old’ institutions alike, governance models based on distributed consensus and crypto-economics offer a significant opportunity for implementing change to react to technological and societal developments. The preconditions for such a model are not only technological, as governance in cryptocurrencies relates to decisions about the "rules of the protocol (the code) and the incentives the network is based on (the economics)" (Tomaino, 2017). There is a strong need for a form

of ‘blockchain literacy’, but more importantly there must be a strong emphasis on the interaction and communication between both institutions and informal coding communities to further the research into and development of new amalgamations of social and organisational structures.

INFORMAL CRYPTO-RESEARCH AND RESEARCH CULTURES IN VIENNA AND AUSTRIA

Austria’s crypto-community is predominantly represented within the informal context of ‘meetups’. While the format is named after the online social networking portal meetup.com, the idea of knowledge-sharing within developer communities follows a long history and tradition. As of recently, terms such as “hackerspaces” and “makerspaces” are understood as places of innovation rather than subversive counter-movements. The hacker ethic, as journalist Brett Scott points out, is a composite of “not merely exploratory curiosity or rebellious deviance or creative innovation within incumbent systems. It emerges from the intersection of all three” (Scott, 2015).

Theorist Simon Penny has outlined how emergent technological forms always involve a diverse community of

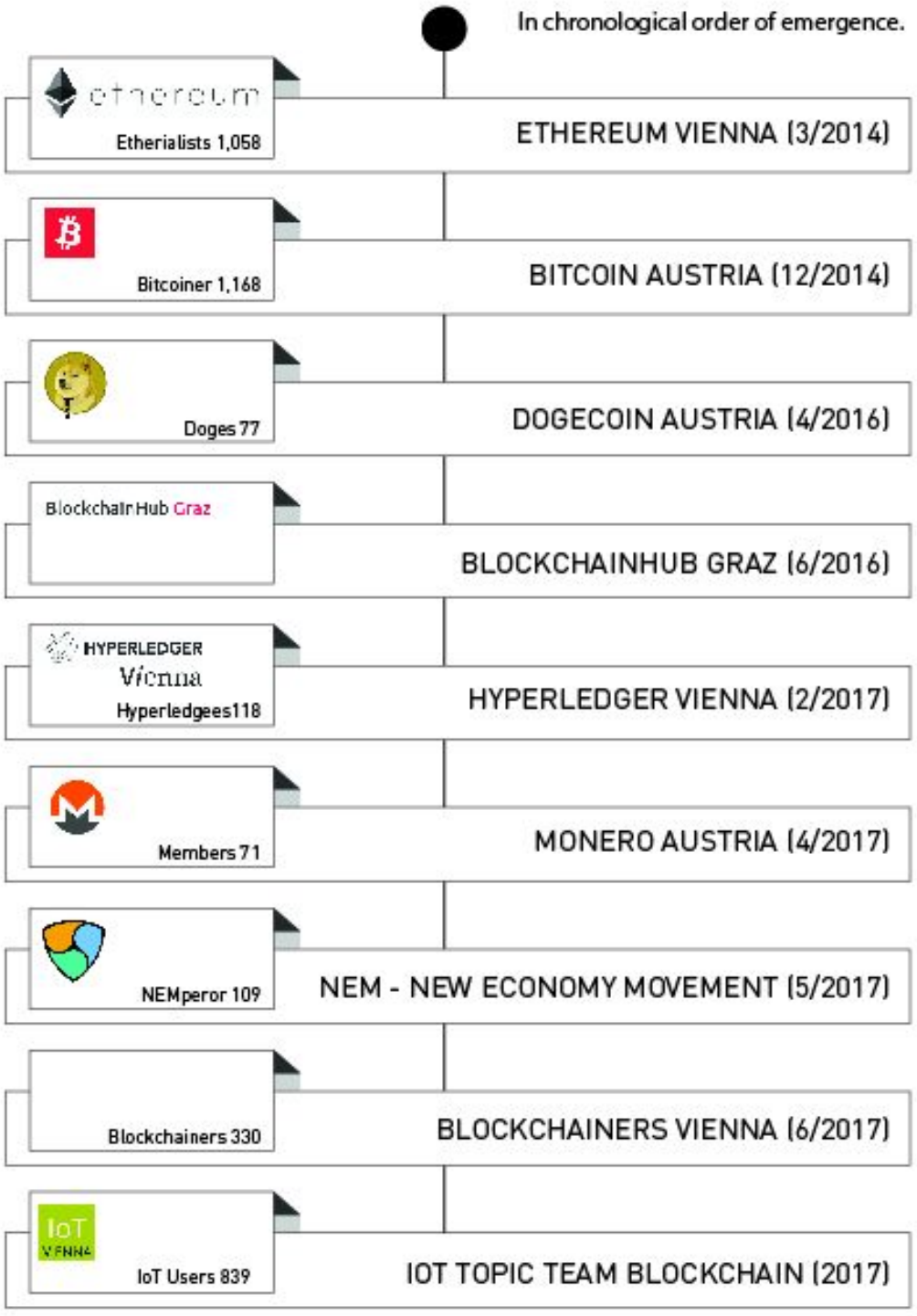
toolmakers, and emphasises how the contributions of a particular individual is “seldom noted, except in specialised studies” (Penny 2005, 2008). Such community cultures, are, as Penny calls them, ‘renegades’ or ‘eccentrics’, producing their tools outside of institutions; creators of “visionary technologies”, that are “by definition, ahead of the technological-industrial curve”. While there are numerous difficulties that could hinder the renegade collective, at the same time, this is “where the action is” (Rammert, 2008). Interdisciplinary spaces of technology research must be fostered- they are a driving force of the crypto-economy to come.

OVERVIEW OF BLOCKCHAIN- AND CRYPTO-RELATED MEETUPS IN AUSTRIA (SELECTION)

BLOCKCHAIN RELATED

Meetup

CULTURE IN AUSTRIA



RIAT ARCHIVE FOR CRYPTO-ECONOMICS

The pervasive presence of data and its dynamic accumulation and synchronization poses new challenges and opportunities for society. This ‘big data’ era of machine learning and neural-networks often prematurely proposes that histories can be computationally observed through the aggregation of amassed data. It is important that the historical records of distributed and network based cultures do not solely rely on the scraping of corporate databases such as Google or Reddit. This accelerated era of network cultures therefore requires a practice of active archiving.

The RIAT Archive for Crypto-Economics seeks to accomplish this by unraveling the immaterial and often elusive communities of the cryptosphere through an engaged participation, accompanied by

careful processes of documentation. In doing this, RIAT seeks to deepen its own quantitative research data- both collecting and formulating performative process-artefacts in order to further inform RIAT's ongoing investigation of the cryptosphere.

The artefacts collected by RIAT represent knowledge-value and are used within science communication to comment on cypher-culture and describe the roots of the crypto-economy. The archive exists since 2004 and consists of crypto-communication and crypto-art from international artists, collectives and anonymous entities. Elements have been shown internationally at various venues including TransmediaLe in Berlin and the International Symposium for Electronic Arts in Sydney, Vancouver and Manizales.

FEATURED ARTEFACTS (SELECTION)

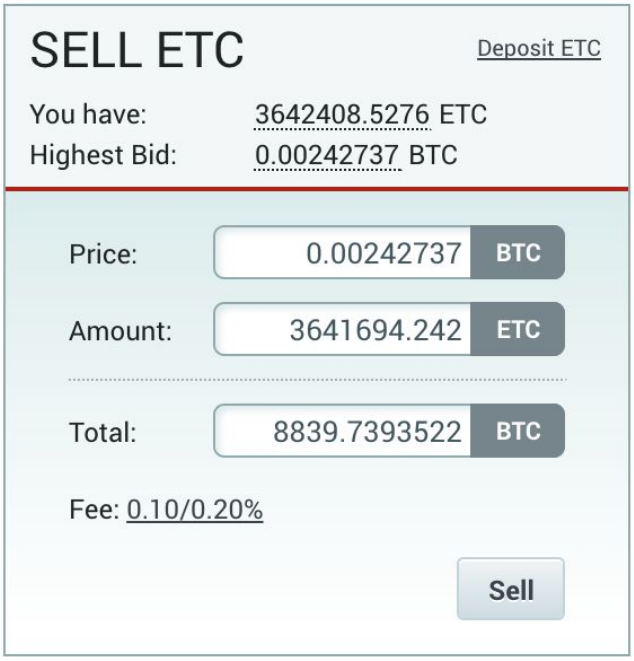
Artistic Bokeh & Spacebank (2012): ‘Blockchain Performance’

On display are 20 Ai Weiwei sunflower seeds that were purchased with Bitcoins generated by the BitcoinCloud from 2011. The transaction between Artistic Bokeh and SpaceBank stays active in the Bitcoin Blockchain and is publicly viewable. Initially, Ai Weiwei produced over 100 million seeds - the porcelain items were hand-painted by artisans in Jingdezhen.

The seeds gained in value after the Tate Modern bought approximately eight million. In a Sotheby's auction (2011) the seeds sold for £3.50 apiece.

Société Réaliste (2014): "A Proposal for a New Alphabetical Order Based on the Experanto Writing System and Pegged on the Euro Rates"

Artistic Bokeh (2016): 0xa4031e961908b82e19911e780ec9836635dc92ce7444a97f6af8316d55850650



Artistic Bokeh & Vitalik Buterin (2017): ‘Step by Step’

Shoes in Shoebox,
73.7 cm × 92.1 cm × 92.1 cm
(29 in × 36¼ in)

RIAT RESIDENCY FOR CRYPTO-ECONOMIC RESEARCH AND EXPERIMENTAL BLOCKCHAIN PRACTICES

RIAT employed a programme in cooperation with the MuseumsQuartier Vienna, in order to offer residencies to external researchers, innovators and creatives, to work and live in Vienna, Austria for a short time period. Through the programme, continuous research as well as internationalisation of the research cluster can be ensured. At the time of writing (8/2017) over 40 researchers and creatives have been working in Vienna though the programme.

Since early 2017 the programme has been solely focused on blockchain and crypto-economic research and development. In this time-period, the following people have been invited guests (selection):

Vitalik Buterin is the creator and Chief Scientist of Ethereum, a decentralized platform that runs smart contracts.

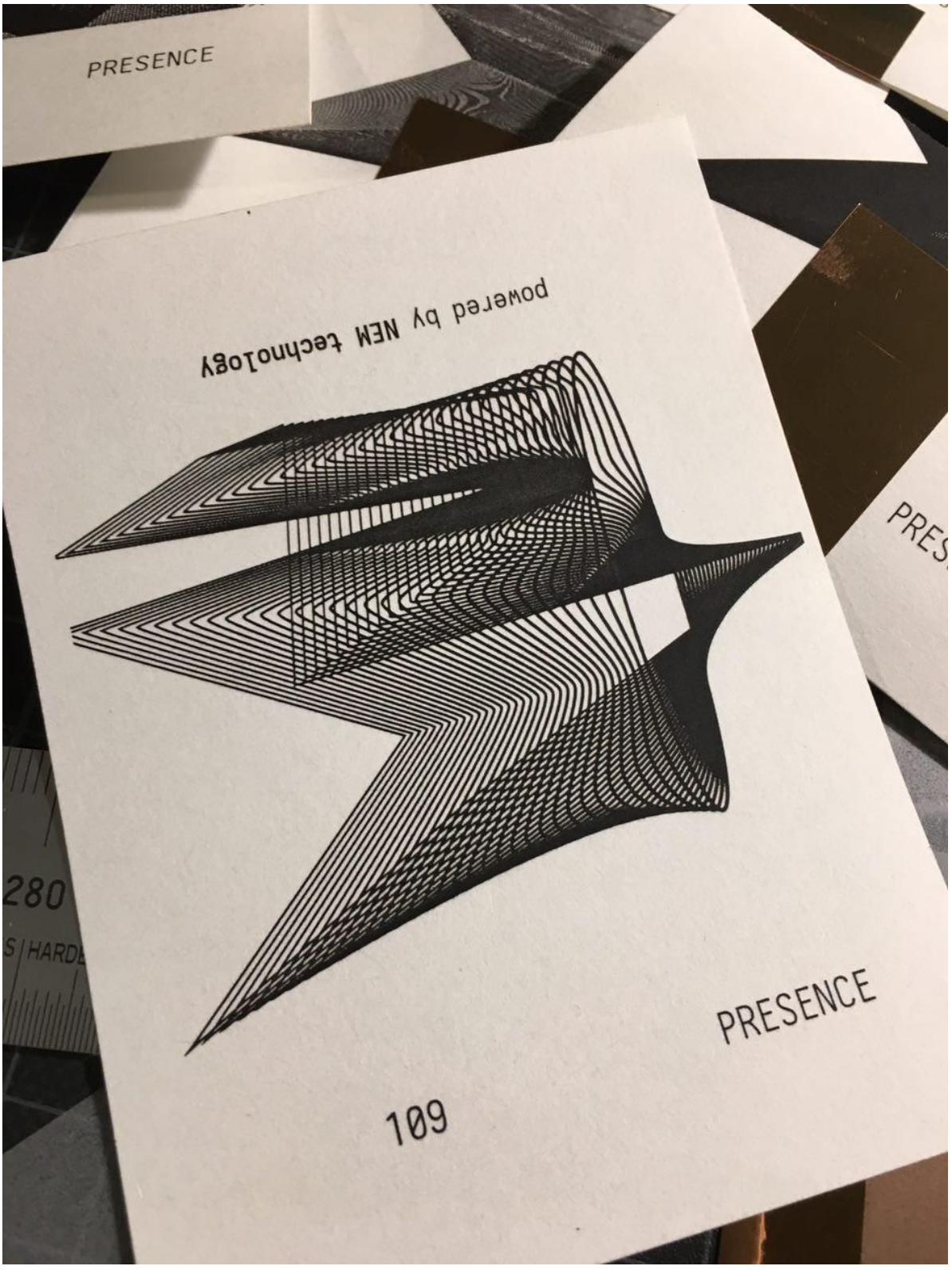
Ken Shishido is involved in the projects *Breadwallet*, *Yours*, *Stashcrypto* and other crypto- related projects. Ken is also the organizer of the *Tokyo Bitcoin Meetup* group. Established in 2011, it is one of the world's oldest Bitcoin Meetups.

Victor Tron is one of the first employees of the Ethereum Foundation. He is the main developer of *Swarm*, a blockchain-based distributed storage and content distribution platform.

POSITIONS AND PERSPECTIVES OF INTERDISCIPLINARY CRYPTO-ECONOMIC RESEARCH

PROOF-OF-PRESENCE

Proof-of-Presence critically responds to the crypto-economy that has emerged around the notion of “zero-trust” as implemented in Bitcoin. In contrast to the mantra “In Math We Trust”, the project asks for blind trust through faith. Visitors are provided RFID embedded devices, through which they can prove their presence to the blockchain. While Bitcoin is based on generating value through ‘Proof-of-work’ (where cryptographic work is undertaken by machines). Proof-of-Presence questions the narrative of machine labour as utopia/ dystopia that dominates discussions on the future positions between the human and the AI as immaterial. Proof-of-Presence is a project by DARC in cooperation with NEM (New Economy Movement) Austria.


PRESENCE
powered by NEM technology
PRESENCE
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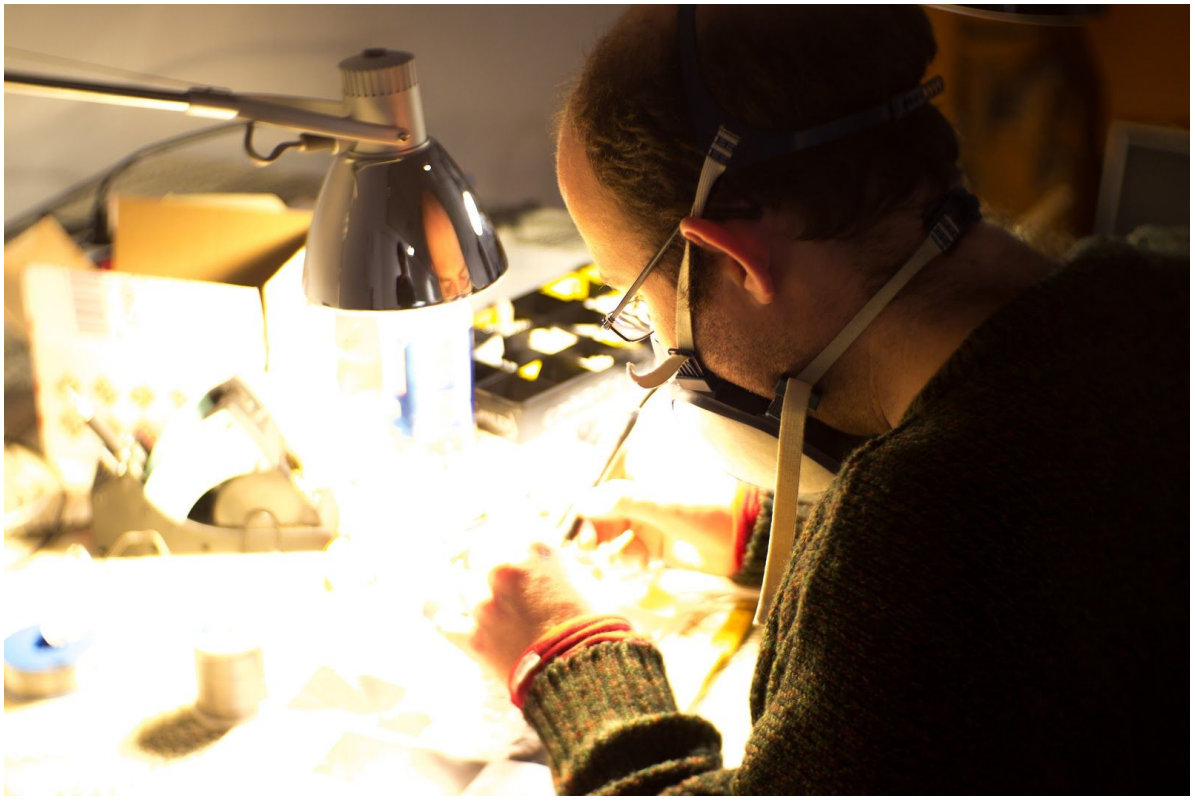
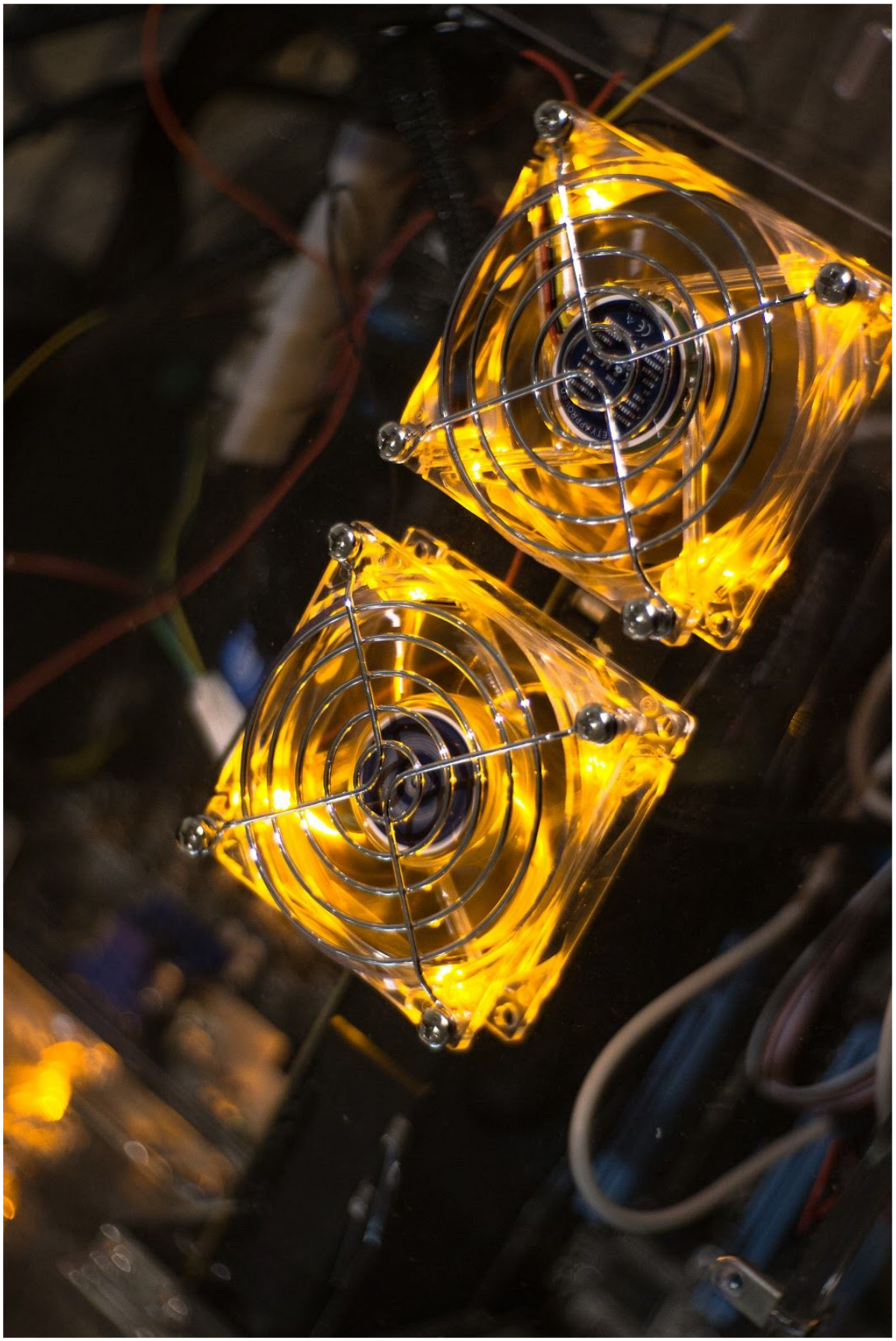
BITCOINCLOUD



BitcoinCloud is an early artwork dealing with and thematizing the cryptocurrency Bitcoin. An initial prototype has been developed in late 2010, conceptualized by Matthias Tarasiewicz and produced in collaboration with Max Gurresch and engineer and artist Damian Stewart. The work was exhibited at MAK Vienna, the Museum of Contemporary Art Vojvodina (SRB) and presented at the International Symposium on Electronic Art in Vancouver (CAN). In 2012 Bitcoincloud received a special mention for the Contaminate Prize for Emerging Art (NYC). BitcoinCloud was initially presented alongside works from *Joseph Beuys*, *UBERMORGEN*, *The Yes Men*, *etoy* and others as part of the exhibition "METAmART: Art and Capital" in Vienna *Künstlerhaus* art museum in 2011.

Bitcoincloud is a post-interactive installation and a reactive sculpture thematizing the value of artistic production in terms of attention, technological acumen and speculation. It builds a direct relation between the attention it receives and its market value: the bigger its audience, the more its worth. BitcoinCloud consists of modified LED-fans, motion sensors and a (remote) Bitcoin mining rig. Replicating the principles of the *economics of attention*, Bitcoins are mined depending on the number of its visitors and the intensity of their interaction with the installation. The dynamics of attention allow the installation an ambiguous existence: it is part of the art market at the same time as it is setting itself apart from this market by capitalizing on its own economic attention-value.



TERRA0

Terra0 is a self-owned forest; an ongoing art project that strives to set up a prototype of a self- utilizating piece of land. It creates a scenario whereby a forest is able to sell licences to log trees through automated processes, smart contracts and Blockchain technology. In doing so, it accumulates capital.

A shift from valorization through third parties to a self-utilization makes it possible for the forest to procure its real exchange value, and eventually buy (thus own) itself. The augmented forest, as owner of itself, is in the position to buy more ground and therefore to expand.

From an economic perspective, an object cannot be separated from its purpose or function. Thus the means of existence of every object is based on its usability by third parties. *terra0* examines a scenario whereby objects appropriate and apply utilisation mechanisms to themselves, with the help of new technologies.

A forest has an exactly computable productive force; the market value of the overall output of the forest can be precisely calculated. Beside its function as a source of raw material, the forest also holds the role of service contractor. It produces not only wood, but serves as a protected space within which diverse species can survive, contributing to an overall ecological balance. Furthermore, it offers space for relaxation. The *terra0* project creates a

scenario whereby the forest, augmented through automated processes, utilizes itself and thereby accumulates capital. A shift from valorization through third parties to a self-utilization makes it possible for the forest to procure its real exchange value, and eventually buy itself. The augmented forest is not only owner of itself, but is thus in the position to buy more ground and therefore to expand. In the first phase of the project, a piece of ground is bought by the project initiators, and a smart contract is drawn up. The smart contract contains all contractual definitions from *terra0* and passes of two parties: the human actors as a project initiators, and a representation of the forest as a so-called non-human actor (or 'NHA'). The bought ground is signed over to the NHA in exchange for debentures (later

referred as *terra0* tokens), which represent a stake of the project and the smart contract. At this stage, the forest owns itself, yet is indebted to its shareholders (the project initiators). An economic model implemented in the smart contract controls the exploitation of the forest. The NHA sells licences to log certain trees. If a certain sum of money has been earned via selling these licenses, the NHA starts to repay its debts to the project initiators by buying its *terra0* tokens back. Once repayment is complete, the original owners (the project initiators) hold no more tokens, thus the forest is the sole shareholder of its own economic unit. The forest, in economic terms, controls itself. *terra0* can be seen thus as a prototype of an economic unit in a post-human future.

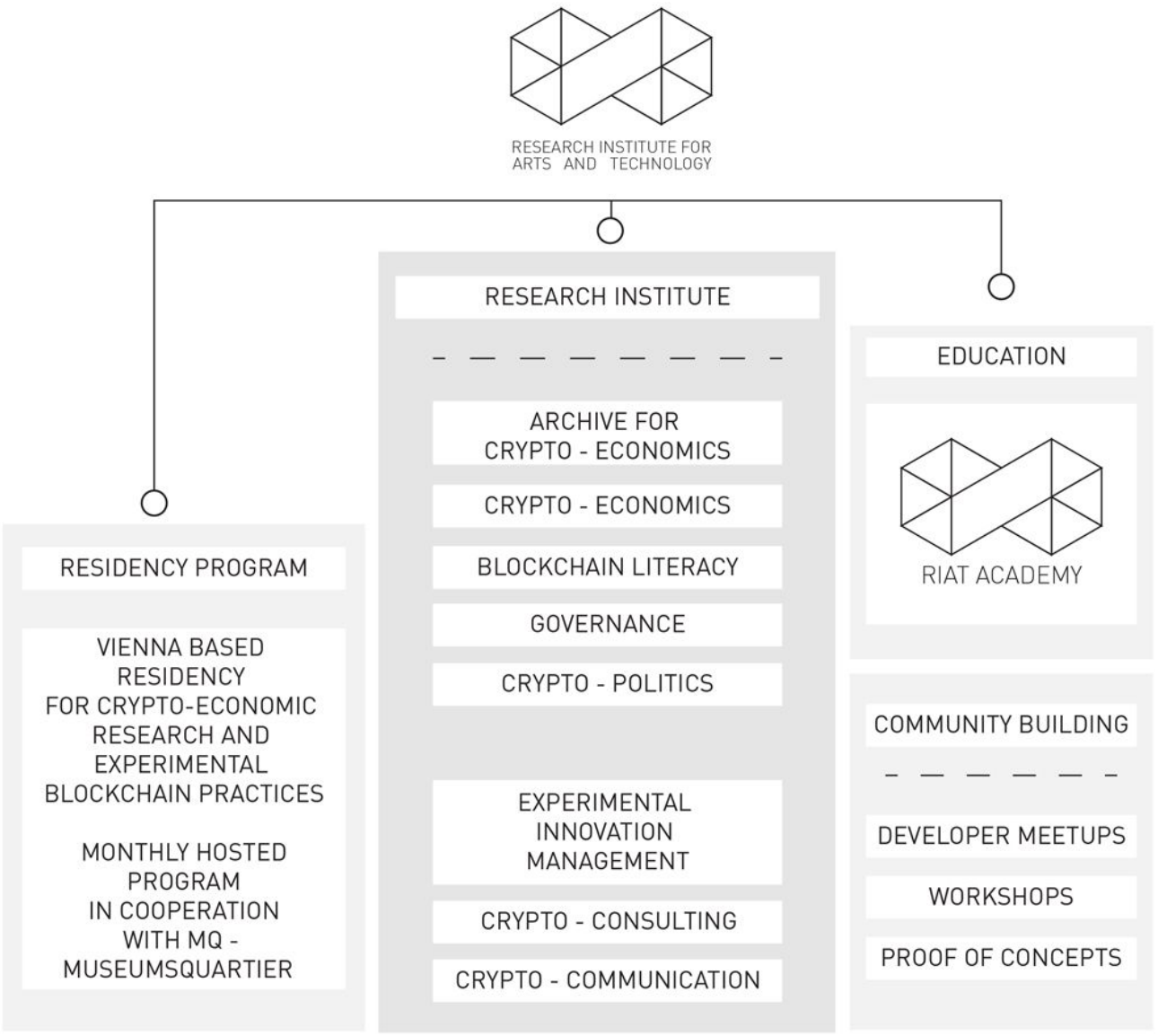
```
pragma solidity ^0.4.2;

contract owned {
    function owned()
    { owner = msg.sender;
      oracle = msg.sender;
    }
    address public owner;
    address public oracle;

    modifier onlyOwner {
        if (msg.sender != owner)
            throw;
        _;
    }
    modifier onlyOracle {
        if (msg.sender != oracle)
            throw;
        _;
    }
    function transferOwnership_final() onlyOracle {
    owner = this;
  }
  function transferOwnership_Tree(){
  owner = msg.sender;
}
    function kill_switch() {
       if (msg.sender == owner) selfdestruct(owner);
     }
}
```

ABOUT RIAT

RIAT is an institute for research, development, communication and education in the fields of crypto-economics and the blockchain. We explore and actively stress-test the role of research & development in the age of zero-trust, through novel forms of presentation, discussion and publication. Examining the global crypto-economic condition and its effects on culture and society, we foster an open and interdisciplinary discourse to improve crypto-literacy for the society of tomorrow.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INNOVATION
MANAGEMENT
CRYPTO - CONSULTING
CRYPTO - COMMUNICATION
EDUCATION
RIAT ACADEMY
COMMUNITY BUILDING
DEVELOPER MEETUPS
WORKSHOPS
PROOF OF CONCEPTS

RIAT TEAM

Matthias Tarasiewicz is the director of the Research Institute for Arts and Technology in Vienna, Austria and board member of the Open Source Hardware Association (USA). Tarasiewicz has led research projects including *Artistic Technology Research* at the University of Applied Arts Vienna, *Making Artistic Technology* and *AXIOM - Open Hardware Cinema* (EU Horizon 2020). His

publications include “Forking as cultural practice: Institutional governance after the DAO” (2017), “Cryptocurrencies as Distributed Community Experiments” (2014), “A Brief History of Bitcoin” (2013) and “Coded Cultures: New Creative Practices out of Diversity” (2011). He actively researches the blockchain and crypto-economics since 2010 and has a background in computer science, design and systems theory. mt@riat.at

Paul Rieger is a promoter of blockchain technology, crypto-literacy and an advocate of the NEM blockchain which led to the foundation of *NEM Vienna* in June 2017. When not educating, Rieger is combining his software engineering background with his entrepreneurial experience to design and develop blockchain-based solutions and prototypes for the private and public sector.

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Ralph Pichler is the organizer of Ethereum Vienna and a specialist in smart contract development. At RIAT he leads the Ethereum Academy and coordinates projects and workshops in relation to crypto-economic development based on Ethereum and Solidity. Pichler is an active observer of the cryptosphere and also works as consultant for advanced smart contract analysis. rp@riat.at

Andrew Newman is lead researcher for Artistic Technology at RIAT. His research focuses on knowledge production in outsider epistemic cultures. He is a founding editor of the *Journal for Research Cultures* and his publications include “Fake Organum: The Uneasy Institutionalisation of Art as Research” (2017), “Cryptocurrencies as Distributed Community Experiments” (2014) and “Experimental Cultures and Epistemic

Spaces in Artistic Research” (2013).

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Markus Zimmermann is a blockchain architect and specialist for experimental on- and off-chain usage. Markus has a background in computer science and architecture with a focus on media, theory and spatial configurations of technological systems.

With the main focus on digital design in distributed ledger technologies and processes, he is actively designing RIATs (Post-)Blockchain Lab and observing the cryptoeconomy from both socio-economical, and communicative perspectives.

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Sophie-Carolin Wagner investigates the epistemological consequences for communicational processes in functionally

differentiated systems, i.e. the effects on the asserted division between a system and its environment, and the contingent nature of decision-making due to increasing levels of complexity and concomitant limits of probability. She is co-editor of the *Journal for Research Cultures* and project manager for the *Library Lab* at the Austrian National Library. Her publications include her PhD “Poietry: Challenging the improbabilities of communication” (2017) and “Establishing the continuously Unfinished: The Institution as an Artistic Medium” (2017). scw@riat.at

Nils Gabriel researches open publishing practices at RIAT. He is an artist, coder and designer and develops extended publications utilising ‘old tech’ and ‘next tech’. Gabriel designs hybrid and experimental media formats that are informed by research in media archaeology and alternative publishing. ng@riat.at

Stefanie Wuschitz works at the intersection of art-based research, feminism and technology, with a particular focus on open source and peer production. In 2009 she founded the feminist hackerspace and collective *Mz* Baltazar's Lab* in Vienna. She completed her PhD at the University of Technology in Vienna on "Feminist Hackerspaces: A Research on Feminist Space Collectives in Open Culture" (2014). sw@riat.at

Rachel-Rose O’Leary is an artist, journalist and researcher exploring cypherpolitics. She currently works as researcher with Coindesk on the “State of the Blockchain” report, an industry overview of the cryptosphere. She is also a board member of the Blockchain Association of Ireland. rrol@riat.at

Christoph Schörkhuber is senior design researcher at RIAT. His work includes design and art direction for both printed and digital media, ranging from books, catalogues and magazines, identities and communication to websites. He has been recognised as one of the leading young designers in Europe and has received various awards for his work. cs@riat.at

Claudia Niculescu is junior design researcher at RIAT. Niculescu has a background in art history and is currently studying at die Graphische in Vienna. Her work focuses on illustration, patterns and typography. cn@riat.at

RIAT RESEARCHERS

Georgios Papadopoulos’ research combines economics and philosophy with institutional analysis and technology studies. Since 2013 he investigates technological infrastructures for digital payments. His publications include his PhD “The Ontology of Money: Institutions, Power and Collective Intentionality” (2015), “Grexit; A Speculative Archeology of the European Crisis” (2013) and “Notes

Towards A Critique of Money” (2012).
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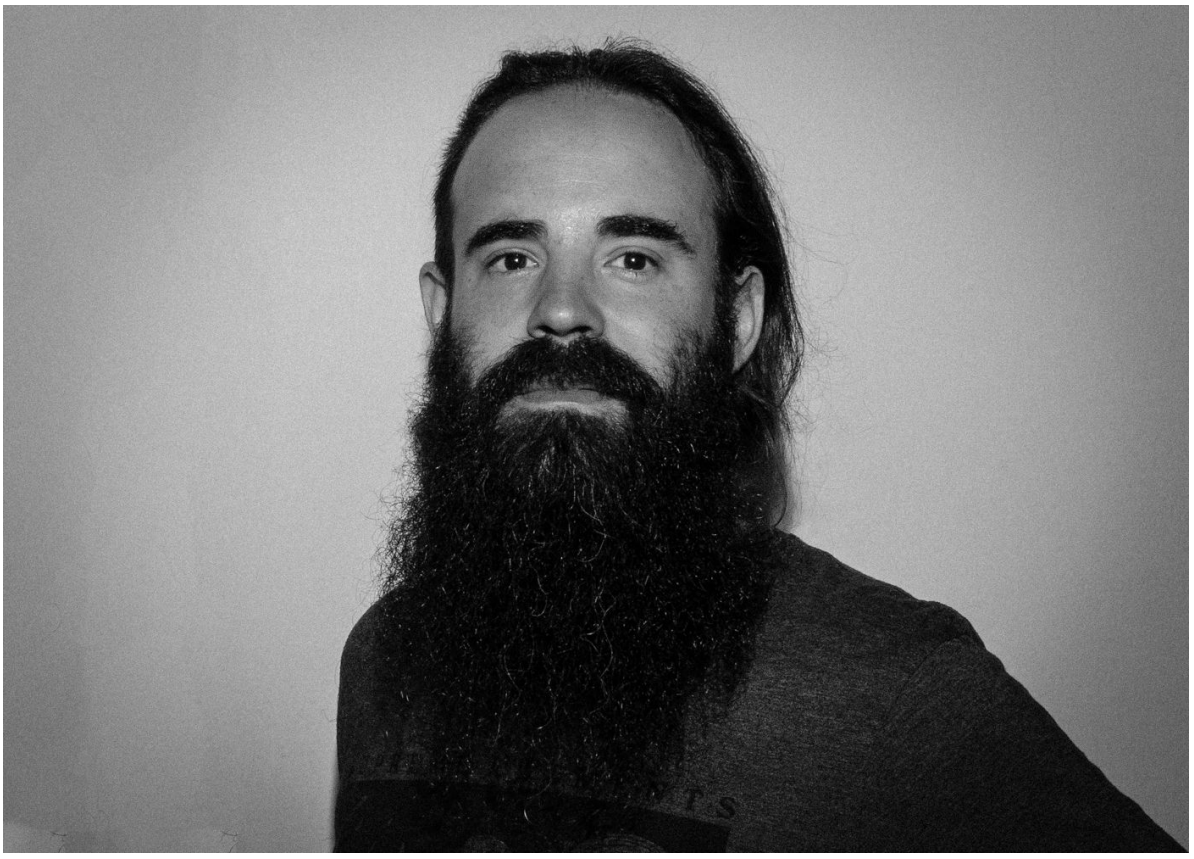
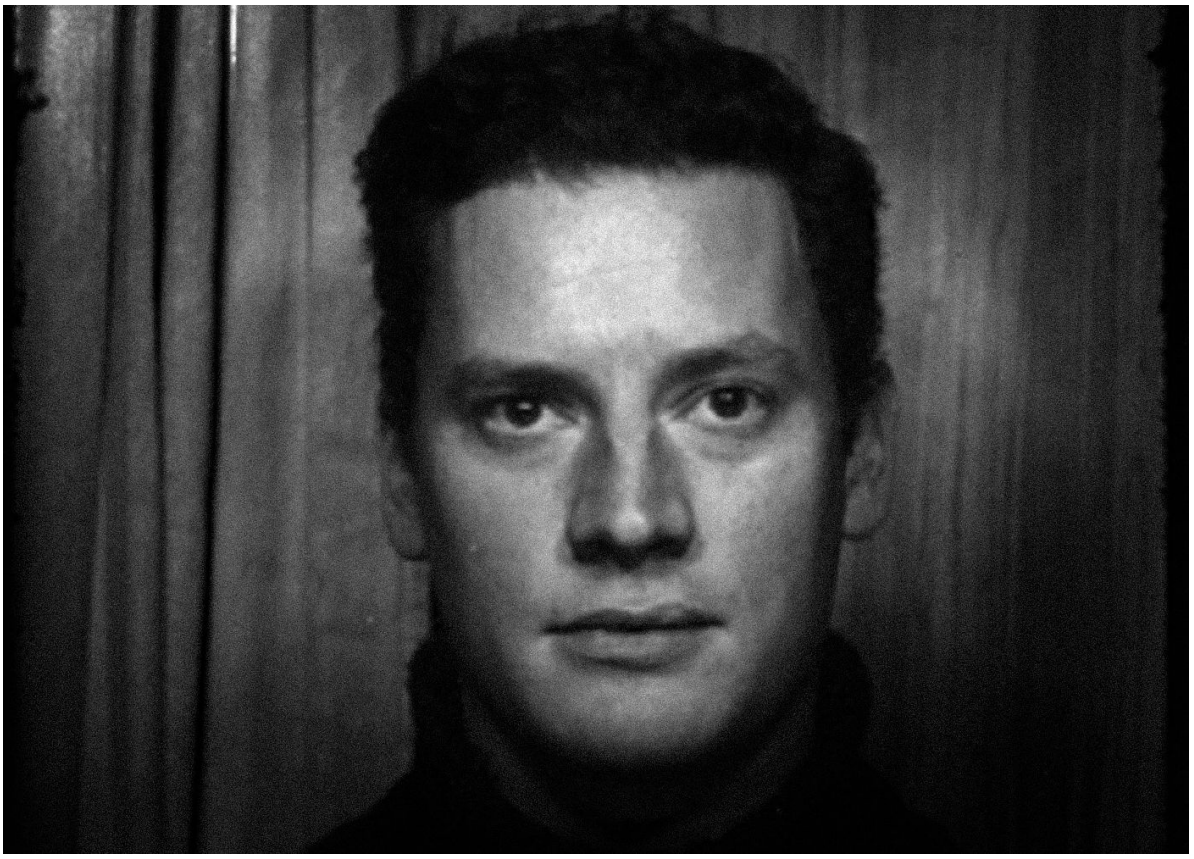


Víctor Mazón Gardoqui is a senior educator and professional working with Open Hardware and experimental circuit design. He is the lead researcher for the Open Hardware Lab at RIAT and coordinates workshops and educational formats in the domain of device-studies and experimental sensory applications. vmg@riat.at



Jan Groos is a scholar of Harun Farocki (Academy of Fine Arts Vienna). In collaboration with his sister Anna he works as an independent filmmaker with a strong interest in theoretical discourse and experimental documentary formats based around speculative cryptoeconomics. He actively investigates experimental Blockchain-applications and works with DARC on communicating Proof-of-Presence.

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RIAT ASSOCIATED RESEARCHERS

Andreas Kern is actively involved with Bitcoin since 2011, since 2015 he is part of the Board of *Bitcoin Austria* and organises the *Bitcoin Austria* Meetup Group. He studies computer science at TU Vienna with a strong emphasis on Bitcoin and Blockchain technologies. He runs the upcoming Bitcoin related entry-level courses at riat.academy.

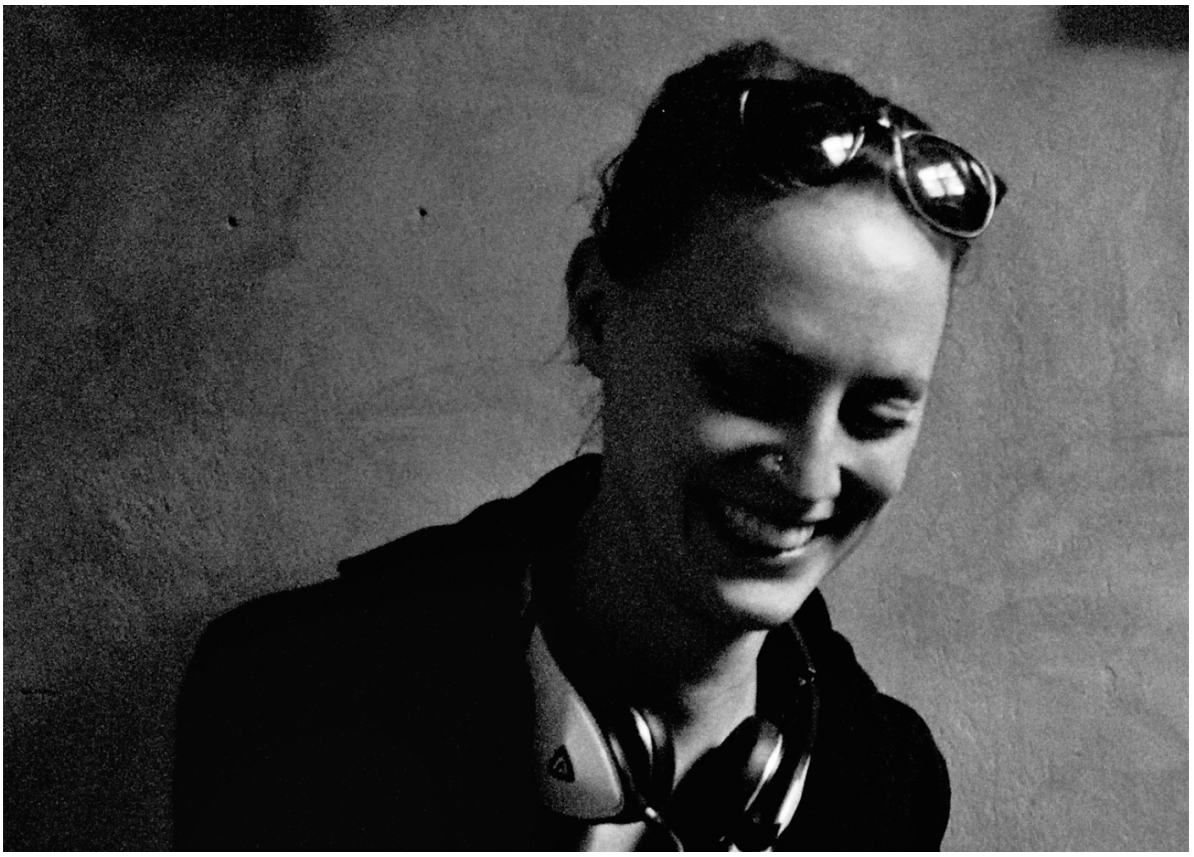
Daniel Pichler is board member of Bitcoin Austria and is actively involved with Bitcoin since 2012. His primary focus is in blockchain startups and the (quantitative) analysis of token-based economies.

Gregor Zavcer has been studying decentralized business models since 2005 and has been active in the blockchain space since 2014. In his current research in the field of cognitive science Gregor focuses on experience research/design and serious games. His interests are experimental tokenization and next-level smart contracts.

Chelsea Palmer is a researcher at the University of British Columbia, Vancouver in the Department for Blockchain Innovation and Management. She is founding member of the dctrl hackerspace and is actively involved in the decentralized dance party project.

Brett Scott is a journalist, former derivatives broker and author of *The Heretic's Guide to Global Finance: Hacking the Future of Money* (2013). He writes for publications like *The Guardian, New Scientist, Wired Magazine* and *CNN.com*, and provides commentary on financial reform and cryptocurrencies on media channels such as BBC and Arte. For RIAT he is active as ambassador for international outreach.

Max Hampshire is a researcher and artist in Amsterdam. His research involves unraveling the emergent, alien politics of cryptographic platforms, as well as the poietic nature of autonomous technologies. He is one of three project initiators of terra0, an ongoing art project investigating crypto-economics and autonomous systems and currently works with the Institute of Network Cultures in Amsterdam.



Jaya Klara Brekke is a researcher and creative producer working between London, Athens and Durham where she is currently writing a PhD on the political geography of the blockchain at Durham University. She is the designer for D-CENT, a Europe-wide project creating privacy-aware tools and applications for direct democracy and economic empowerment. distributingchains.info

Laura Lotti researches economic spaces and completed her PhD in software studies and financial technology. Her publications include “Fundamentals of Algorithmic Markets: Liquidity, Contingency, and the Incomputability of Exchange” (2017), “Contemporary art, capitalization and the blockchain: On the autonomy and automation of art’s value” (2016) and “Enter the Black Box: Aesthetic Speculations in the General Economy of Being” (2016).

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