

# Delphi

## AUTONOMOUS VEHICLES

Self-Driving Cars: Risk Constellation  
and Acceptance Issues

*Armin Grunwald*

## HUMAN ENHANCEMENT

Gilles Deleuze and the Relationship  
Between Smart Drugs, Authenticity,  
Control and Fairness

*Sean Blanchet and Sean Devine*

## STARTUP DIGEST

Blockchain4Good: How Startups Are  
Pioneering Land Registries, Supply  
Chains and the Solar Industry

*Anna Laesser*

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**Delphi** is a pioneering interdisciplinary review of emerging technologies as seen through the perspectives of experts from the fields of **science** and **technology**, **ethics**, **economics**, **business** and **law**. Inspired by the idea to encourage inclusive, thoughtful – and sometimes unsettling – debates on the many opportunities and challenges created by technological progress, the international quarterly review brings together authors with different professional backgrounds as well as opposing views. Contributions to Delphi come in compact formats and accessible language to guarantee a lively dialogue involving both thinkers and doers.

### What's in it?

**Delphi** reviews recent developments in **artificial intelligence** and **robotics**, **digital** and **financial technologies**, as well as in **bio**, **health** and **human enhancement technologies**.

We invite authors from Delphi's focus disciplines science and technology, ethics, economics, business and law to contribute articles, essays and country/thematic reports and to critically review relevant books, art and media. The length of the contributions should range between 1000 and 3500 words. All submissions should be written in British English. Contributions will be subject to a quality check by experts before acceptance for publication.

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- Delphi 2/2019: 15 March 2019
- Delphi 3/2019: 15 June 2019
- Delphi 4/2019: 15 September 2019

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# Delphi

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## Publisher's Note

As a publishing house, we at Lexxion see it as our responsibility and honour to disseminate knowledge on topics of outstanding societal importance.

In our main work across different fields of EU and international law, we recognised the growing relevance of a new issue – emerging technologies, such as AI, robotics, bio-medicine, etc. However, we also noticed an alarming gap. Legal experts working on the up-and-coming technologies were debating in-depth amongst each other ... but rarely with experts from other disciplines like ethics, science & tech, economics or business.

Why did this absence of dialogue strike us as a missed opportunity at best, and a dangerous oversight at worst? Emerging technologies have the potential to reshape (for better or worse) our society, economies, environment, even the very concept of who we are as human beings. We need the experts working on those technologies to talk to each other. The products of their labour – whether they are programming a new AI algorithm, drafting a law regulating AI use, coming up with new business models based on smart algorithms, or analysing the moral implications of an AI – exert a combined effect on society. But where is the platform for these experts from different fields and geographic regions to hold regular, high-quality and jargon-free debate? Enter Delphi.

Delphi is an interdisciplinary review of emerging technologies that presents the latest analyses from the fields of science and technology, ethics, economics, business and law. We chose to name it after the ancient Greek oracle of Delphi who looked into the future and made her predictions. Sometimes those prophecies were of happy outcomes, but other times they spelled doom. We want to make it possible for you to 'ask the prophets' – the emerging tech experts – and together to make that vision of the future perhaps a little bit clearer.

I want to take the opportunity to thank one particular member of the Lexxion editorial team – Delphi's executive editor Clara Hausin. Clara ignited the spark of this idea to create a journal on emerging tech. She made all of us here at our publishing house excited about the new project and pushed us to step out of our comfort zone by launching an interdisciplinary journal.

In addition to thanking everyone on the Editorial Board and our Associate Editors, I want to express my sincere gratitude to Prof Ciano Aydin, the Editor-in-Chief of Delphi. You have taken on the difficult role of steering this ambitious project, but after our many talks I am confident there is no one I would rather entrust with this position.

Finally, a word to you – our reader. I hope you enjoy perusing the pages of Delphi and decide to accompany us on this exciting journey!

*Wolfgang Andreae*



# Editorial

In recent years technology has become ever more present in our lives. Not only has it become indispensable in scientific research and in the laboratory, but it has also become impossible to imagine our homes, schools, workplaces, public buildings, and cities without it. Today so-called 'emerging technologies', which in general refer to the technological fields of nanotechnology, biotechnology, information technology, and cognitive science and technology, are on the rise. By facilitating the convergence of emerging technologies (sometimes labelled NBIC-convergence) proponents of these technological fields envision radical progress and even radical augmentation of human capacities. Developments have also brought about more specific fields of technology, such as artificial intelligence, robotics, 3D printing, stem cell therapy, gene editing, blockchain technologies, immersive media, and quantum computing. The list is getting ever-longer and new specialisations and branches are emerging all the time.

However, emerging technologies are not only characterised by radical novelty, fast growth, and a potentially high impact, but also by increasing uncertainty and ambiguity. Moreover, embracing interdisciplinarity has not only fostered technological and scientific progress but has also increased the possibility of developments that are very difficult to anticipate and, hence, are difficult to assess in terms of their impact. In addition, experiments in little basement rooms that allegedly have resulted in the development of Apple computers and Microsoft software (leaving aside the question whether these stories are apocryphal) have been, one could argue, professionalised by start-ups springing up like mushrooms all over the world, which promises further innovation.

There is also another aspect that is becoming increasingly relevant in debates concerning emerging technologies: although technologies are becoming ever more present and invasive, the digital technologies that are currently being developed are actually fading away from sight. Although a great part of the network that constitutes the current computer era is already invisible to us (wires, base stations, servers, antennas, satellites, etc), in the upcoming years the 'computer as we know it' is expected to 'dissolve' in a new generation of technologies, technologies that will move from our desktops and pockets to our environment, merging into all kinds of objects and material infrastructures.<sup>1</sup>

Adding to the intrusive force of technology, information and communication technologies will not only be embedded in devices that we explicitly 'use' but increasingly become an intrinsic part of the material environment in which we live.<sup>2</sup> These developments are paving the road for pervasive technological environments that will be

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1 S E Bibri, *The shaping of ambient intelligence and the Internet of Things* (Atlantis Press, 2015); M Weiser, 'The computer for the Twenty-First Century' (1991) *Scientific American*, 94–104

2 C Aydin, M Gonzales and P P Verbeek, 'Technological Environmentality' (2018) *Philosophy and Technology*, 1–18

ever more seamlessly and unobtrusively integrated in our lives, technological environments that will reveal their functionality by sensing and predicting behaviour, as well as adapting to and also influencing people.

The increasing degree of technological uncertainty, ambiguity, complexity, and invisibility that is produced by these multi-layered sociotechnical developments, has once and for all marked an end to an era of ethic councils and advisory boards drafting lists of do's and don'ts. At the same time, there has never been a greater need for thorough and intensive deliberation and debate about emerging technologies. The combination of radical novelty, fast growth and prominent impact, on the one hand, and increasing uncertainty, ambiguity and invisibility, on the other hand, highlights the urgent need for accurate and thorough analysis, serious review and in-depth discussion. Choices made today might irreversibly determine the course of our lives and planet. How do we recognise the enormous complexity of an emerging multi-layered technological infrastructure and, at the same time, prevent becoming a plaything of contingent influences and forces? And in what way can we cultivate a critical disposition that guides us in distinguishing the benefits from the harms?

This is the backdrop that justifies the need for the establishment of Delphi. Delphi is a pioneering interdisciplinary review of emerging technologies that focuses on the influence of radical technological developments on society and our human condition. It encourages experts from the fields of science and technology, ethics, economics, business and law to engage in inclusive, thoughtful – and sometimes unsettling – debates on the opportunities and challenges created by technological progress and disruption. Delphi aims to create focal points that enable thinkers and doers from academia, government and industry to find one another and develop and discuss big picture views. It wants to move beyond empty buzzwords and shallow popular publications and, at the same time, offer diverse, in-depth and concise contributions in an accessible language.

This first issue opens with two forewords from representatives of the regulatory and business world. Specifically, Paul Nemitz of the European Commission and Anna Zeiter of eBay reflect on the added value that Delphi will bring to those working in government and in industry. In the *Article* section Armin Grunwald, Takashi Izumo, Jean-Aymeric Marot, Sean Devine and Sean Blanchet will respectively reflect on self-driving cars, whether robots should be granted property rights, human enhancement technologies and the use of nootropics. The section is concluded by Celine Melanie A. Dee who addresses the topic of copyright protection of AI-generated art. In addition to our main articles, each issue of Delphi will include a section focusing on startups that are having a significant impact on the way we live and work. The inaugural issue of *Startup Digest* features three interviews with startups applying blockchain technology in new and interesting ways. Finally, the issue concludes with a review of Annie Lowry's new book *Give People Money*, which explores ways in which we could address the technological impact on the future of work.



At this point, I would like to thank the scholars and practitioners who kindly agreed to serve on the Editorial Board of Delphi. The time and effort they put into this inaugural issue made the difficult task of launching a new journal a rewarding experience. I would like to conclude this editorial by asking you to join our discussion! If you would like to contribute to a future issue or would like to provide feedback on this issue please get in touch.

*Ciano Aydin*  
*Editor-in-Chief*  
*University of Twente*

# Responsibility in the Age of Emerging Technology

As a lawyer, I normally write legal articles for very few readers. We lawyers are happy if some high judges and a few professors from a similar field read our articles and if we are quoted occasionally.

So I was all the more surprised to see that my recent article entitled 'Constitutional Democracy and Technology in the age of Artificial Intelligence'<sup>1</sup> was downloaded, and I suppose thus read, more than 10,000 times within one month.

What has happened? I can only speculate. Probably many people from academic fields other than law read the article after its content had been reported in the UK newspaper 'The Guardian'.<sup>2</sup> And indeed, my article was published in a collection of articles on the legal, ethical and technical challenges of governing AI together with articles by engineering professors, professors of philosophy and political scientists.<sup>3</sup>

With the ever more pervasive colonisation of our lives (Jürgen Habermas) by and through markets and technology, there seems to be an ever increasing demand, first and foremost, by the drivers of technological advancement, for rules which provide them with guidance in order to ensure that their inventions are good for society as a whole, and not just for those who seek to draw profit – and increasingly monopoly profit (Peter Thiel) – from new technologies. In the same way that social scientists, philosophers, lawyers and politicians alike need to learn about the new capabilities of the code, the internet of things, artificial intelligence and biophysical systems, to mention just a few marvels of innovation, it seems that the technical innovators seek guidance on purposes to pursue, and how to contribute to democracy, to social justice, to solidarity and fairness. Have all the technologists started to read up on Friedrich Dürrenmatt's 'The Physicists', which every child High School in Germany once had as an obligatory reading assignment? Or Hans Jonas' 'Principle of Responsibility', who in 1979 had already developed the quintessential, and until today unsurpassed, philosophy for the technical age, which resulted in the precautionary principle being taken up in primary constitutional law in the European Union? We can only speculate. But with walk outs of coders and developers in Silicon Valley, with hundreds of books and articles published on ethics and law of new technologies today and numerous working groups being mounted with public or private financing to find a consensus on the way ahead on ethics and law for AI, one thing is clear: There is a need for the

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1 Paul Nemitz, 'Constitutional Democracy and Technology in the Age of Artificial Intelligence' (2018) 276 Royal Society Philosophical Transactions A 2133

2 Paul Chadwick, 'To regulate AI we need new laws, not just a code of ethics' *The Guardian* (London, 28 October 2018)

3 Corinne Cath, 'Governing artificial intelligence: ethical, legal, and technical opportunities and challenges' 276 Royal Society Philosophical Transactions A 2133

assessment of new technologies and their impact on society and there are many who want such assessments to be carried out with rigour and in public discourse, and not only behind closed doors by easily captured small groups of the initiated. And there are many who want to make sure that through their work, they do not only contribute to private profits but also to the public good. Technological innovators are no longer naively calling for independence of cyberspace (John Perry Barlow) and are entering a new era defined by taking stock of the societal impacts of their innovations. Some do it out of conviction, some do it because they are being held to account or fear being held to account in the future. Whatever the motivation may be, this is a good thing as with power and capabilities comes responsibility; this is the golden rule of healthy societies and old professions. Understanding and exercising responsibility in the technical age requires interdisciplinary exchanges and dialogue and it requires a multi-faceted and early analysis of potential impacts of technology on the many public interests democratic societies share.

Absolutists, whether of the communist or of the capitalist persuasion, want to hear nothing of such impact assessments, and even less of laws which limit profit or innovation in the interest of the public good. As Hans Jonas described so well, this is the space where some from Silicon Valley or Wall Street meet with some from China, a space where financial power combined with technological innovation radically brushes aside any other interest.

But make no mistake, Europe is not free from such tendencies. And of course, there are great thinkers, innovators and entrepreneurs in America and other parts of the world who seek to align their projects with the public interest and who pursue altruistic goals rather than just raw profits.

But nevertheless, there is a geo strategy of innovation, and Europe has chosen to go down the road of guiding innovation towards purpose and responsibility, with the conviction that this in the end will be the most sustainable path from a societal, as well as an economic point of view. It is this spirit which pervades this new publication, the spirit of responsible innovation, which requires impact assessment and interdisciplinary dialogue. May our readers be inspired to contribute to the dialogue across disciplines and to shoulder their responsibilities in line with the technical capabilities they develop and the economic success they may have with their innovations.

*Paul Nemitz  
Directorate-General for Justice and Consumers  
European Commission*

# Data Protection, Privacy and Ethics: Why We Need Interdisciplinary Conversations

On 24 October 2018 the International Conference of Data Protection and Privacy Commissioners hosted a remarkable event in the European Parliament in Brussels. They invited ca. 1,500 experts from the fields of data protection, privacy and digital ethics, and also from different professional areas, such as regulators and governmental authorities, non-governmental organisations, academia, companies and law firms to engage in a global discussion on ‘Ethics – Dignity and Respect in Data Driven Life’. The most prominent speakers at this conference included Giovanni Buttarelli of the EDPS (the European Data Protection Supervisor), Tim Cook of Apple, Sundar Pichai of Google and Mark Zuckerberg of Facebook. All speakers agreed that privacy, as a fundamental right, is becoming more and more important while also concurring that a comprehensive federal privacy law in the United States should seek to use the EU General Data Protection Regulation (GDPR) as a guiding model.

Interestingly the discourse of this conference did not only focus on international data protection and privacy standards – it went far beyond that. All speakers, no matter if they were representing regulators, multinational companies or academia, emphasised that, together with data protection and privacy, digital ethics will be one the most important topic of the next decade. Giovanni Buttarelli, who started the debate, noted that there is a clear difference between legal compliance and ethical behavior. ‘It is not anymore about compliance with laws. We also have to make sure that the laws we are complying with are ethical. Not everything which is legal is also ethical.’ Echoing Buttarelli, Tim Cook also urged us to go beyond a purely legalistic approach and pointed out that, ‘technology is capable of doing great things. But it does not want to do great things. It does not want anything. That part takes all of us. [...] We have to make technology human. It must respect human values and privacy is part of this.’ Arguing that it is in the interest of companies to respect privacy, Mark Zuckerberg pointed out that ‘users need to trust companies’ and that ‘this is a company's’ biggest incentive to invest in privacy and ethics.’ Anita Allen (Professor of Law and Philosophy, University of Pennsylvania) saw a common theme in our understanding of ethics across the world, despite obvious cultural differences: ‘Ethics are moral cornerstones of society, for example fairness, dignity and humanity. Ethics may differ from culture to culture but have a lot of similarities. We have to act proactively before it is too late.’

The event in Brussels not only showed that everybody recognises the importance of data protection and privacy but also that discussions on data protection are thematically widening to include issues such as dignity and ethics. Furthermore, the event made clear that different disciplines are currently approaching the topic of

digital ethics from different directions, with each field applying a different analytic lens. Finally, the discussion in Brussels demonstrated that discussions on privacy and digital ethics cannot be limited to one country or region. Data protection is an issue which, like climate change, does not respect international borders – our future conversations need to reflect this.

Similarly, discussions must not be limited to consumer trust. In an age of rapidly emerging technology – one must only look at developments in the fields of artificial intelligence, robotics and blockchain – we require an interdisciplinary discourse about emerging technologies and their relationship to privacy and digital ethics. Questions which require thoughtful, detailed and, most importantly, interdisciplinary answers include: How shall personal data be used in an all-connected world? What is the ethics of machines, robots or robotized humans? How will AI transform healthcare, banking and insurances, and what are the ethical limits in these fields? How far can bioengineering and biomedicine go? What are the pros and cons of cryptocurrency regulation? What ethical issues are being raised by the emergence of self-driving cars? How shall autonomous weapons be regulated?

Delphi aims to provide a platform which can develop such discussions and is the first review which explicitly intends to address these topics on a comprehensive and global level. Delphi is an interdisciplinary journal of emerging technologies as seen through the perspectives of experts from the fields of law, ethics, science, technology, economics and business, bringing together authors of different professional backgrounds to share and discuss diverse perspectives and opposing views in a neutral forum. Delphi aims to provide an open forum for big picture thinkers to discuss how emerging technologies could and should shape not only our present but also our future.

I hope you enjoy the inaugural edition of Delphi as much as I did and perhaps are inspired to join the conversation with a contribution of your own. The discussions we have here will tackle some of the most important issues we face over the coming decades and I am excited to be on board from the beginning of this journey. I know it will be an interesting one.

*Anna Zeiter*  
*eBay Inc. / University of Bern*

# Self-Driving Cars:

## Risk Constellation and Acceptance Issues

Armin Grunwald\*

*Self-driving cars have become a challenging and discussed mobility option in Western societies in recent years. Technology is advancing quickly while simultaneously posing many ethical, legal, and social questions to the reflective scientific disciplines and to society as a whole. This paper focuses on the risk constellation of self-driving cars and draws some conclusions of their social acceptance. The final thesis is that an overly hasty introduction of self-driving cars motivated by economic competition might not only increase risk to road users but may also undermine the social acceptance of this technology. Hence, an ethical and legally responsible introduction should happen step by step in order to allow problems to be resolved as they emerge. Interdisciplinary cooperation between engineering, information technology, legal science, ethics, and the social sciences is needed to develop sound solutions to the many challenges of coping with risks and ethical issues of automated driving in a pro-active manner.*

### I. Self-Driving Cars – A Disruptive Innovation

The future of mobility is closely related to the ongoing digital revolution. In recent years, drivers have had access to more and more assistance based on advanced sensors, the real-time evaluation of the collected data, and actuators implementing conclusions made by algorithms. The latest processors and sensors are able to observe the traffic situation in the surroundings of a car in real-time and can determine the next steps to be taken in order to adapt the car to the respective traffic conditions. This development has already led to a partial automation of driving in new vehicles. Highly automated systems can autonomously change lanes and exert other functions without human intervention. In some countries, test fields have been established on which highly or fully automated vehicles can operate. In Karlsruhe (Germany), for example, a test field is currently being implemented by the Karlsruhe Institute of Technology (KIT) in an urban quarter. This test field will take into account the high complexity of urban mobility involving different participants in road traffic such as pedestrians, cars, bikers, and messenger and logistics services.

These developments put pressure on governments and society to reflect, to establish positions and to make decisions on whether and how autonomous mobility technologies could become part of the ex-

isting transportation system. Decisions have to be made whether and under what conditions automated driving systems can be approved, depending on ethical and legal issues. Questions of responsibility, accountability and liability have to be analysed and solved in order to create clear legal boundaries for self-driving cars, their developers, producers and owners as well as for mobility service providers such as car-sharing companies. Several ethical and even philosophical questions are involved, eg on the distribution of autonomy and responsibility between humans and technology by designing new interfaces between humans and technologies and possibly restricting human freedom to act as a driver in case of safer self-driving cars.

Autonomous driving is a fascinating field in a technological but also in ethical and legal respect.<sup>1</sup> A huge wave of public interest has developed in recent years, with most of the attention being captured by the lat-

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\* Prof. Dr. Armin Grunwald, Head of the Institute for Technology Assessment and Systems Analysis (ITAS) at Karlsruhe Institute of Technology (KIT) and Head of the Office of Technology Assessment at the German *Bundestag*. For correspondence: <armin.grunwald@kit.edu>. The author builds on his own work (fn 4) and on the experiences in the ethics commission mentioned in fn 5

1 Markus Maurer; Jan Gerdes; Barbara Lenz; Hermann Winner (eds.), *Autonomous driving. Technical, legal and social aspects* (Springer Open 2016)



ter issues rather than by the technological developments. In these debates the frequently-taken focus on simply replacing human drivers by algorithms and board computers is much too narrow. It is probably more important to recognise that autonomous driving opens up a wide space of new mobility options beyond the traditional individual auto-mobility with private cars; new mobility conceptions and patterns, new business models for mobility providers, and new combinations of private and public transport or even blurring the traditional borders between them, could become possible. This property only makes self-driving cars a possibly disruptive innovation.

Disruptive innovations, however, usually are disruptive in several respects. They might challenge the economy, existing business models, value-added chains, competition, consumer behavior, legal frameworks, incentive systems etc which can lead to major changes. A smooth and responsible transition to new transportation systems, including self-driving cars and other autonomous elements, requires proactive analysis as well as the exploration and development of feasible innovation strategies combining the various issues in an integrated manner. Interdisciplinary cooperation is needed between engineering, information technology, legal science, ethics, and the social sciences in order to develop sound solutions to the many challenges of coping with risks and ethical issues in a pro-active manner.

This paper focuses on the risk constellation of self-driving cars (Section II) and discusses some issues of acceptance (Section III). The final thesis is that a hasty introduction of self-driving cars motivated by economic competition might cause damage not only to human participants in road traffic and to people affected by accidents but also to the social acceptance of this technology. Hence, an ethically and legally responsible introduction should happen step by step in order to allow problems to be resolved as they emerge.

## II. Risk Constellation of Self-Driving Cars

Technological advancement often changes societal risk constellations. Intended results frequently in-

clude, amongst other positive expectations, significantly improved safety standards, improvements in health, longer life expectancy, environmental efficiency and greater prosperity. However, technological innovations also often bring with them unintended and unforeseen consequences, including new risk types.<sup>2</sup> In many respects, autonomous driving represents an attractive innovation for the future of mobility. Greater safety and convenience, use of the time required for driving for other purposes, better access to mobility for disabled and elderly persons, and efficiency gains on the system level are a few of the most commonly expected advantages. At the same time, the systems and technologies for autonomous driving are susceptible to risks. Comprehensive analysis and prospective evaluation of the possible risks of autonomous driving are an indispensable part of a responsible research and innovation process and thus equally important preconditions for acceptance both on the individual and societal levels.

Risk is possible harm that can occur as the result of human action and decisions. It contains three central semantic elements:

- *Epistemic moment of uncertainty*: What type and how severe is the harm that could occur? And how plausible and probable is it that the harm will actually occur? For both questions, the spectrum of possible answers ranges from scientifically attested and statistically evaluable to mere assumptions and speculation.
- *Ethical moment of the undesired*: Representing possible harm, risks are obviously undesirable. Nevertheless, the evaluation of the possible consequences of actions as a risk or opportunity may be disputed. One example is whether genetic modification of plants is perceived as a means of securing world nutrition or as a risk to humanity and the environment.
- *Social moment of risk distribution*: Often opportunities and risks are distributed differently among different groups of people. In extreme cases, the beneficiaries are not affected by possible harms at all, while those who bear the risks have no part in the expected benefits. It is crucial to consider who is affected by the opportunities and risks, in what ways and whether the distribution is fair.

A societal risk constellation consists of the relationship between groups of people such as decision-makers, regulators, stakeholders, affected parties, advi-

<sup>2</sup> Armin Grunwald, *Technology Assessment in Practice and Theory* (Routledge 2019) 16 ff

sors, politicians and beneficiaries in view of the frequently controversial diagnoses of expected benefits and feared risks. It is among the tasks of technology assessment<sup>3</sup> to make the respective risk constellation of new technologies as transparent as possible. Metaphorically speaking, a map of possible risks and groups affected has to be developed in order to inform public debate and political judgment, thereby taking into account all the three risks mentioned above.

Autonomous driving shows several possible types of risk, of which some are well-known from traditional driving while others are new, often related with the digitisation of driving. The following risk types have been identified in the framework of a project of the Daimler Benz Foundation.<sup>4</sup>

(1) *Individual accidents*: One of the expected advantages of autonomous driving is a major reduction in the number of traffic accidents and their consequences in terms of harm to life, health and valuables because human misbehavior is the reason for 90 to 95% of road traffic accidents. However, due to technological problems or in situations for which the technology is not prepared, accidents specific to autonomous driving can occur. Two accidents with fatalities have already occurred in the United States. Accidents are omnipresent in the practice of everyday traffic. The fact that these accidents happen is widely accepted in society. This is exemplified by the fact that the currently more than 3,000 annual traffic deaths in Germany, for example, do not lead to protests or public rejection of car transportation. The gradual introduction of self-driving cars into the transportation system will provide the chance to learn from incidents and make step-by-step improvements. Continuous monitoring and careful cause analysis will be of critical importance here. In particular, accountability and liability issues must be investigated and clearly determined, based on a clear distribution of responsibilities among car developers and producers, mobility service providers, the owners of self-driving cars, and possibly further groups involved.

(2) *Systemic risks*: Autonomous driving adds new types of systemic effects to the existing ones. While in the automotive world to date vehicles are operated more or less independently of one another and mass phenomena only occur through the unplanned interactions of the individually guided vehicles, autonomously guided traffic will to some extent be con-

nected through control centers and networking. Through the control software and the reliance on the internet, new effects could emerge. The control of a large number of vehicles will in all likelihood be conducted through software that is identical in its fundamental structure, as the complexity and concentration of companies will presumably strongly limit the number and diversity of providers. This situation could lead to the simultaneous breakdown or malfunctioning of a large number of vehicles based on the same software. Naturally this leaves the system vulnerable and a number of security issues must be taken into account. Software hackers might influence and damage the mobility system which is not present to date. The system may also be vulnerable to attacks by terrorists, mentally ill individuals or even militarily motivated cyber warfare. Control centers could be hacked, malware installed, or even a system collapse triggered through malicious action. These problems would then no longer remain on a micro-scale but could take on economically significant proportions and could hit a large number of people simultaneously. This is primarily an issue of software dependability and IT security.

(3) *Investment risks*: Research and development of autonomous driving is extremely cost-intensive. Considerable additional investment is required before any introduction of autonomous driving to the marketplace is possible. As with other investments, the business risk exists that the return on investment may not be on the expected scale or in the expected timeframe due to autonomous driving failing to catch on on a large scale, eg because of low acceptance by users. Even after a successful market launch, mishaps or technology-related system effects can occur posing a major risk for the affected brands. Special attention in this context needs to be paid to the risk factor posed by the complexity of the software required for autonomous driving. Complex software is impossible to test in its entirety. Unexpected problems can occur in actual use as we know from any other software. However, self-driving cars behaving

3 Armin Grunwald, *Technology Assessment in Practice and Theory* (Routledge 2019)

4 Armin Grunwald, 'Social risk constellations for autonomous driving. Analysis, historical context and assessment' in Markus Maurer, Jan Gerdes, Barbara Lenz and Hermann Winner (eds) *Autonomous driving. Technical, legal and social aspects* (Springer Open 2016) 641-662. This part follows closely the line of argumentation developed there

unexpectedly due to software problems may create risks to other traffic participants or bystanders. When an autonomous vehicle causes an accident due to a software error, it is unacceptable for ethical and legal reasons. In such cases the massive media attention which would follow could undermine trust in the products of a specific car company and create massive economic problems.

(4) *Labor market risks*: Automation is associated with concerns about the loss of jobs in many fields of work. Comprehensive introduction of autonomous driving would undoubtedly affect the labor market. The primary losers would be drivers of vehicles which are currently manually operated: truck drivers, taxi drivers, employees of logistic and delivery companies. A mobility system completely converted to autonomous driving could in fact largely do without these jobs altogether. On the other side, highly qualified personnel will be needed in the development, testing and manufacture of the systems, particularly in the supply industry. New jobs to operate new business models and new mobility services could also emerge. But even if there was a balance regarding the amount of work to be done by humans, the issue of distribution will remain; the elimination of unskilled jobs and the creation of new, highly skilled positions will lead to a field with winners and losers as well. This potential problem needs early political consideration.

(5) *Privacy risks*: Even today modern automobiles leave electronic traces, eg by using navigation aid or through data transmitted to the manufacturer. If autonomous vehicles are connected to the internet at all times, the electronic trail would amount to a complete movement profile. Movement profiles provide valuable information for intelligence services, which could for instance track the movements of regime opponents, but also for companies, who could use such information to create profiles for targeted advertising. In view of the increasing digitisation and connectedness of more and more areas of our social and personal lives, the specific additional digitisation in the field of autonomous driving would presumably represent just one element among many others. The

problem is immensely larger, as current debates about Big Data and many scandals such as the Facebook Cambridge Analytica case show. While autonomous driving is presumably of only minor specific significance in this debate it is of greatest significance to democracy to solve the problem at large.

(6) *Dependency risks*: In the case of a large-scale shift of mobility capacity to autonomous driving, a high proportion of society's mobility needs would naturally depend on the functioning of this system. A breakdown, due to software problems or cyberattacks (see above), would be manageable only if there were enough people who could still operate the vehicles manually. If a large share of the logistics and freight traffic were switched over to autonomous systems, it would be impossible, in the case of a longer-term total breakdown of the system, to maintain a sufficient pool of drivers, not to mention the fact that the vehicles would have to be equipped to enable manual operation in the first place. Even if significant logistics chains were to be interrupted for a lengthy period due to a system failure, bottlenecks could still quickly form, both in terms of supplying the population and maintaining production in the manufacturing industries. The ongoing digitisation of mobility will further increase society's vulnerability to intentional disruptions and external attacks. Standby or backup measures to address these issues are necessary and technically feasible.

The risk constellations described here are based on qualitative and exploratory considerations from the current world of mobility. They therefore have a certain plausibility, but also involve speculative aspects. They should not be understood as predictions, but as guideposts that should be observed along the way to the research, development and introduction of autonomous driving. The evidence suggests that a responsible introduction of this technology is possible. However – would people accept or even use and love self-driving cars?

### III. Introduction Scenarios and Risk Perception

Many concerns arise around the issue of public acceptance of autonomous driving. The so-called ethics dilemma (the trolley problem),<sup>5</sup> the unclear distribution of liability among several actors in the field, challenges to the distribution of responsibility be-

5 Ethics Commission on Automated and Connected Driving, established by Germany's Federal Ministry of Transportation and Digital Infrastructures, Final Report, <<https://www.bmvi.de/SharedDocs/EN/publications/report-ethics-commission.html>> accessed 5 November 2018

tween autonomous technology and humans, uneasiness with accepting an on-board computer making decisions on life and death, and psychological issues of boarding a car without a human driver and trusting the machine to safely navigate through today's complex traffic are among the issues that could prevent the willingness of possible users to change their mobility behaviour.

Acceptance cannot be manufactured but can only develop (or not). Its development depends on many factors, some of which can certainly be influenced. First of all, public as well as individual acceptance depends largely on perceptions of the benefits and risks of self-driving cars. It is crucial that the expected benefits manifest themselves at the individual level of users. Furthermore, it is essential that the involved institutions (manufacturers, operators, regulators, monitor and control authorities) enjoy public trust. Therefore, communication about possible risks must be conducted in an environment of openness – nothing is more suspect from a public debate standpoint than to assert that there are no risks and that everything is under control. The history of nuclear power in many European countries is an excellent example of this. Instead, concerns and questions of users and citizens must be taken seriously. All of this requires early and open communication with relevant civil society groups and citizens as well as in the mass media sphere.

The public perception of the risk will, in addition, depend largely on how autonomous driving is introduced. If it happens as part of a gradual automation of driving, the potential to learn gradually from the experiences gained along the way will greatly lessen possibilities of diagnosing autonomous driving as a high-risk technology for passengers and bystanders. Unlike switching on a nuclear reactor, for example, the process of increasing driver assistance towards greater automation has so far progressed gradually. We are comfortable with ABS, ESP and parking assistants. Incremental introduction allows for a maximum degree of learning and would also enable gradual adaptation of the labor market, for example, or alleviation of privacy concerns (see above).

In more revolutionary introduction scenarios, risk perception could be faced with more radical and fundamental issues. The public perception then could react more sensitively to accidents or critical situations. Consequently, the risk of 'scandalisation' would be greater and investment risks (see above)

could develop into a real problem for individual suppliers or brands in case of severe accidents in line with a hasty introduction. Hence, an ethical and legally responsible introduction should happen step by step in order to allow learning from problems as they emerge. However, this approach also includes risk. A gradual shift from conventional to automated driving would imply a long time of co-existence of both types with increased complexity. Also the well-known dilemma of automation has to be taken into account.<sup>6</sup>

There is some reason to believe that for the acceptance of autonomous driving, expected benefits will outweigh concerns regarding risks.<sup>7</sup> A focus on risks would therefore presumably miss the core of the challenge: the decisive factor seems to be the expected benefits not at the macro-economic but at the individual level of end-users. Rather than focusing on risk, it seems appropriate to regard the elements and options of autonomous driving as parts of an attractive mobility future with greater safety and efficiency, more social justice and more convenience/flexibility. Of course, there is no zero-risk scenario – but that has not been the case with conventional driving either.

A big unknown is human psychology. Whether, to what degree and under what conditions people will entrust their lives and health to self-driving cars is an open question. Other autonomous transportation systems such as subways or shuttle services did not face acceptance problems. But railway vehicles are perceived different from cars, in particular because of much lower complexity of the system. Also the controllability of risks is different. Therefore experiences from autonomous railway services cannot be simply transferred to road traffic.

Another aspect with regard to acceptance is that in conventional automobile transportation a well-developed culture of damage adjustment is in place through the traffic courts, appraisers and insurance companies which has reached a high degree of precision and reliability. Autonomous driving, by con-

6 Lisanne Bainbridge, 'Ironies of Automation' (1983) 19(6) <[https://ac.els-cdn.com/0005109883900468/1-s2.0-0005109883900468-main.pdf?\\_tid=dfd7da6a-56ba-4fb9-976b-5c684ede220c&acdnat=1539961997\\_0d11f4d176568d8e0d3c38a014e921fb](https://ac.els-cdn.com/0005109883900468/1-s2.0-0005109883900468-main.pdf?_tid=dfd7da6a-56ba-4fb9-976b-5c684ede220c&acdnat=1539961997_0d11f4d176568d8e0d3c38a014e921fb)> accessed 5 November 2018

7 Armin Grunwald, 'Social risk constellations for autonomous driving. Analysis, historical context and assessment' in Markus Maurer, Jan Gerdes, Barbara Lenz and Hermann Winner (eds), *Autonomous driving. Technical, legal and social aspects* (Springer Open 2016) 656 ff

trast, would pose new challenges to the damage adjustment system. Questions such as 'Who caused the damage, man or machine?' or 'Who is liable, the mobility service provider or the manufacturer?' have to

be answered in an unambiguous and legally unassailable manner. Acceptance of autonomous driving will also depend on the development of adequate and clear answers to these questions.

# Digital Specific Property of Robots:

## A Historical Suggestion from Roman Law

Takashi Izumo\*

*Modern technology calls for the judicial integration of robots into our society as well as their functional integration. Some scholars and industrialists argue that robots might possess their own property and should pay tax; however, it seems premature to grant an electronic personhood to robots at their current technological level. Therefore, another legal institution is needed. With this in mind Pagallo suggests that the concept of 'specific property' (peculium), which was given to Roman slaves, could be applied to highly developed robots. He calls it digital peculium (DP). In this paper, I explain what peculium was in Roman law and compare it with some future regulations for an autonomous taxicab to clarify the similarity and differences between the Roman peculium and DP. Two merits of the introduction of DP are found in my study. First, a robot may have its own DP although it has no personhood. Second, substantive regulations, which were applied to Roman slaves for supporting their masters and creditors, may be reused without destroying the current legal system. In conclusion, it becomes clear that DP is useful as a chrysalis legal institution for supervising robots before they become autonomous in the truest sense of the word.*

## I. Introduction

Modern technology, especially robotics and data science, is aiming at the creation of autonomous entities which can forecast the future and operate by themselves. Industrial robots, home robots, and the artificial intelligence operating behind these devices would replace human workers or at least support them in various fields; therefore, it will be necessary to integrate such entities into our society. Weng et al point out that '[t]he actual situation involves input and innovation from multiple non-engineering fields that pave the way for harmonious interactions between humans and robots of all shapes, sizes, appearances, and capabilities'.<sup>1</sup>

This integration should cover, also, the application of jurisprudence, above all in the context of justice. The concept of justice is concerned with resource allocation and requires us 'to render to each his/her own' (in Latin: *suum cuique tribuere*);<sup>2</sup> therefore, in a future society where humans and robots will live together and share limited resources, this classical definition of justice calls for extension. For example, Bill Gates suggests that either an owner should pay a hefty tax for a robot they have installed or this robot should pay income tax when it replaces

a human worker.<sup>3</sup> From a legal point of view, his suggestion can be interpreted as a method for realising justice: namely, capitalists and their robots should not deprive humans of living resources. However, this admonishment is based on the unproven assumption that robots will be competent enough to possess their own property, otherwise we cannot think of a robot's income or a robot's tax at all. Pagallo argues that this problem would be solved by the legal concept of 'specific property' (in Latin: *peculium*) that was granted to slaves during the Roman period.<sup>4</sup>

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1 Yueh-Hsuan Weng, Chien-Hsun Chen and Chuen-Tsai Sun, 'Toward the Human-Robot Co-Existence Society: On Safety Intelligence for Next Generation Robots' (2009) 1 Int J Soc Robot 267, 268

2 Max Kaser, Rolf Knütel and Sebastian Lohsse, *Römisches Privatrecht* (21th edn, C H Beck 2017) 244–245

3 Richard Waters, 'Bill Gates calls for income tax on robots' *Financial Times* (20 February 2017) <<https://www.ft.com/content/d04a89c2-f6c8-11e6-9516-2d969e0d3b65>> accessed 11 September 2018

4 Ugo Pagallo, *The Laws of Robots: Crimes, Contracts and Torts* (Springer 2013) 103–106



In this paper, I compare Roman slaves with highly developed robots on the basis of Pagallo's idea and discuss the possibility of 'digital peculium' (hereinafter, this is called 'DP') to identify a method for the judicial integration of this new technology into our society.

## II. The Concept of Peculium in Roman Law

### 1. What is Peculium?

Watson defines this Latin word in a concise and precise manner as 'the fund that the master allowed a slave to use as if it were the slave's, though in reality it was the master's (since a slave could own nothing).'<sup>5</sup> On the one hand, the granting of peculium to slaves aimed to establish their financial independence.<sup>6</sup> Julius Paulus, a distinguished jurist of the Roman Empire, permitted slaves free administration of their peculium.<sup>7</sup> On the other hand, a *paterfamilias*, ie a man who is the head of a household, could make money through this legal remedy because he maintained ownership of peculium and therefore the more peculium a slave gained through his commercial activities, the larger the estate their master had.<sup>8</sup> Thus, as Johnston points out, 'the problem here, not least, is that owners ought surely to be free to dispose of their property as they see fit, and to arrange and rearrange their affairs so that property which was once in one *peculium* is now in another or in none at all'.<sup>9</sup> Therefore, Roman jurists made rules about the troublesome behaviour of a master who was 'frustrating the trading partner's reasonable expectations as to creditworthiness'.<sup>10</sup>

## 2. Rights and Obligations around Peculium

### a. The Basic Rule

The legal status of Roman slaves should be understood in two different contexts: namely, contract law and tort law. 'Slaves are bound by their delicts, and if they are manumitted [ie freed from slavery], they remain bound. On contracts, however, they are not bound at civil law, but by natural law their contracts both bind others and they are bound. And so if I pay to a manumitted slave who had lent me money I am released'.<sup>11</sup> Tort liability is not taken up in this chapter since the focus of this study is on the economic integration of robots.

According to contractual liability in Roman law, a basic rule was that a free person who concluded a contract with another person's slave could sue neither the slave nor this other person in ordinal procedure.<sup>12</sup> This commercial hardship could be overcome with two legal actions: namely 'action over specific property' (in Latin: *actio de peculio*) and 'action over something converted to benefits' (in Latin: *actio de in rem verso*) that were introduced by Roman praetors. 'Here the master was liable up to the value of the peculium at the time of judgement, and also to the extent that his estate had profited'.<sup>13</sup> Kaser et al interpret that the phrase 'up to the value of the peculium' did not mean that a master was obligated to make over the rest of peculium to his slave's creditors, but that he had to pay the debt from his own wallet in the place of the slave.<sup>14</sup>

Imagine the following case. Gaius was the master of Titius, a slave to whom Gaius granted 1,000 sester-tius and a small house as peculium. Titius invested 1,000 sester-tius in corn dealing and he suffered a serious loss from his own business. He lost all his investment and furthermore owed Sempronius, a corn dealer, 500 sester-tius. Sempronius sued Gaius with *actio de peculio* because he could not sue Titius who was a slave. In this case, Gaius' liability should be limited up to the value of the peculium that was left at the time of judgement. If Titius kept the house which he received from Gaius, then Gaius should pay the debt to Sempronius in place of Titius up to the value of the house. For example, if the house was estimated at 800 sester-tius, then Gaius had to pay the debt of 500 sester-tius in full; but if it was only worth 300 sester-tius, then he was liable only for 300 sester-tius.

5 Alan Watson, *Roman Slave Law* (The Johns Hopkins University Press 1987) 13

6 Kaser et al (n 2) 103

7 Dig 15.1.48 pr (Dig is an abbreviation for 'Digesta', pr for 'principium')

8 Kaser et al (n 2) 103

9 David Johnston, 'Peculiar Questions' in Paul McKechnie (ed), *Thinking Like a Lawyer: Essays on Legal History and General History for John Crook on his Eightieth Birthday* (Brill 2002) 6

10 *ibid* 6

11 Dig 44.7.14, translated by Watson (n 5) 91

12 Watson (n 5) 91

13 *ibid* 91

14 Kaser et al (n 2) 305

## b. Special Remedies for Creditors

### i. *Fraudulent Disposition through Slaves*

At least three loopholes can be found in the above basic rule. First, a master might reduce the value of peculium fraudulently (eg he could donate it to another free person) and Roman jurists forbade such fraudulent behaviour from masters. Domitius Ulpian (circa 170–223 AD), a prominent Roman jurist, explained what the word ‘fraudulently’ (in Latin: *dolo malo*) actually meant. According to his interpretation, this term covered one of the following three cases: (a) a master took back the peculium of his own slave (eg Gaius took back the house from Titius as in the above example), (b) a master allowed his own slave to throw the peculium into disorder, or (c) a master who was notified that he would be sued diverted the peculium to another person.<sup>15</sup>

### ii. *Unjust Enrichment through Slaves*

Second, it was identified as unfair that a master was not liable for the debts of his slave after his estate was enriched through the use of the peculium (eg slaves shouldered their master’s debt or bought daily necessities for their master’s family).<sup>16</sup> According to Roman law, masters who were enriched by their slaves’ expenses had to pay their slaves’ debts up to a ceiling of the value of the enrichment. Even today, this rule is applied in courts (*actio de in rem verso*).

### iii. *Instruction from Masters to Slaves*

Third, as Johnston described, the restriction of a master’s liability up to the value of the peculium and the actual enrichment was removed when he instructed his slave to trade (eg when appointed as a captain of a ship).<sup>17</sup> I explain this topic in Section III.2.c in detail.

## III. Application to Robots

### 1. The Concept of Digital Specific Property

#### a. Definition of DP

It is plausible to compare Roman slaves with multifunctional robots for two reasons. First, according to Bodel, Roman slaves flexibly shifted from one job to another; in other words, they were multifunctional

entities in Roman society.<sup>18</sup> Second, a master might increase the value of his slaves by training them, and this training ‘was thus an economic as well as a practical investment’.<sup>19</sup> Likewise, owners of robots can train their robots through machine learning.

On the basis of Watson’s definition of peculium (Section II.1), I define the concept of DP as a fund that an owner would permit a robot to use as if it were the robot’s, though in reality it was the owner’s (since a robot could own nothing). According to Pagallo, this legal institution enables a robot to be an accountable agent without legal personhood. Thus, DP is one of the effective legal systems ‘which can properly address the challenges of the agency of AI robots in contracts and business law, by making them accountable, without resorting to any form of corporation and hence, any kind of legal personhood of AI robots’.<sup>20</sup>

#### b. Comparison to Electronic Personhood

The grant of judicial personhood to robots is another legal means that ‘was first coined in 1967 article for LIFE magazine and was more recently introduced in the *Draft Report with Recommendations to the Commission on Civil Law Rules on Robotics* of the European Parliament’s Committee on Legal Affairs’ (electronic person, hereinafter, is called ‘EP’).<sup>21</sup> One of the most important differences between DP and EP is in this point; that a robot which is registered as an EP possesses its own regular property and the owner no longer has direct ownership (in German: *Eigentum*, in French: *propriété*) of the estate of the robot.

However, Pagallo highlights that ‘[g]ranted robots the status of legal persons just like corporations

<sup>15</sup> Dig 15.1.21 pr

<sup>16</sup> Kaser et al (n 2) 305

<sup>17</sup> David Johnston, ‘Limiting Liability: Roman Law and the Civil Law Tradition’ (1995) 70 *Chi-Kent L Rev* 1515, 1517–1521

<sup>18</sup> John Bodel, ‘Slave labour and Roman society’ in Keith Bradley and Paul Cartledge (eds), *The Cambridge World History of Slavery: Volume 1 The Ancient Mediterranean World* (Cambridge University Press 2011) 331

<sup>19</sup> *ibid* 331

<sup>20</sup> Ugo Pagallo, ‘Apples, oranges, robots: four misunderstandings in today’s debate on the legal status of AI systems’, (2018) 376 *Phil Trans R Soc A* 1, 8–9 <<http://dx.doi.org/10.1098/rsta.2018.0168>> accessed 20 October 2018

<sup>21</sup> Filipe Maia Alexandre, ‘The Legal Status of Artificially Intelligent Robots: Personhood, Taxation and Control’ (1 June 2017) 16 <<https://ssrn.com/abstract=2985466>> accessed 20 September 2018

would indeed be a terrible mistake',<sup>22</sup> because there are some problems which would occur from this conception, for example, 'corporations cannot be held criminally responsible in the civil, as opposed to the common, law tradition'.<sup>23</sup> This difference would cause defection of EPs from the US to the EU in criminal cases. Furthermore, Solaiman argues that robots, like chimpanzees, are ineligible to be persons as they cannot perform their own duties.<sup>24</sup>

Therefore, as Pagallo recommended, 'in the mid-term, we should skip any hypothesis of granting AI robots full legal personhood'.<sup>25</sup> In the present study, accordingly, the legal status of robots with their DP will be clarified as follows: Robots may possess and administrate their own assets as DP, purely *de facto*; whereas owners could notify through this instrument how they are willing to invest in these artefacts and trade with others *de jure*. This *de-facto* characteristic of DP would make an empirical test possible, as Pagallo citing the example of *Tokku* in Japan explains, 'most of the issues we are dealing with in this field of technological innovation should in fact be tackled pragmatically'.<sup>26</sup> Furthermore, Bryson et al argue that by suspecting the possibility of keeping an appropriate balance between the rights and obligations of AI agents, '[a]utonomous or semi-autonomous robots interacting with humans will inevitably infringe the legal rights of humans';<sup>27</sup> in the case of DP, however, since robots operate purely *de facto* while humans interact with each other *de jure*, DP would not be a target for this criticism of Bryson et al.

### c. An Example: Autonomous Taxicab with DP

Let us explore this issue further using the concrete example of an autonomous taxicab. Imagine a society where a highly developed taxicab system per-

forms autonomously. Each car navigates a city, analysing taxi demand and the other information that may contribute to the revenue of its owner. If a taxicab detects a problem with its functioning (eg extraordinary noise), then it will change direction to a repair shop without human control. Now, an owner (James) has an autonomous taxicab which he calls Nexus. Nexus is usually maintained at Emily's auto repair shop. Here both James and Emily each have a reasonable motive for introducing DP. It is dangerous for James to connect Nexus' debts with his bank account directly (eg Nexus could make a contract with Emily for repairing at high prices even though it is better for James to scrap this taxicab in the event of a serious breakdown or time-related deterioration). This situation is risky for Emily too because it is difficult to know how much James is willing to pay and she cannot sue Nexus directly on the ground because the taxicab does not have personhood.

DP may offer a solution, if Nexus has DP and Emily can inquire about it with a special app. If the app indicates that Nexus' DP will not cover payment, or even if it is enough, but the repair cost is very expensive, then Emily should contact James before performing the repair, or risk that this taxicab might become insolvent before the DP payment due date. If she sues James for payment in the place of Nexus, then he is liable but only up to the value of the DP that was left on the due date. In other words, DP is a so-called yardstick which humans could use to measure the appropriateness of a contract.

Someone could question why James' estate is not strictly separated from Nexus' DP; however, this continuity of ownership between the owner's assets and the DP could be of merit. For example, Maia Alexandre is concerned about tax avoidance via the assets of artificially intelligent agents and calls on regulators to prevent such abuse.<sup>28</sup> In the case of DP, the risk of tax avoidance would be relatively low because the owner of a robot is the owner of its DP and hence he should pay tax imposed on the DP by himself/herself.

### d. Multiple Legal Relations

Perhaps the Roman concept of *peculium* could be applied to multiple legal relations. For example, if two masters (eg Gaius and Titius) share one slave, Stichus, then Gaius and Titius should obey the following two rules:<sup>29</sup> (1) if it is clear which parts of

22 Pagallo (n 20) 8

23 *ibid* 9

24 S M Solaiman, 'Legal personality of robots, corporations, idols and chimpanzees: a quest for legitimacy' (2017) 25 *Artif Intell Law* 155, 175

25 Pagallo (n 20) 14

26 *ibid* 13

27 Joanna J Bryson, Mihailis E. Diamantis and Thomas D. Grant, 'Of, for, and by people: the legal lacuna of synthetic persons' (2017) 25 *Artif Intell Law* 273, 288

28 Maia Alexandre (n 21) 23–24

29 Dig 15.1.15

Stichus' peculium belong to Gaius and which to Titius (eg Stichus' house was given as peculium by Gaius but his horse by Titius independently), then each master should be liable only up to his own share of the peculium; however, (2) if not only the slave but also his peculium was common to Gaius and Titius, then they should be joint debtors of the entire value of peculium. Likewise, these two rules seem applicable to DP: the co-owners of a robot should be joint debtors for their robot's activities when it is unclear which parts of DP belong to whom. Similar rules can be found even today, especially regarding the co-ownership of real estate (eg in Germany: § 134 Abs 1 Satz 4 BauGB).

## 2. Legal Measures against Responsibility Avoidance

### a. Fraudulent Disposition and Unfair Payments through Robots

Stability and predictability are the two bases of the modern legal system. It is destructive that a classical rule will be abolished just because a new concept has been introduced into an old system. Therefore, I argue that a new legal system should include some regulations about highly developed robots which should take over the current legal concepts as much as possible. For example, the precedents and laws about fraudulent disposition should be applicable to owners whose robots with DP become insolvent *de facto*. Today, also unfair preference, ie preferential payments shortly before becoming bankrupt, is forbidden by law (eg Chapter 11 United States Code § 547).

If the complexity of a free market calls for an efficient digital system to supervise trading robots, then I suggest that their contracts could be controlled in the form of smart contracts. As Swan explains, 'the blockchain could be one potential path to artificial intelligence (AI) in the sense that smart-contract platforms are being designed to run at graduated stages of increasing automation, autonomy, and complexity'.<sup>30</sup> Thus DP as a blockchain wallet could be an extensive application of smart contracts, separating DP from the owner's wallet purely *de facto*. Owners of robots would be able to calculate their exact investment in their artefacts through this virtual wallet without violating each other's financial privacy. This technology could contribute to the ability to trace en-

tire series of trading transactions and check whether or not a robot has already become insolvent. An insolvent robot would be banned from the market as soon as the blockchain system identifies its insolvency or breakdown. As Pagallo observes, a master could prohibit other free persons from dealing with a certain slave through public notification.<sup>31</sup> In comparing Roman and US slavery, Scheidel similarly mentions that a tracing system is important, especially for future generations to be able to inquire into the details of past trades.<sup>32</sup>

Evidently, there are some technical challenges related to blockchain, including data bloats, which increase the time required to download information to as long as one day.<sup>33</sup> It is reasonable to predict that the total sum of data on the smart contracts concluded by AI agents will be so enormous that the system will eventually become incapable of functioning; therefore, the successful operation of a smart contract system with DP would require restrictions on the kinds of trade to which blockchain should be applied (eg land transactions).

### b. Unjust Enrichment through Robots

If a robot used its own DP for the owner or the owner's family, then this enrichment should be taken into account when locating responsibility, as in the Roman case of *actio de in rem verso*. For example, if Nexus paid James' debt of €10,000 and became insolvent, then Emily can charge James up to the limit of the value of the DP plus €10,000 that he profited by Nexus's payment.

Abundant precedents concerning so-called unjust enrichment contribute an answer to the question of what kind of profit should be returned to creditors in such a case. Leow et al point out in the context of the Singapore legal system that '[t]he current shape and continued development of the law of unjust enrichment is the product of an *ongoing conversation* between academic commentators and courts' (italics

30 Melanie Swan, *Blockchain: Blueprint for a New Economy* (O'Reilly 2015) 26

31 Pagallo (n 4) 104

32 Walter Scheidel, 'The Roman slave supply' in Keith Bradley and Paul Cartledge (eds), *The Cambridge World History of Slavery: Volume 1 The Ancient Mediterranean World* (Cambridge University Press 2011) 287

33 Swan (n 30) 82

mine),<sup>34</sup> and the problem of the unjust enrichment performed through autonomous robots probably will become a future topic in this field.

### c. Instruction from Owners to Robots

In Roman law, if a master authorised his slave to make a certain contract or appointed the slave as a manager of a business, then he had to pay the debts that derived from the authorisation or appointment in full, and Roman jurists granted creditors 'action over something ordered' (in Latin: *actio quod iussu*) in the former case and 'action over management' (in Latin: *actio institoria*) in the latter.<sup>35</sup> In this paper, I refrain from discussing the latter action because no robot has the ability to be a manager at the moment.

This persuasive Roman rule is applicable to robots at least in the context of specific instruction, and therefore an owner must be liable for problems caused by their programming or data installation when they intended their robot to take a certain action. For example, in the above case of the autonomous taxicab, if James gave an order to Nexus to be repaired by Emily, then he should be liable for the repair cost in full. However, contrary to the unmistakable instruction, it seems difficult to establish a simple rule for an ambiguous one (eg James said: 'Nexus, you should be repaired by Emily *if necessary*'). I argue that safety and stability are the minimum rules determining this matter. It is unacceptable that an owner programmes his/her autonomous

cab to reduce maintenance costs and to prioritise making money, because such frugality could lead to a traffic accident.

## IV. Conclusion

DP, an imitation of the concept of peculium granted to Roman slaves, is not only possible but also useful for determining the location of property and the identity of the entity responsible for it. By granting DP, the owner of a robot can declare *de jure* how much he/she thereby invests in it and can inform creditors who deal with this robot about its financial affairs, while the robot itself interacts with other robots or humans purely *de facto*, ie this artefact does not call for its own rights or obligations. DP, like the Roman peculium, would be in danger of abuse (eg fraudulent disposition); however, measures developed by Roman and modern lawyers can be taken, despite its continuous development today. By introducing blockchain smart contracts, the legal function of DP could be enhanced, although there are some limitations, because creditors might need to trace the details of trading processes. An alternative legal remedy, ie the granting of a judicial personhood to robots, is premature, especially because legal systems pertaining to judicial personhood are different from one state to another and it is difficult to unify them. In the meantime, owners should supervise their robots appropriately and take responsibility for them now as the *de-facto* agenthood of robots is improved day by day. The introduction of DP should be understood as a chrysalis stage in the development of the autonomy of robots in the true sense of the word.

34 Rachel Leow and Timothy Liao, 'Unjust enrichment and restitution in Singapore: Where now and where next?' (2013) *Sing J Legal Stud* 331, 332

35 Kaser et al (n 2) 306



# Human Enhancement Technologies:

## New Hope or Threat to Society?

Jean-Aymeric Marot\*

*The Western world has undergone a paradigm shift over the course of the last 50 years, whereby individuals have increasingly gained control over their own body and life choices. Meanwhile, new technologies have increased their breadth of application, progressively blending into manifold aspects of our daily life. Human enhancement technologies in particular will bring a new set of risks and opportunities that may significantly disrupt the health and employment sectors, leading us to rethink our approach to science and the human body.*

### I. Introduction

Our relationship with technology has changed dramatically over the past five decades. It has become an integral part of our daily life; today we are able to buy groceries on the internet, check our bank accounts on our smartphone or smoke chemically flavoured e-cigarettes. However, we do not think of high-tech everyday items becoming parts of our bodies... yet.

This might change in the coming years, with the advent of human enhancement technologies (HETs). An enhancement is 'an intervention – a human action of any kind – that improves some capacity (or characteristic) that normal human beings ordinarily have or, more radically, that produces a new one'.<sup>1</sup> HETs come in all shapes and sizes, from prosthetics to genetic engineering, and are bound to spark debate between the proponents of a right to self-ownership and those advocating a more traditional view of the sanctity of the human body.

This article will first address the growing importance of personal autonomy and control over one's own body in modern society through a human rights lens. Then, will demonstrate how HETs challenge the very notion of health as we understand it. The article will conclude with a closer look at genetic enhancements and the various issues they raise.

torships and authoritarian regimes tend to restrict body freedoms, either by way of prohibition or compulsion. Fallacious, sometimes dangerous ideologies often lay the ground for state programs that remove people's most basic liberties. In a not-so-distant past, those types of policies led to slavery by colonial powers, state-backed eugenics in Nazi Germany and coerced sterilisation of indigenous women in Canada. In such settings, the introduction and use of HETs could have devastating effects because they would essentially negate the ability for individuals to express any kind of choice.

Nevertheless, optimists may argue that times have changed. Human rights standards keep improving globally, civil liberties have increased, and the progressive empowerment of individuals has enabled them to regain control over their own bodies. But to what extent do we actually exercise this control? Depending on the applicable legal system, the answer may vary.

In the United States, citizens have traditionally enjoyed a high degree of freedom with regards to decisions affecting their body, their beliefs or more generally their lifestyle. This is a direct consequence from the importance given to the right to privacy. This right, which has achieved quasi-constitutional status since the landmark Supreme Court case *Griswold v Connecticut*, essentially prevents public au-

### II. The Rise of Personal Autonomy

In essence, personal autonomy is the power to make choices in regard to our own bodies. It is what enables us to display our tastes, our personality, and it should not be taken for granted. For example, dicta-

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1 Allen Buchanan, *Better Than Human – The Promise and Perils of Enhancing Ourselves* (Oxford University Press 2011) 5



thorities from interfering with the enjoyment of citizens' personal rights and liberties.<sup>2</sup> This goes so far as to allow, under certain conditions, for individual views to override the interests of society – for instance in the case of a Jehovah's Witness refusing to undergo a life-saving blood transfusion, against the interest of the state to protect her.<sup>3</sup>

In Europe, on the other hand, Constitutional Courts usually give priority to well-established public order principles that safeguard the values deemed most important by the states. This is especially true in civil law countries, such as France or Belgium, which strictly uphold principles like the unavailability of the human body, whereas the legal status of human body parts remains unclear in common law countries<sup>4</sup>. However, this lack of consensus seems to be progressively fading as a result of the significant changes in society's attitude towards the human body, which are crystallised in the recent case law of the European Court of Human Rights (ECtHR).<sup>5</sup>

Indeed, starting in the 1960's, the last decades of the 20<sup>th</sup> century saw growing calls for political liberalisation and expanded civic rights by large population groups throughout Europe. A shift in mentality

took place, as the eagerness for individual self-governance rose and the prevalence of conformist ideas declined. Accordingly, the ECtHR, undeniably inspired by the American right to privacy, began interpreting more broadly the scope of Article 8 of the European Convention on Human Rights; in 2002, the legal notion of personal autonomy was born.<sup>6</sup> The case of *Pretty v the United Kingdom*, also known as the *right-to-die* case, marked the first step of a spectacular rise of this notion, which the ECtHR even ended up acknowledging as a right.<sup>7</sup>

Personal autonomy, understood as a right to make choices about one's own body, is a prerequisite to freely use HETs in modern democracies. It certainly is a powerful tool for those advocating a right to full self-sovereignty or self-determination. But most importantly in our case, it may function as a strong vector for normalising the use of emerging or innovative technologies within the human body. Our limbs are becoming increasingly shaped by and intertwined with technology; whether we seek convenience, customisation or performance, it is undoubtedly the path we as a society have embraced. Yet oddly enough, the term 'enhancement' remains largely unknown to the broader public.<sup>8</sup> This comes as no surprise, since today most HETs are merely diverted uses of medical treatments.

### III. The Therapy vs Enhancement Distinction

No one would dispute the fact that therapeutic treatments play a major role in sustaining good health. When we are struck with illness or when our physician spots something unusual in our blood test, we resort to treatments in order to help restore our metabolism to its normal workings. The reason for using HETs, on the contrary, is to bring the capabilities of our body or mind beyond their ordinary level; however, this does not necessarily correlate into an uplift in baseline health measurements. This could imply that HETs are somehow dissociated from the concept of health as we commonly perceive it, making them seem like a commodity product. But what does it actually mean to be healthy?

According to the World Health Organization, health is 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'.<sup>9</sup> This definition provides the advantage

2 *Griswold v Connecticut*, 381 US 479 (1965), in which the Court ruled that a Connecticut law prohibiting access to contraception violated a woman's right to privacy.

3 See *Munn v Southern Health Plan, Inc.*, 719 F Supp 525 (1989); see also Geraldine Koeneke Russell & Donald Wallace, 'Jehovah's Witnesses and the Refusal of Blood Transfusions: A Balance of Interests' (2017) 33 *The Catholic Lawyer* 361

4 Thérèse Callus, 'A Pragmatic Approach to Protecting the Human Body in English Law' in Brigitte Feuillet-Liger, Geneviève Schamps & Kristina Orfali (eds), *Protecting the Human Body: Legal and Bioethical Perspectives From Around the World* (Bruylant 2016); Thérèse Callus, 'Le mythe du principe de non-patrimonialité du corps humain en droit anglais : un droit ambivalent' in Brigitte Feuillet-Liger, Geneviève Schamps & Kristina Orfali (eds), *La non-patrimonialité du corps humain : du principe à la réalité* (Bruylant 2017) [to be translated]

5 The landmark cases in this regard are *Pretty v UK* ECHR 2002-III 155 and *Christine Goodwin v UK* ECHR 2002-VI 2

6 *Pretty* [61]; The wording 'personal autonomy' can be found in the English version of previous cases, but its French equivalent 'autonomie personnelle' was always omitted in official French translations until *Pretty v UK*.

7 *Evans v UK* ECHR 2007-I 353 [71]

8 Debra Whitman, Jeffrey Love, G. Rainville, Laura Skufca, Simone Schuerle, Daphne Bavelier & Corinna Lathan, 'What Americans Think of Human Enhancement Technologies' (*Scientific American*, 16 January 2018) <<https://blogs.scientificamerican.com/observations/what-americans-think-of-human-enhancement-technologies/>> accessed 15 September 2018

9 Preamble to the Constitution of the World Health Organization, opened to signature in New York on 22 July 1946 and entered into force on 7 April 1948 <[http://www.who.int/governance/eb/who\\_constitution\\_en.pdf](http://www.who.int/governance/eb/who_constitution_en.pdf)> accessed 15 September 2018

of not making good health depend on an arbitrarily settled concept of normalcy. There is no such thing as a normal state of health, simply because each person (and, more broadly, each organism) comes with a different set of biologic features and operates in a different environment.<sup>10</sup> This was emphasised by the UN Committee on Economic, Social and Cultural Rights in its *General Comment No. 14: The Right to the Highest Attainable Standard of Health (Article 12)*, stating that this standard ‘takes into account both the individual’s biological and socio-economic preconditions and a State’s available resources’.<sup>11</sup>

Despite these explanations, sceptics were quick to draw an impermeable border between HETs and therapeutic treatments, arguing that the former was ethically dubious and the latter completely fine. Using such a shortcut proves problematic, and expert panels on both sides of the Atlantic agreed that this view failed to consider many parameters. In the US, former President George W Bush’s Council on Bioethics released a report titled *Beyond Therapy: Biotechnology and the Pursuit of Happiness* which deconstructed this somewhat artificial moral distinction.<sup>12</sup> Similarly, a 2009 study commissioned by the European Parliament’s Science and Technology Options Assessment (STOA) panel explicitly addressed the issue, pointing out that while there are certain characteristics that do fundamentally differ from one to the other, HETs and therapies increasingly tend to overlap.<sup>13</sup>

Nevertheless, even though it may appear as a false dichotomy, it is important to bear in mind that HETs and therapies serve a separate purpose, as the first aims to improve the capabilities of the body and the second aims to restore health. Keeping a clear distinction is essential if we are to define a framework for HETs, with significant cultural, ethical and social implications for individuals as well as for policymakers. That being said, both disciplines will inevitably feed from each other, learning lessons and sparking ideas. Technologies that have potential applications for HETs can help reinvent traditional therapies and push forward the overall state of medicine.

For instance, the onset of illness is currently the starting point of the treatment process. But the emergence of P4 medicine (predictive, preventive, personalised and participatory) may change the way we conceive healthcare and radically transform medical systems.<sup>14</sup> The idea underlying P4 medicine is that studying a person’s genetic susceptibilities along with their lifestyle and social environment could al-

low for the detection of illness before it even appears, thus facilitating its ‘treatment’.

Genomics – the study of complex sets of genes and how they interact with each other and with their environment<sup>15</sup> – will play a key role in this new paradigm. Advances in the fields of computer technology and DNA sequencing techniques have allowed for its rapid development, opening up possibilities for population-wide research and original public health initiatives. But at the same time that opportunities arise, other types of risks are looming. The big data needed to effectively use genomic tools could be diverted, and genomic data privacy is a topic that most certainly will fuel heated discussions in the near future.

## IV. Genetics and the Law

At a different scale, our knowledge and mastery of genetics have also considerably expanded. This unfortunately comes with a set of drawbacks; I will focus specifically on two issues, namely genetic discrimination and controversies surrounding the alteration of one’s genetic fingerprint.

### 1. Genetic Discrimination

In the context of HETs and because they are intrinsically linked to predictions as well as measurements

10 Isabel Karpin & Roxanne Mykitiuk, ‘Going Out on a Limb: Prosthetics, Normalcy and Disputing the Therapy/Enhancement Distinction’ (2008) 16 Med L Rev 413

11 UN Committee on Economic, Social and Cultural Rights, *General Comment No 14: The Right to the Highest Attainable Standard of Health (Art 12 of the Covenant)* [2000] UN Doc E/C12/2000/4, para 9 <<https://www.refworld.org/docid/4538838d0.html>> accessed 15 September 2018

12 The President’s Council on Bioethics, *Beyond Therapy: Biotechnology and the Pursuit of Happiness* (Regan Books 2003)

13 Christopher Coenen, Mirjam Schuijff, Martijntje Smits, Pim Klaassen, Leonhard Hennen, Michael Rader & Gregor Wolbring, ‘Human Enhancement’ [2009] Science and Technology Options Assessment Study, 16ff <[http://www.europarl.europa.eu/stoa/en/document/IPOL-JOIN\\_ET\(2009\)417483](http://www.europarl.europa.eu/stoa/en/document/IPOL-JOIN_ET(2009)417483)> accessed 15 September 2018

14 Mauricio Flores, Gustavo Glusman, Kristin Brogaard, Nathan D Price & Leroy Hood, ‘P4 Medicine: How Systems Medicine Will Transform the Healthcare Sector and Society’ (2013) 10 Personalized Medicine 565

15 Clarissa Allen, Karine Sénécal & Denise Avard, ‘Defining the Scope of Public Engagement: Examining the “Right Not to Know” in Public Health Genomics’ (2014) 42 J.L. Med & Ethics 11

of performance, the sectors of employment and insurance are particularly exposed to high risks of discrimination. Genetic discrimination is nothing new: a 1992 study conducted by a team of American scientists showed that after taking genetic tests, individuals labelled with genetic conditions suffered stigmatisation and were denied basic services such as insurance coverage or adoption requests, even if the individuals concerned were asymptomatic or merely harboured disease-associated genes.<sup>16</sup>

In employment matters, genetic screening could potentially lead employers to only hire workers whose genetic constitution shows that they are at low risk of falling sick, and discard all the others who were less fortunate at birth. On the flip side, genetic monitoring might prove useful in a work environment where the employees need to handle toxic products that can influence genetic features, for their own safety but also for that of their co-workers or third parties.<sup>17</sup> With respect to insurance however, it seems that no one is winning: insurers would evidently raise premiums of persons at risk (or default premiums in case you refuse to hand out your genetic test), whereas policyholders would knowingly hide or forge their results. Low risk individuals might even

decide to opt out of the insurance market and cover their own expenses. By taking out the uncertainty factor, the very principle of the insurance contract – risk pooling – becomes compromised.

HETs do not *per se* create genetic discrimination – this phenomenon does not necessarily correlate with the mainstreaming of HETs – however, they might amplify the divide between the genetically strong or those who can afford an enhancement, and those who cannot. Genetics are becoming a new marker for discrimination and HETs will potentially play a part in increasing wealth disparities in the coming years. The question, then, is what can we do about it?

The answer probably lies in the protection of individual genetic data and limitation of access to this data by unauthorised parties. But the situation is made trickier by the fact that genetic data is partly shared between members of the same family; disclosure of one member's genetic information can lead to a breach of the others' genetic privacy. The problem was explicitly addressed in the US, where Congress passed the Genetic Information Nondiscrimination Act (GINA) in 2008. GINA expressly prohibits employers and insurers from requesting or purchasing genetic information pertaining to individuals concerned or their family members.<sup>18</sup> In Europe, the Convention on Human Rights and Biomedicine (Oviedo Convention), binding on those member states of the Council of Europe (CoE)<sup>19</sup> that have ratified it, ensures the respect of the principles of confidentiality as well as non-discrimination on grounds of genetic heritage, and narrows circumstances in which predictive genetic tests may be performed.<sup>20</sup> Non-binding instruments, such as the 2016 Recommendation on data resulting from genetic tests and the revised Recommendation on the processing of personal data in the context of employment, are based on the same approach.<sup>21</sup> In the European Union's legal system, genetic information qualifies as sensitive data under Article 9 (1) of the General Data Protection Regulation (GDPR), which makes it prohibited to process unless specifically authorised under Article 9 (2).<sup>22</sup>

## 2. Alteration of One's Genetic Fingerprint

Perhaps even more contentious than control over our bodies is the subject of control over our genetic material. Genetic engineering is technically very much

16 Paul R Billings, Mel A Kohn, Margaret de Cuevas, Jonathan Beckwith, Joseph S Alper and Marvin R Natowicz, 'Discrimination as a Consequence of Genetic Testing' (1992) 50 Am J Hum Genet 476

17 Heleen L Janssen 'Genetic Information in European States' in Janneke H Gerards, Aalt W Heringa & Heleen L Janssen (eds), *Genetic Discrimination and Genetic Privacy in a Comparative Perspective* (Intersentia 2005) 49

18 Genetic Information Nondiscrimination Act of 2008, Pub L 110-233, 122 Stat 881 (2008), Sec 101 (d) (1) & 202 (b)

19 The Council of Europe, not to be confused with the Council of the European Union or with the European Council, is an international organisation composed of 47 member states and tasked with the promotion of human rights in Europe. It notably drafted the European Convention on Human Rights and established the European Court of Human Rights.

20 Convention on Human Rights and Biomedicine, opened to signature in Oviedo on 4 April 1997 and entered into force on 1 December 1999, arts 10-12 <<https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/164>> accessed 15 September 2018

21 Council of Europe, Committee of Ministers (2016), Recommendation Rec(2016)8 to member states on the processing of personal health-related data for insurance purposes, including data resulting from genetic tests, 26 October 2016; Council of Europe, Committee of Ministers (2015), Recommendation Rec(2015)5 to member states on the processing of personal data in the context of employment, 1 April 2015

22 Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) [2016] OJ L119, art 9

feasible today, only for now it is exclusively used for research and strictly therapeutic purposes. Nevertheless, medical acts affecting our genome are slowly becoming trivialised, paving the way for wider acceptance of genetic enhancement. Sometimes, personal autonomy is invoked to justify freely disposing of one's genetic material, as in the case of a woman willing to donate her frozen embryos to scientific research.<sup>23</sup> Other times, a breakthrough in gene therapy will make it possible to cure (or at least mitigate) a disease refractory to more traditional therapies.<sup>24</sup> In the latter instance, a person's genes are directly altered. This can be done in two ways: either via somatic gene therapy, whereby only the genetic material of body cells is being modified, or germline gene therapy, which targets the gametes.<sup>25</sup>

It follows that somatic gene therapy affects only the individual undergoing treatment, whereas the effects of germline gene therapy – or enhancement – will be passed on to their offspring. From a legal standpoint, ethical conundrums aside, somatic gene therapy is perfectly fine. The status of germline gene therapy, on the other hand, is unclear. As of today, no universally binding treaty dealing with the matter exists, which leaves it up to the states. In the US, human germline modification is *de facto* banned as a result of a rider on the Consolidated Appropriations Act of 2016, even though no federal legislation expressly prohibits it.<sup>26</sup> In Europe, the Oviedo Convention stipulates that interventions seeking to modify the human genome may not aim to introduce any modification in the genome of any descendants, but states that have not ratified it remain free to legislate as they see fit.<sup>27</sup>

If germline gene therapy could theoretically eradicate over the span of one generation most hereditary disorders, some fear that it would rapidly turn into a way to create 'designer babies' or to promote eugenics. Proponents of those concepts may argue that genetically enhancing the future child is in his best interest, since he will be able to become virtually anything in life.<sup>28</sup> However, such a view fundamentally disregards the potentially disastrous psychological consequences that the genetically engineered child might face, not to mention the unknown side effects germline gene therapy could show in the longer term. In the end it all boils down to personal choice, which cannot be made by the parents. Along the same lines, the Parliamentary Assembly of the CoE as well as a handful of legal scholars have put

forth the idea of a right to a genetic inheritance which has not been artificially interfered with, either to the benefit of the child once he is born (embryos, as a rule, do not enjoy legal personality)<sup>29</sup> or to the benefit of mankind as a whole.<sup>30</sup>

## V. Conclusion

For better or worse, the world around us is constantly evolving. The pace is fast, and HETs are one of many emerging technologies that are bound to expand globally. Our society reflects our aspirations;<sup>31</sup> and it shows signs that we are longing for more autonomy in our life choices and in the way we make them. The focus has shifted from the protection of conservative values to the fostering of personal growth and self-fulfilment.

HETs also make us question seemingly obvious constructs such as the notion of health. We may be approaching a medical revolution, a new era that comes with its opportunities and risks. Progress in genetics and genomics could improve the living conditions of millions, as much as they could create a pervasive form of social Darwinism. The development of HETs raise a number of issues that are at the

23 See the Dissenting Opinion of Judge Sajó in *Parrillo v Italy* ECHR 2015-V 249

24 Eric A Pierce and Jean Bennett 'The Status of RPE65 Gene Therapy Trials: Safety and Efficacy' (2015) 5 Cold Spring Harb Perspect a017285

25 To go further, see Michael H Shapiro 'Does Technological Enhancement of Human Traits Threaten Human Equality and Democracy?' (2002) 39 San Diego L Rev 769

26 Joshua D Seitz 'Striking a Balance: Policy Considerations for Human Germline Modification' (2018) 16 Santa Clara J Int'l L. 60, 73

27 Convention on Human Rights and Biomedicine, art 13

28 Supporters of this view often base their claims on the works of philosopher Joel Feinberg, who coined the term "child's right to an open future" in his eponymous essay; see Joel Feinberg 'The Child's Right to an Open Future' in William Aiken & Hugh LaFollette (eds), *Whose Child? Children's Rights, Parental Authority and State Power* (Rowman and Littlefield 1980).

29 *Vo v France* ECHR 2004-VIII 67 [84-85]; Bernard M Dickens, Rebecca J Cook 'The Legal Status of In Vitro Embryos' (2010) 111 International Journal of Gynecology and Obstetrics 91

30 Council of Europe, Parliamentary Assembly (1982), Recommendation Rec(1982)934 on Genetic Engineering, 26 January 1982; see also Rose-Marie Lozano, *La protection européenne des droits de l'homme dans le domaine de la biomédecine* (La documentation française 2001)

31 For more on this, see Armin Grunwald 'Are We Heading Towards an 'Enhancement Society'?' in Elisabeth Hildt & Andreas G Franke (eds), *Cognitive Enhancement – An Interdisciplinary Perspective* (Springer 2013)

crossroads of science, law, ethics and philosophy: are we playing God? To what degree should we apply the precautionary principle? What responsibility do we bear towards our own body? Dealing with these mat-

ters is no easy feat. But it is for certain that finding the answers will require critical forward thinking as well as genuine cooperation on the international scale.



# Nootropics in Postmodernity:

## What the Philosophy of Gilles Deleuze Can Tell Us About the Relationship Between Smart Drugs, Authenticity, Control and Fairness

Sean Blanchet and Sean Devine\*

*Pharmaceutical products aimed at enhancing cognitive performance – smart drugs, nootropics, etc – have garnered considerable attention. Many ethical questions accompany their growth in popularity. Three of these questions will be addressed in this paper: Do nootropics preclude authenticity? Are nootropics a good thing for society? And, is it fair to use nootropics? We argue that these questions can be answered by appealing to Gilles Deleuze and Felix Guattari's concepts of individuation, Society of Control, and dividuality. On the one hand, drawing on the concept of extrinsic individuation, we posit that nootropics have the potential to expand horizons, disrupt traditional human-object interactions, and allow users to experience their surroundings in novel, more authentic, ways. On the other, it also risks concentrating success in the hands of a minority of individuals and reinforce the normative power of the Society of Control. Ultimately, we suggest that whether it is fair, indeed ethical, to use nootropics depends on the control the user has over herself and her cognition within the Society of Control.*

### I. Introduction

From early weaponry to modern vaccines, the pursuit of progress through technological means can be found in nearly every human society. Today, we see this pursuit manifest in the form of cognitive enhancement. From synthetic drugs to music and exercises, cognitive enhancement can take many shapes. That being said, in a world in which our success often depends on our cognitive skills, fast-acting nootropic drugs have become increasingly popular. But, a number of important ethical questions accompany this increase in popularity. In this short article, we want to tackle three questions for a society in which nootropics are becoming increasingly commonplace, with a particular focus on synthetic nootropic drugs.<sup>1</sup> First, does nootropic use preclude authentic expression? Nootropics change the brain. If their use becomes commonplace, it would be important to discern to what extent behaviour is a result of individual volition or the drugs' influence. Moreover, we want to consider the possibility that these drugs might in fact enhance authentic expression rather than limit it. Second, are nootropics a

good thing for society at large? On the one hand, a smarter society might be a better society. The more people that take nootropics, the higher the cognitive performance of the average individual; the more difficult problems solved, the better off society is. On the other hand, the prioritisation of a certain set of cognitive abilities (eg, spatial reasoning, fluid abilities, etc) might come with the discouragement of others (eg, creativity, awkwardness, quirkiness, etc). At its most extreme, this approach risks minimising cognitive diversity and lead to a homogeneous mass of people unable to think outside the confines of what has been prescribed for them. Third, is it fair to use nootropics? As with any commodity that is bought

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1 This is not to say that natural nootropics do not play an important role in society however, nor that they do not come with ethical baggage themselves. Indeed, this is an area that merits (requires) more research, but falls outside of the scope of this paper.



and sold, there is a risk of inequality. For nootropics, this inequality risks not only to be economic, but also cognitive: a society in which the rich have the means to consistently outperform the poor.

Ethicists have proposed many different answers to these questions.<sup>2</sup> But, they have mainly treated the use of nootropics as *either* an individual choice *or* an issue for society at large. In actuality however, the two are not separate. The individual is shaped by her surroundings, and her surroundings are shaped by her. This dynamic interplay between the individual and her environment can be best understood through the works of French philosophers Gilles Deleuze and Félix Guattari. For Deleuze and Guattari, the relationship between the individual and society is complicated. On the one hand, they recognise the undeniable effect that *Societies of Control* have on the individual. Building on the work of Michel Foucault, they highlight how sociotechnological advances in society can contribute to a life of servitude and indeed even mold an individual's subjectivity through a process known as *dividuation*.<sup>3</sup> On the other hand, the pair are optimistic about the individual's capacity to challenge and transcend the constricting hold of the state: to live as a *nomad*, as they put it.<sup>4</sup> Importantly, doing so requires a deep critique and expansion of one's perception away from the limits imposed on it by the state. As Genn-Bash has pointed out however, for Deleuze, the individual's relationship to the status quo, to the state, might critically depend upon the use of external substances; that is, it might depend on the use of drugs.<sup>5</sup> As such, we suggest that nootropics have the potential to simultaneously reinforce and challenge the *Society of Control*.

With this in mind, we argue that the philosophy of Deleuze and Guattari can be used to provide nuanced answers to our three questions: does nootropic use preclude authentic expression? Are nootrop-

ics a good thing for society? And is it fair to use nootropics? To answer these questions, we will appeal to Deleuze and Guattari's concepts of *individuation*, *Society of Control*, and *dividuation*. As nootropic use becomes more commonplace, it is crucial to consider their ethical implications within the postmodern condition. Given Deleuze and Guattari's important influence on the postmodern condition, we believe their work can provide valuable insight into the ethical implications of nootropic use today.

## II. Does Nootropic Use Preclude Authentic Expression?

One of Deleuze and Guattari's key insights is that neither the society nor the individual exist in isolation; societies are formed by individuals and individuals are molded by societal influence. This notion is captured most succinctly in their process of *individuation*. To understand what is meant by *individuation*, we must first keep in mind that every individual is subject to this process. One cannot take on a role in an institution, a job, or a household without being considered individuated or becoming individuated. Second, we need to avoid our desire to define *individuation* (as with any of Deleuze and Guattari's concepts) as strictly good or bad. Instead, we should observe whether the elements that mold this process allow for a continuous, dynamic, (*nomadic*, if you will) development or if they emerge from a static environment where the result is final and considered unchangeable. In other words, whether it is a process of intrinsic *individuation*, where the properties of the individual are fixed and innate, or extrinsic *individuation*, where the individual adapts, molds and changes according to the changing environment. This difference is best captured in this section of *A Thousand Plateaus*:

Chess pieces are coded; they have an internal nature and intrinsic properties from which their movements, situations, and confrontations derive. They have qualities; a knight remains a knight, a pawn a pawn, a bishop a bishop. Each is like a subject of the statement endowed with a relative power, and these relative powers combine in a subject of enunciation, that is, the chess player or the game's form of interiority. Go pieces, in contrast, are pellets, disks, simple arithmetic units, and have only an anonymous, collective, or third-person

2 For a review and an example of some responses, see Arthur Saniotis, 'Remaking *Homo*: ethical issues on future human enhancement' (2013), *Ethics in Science and Environmental Policies* <<https://www.int-res.com/articles/esep2013/13/e013p015.pdf>> accessed 23 August 2018

3 Gilles Deleuze, *Postscripts on the Societies of Control* (1992)

4 Gilles Deleuze & Félix Guattari, *A Thousand Plateaus* (University of Minnesota Press, 1987) 380

5 Oli Genn-Bash, 'Gilles Deleuze and Psychedelic Thought as Resistance' in David Luke and Dave King (eds), *Neurotransmissions: Essays on Psychedelics from Breaking Convention* (Strange Attractor Press 2015)

function: 'It' makes a move. 'It' could be a man, a woman, a louse, an elephant. Go pieces are elements of a nonsubjectified machine assemblage with no intrinsic properties, only situational ones. Thus the relations are very different in the two cases. Within their milieu of interiority, chess pieces entertain biunivocal relations with one another, and with the adversary's pieces: their functioning is structural. On the other hand, a Go piece has only a milieu of exteriority, or extrinsic relations with nebulae or constellations as bordering, encircling, shattering. All by itself, a Go piece can destroy an entire constellation synchronically; a chess piece cannot.<sup>6</sup>

Within the context of nootropics, we speak of being extrinsically individuated. That is, characteristics that were once outside of the eyes of society, systems of technology, and even ourselves are now being evaluated and measured, ultimately contributing to new possibilities and the lifting of restrictions. New properties are evaluated and come to define our place and role on the chess board. New rules, new opponents, and new opportunities on the board re-define your options as a Go piece. Put simply, the ability to temporarily modify our brains in order to increase performance tears down boundaries. Fixed elements, those that were once largely unalterable by the individual, such as brain chemistry and cognitive capacity, become variable. Those who were discredited or singled out, considered unable to attain certain positions due to certain particularities, could find ways to experiment with their capacities. That is, they could subvert or compensate for what might currently be considered a 'weakness' by further exploring their own particularities with the help of nootropics. In this context, nootropics allow for greater extrinsic *individuation*. They give us the opportunity to express our peculiarities, our personal traits, and our authentic selves, in new and interesting ways.

### III. Are Nootropics a Good Thing for Society?

To answer this question, we can appeal to Deleuze and Guattari's notion of the *Society of Control*. The *Society of Control* is different than *Societies of Discipline*<sup>7</sup> (a concept popularised by Michel Foucault). In *Societies of Discipline*, control is maintained through

a rigid combination of systems of technology and rules forming an all-seeing and all-powerful authority (known as a panopticon). In contrast, *Societies of Control* do not forcefully exert their authority on their subjects. Rather, they guide and evaluate their behaviour. To be clear, *Societies of Control* are not less oppressive nor more progressive than *Societies of Discipline*. Control is achieved and maintained through the use of the corporate structure and an inherent culture of competition. By pitting one against the other in a contest of productivity, in a maze of meetings and group sessions (often done in the name of 'team building', even though the individually varying nature of salary does not encourage you to partake in cooperation), individuals come to be controlled by a master that they can't name. Instead of a progression, the shift from *Society of Discipline* to one of *Control* marks a transition from a binary model of control (conformity vs nonconformity, productive vs unproductive, etc) to a numerical model, in which you are assigned a specific value (eg, individually varying salaries) and different institutions, corporations or otherwise, determine your possible use. As Deleuze puts it in *Postscripts on the Societies of Control*: 'We no longer find ourselves with the mass/individual pair. Individuals have become individuals, and masses, samples, data, markets, "banks".'<sup>8</sup> The process of *dividuation* consists of the internal division of entities into measurable and adjustable parameters, in a similar fashion, to say, a pig or cow that is divided into multiple sectors (cuts of meat) and accompanied by a set of instructions giving detailed information on how one adjusts the preparation of said meat depending from on which sector it comes from.

Importantly, these societies don't gain control in some deterministic way. Control is reinforced by sociotechnological change. As technology comes to occupy a predominant role within society, it comes to shape our expectations of each other. Whether someone is good or bad, successful or unsuccessful, valuable or dispensable, is inherently linked to what tools we use to measure them. This way, nootropics risk to reinforce the *Society of Control*. By breaking up cog-

6 Gilles Deleuze & Félix Guattari, *A Thousand Plateaus* (University of Minnesota Press 1987) 353

7 Michel Foucault, *Discipline and Punish: The Birth of a Prison* (Gallimard 1975)

8 Gilles Deleuze, *Postscripts on the Societies of Control* (1992) 5

nitive abilities and ways of thinking into sectors, by dividuating people, control is seized over yet another aspect of our lives. A numerical code is assigned to our abilities and those who fail to meet a certain cut-off face persecution within the society. Of course, it might be said that this is already happening. The risk with nootropics is that we provide a material commodity with which this cutting-up is done. The brain becomes like any other piece of meat: divided, scaled, and sold for social value, all while the butcher, the *Society of Control*, profits and becomes more powerful.

#### IV. Is It Fair to Use Nootropics?

With regards to fairness, the questions of control and authenticity might seem trivial. If using nootropics is fair, we might be less concerned with control and perhaps more willing to use them for reasons of authenticity. If they are unfair, the opposite might be true. As we have seen thus far with Deleuze and Guattari though, these questions are seldom separate and rarely so black and white. As we've seen, nootropics contain an emancipatory potential. They can extrinsically individuate and promote authentic expression. Through continued, widespread use, they offer the opportunity for individuals to challenge the *Society of Control* and assert power. Further, this process of autonomous assertion has the potential to guide the development of future nootropics away from the desires of the society and towards a more open, community-driven, means for improvement and authenticity<sup>9</sup>. In this way, nootropics can be very fair. However, we must recognise that currently nootropics are both funded by and made for individual who profit from a world that is heavily regulated and productivity-oriented; they are made by and for businesses. And as with any business, the end goal is profit. As such, within the corporate structure, a place where competition and productivity reign, nootropics are less of a tool of self-exploration and self-expression, but more a means to increase productivity and diminish costs. Were nootropics to become commonplace, this could manifest both from the top and the bottom. In a top-down model, corporations could impose regulations that directly or

indirectly select for certain capacities. For instance, a tech startup might require all employees to have two different versions of an app ready for Friday. To complete this task, employees would have to work long-nights and expend great cognitive effort. Of course, this type of work is entirely feasible when nootropics are available. Indeed, it might only be possible using nootropics. In this way, nootropics are still being used to enhance certain qualities within an individual, but we are far from the extrinsic, authentic, *individuation* we saw earlier. Rather, the *Society of Control*, through the corporate structure, tightens its grips as it dividuates the individual, transforming her particularities, her uniqueness, into a value. Should that value fall below some threshold, the individual risks exclusion or even persecution. This continued exclusion of undesirable capacities leads to a more homogeneous, conforming, and controllable mass. In a bottom-up model, we might see employees using nootropics competitively to get a leg-up on their coworkers. Since nootropics are not free, this competitive drive could reify pre-existing class divisions. Those with the means to afford cognitive enhancement can consistently outperform those who don't and as a result they accumulate even more wealth (ie, they get the promotion, they get the bonus, etc). In this case, unfairness begets unfairness in both models.

#### V. Conclusions

We argue that the ethical status of nootropic use is not inherent in the technology, but depends critically on the relationships it forms with society and the individual. Deleuze and Guattari show us above all that cognitive enhancement has both the potential for emancipation and exploitation. On the one hand, motivated by a desire to transcend limitations and explore one's self, nootropic use can extrinsically individuate, allowing us to transform the way we experience and interact with our world. At its most powerful, it can be used as tool to promote authentic individuality and challenge the status quo. On the other hand, it can be used to dividuate, enforce normative behaviour, and deepen the *Society of Control's* influence on our lives. Nootropics can be used to promote a certain set of behaviours deemed valuable by the society at the expense of those deemed undesirable. At the practical level, this reinforcement of so-

9 We are grateful to the reviewers for pointing this out.

ciety's control is done by corporations that have the material power to effectively enforce (explicit and implicit) rules that do this dividuating. As such, whether using nootropics is fair, whether it is ethical in the long-run, will depend on the dynamic interplay between the individual and the society and wherein the power of the user lies. The transcendent potential of nootropics can only be realised if it exists in an open plane where individual potential can be explored, expanded, and ultimately enhanced.

Though the majority of this paper has been theoretical, we hope to conclude by remarking that many of these ideas are not just speculative. Cognitive enhancers are already being marketed across silicon valley as miracle drugs<sup>10</sup> and prescription drugs like

Adderall are being abused in schools to help students study every day.<sup>11</sup> Technology does not exist in a vacuum; it is deeply connected to the social milieu in which it finds itself. In the postmodern condition, these technologies determine our lives just as we determine their use.

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10 Jillian D'Onfro, 'Marissa Mayer and Mark Pincus invested in a startup that makes 'brain drugs' and chewable coffee' (Business Insider, October 13, 2015) <<https://www.businessinsider.com/nootrobox-nootropics-startup-raises-seed-round-of-funding-2015-10>> accessed 12 September, 2018

11 Christian J. Teter, Sean Esteban McCabe, Kristy LaGrange, James A. Cranford, and Carol J. Boyd, 'Illicit Use of Specific Prescription Stimulants Among College Students: Prevalence, Motives, and Routes of Administration' (2006) *Pharmacotherapy*

# Examining Copyright Protection of AI-Generated Art

Celine Melanie A. Dee\*

*Through time, the world has witnessed the evolution of art as painstakingly created by human authors, to art created by human authors with aid of computer technology, and more recently, to art created by artificial intelligence. Although art as an output remains unchanged, its very essence, as embodied in the process of creation, is altered. Advancements by generative artificial intelligence systems in the field of art ('AI-Generated Art') has disrupted the way in which art is created thus raising a myriad of questions on its creation, ownership, and protection. While AI-Generated Art has certain similarities with contemporary art thus meriting copyright protection, AI-Generated Art and its underlying system do not exactly fit within the traditional copyright framework. An absence of a protection framework will cause AI-Generated Art to immediately fall into the public domain, and its use may place it in a state of perpetual infringement. Failing to extend adequate protection to AI-Generated Art is a disservice to creativity and innovation and a blatant disregard of what is beautiful, appealing, or provocative as manifested in AI-Generated Art.*

## I. Introduction

Connected to a piece of art is an author, a soul of human creativity who seeks to convey his or her deepest thoughts and strongest emotions to the world. The author treats art as a physical manifestation or expression of his or her personal experiences. A 'pure creative activity of the human spirit'<sup>1</sup>, art embodies rich meaning rooted in 'a feeling [the author] has experienced'<sup>2</sup>.

Art traditionally serves as a medium by which the audience peers into the ideas shaped by the author's distinct experiences. Through the 'emotive force of art-work [sic]', the audience forms a deep connection with the author based on 'perceptual and emotional immediacy of direct experience'<sup>3</sup> with the artwork.

The rise of technological developments is constantly disrupting how the author and the audience interact through a piece of art. Through time, the world has witnessed the evolution of art as painstakingly created by human authors, to art created by human authors with aid of computer technology, and more recently, to art created by artificial intelligence. Although art as an output remains unchanged, its very essence, as embodied in the process of creation, is altered. Technological developments, particularly creation by artificial intelligence inadvertently removes the fundamental aspect of art's evocative meaning thereby decreasing opportunities to develop connections with and draw emotions from art as an expression of human creativity. Advancements by generative artificial intelligence systems in the field of art ('Art-generating AI Systems') has disrupted the way in which art is created thus raising a myriad of questions on its creation, ownership, and protection.

This article shall examine art generated by artificial intelligence ('AI-Generated Art') and its implications on intellectual property laws. It seeks to focus on issues arising from legal protection, and governance of AI-Generated Art under the traditional intellectual property framework. Part II shall briefly discuss the conceptual framework of AI-Generated

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1 Alfredo Casella and Otis Kincaid, 'What is Art?' [1922] The Musical Quarterly 1

2 Leo Tolstoy, 'Art and Sincerity' <<http://www.denisdutton.com/tolstoy.htm>> accessed 15 November 2018

3 Michelle Marder Kamhi, 'Thought and Feeling in Art – An Integrated View' (Aristos, July 2009) <<https://www.aristos.org/aris-07/thoughtinart.htm>> accessed 15 November 2018

Art. Part III shall address whether AI-Generated Art merits protection and if so, whether the current applicable intellectual property regime is sufficient to protect AI-Generated Art, particularly those created by direct guidance of humans or by autonomous creation. Part IV shall inquire whether other legal means apart from copyright protection are more suitable to protect AI-Generated Art.

## II. Defining Artificially-Generated Art

Art encompasses a myriad of artistic fields ranging from literature, performing arts, and visual arts.<sup>4</sup> It is characterised by a human author's expression of creativity often rooted in his or her ideas and emotions. The process of creating art is deemed highly creative where 'movements, lines, colors, sounds, or forms expressed in words'<sup>5</sup> 'signifie[s] "variation"'<sup>6</sup> based on a human author's distinct 'mental conceptions'<sup>7</sup>.

Artificial intelligence has fundamentally changed the way art is created. Traditionally, creation of art is contingent on the efforts of a human author who exemplifies his or her creativity and skill through the craft. In the 1950s, it evolved to computer-aided creation whereby human creativity is supplemented with the use digital tools.<sup>8</sup> Most recently, it has displaced the role of individuals by means of Art-generating AI systems, particularly machine learning.

Machine learning is defined as 'a form of Artificial Intelligence called an "expert system" [which] combines a knowledge based of facts, and rules derived from those facts, with an inference engine that reaches conclusions'.<sup>9</sup> Systems that use machine learning commonly train themselves on existing works and generate output works based on previous learnings.<sup>10</sup> In the case of AI-Generated Art, the expert system analyses countless works of art based on artistic style and produces a similar output. It is capable of learning how to 'generate prose, paintings, motions pictures, musical compositions, and so on' from information compiled.<sup>11</sup> Existing systems which have successfully generated art include 'The Next Rembrandt', an artwork generated by a computer that analysed the works of 17<sup>th</sup> century Dutch artist Rembrandt van Rijn<sup>12</sup>; 'Konpyuta ga shosetsu wo kaku hi (The Day a Computer Writes a Novel)', a short novel written by a Japanese program which advanced

in the Hoshi Shinichi national literary award<sup>13</sup>; and 'Magenta', Google's Deep Mind – created software which has the ability to generate music by listening to past recordings<sup>14</sup>.

Scholars have identified four key elements to explain the basic structure of Art-generating AI systems: Inputs, Learning Algorithms, Trained Algorithms, and Outputs. Inputs are pre-existing works of art which are loaded into the expert system.<sup>15</sup> Inputs essentially act as basic building blocks which serve as training data for the expert system to learn from. Learning Algorithms utilise these building blocks and analyses any relevant characteristics through a machine learning algorithm.<sup>16</sup> It collates information generated from its analysis in a data structure, which corresponds to Trained Algorithm.<sup>17</sup> Trained Algorithms link data generated from Inputs and Learning Algorithms, to Outputs. It is information in the form of a data structure consisting of probabilities and operations.<sup>18</sup> By means of seed materials, a set of instructions either provided though a template or selected by the system itself, it transforms probabilities and operations into a specific Output.<sup>19</sup> Outputs represent a tangible 'form

4 Merriam-Webster, 'Arts' <<https://www.merriam-webster.com/dictionary/the%20arts>> accessed 15 November 2018

5 Tolstoy (n 2)

6 Casella (n 1)

7 Kamhi (n 3)

8 Cade Metz, 'How A.I. Is Creating Building Blocks to Reshape Music and Art' *New York Times* (New York, 14 August 2017)

9 Benjamin L. W. Sobel, 'Artificial Intelligence's Fair Use Crisis' (2017) 41 *Colum. J.L. & Arts* 45, 58

10 *ibid*

11 *ibid*

12 ING, 'The Next Rembrandt' <<https://www.nextrembrandt.com/>> accessed 15 November 2018

13 Netexplo Observatory 'Konpyuta Ga Shosetsu Wo Kaku Hi' (*NetExplo Observatory*) <<https://www.netexplo.org/en/intelligence/innovation/konpyuta-ga-shosetsu-wo-kaku-hi>> accessed 15 November 2018

14 Magenta, 'Magenta' <<https://magenta.tensorflow.org/>> accessed 15 November 2018

15 Jessica Fjled and Mason Kortz, 'A Legal Anatomy of AI-generated Art: Part I' (*Jolt Digest*, 21 November 2017) <<http://jolt.law.harvard.edu/digest/a-legal-anatomy-of-ai-generated-art-part-i>> accessed 15 November 2018

16 *ibid*

17 *ibid*

18 *ibid*

19 *ibid*



recognisable as “art”<sup>20</sup>, which is more commonly known as AI-Generated Art.

It is evident that the creative process involved in AI-Generated Art vastly differs from that of contemporary art. The former is a by-product of technological expertise, information fed into the expert system, and algorithms, while the latter is a result of the artistry rooted in the thoughts and experiences of a human author. This raises the question of whether AI-Generated Art is still considered art. The proponent submits that art created by Art-generating AI systems remains art due to the creative output produced. Although the creative process involved in AI-Generated Art vastly differs from that of contemporary art, the end result remains the same in the sense that both processes produce tangible creative works.

Naysayers argue that ‘machines will never be as creative in the sense humans are creative’<sup>21</sup> and art-generating AI systems are nothing but ‘tools...[or] computational techniques [which] create a broader palette for artists’.<sup>22</sup> It is often deemed that creativity differentiates humans from machines.<sup>23</sup> Aspects of ‘emotion, intuition, and imagination’<sup>24</sup> which characterise contemporary art is as ‘an expression of human skill and creativity’ and as a ‘catalyst for human reflection and contemplation’<sup>25</sup> are often deemed lacking in AI-Generated Art. Nonetheless, the core concept of art as a means of creative expression ‘of what is beautiful, appealing, or provocative’<sup>26</sup> remains poignantly evident in AI-Generated Art. Art-generating AI Systems’ capacity to create ‘artistic and

innovative works’<sup>27</sup> has paved the way for it to be treated as a ‘new source of creativity’<sup>28</sup>.

### III. Protection of AI-Generated Art

Art-generating systems product artistic works through technologies such as machine learning. These systems learn from a Trained Algorithm and are capable of generating original artistic work which merit protection.

Traditionally, art and artistic works enjoy intellectual property protection, particularly copyright. Intellectual property rights extend protection ‘to promote and encourage cultural and technological development’.<sup>29</sup> Copyright protection, in particular, exists ‘to encourage a dynamic creative culture, while returning value to creators so that they can lead a dignified economic existence, and to provide widespread, affordable access to content for the public’.<sup>30</sup> It aims to protect and reward creators and other right holders with some sort of monopoly over a period of time for their efforts geared towards innovation. It likewise serves as a legal tool against unscrupulous free-riding thereby inhibiting development of works and ‘discourage[ing] future investments in new literary, artistic and creative works’.<sup>31</sup>

Copyright protects the expression of ideas manifested in literary, dramatic, musical, or artistic works. It requires eligible subject matter, originality, and fixation in a tangible medium.<sup>32</sup> As long as the three

20 *ibid*

21 Martin Gayford, ‘Robot Art Raises Questions about Human Creativity’ (2016) MIT Technology Review., <<https://www.technologyreview.com/s/600762/robot-art-raises-questions-about-human-creativity/>> accessed 15 November 2018

22 Metz (n 8)

23 New Art Academy, ‘Art and AI: What Place for Human Artists in a Future Dominated by Artificial Intelligence?’ (*New Art Academy*, 30 January 2018) <<https://www.newartacademy.com/blog/2018/1/30/artificial-intelligence/>> accessed 15 November 2018

24 *ibid*

25 Dr. Marcus Volz, ‘When Computers Make Art’ (2018) University of Melbourne <<https://pursuit.unimelb.edu.au/articles/when-computers-make-art>> accessed 15 November 2018

26 *ibid*

27 Kalin Hristov, ‘Artificial Intelligence and the Copyright Dilemma’ (2017) 57 *IDEA* 431, 433

28 *ibid* 431

29 Candidate 183, ‘EU Copyright Protection of Works Created by Artificial Intelligence Systems’ (MSt thesis, University of Bergen 2017)

30 Yahong Li, Professor, University of Hong Kong, (Hong Kong, 13 September 2017)

31 Candidate 183 (n 29) 10

32 Berne Convention for the Protection of Literary and Artistic Works [1886] 1 B.D.IEL. 715 [Berne Convention], art 2. (1) The expression ‘literary and artistic works’ shall include every production in the literary, scientific and artistic domain, whatever may be the mode or form of its expression, such as books, pamphlets and other writings; lectures, addresses, sermons and other works of the same nature; dramatic or dramatic or musical works; choreographic works and entertainments in dumb show; musical compositions with or without words; cinematographic works to which are assimilated works expressed by a process analogous to cinematography; works of drawing, painting, architecture, sculpture, engraving and lithography; photographic works to which are assimilated works expressed by a process analogous to photography; works of applied art; illustrations, maps, plans, sketches and three-dimensional works relative to geography, topography, architecture or science.

fundamental requirements are evident, then copyright protection extends to the expressed work.

At first glance, AI-Generated Art is likewise eligible for copyright protection. The expression of ideas is manifested in the AI-generative system's 'ability to derive valuable information'<sup>33</sup> from Inputs to generate a Learning Algorithm. Through this process, the AI-generative system is able to 'glean value from ["Inputs"] expressive aspects'<sup>34</sup> and consequently express ideas in the form of Outputs.

AI-Generated Art satisfies the above requirements of copyright protection. First, AI-generative systems produce art which falls under the domain of artistic work, an eligible subject matter of copyright.<sup>35</sup> Outputs generated by the systems fall under 'every production in the literary, scientific and artistic domain, whatever may be the mode or form of its expression'<sup>36</sup>, as defined in the Berne Convention. However, it likewise raises the question of whether AI-Generated Art should be considered as artistic work or as a computer-generated work. This shall be addressed in Part IV.

Second, AI-generative systems are capable of exemplifying independent creation and a modicum of creativity<sup>37</sup> thus satisfying originality. The modicum of creativity required under originality is often misunderstood as inventiveness. It is important to note that the degree of creativity required in copyrighted works is only 'a spark or minimal degree of creativity'.<sup>38</sup> The low standard simply entails that 'the work contains a minimal amount of material that goes beyond being an idea, a fact, or other basic building block'.<sup>39</sup> AI-Generated Art complies with the required standard by using Learning Algorithm and Trained Algorithm to recognise and learn from any patterns made available through Inputs.<sup>40</sup> By 'mimicking human learning'<sup>41</sup>, the system 'reorganises] existing data in different patterns'<sup>42</sup> akin to the 'reordering of things that [humans] already know' during the creative process. Contrary to popular belief, works arising from the so-called creative process are often not a result of pure imagination or 'a spark in the mind that cannot be quantified or described in terms of data'<sup>43</sup> but rather some sort of recombination of what already exists. In fact, scholars are of the view that 'the very act of authorship in *any* medium is more akin to translation and recombination than it is to creating Aphrodite from the foam of the sea'<sup>44</sup> since creative actors 'all engage in the process of adapting, transforming, and

recombining what is already "out there" in some other form'.<sup>45</sup>

The facility of AI-generative systems goes further than reorganisation of existing data structures. Some systems produce entirely original works which are far more advanced and intricate than those created by human authors. This results from the technological capabilities of the systems which stems from a human author's efforts in developing such systems, to wit:

In my own work, I visualise structures and concepts from a variety of mathematical fields, such as fractals (never ending patterns), cellular automata (grids), and computational geometry. In contrast to traditional art creation, in which people create from inspiration, I develop systems for generating art, ones that have built-in parameters that I can modify and tweak. Usually I will introduce randomness and variability into the system, a process that can lead to unexpected results. Sometimes I write scripts that generate thousands of candidate images with different parameter settings, from which I select the final piece.<sup>46</sup>

Evidently, the works generated by uniquely-designed and built AI-generative systems satisfy the originality requirement. After all, the 'randomness' utilised by the system adds a creative spark to the work which is 'something that cannot be attributed to the human programmer of an AI machine'.<sup>47</sup>

33 Sobel (n 9) 48

34 *ibid*

35 Berne Convention (32) art 2

36 Berne Convention (32) art 2

37 *Feist Publications, Inc v Rural Telephone Service Co*, 499 US 340, 340 (1991)

38 *ibid* [340]

39 Li (n 30)

40 Bridget Watson, 'A Mind of Its Own – Direct Infringement by Users of Artificial Intelligence Systems' (2017) 58 IDEA 65, 76

41 *ibid*

42 Contributors, 'Understanding the Impact of Artificial Intelligence on Music and Arts' (*Tech Financials*, 25 October 2017) <<https://techfinancials.co.za/2017/10/25/understanding-impact-artificial-intelligence-music-arts/>> accessed 15 November 2018

43 *ibid*

44 Yahong Li, Professor, University of Hong Kong, (Hong Kong, 27 September 2017)

45 *ibid*

46 Volz (n 25)

47 Hristov (n 27) 436

Third, the end-result of the AI-generative system produce Outputs which exemplify fixation in a tangible medium. AI-generated art generated by the system is a tangible result of the underlying expression.

Considering the foregoing, it appears that AI-generated Art is entitled to copyright protection since it satisfies the elements of eligible subject matter, originality, and fixation. However, it begets the question of whether copyright protection is most suitable for protecting AI-Generated Art.

## Is Copyright Sufficient?

As discussed, copyright and other traditional intellectual property rights were developed to promote innovation and to protect the interest of humans by preventing theft which deprives the original creator from the benefits of his or her personal efforts.<sup>48</sup> However, the move from atoms to bits has consistently affected how traditional intellectual property rights are enforced. Particularly, it challenges legal protection and governance of technological advancements thus resulting to a shift in the essence of intellectual property protection.

Historically, it appears that most, if not all, innovations introduced by technological developments are forced into the confines of copyright protection. When computers made its first foray, academic scholars and jurists alike were lost on how to protect computer programs. This was resolved by the World Intellectual Property Organisation (WIPO) Copyright Treaty ('WCT') which extended copyright protection to computer programs 'whatever the mode or form

of their expression' and databases 'in any form, which, by reason of the selection or arrangement of their contents, constitute intellectual creations'.<sup>49</sup> Moreover, notable cases held that software is protected by copyright because of its source codes' visual similarities to written text.<sup>50</sup> Despite the convenience it presents, copyright is not a one-size fits all protection mechanism. It cannot be unnecessarily and forcibly be expanded to accommodate every new technological development, including artificial intelligence.<sup>51</sup>

Protection of AI-generated Art seemingly fits within the traditional copyright framework. However, an in-depth analysis will show that the law is 'being stretched to the maximum to accommodate disruptive consequences of the advent of artificial intelligence'.<sup>52</sup> The rapid development of AI has led to a blurring of the distinction between art created by humans, and art created by machines. Computers have traditionally been used as tools to assist humans to create art. However, we are rapidly shifting to a world wherein computers themselves are now deemed as creators of art. While AI-Generated Art has certain similarities with contemporary art thus meriting copyright protection, AI-Generated Art and its underlying system do not exactly fit into the copyright system. Doing so may result to the utter disregard of the established principles of copyright and 'the very foundation of Intellectual Property law'.<sup>53</sup>

The copyright system constricts AI-Generated Art into a mere vacuum. It disregards the striking peculiarities which distinguish AI-Generated Art from contemporary art. AI-Generated Art may be divided into two distinct categories: creation by direct guidance and autonomous creation.<sup>54</sup> The former is performed with the 'assistance or input of human beings', while the latter is produced by computer programs without any direct human intervention.<sup>55</sup> This distinction 'forces artificial intelligence into a binary – it is either a mystical author or a machine'.<sup>56</sup> This presents a host of issues, including ownership, and originality, should copyright protection be forced upon protecting AI-Generated Art.

Unlike contemporary art, AI-Generated Art does not necessarily have legally recognised authors who create the work which results to issues on ownership. Copyright law bestows ownership in the author of the work.<sup>57</sup> The author is defined as 'the person who effectively is, as near as he can be, the cause of the [work] which is produced, that is, the person who has

48 World Intellectual Property Organization, 'What is Intellectual Property?' <[http://www.wipo.int/edocs/pubdocs/en/intproperty/450/wipo\\_pub\\_450.pdf](http://www.wipo.int/edocs/pubdocs/en/intproperty/450/wipo_pub_450.pdf)> accessed 15 November 2018

49 World Intellectual Property Organization 'WIPO Copyright Treaty (WCT)' <<http://www.wipo.int/treaties/en/ip/wct/>> accessed 15 November 2018

50 *Sega Enterprises, Ltd v Richards* [1983] FSR 73

51 Andrea Moriggi, 'The Role of Intellectual Property in the Intelligence Explosion' <[https://www.4ipcouncil.com/application/files/9615/1638/1031/The\\_Role\\_of\\_Intellectual\\_Property\\_in\\_the\\_Intelligence\\_Explosion.pdf](https://www.4ipcouncil.com/application/files/9615/1638/1031/The_Role_of_Intellectual_Property_in_the_Intelligence_Explosion.pdf)> accessed 15 November 2018

52 *ibid*

53 *ibid*

54 Hristov (n 27) 435

55 *ibid*

56 Sobel (n 9) 49

57 Berne Convention (32) art 3

superintended the arrangement, who has actually formed the [work]<sup>58</sup>. If the direct guidance of a human author results to AI-Generated Art, then ownership may be attributed to the human author who directed the Inputs and algorithms.<sup>59</sup> This is akin to a situation wherein a computer, used as a tool, has aided the generation of art

The problem arises when autonomous creation results to AI-Generated Art. This occurs when the Art-generative AI System learns to make decisions and create based on its own computations and recognised patterns,<sup>60</sup> or when ‘randomness and variability [are introduced] into the system, a process that can lead to unexpected results’.<sup>61</sup> In this case, the Art-generative AI System shifts into the role of author or creator of the work which results to confusion. As discussed, ‘author’ pertains to an human author or an ‘actual individual who was responsible for creating the work’.<sup>62</sup> This connotes that an author should have a legal personality who may be held legally responsible before the law. In the case of autonomously created AI-Generated Art, the Art-generating AI System does not have legal personality. It is considered as a non-human and is not an inventor or creator according to established Intellectual Property principles.<sup>63</sup> As such, it cannot own copyright over a work it has created. Absent a human author requirement, AI-Generated Art, in this case, is not copyrightable, and will likely fall into the public domain upon its creation.<sup>64</sup>

While allowing these works to fall into the public domain may appear beneficial, it ultimately inhibits an author from creating and disseminating his or her work.<sup>65</sup> Falling into the public domain without due regard to an author may result to exposing such work to a culture of theft. It disregards the value of an author’s creative and innovative efforts since it neglects to provide him or her with fair and viable incentives to share his or her work.<sup>66</sup>

The absence of clear ownership likewise leads to issues on the period of protection of the work. Copyrighted works generally enjoy protection during the life of the author plus fifty years after his or her death.<sup>67</sup> Without a legally recognised author, it will be impossible to establish a period of protection for the work and for the enjoyment rights attached thereto.

Another prevalent issue is originality. As previously discussed, originality is one of the essential requirements of copyright protection. This issue comes into play when the Art-generating AI System is fed with

Inputs comprising of unauthorised copies of copyrighted works.<sup>68</sup> This allows the System to train itself by ‘reduplicat[ing] and modif[y]ing [works] countless times throughout the training process’.<sup>69</sup> As a result, the System may generate art glaringly similar to an existing work since the System ‘sometimes reconstruct[s] idiosyncrasies of [I]nput data instead of reflecting underlying trends about those data’.<sup>70</sup> This raises the question of whether the doctrine of fair use may protect the use Inputs in the System. If not, then AI-Generated Art may find itself in a state of perpetual infringement.

Though seemingly appropriate, copyright is inadequate to protect AI-Generated Art. Its core principles on ownership and originality neglect to address the idiosyncrasies and ever-changing advancements of AI-Generated Art.

## IV. Conclusion and Recommendation

Having established the inadequacy of the protection of traditional Intellectual Property framework on AI-Generated Art, the proponent submits that a *sui generis* framework (‘Framework’) may best protect the dynamic area of AI-Generated Art. The Framework aims to adequately protect AI-Generated Art by recognising the value of AI developers’ ‘investment of time and skills’<sup>71</sup> and incentivising them ‘to continue creating, using, and improving their capabilities’<sup>72</sup>. The Framework should address the issues paramount to protecting AI-Generated Art, to wit:

58 Ralph D Clifford, ‘Intellectual Property in the Era of the Creative Computer Program: Will the True Creator Please Stand Up?’ (1997) 71 Tul L Rev 1675, 1685

59 Moriggi (n 51)

60 Watson (n 40)

61 Volz (n 25)

62 Clifford (n 58)

63 Moriggi (n 51) 7

64 *ibid*

65 Candidate 183 (n 29) 11

66 *ibid*

67 Berne Convention (32) art 7

68 Sobel (n 9) 48

69 Moriggi (n 51) 7

70 Sobel (n 9) 64

71 Hristov (n 27) 438

72 *ibid*

- (1) Comprehensively define Art-generative AI Systems and AI-Generated Art in order to elucidate the distinctions between AI-Generated Art created by direct guidance of humans and autonomous creation solely by the Systems;
- (2) Adapt traditional copyright protection for AI-generated Art created by direct guidance of human authors and developers akin to principles in computer-assisted works;
- (3) Address authorship and ownership issues, if any, of autonomously created AI-Generated Art by considering allocation of ownership and corresponding rights over AI-Generated Art to developers of AI-generative AI Systems with the aid of established principles of agency law and contract law;
- (4) Examine joint ownership of AI-Generated Art between developers and users of Art-generative AI systems to encourage advancement of rights;
- (5) Review suitable periods of protection of AI-Generated Art in line with rapid technological advancements in the field;
- (6) Promote the use of licensing methods to best ensure that Inputs used are authorised by copyright owners, and that AI-Generated Art are not unauthorised reproductions of existing works;
- (7) Establish rules on accountability to identify parties liable and degree of liability in case of infringement; and
- (8) Encourage compliance with the principles of Open Source and Creative Commons Licensing in order to promote constant innovation and creativity.

Ensuring ample protection of AI-Generated Art is vital to encourage constant innovation in the field. The time has come to acknowledge that humans are no longer the 'only source of innovation and creativity'<sup>73</sup>. Akin to contemporary art, AI-Generated Art is likewise a creative manifestation deserving of protection. An absence of a protection framework has dire consequences – it will cause AI-Generated Art to immediately fall into the public domain, and its use may place it in a state of perpetual infringement. Failing to extend adequate protection to AI-Generated Art is a disservice to creativity and innovation and a blatant disregard 'of what is beautiful, appealing, or provocative'<sup>74</sup> as manifested in AI-Generated Art.

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73 Hristov (n 27) 431

74 Volz (n 25)

# Blockchain4Good:

## How New Startups Around the World Are Pioneering Land Registries, Supply Chains and the Solar Industry

Anna Laesser\*

*The Startup Digest section introduces startups and grassroots initiatives from around the world that push the boundaries of emerging technologies. Most conversations around emerging technologies are stuck in silos and are quite hyped, making it hard to understand their actual impact on businesses, society and governance. The Startup Digests aim to demystify what is happening on the ground by establishing a discourse via case studies and interviews with startups and grassroots initiatives. Each edition will take a critical look on how these movements apply emerging technologies to achieve a specific purpose – facilitating a discourse that makes the (new) thinking, the approach and potential impact become more tangible.*

*This first edition of the Startup Digest focuses on the nascent blockchain technology that is strongly driven by startups. These enterprises are exploring new opportunities and business models that may have the potential to transform many existing processes in business, society and governance. According to the World Economic Forum, blockchain technology can be a game-changer in how the 17 Global Sustainable Development Goals (SDGs) are tackled: It enables a shift towards 'cleaner and more resource-preserving decentralised solutions, to unlock natural capital, and to empower communities'<sup>1</sup> and thus incentivise new behaviour.*

*This edition features three startups that pioneer blockchain technology, exploring new business models designed to create a positive impact. The startups that have been sourced via the global network of Impact Hub Berlin are: (1) BenBen – land & real-estate market, Ghana, (2) Minespider – mineral supply chain, Germany and (3) SolarLux – solar energy, Thailand.*

*Each interview will give insights on opportunities for growth, challenges and risks to reveal what is happening on the ground. Additionally, possible spill over effects to other emerging technologies will be taken into consideration.*

### Interview I: BenBen – Digitising Land and Real-Estate Markets through Blockchain

**Name of your startup:** BenBen

**Name:** Emmanuel Noah, Co-founder

**Location:** Accra, Ghana

**Question:** *What is the current situation of land and property management in Ghana?*

It's not a coincidence that Ghana, Sri-Lanka, Peru and many indigenous nations suffer from land tenure

and management issues. '65% of the world's land holding falls under traditional land tenure systems.'<sup>2</sup>

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1 Celine Herweijer, Dominic Waughray, Sheila Warren, 'Fourth Industrial Revolution for the Earth Series – Building Block(chain)s for a Better Planet' (World Economic Forum, September 2018) <[http://www3.weforum.org/docs/WEF\\_Building-Blockchains.pdf](http://www3.weforum.org/docs/WEF_Building-Blockchains.pdf)> accessed 19 November

2 Rights and Resources Initiative, 'Who owns the world's land?' (September 2015) <[https://rightsandresources.org/wp-content/uploads/GlobalBaseline\\_web.pdf](https://rightsandresources.org/wp-content/uploads/GlobalBaseline_web.pdf)> accessed 10 October 2018



The recent fast paced, and uninformed post-colonial adoption of foreign land tenure practices has created a legally pluralistic land tenure ecosystem in Ghana where 'modern' and formal land governance, and administration practices are in conflict with traditional (informal) ones. The culminating result is one where data and transactions within the local Ghanaian land and real-estate market are distributed between the two systems which ends up leaving a trail of lost transactions, data inconsistencies and asymmetry in the land market ecosystem.<sup>3</sup> Remember, this applies not just to Ghana but to '65% of the world's land holdings which represents \$26 Trillion in dead capital globally'.<sup>4</sup>

Moreover, due to the ever-increasing pace of urbanisation, the demand for land as the foundation for these efforts has given birth to an array of new challenges (land fraud, high transaction costs, land litigation, increase in dead capital). However, despite the challenges, there's always the opportunity to innovate.

**Question:** *What is your solution?*

The idea behind BenBen was to create a trusted and reliable transaction environment to unlock this dead capital and eliminate the barriers of entry into local housing, mortgage, and land markets. BenBen builds distributed ledger transaction systems for public and private land sector related institutions. Our primary solution focuses on facilitating end-to-end housing finance transactions between property developers, commercial lenders, property buyers and land sector agencies. By offering services with institutions that simultaneously act as a property market data sources ie mortgage banks, property developers, land courts, land registries etc, we are able to aggregate formal market and off-market land transaction data. The end result is a self-sustainable land registry that runs in parallel to the official land registry.

3 Mawuli Y. Ahorlumeagah, 'National Mortgage and Housing Initiative to provide Ghc1bn Housing Fund', (Ghana News Online, 4 July 2018) <<http://ghananewsonline.com.gh/national-mortgage-and-housing-initiative-to-provide-ghc1bn-housing-fund/>> accessed 19 November 2018

4 Alan Gilbert, 'Viewpoint: De Soto's The Mystery of Capital: reflections on the book's public impact' (2012) <[https://www.researchgate.net/publication/279207595\\_De\\_Soto's\\_The\\_Mystery\\_of\\_Capital\\_Reflections\\_on\\_the\\_Book's\\_public\\_impact](https://www.researchgate.net/publication/279207595_De_Soto's_The_Mystery_of_Capital_Reflections_on_the_Book's_public_impact)> accessed 10 October

**Question:** *How do you leverage blockchain technology?*

Utilising blockchain in our solution allows us to ensure transparency and immutability in transactions through the platform. Trust is a key factor in land market transactions and by decentralising transactions, each party within the chain is provided equitable access, visibility, and control to data based on pre-set rules within the transaction process. Extending this principle further allows us to validate audit trails on aggregated formal and off-market transaction data. Furthermore, as opposed to our previous pilots our future pilots are looking at leveraging the EOS blockchain due to its high transaction rates, affordable contract execution costs and compatibility with BenBen's consortium model for client interaction.

**Question:** *Why did you decide to focus on the nascent blockchain technology?*

Deciding to focus on blockchain technology was a gradual process as well as a direct result of my interest in African land economics. In 2014, I was part of a team out of the University of Michigan that won a Bill & Melinda Gates Foundation grant to research into the prospects of crypto in the Sub-Saharan African mobile payments ecosystem. My research took me on an 18-month journey where I began to relate my learnings to the African land economy as well as involve myself more and more in the crypto scene. Shortly after completing my studies at the University in 2015 I returned to Ghana where I decided to look at how I could apply my findings to the land payments sector and hence BenBen was born. Through our pilots with stakeholders such as the Lands Commission and Barclays Bank Ghana we were able to finally pivot into the mortgage finance sector. The working principles of 'trustlessness' 'auditability', 'consensus' and 'accountability' of blockchain systems particularly caught my attention. In indigenous African society, community decisions are woven by similar principles of community, decentralisation and consensus. As such I believe the principles behind blockchain tech represent a paradigm shift that will remedy many of the ailments in our 'modern' economic systems as a whole – land & property chief among them.

**Question:** *How do you address current issues of property disputes?*

Although we don't involve ourselves in dispute management, we employ risk-mitigation techniques that map out asymmetries and conflicts in land record information and assign risk-ratings to properties. Commercial lenders utilise this in grading collateral risk, as such, we tend to look at dispute prevention.

**Question:** *Will and should blockchain for the land and real-estate market be regulated?*

Regulation is an inevitable and necessary part of ensuring cohesion between specific country land policy and technology frameworks. However, it should not be rushed into. Many of the expected challenges can be prevented by running operations within a regulatory sandbox aimed at ensuring compliance and protection amongst stakeholders until national and continental policy is developed. The results from these sandbox tests will then be able to inform policy formation. One initiative spearheading this effort is the Pan-African Digital Asset Framework that's being led by Marvin Coleby, Director of the Africa Digital Assets Forum (ADAF).<sup>5</sup>

Countries such as Uganda and Kenya have also set up dedicated blockchain task-forces to handle policy development. That said, consultations should always be done in collaboration with sector working groups (Land, Payments, Capital Markets etc) to ensure that all potential blockchain use-cases are accounted for in the policy formation process.

**Question:** *What are the biggest opportunities for BenBen to use blockchain to record and verify land and property data in Ghana? How does it impact (new) business models?*

Big constraints represent big opportunities. Over the past decade, high population growth and urbanisation rates have led to a considerable increase in land market activity. So naturally the two biggest opportunities we are targeting are the mortgage/land financing and housing delivery sectors. With a housing deficit of over 1.5 million housing units, the Ministry of Finance and Economic Planning has commissioned work on a \$200 National Housing and Mortgage Initiative as well as the \$5Bn Social Impact Housing Initiative between the Government of Ghana and the United Nations Office for Project Services (UNOPS) aimed at granting access to afford-

able construction financing and mortgage financing.<sup>6</sup>

Although very laudable, the present disconnect between stakeholders in the housing delivery value chain threatens to frustrate innovative projects and investments akin to those mentioned earlier. In order to overcome these barriers, we have signed formal agreements with key bodies such as the Ghana Real Estate Developers Association (GREDA) where we facilitate end-to-end housing delivery and mortgage origination between its membership body of 154 developers and stakeholders across the real-estate market value chain. In addition to the reduced turnaround times and collateral perfection costs, financial institutions benefit from access to real-time property market data as well risk-mitigation data which translate into lower collateral risk premiums hence access to cheaper credit for borrowers/mortgagors.

**Question:** *How does BenBen disrupt land and property management of Ghana (and add to its digitalisation)?*

Unlike many tech competitors in our space, BenBen builds upon existing government land registry infrastructure by integrating with both public and private sector actors in the land market (land registries, mortgage bank institutions, developers etc). Leveraging shared and public transaction data has also positioned us as a key facilitator in the mortgage finance space by streamlining the process of connecting mortgage financing to development opportunities on verified real-estate holdings. Furthermore, our model represents a market-based compliment to large scale donor funded land registry digitalisation projects where we are able to reconcile off-market data with formally registered transactions as well as carry out subsidised per-parcel record digitalisation on a transactional basis – all of which we are currently exploring with the Lands Commission of Ghana. Our

5 CryptoDavid, 'ADAF Holds Nairobi Inaugural Meeting to Establish a Pan-African ICO Framework' (May 2018) <<https://bitcoinke.io/2018/05/adaf-meeting-for-pan-african-ico-framework/>> accessed 10 October

6 Peter Nii Lartey, 'Ministry of Water Resources, Works and Housing Blog' (2018), <<http://dailyguideafrica.com/ghana-gets-5bn-un-housing-deal/> and <http://www.ghana.gov.gh/index.php/blog-categories/blog-quisque-gravida-purus-vitae/53-gov-t-projects/266-ministry-of-water-resources-works-and-housing>> accessed 10 October

current model does not seek to displace any key actors in the chain but is on the trajectory to reduce the dependency on intermediaries (notaries, land agents, land guards, etc).

**Question:** *Do you see connections to other emerging technologies such as big data analytics and AI?*

As markets become more connected, I see the general trend for the underlying infrastructure to evolve in a similar fashion. In a hyper-connected world, AI and big-data will have an immense impact on the future of proptech.

**Question:** *What motivates you to push the boundaries of land and property registry through blockchain technology? What are your aspirations and future plans?*

Technology is fast-becoming a determinant of national geopolitical standing; hence, its role needs to be highlighted and paid particular attention to. Africa is home to 20% of the world's total land mass and 60% of the world's arable land – proportions that keep the continent on the current world economic system's radar. Aside from building the right political, institutional and cultural frameworks I am excited about the new ways exponential tech can shape our land administration systems in the next 30 years. However, as CEO of BenBen, my aim is to grow BenBen into the premier Pan-African firm for building digitised land and real-estate markets and serve as the basis for securing land-based investment, growth and development on the continent. After building a solid foundation for spatial and off-chain land data, the next logical step will be tokenisation as well as exploring how AI in combination with Decentralised Autonomous Organizations (DAOs) can be used in bridging statutory and customary land tenure systems and bring us closer to a trusted, secure, transparent, and risk-free African land market.

## Interview II: Minespider – Tracking Raw Materials through Blockchain-based Certification

**Name of your startup:** Minespider

**Name:** Nathan Williams, Founder

**Location:** Berlin, Germany

**Question:** *What is the current situation of the mineral industry and the due diligence of its supply chains? What main challenges and inefficiencies do you see in the current system?*

About 10 years ago the US passed a regulation, Section 1502 of the Dodd-Frank act, requiring companies to disclose if the Gold, Tin, Tantalum, or Tungsten they purchase was funding armed groups in the Democratic Republic of Congo. This put the spotlight on the mineral industry in the same way that the spotlight was on the clothing industry in the past. One way companies dealt with this challenge was supply chain mapping – asking all their suppliers if there were conflict minerals in what they were purchasing and if they didn't know, having them ask their suppliers. This was a slow, expensive process that did help, but did not eliminate the risk that there were conflict mines in their supply chains.

There were unintended consequences of these efforts to make the mineral supply chain more responsible. Companies who wanted to make a difference started to actively avoid sourcing from the Congo, meaning only companies who did not prioritise responsibility remained, making the problem worse. In addition, it was often the miners themselves who had to bear the increased costs of due diligence programs, giving a negative incentive for them to participate in legal sourcing programs.

Another big issue is that minerals are fungible. Unlike unique items like diamonds, antique cars, or designer handbags, metals from multiple sources are smelted together during processing, masking the original source. We can put ores in a container with a tag to uniquely identify them but eventually the container has to be opened and shipments are mixed together. This makes tracking difficult beyond points of processing.

**Question:** *What is your solution? How do you leverage blockchain technology to solve this problem?*

To track beyond the points of production we use a mass-balance approach, essentially treating minerals the same way we treat green energy on the electrical grid. If you purchase green energy tomorrow, your electricity will still come from the grid, mixed with coal and nuclear power, however because we've tracked how much energy was produced at the solar farm, we know all the money paid has gone to the

solar company. We realised ultimately the problem isn't that the material itself is corrupted, but that the money paid for the materials has funded the armed groups using illicit extraction practices.

Rather than moving backwards through the supply chain, we start at the point of responsible production and allow the companies to create digital blockchain-based certifications based on the amount of material produced. As long as these certifications are sold along with an equivalent amount of material, we can be sure that the money paid for the material has gone to a responsible source.

**Question:** *Why did you decide to focus on the blockchain technology?*

Blockchain is most useful in situations where we see 4 main factors at play:

- a. There is a middleman adding no value that can be removed.
- b. There are multiple parties that need to work together who do not trust each other.
- c. We need to decentralise a traditionally centralised system.
- d. We need to shift incentives so that the parties contributing value to the system are the ones who receive value for it.

In the mineral supply chain, we have all of those factors at play which is why it is likely a best-fit solution for supply chain transparency.

As for why I personally was attracted to blockchain, I've always been most comfortable dealing with emerging technology. It gives you the most freedom to innovate because many of the use cases haven't been thought through yet. With the excitement and hype around blockchain, it made promoting the solution much easier than any of my previous projects because so many people are looking in to how blockchain can be best used.

**Question:** *What are the biggest opportunities for Minespider to use blockchain to track responsibly sourced minerals and overcome complex and opaque value chains?*

Right now the world's eyes are on cobalt because so much of it comes from Congo and goes into lithium ion batteries. The other element the industry is really focused on is gold because it has a high value to

mass ratio, which makes it easy to fund armed groups with gold mining.

**Question:** *What are the biggest challenges Minespider faces to enhance supply chain integrity for raw materials?*

There are plenty of challenges with any new technology, especially one that crosses borders and languages, requires internet connectivity in undeveloped rural areas, requires multiple old-economy companies to adopt technology, and political buy-in from multiple state entities. The main challenge we see for the near term, however, is preventing the fragmentation of the industry.

Supply chain data is very sensitive data. No company wants their competitors to see their supply chain information, and yet the entire benefit of blockchain is in its transparency and immutability. We could build a tracking system much more efficiently with a centralised database, but that would give way too much control to whoever runs that database, and there would be a single point of failure for any sort of data breach.

Some companies are looking at private permissioned blockchains as a solution. If you control access to your blockchain, you prevent external entities from seeing the supply chain data. The problem is that it is very hard to make blockchains talk to each other. If brand X and brand Y each have their own blockchain and they use the same supplier, the supplier has two different systems to use that do not talk to each other. Expand this to 50 or 100 companies and the whole system can collapse.

Our solution to this is to create one standard protocol on a public blockchain, like the Internet of responsible supply chain tracking. We encrypt the data in such a way that each company owns and controls their own data. No one else can access the data without owning the access even though it is on a public chain. This removes the incentive for companies to create their own private permissioned blockchains.

**Question:** *Who are the key stakeholders you collaborate with to innovate responsible mineral sourcing?*

The key stakeholders are the mines, transporters, smelters, manufacturers, mining consultants and auditors, regulators, and NGOs, as well as the end consumers who ultimately want responsibly sourced

products. Most of the demand for responsible sourcing is driven by the manufacturers downstream who want to protect their brand from supply chain risk, although we have seen a number of mineral producers take a leading role in responsible production as well.

Under the status quo, mineral producers collect due diligence data on the minerals they produce: reports, audits, certificates of origin, quality, and so on. All of this data has a cost, and the cost is born by the mine. With Minespider, the mineral producer uploads this data to create a digital due-diligence data packet that is rated for the amount of minerals in a shipment. The mine can then sell this data to their customers and recoup the value it contains. This digital due diligence is essentially a commodity for the customers as well who can add their own information and re-sell to their customers, ultimately being beneficial for the downstream manufacturer who can see the origin of their materials.

Moreover, there's an efficiency gain here. Mineral shipments can be delayed if the proper paperwork isn't all in place at the right time. With an immutable blockchain record of all the due diligence information companies can avoid costly delays.

**Question:** *How does Minespider disrupt the way the world manages environmental resources and help drive sustainable growth and value creation? How does it impact existing and new business models?*

The first step to making sure that our minerals are sourced sustainably is to have good data about the provenance of the material and the conditions under which it was extracted. By incentivising good data collection, we build a foundation for the next generation of industry which we expect will be more inclusive, circular, and sustainable than industry of the past.

Consumers want responsible products, but up until now have had no way of gauging the impact their products had. Our protocol makes responsibility data feasible for manufacturers and ultimately consumers, and so we can expect demand for responsibility certification and governance systems in the mineral supply chain to increase as the technology is adopted.

**Question:** *What principles for developing blockchain applications for the environment do you believe are*

*needed to create a responsible blockchain ecosystem?*

There are always unintended consequences. Blockchain's strength is incentives, immutability, and game theory. The outcomes of a blockchain system or new incentive model aren't always easy to predict so it is important to think through and then test your hypotheses to make sure your application is making a positive environmental impact and that the unintended consequences aren't hurting more than they help.

**Question:** *What motivates you to push the boundaries of responsible mineral sourcing through blockchain technology? What are your aspirations and future plans?*

Responsible sourcing is more than just an interesting problem to solve or a way to make money, it's a serious social issue and before now we didn't really have a way to make a difference. Having the ability to craft a new infrastructure that can alleviate serious issues while also having a business case is a magic bullet scenario that doesn't come along every day. Our entire way of life starts with raw materials and sourcing, and I hope Minespider is at the centre of the shift to a more ethical, sustainable and responsible global economy.

## Interview III: SolarLux – Incentivising Solar Energy Through Blockchain

**Name of your startup:** SolarLux Ltd.

**Your name:** Thomas Chrometzka

**Location:** Hong Kong / global

**Question:** *Tell me about the solar market in Thailand.*

Thailand is spearheading solar market development globally. In the past, solar markets were catalysed when governments provided incentives in the form of subsidies. Nowadays, markets are undergoing changes, solar is becoming more competitive, however, this still depends on the specific market segments and geographies.

In Thailand, solar installations are installed on a purely competitive basis in the commercial and industrial rooftop systems. A process to phase out gov-



ernment subsidies and provide smarter market-based, bottom-up incentives and rewards, such as SolarCoin, is a challenge that needs to be addressed.

**Question:** *What is your solution?*

SolarCoin was founded in 2014 with the vision to incentivise a solar-powered planet. As rewards drive action, SolarCoin is rewarding solar energy producers. The SolarCoin Foundation grants solar energy producers with blockchain-based digital tokens, one SolarCoin per one unit of solar energy (a megawatt hour) produced.

We realised that the project was not getting enough traction and founded SolarLux to make SolarCoin accessible. We assist energy companies and monitoring platforms to access and distribute SolarCoin to as many users as possible. This will massively drive user adoption and increase the usability of SolarCoin. Eventually, SolarCoin will be the first sustainable currency.

**Question:** *Why did you decide to focus on the blockchain technology?*

Blockchain is a breakthrough technology that allows currency to be issued by others than central authorities, such as governments. We used to base currency on national economies, however, basing currency on global solar energy production promises to be more stable and offer more value to society. Blockchain technology is a viable option to achieve the SolarCoin mission. Low transaction cost, speed of transaction, immutability of transactions records, counterfeit-proof, etc are a few of the characteristics that make it not only feasible but also desirable.

**Question:** *What are the biggest opportunities to make SolarCoin accessible to enterprises?*

In a global world, energy companies are doing projects around the globe. Imagine a world where companies can earn SolarCoins in Morocco, pay their suppliers in China and do their accounting in Singapore in one single currency. Basing trade on commerce on a currency that is shared by the participants of this industry will have huge benefits for the industry. And beyond: The theory of value for SolarCoin is based on the assumption that the more active users (nodes) participate in SolarCoin the more valuable

the network gets. Solar is decentralised meaning everyone who produces solar energy can get SolarCoins for free. On top of this, the more SolarCoin is used, the more valuable the network. Which means that more people will want to install solar to earn SolarCoins – a virtuous circle.

**Question:** *What are the biggest challenges for SolarLux in integrating blockchain technology into the solar industry?*

The industry is nascent and the technology is just developing. As such, we are working on improving user experiences and onboarding energy companies to the new world of blockchain-based business. SolarLux is focusing firstly on making it easy for energy players to access these new technologies and be able to use them. Even more important is explaining and building capacities of potential partners and users.

**Question:** *Who are the key stakeholders you engage with to innovate the energy and climate sector via blockchain technology?*

SolarLux firmly focuses on large energy companies and monitoring platforms. Energy companies (i.e. ACWA Power) must be our champions. They draw the attention of other energy players and create traction that is needed to spread the word and create followers. We focus on the monitoring platforms (i.e. SMA Solar) to get SolarCoin to the end-customer. They aggregate the final users. If we partner with a monitoring company, they can immediately distribute SolarCoin to thousands of users – which will make our network more valuable.

**Question:** *How does SolarLux disrupt the solar market in Thailand and ASEAN?*

If SolarCoin is successful, government incentives for solar globally will phase out. It is massive change. The SolarCoin blockchain would become a public database of solar produced around the globe. This data will be crucial for utilities and grid operators to plan more sustainable energy systems. It will provide transparency in a market that suffers from a lack of publicly available data in a world where data is power. At the same time, SolarCoin verifies solar energy production data. This is relevant for the climate sec-



tor (carbon credits, guarantees of origin) where SolarCoin might have better value propositions in store. A publicly traceable, yet freely tradable SolarCoin that can't be counterfeited will have impact on this sector.

**Question:** *How does it impact existing and new business models in the energy sector?*

SolarCoin could massively impact business models in the sector. Today, solar energy operators receive revenue from selling solar. SolarCoin offers a new revenue stream with the value add mentioned above.

Currently, the energy markets are determined by energy scarcity. We believe that energy will become more abundant with the advent of new sustainable energy technologies such as wind and solar. SolarCoin, however, would continue to reward those who install solar with its use case as global sustainable currency. Selling solar energy might not be that financially viable any more, producing SolarCoins, however, might.

**Question:** *What motivates you to push the boundaries of the energy, climate and solar industry through blockchain technology? What are your aspirations and future plans?*

At SolarLux, we want to shape a world that is powered by solar energy. We think that SolarCoin can massively contribute to this goal. We are all in.

## Conclusion

BenBen, Minespider and SolarLux show that there certainly is momentum on the ground. They all apply different blockchain solutions to tackle societal and environmental problems that the traditional system is unable to solve. BenBen and Minespider build their own blockchain whereas SolarLux saw an opportunity to work with an existing token system to build more traction. The three startups are actively creating a new ecosystem in which they collaborate with key stakeholders, decision-makers and governments to test and explore their 'playing field'. This

openness and enthusiasm enables them to further develop and integrate their solution to build a better future.

Their common opportunities and challenges can be summed up as follow:

## Opportunities

- *Potential to overcome complex challenges*  
Blockchain technology creates trust – as it allows transparency, traceability and immutability of transactions. Thereby it can stop fraud, information asymmetries and create powerful new incentives. Decentralised data management and tokenization can:
  - empower citizens to invest differently based on the value of land they are buying;
  - change the consumption behaviour of consumers based on the information they have of a product; and
  - reward companies to become more sustainable.
- *Catalyse a paradigm shift*  
The interviews above show that the traditional centralised systems are limited in their ability to help overcoming some complex issues. They revealed that key stakeholders are curious and eager to work together to further understand its potential. Thereby Blockchain-technology allows to craft and play with new infrastructures that can pave the way to novel business models, shift of power and impact.

## Challenges

- *Interoperability*  
Overall governance is tricky. The lack of standards makes it hard to integrate different platforms, systems, languages and stakeholders within and across borders. This is important during implementation and scaling.
- *Regulations & policy making*  
Current regulations and policies are not ready to incorporate blockchain yet. However, they should not be rushed as it requires regulatory sandbox testing and close collaboration among stakeholders to form suitable policies.

# Book Review

## **Give People Money: How a Universal Basic Income Would End Poverty, Revolutionize Work, and Remake the World**

By Annie Lowrey

Crown 2018; 272 pages

Theo Curtis\*

'Give People Money' is Annie Lowrey's contribution to the rapidly growing literature on the increasingly popular idea that the state should provide a minimum income for every citizen, without any conditions attached. Lowrey gives the perspective of a seasoned policy analyst and economic journalist. This gives the book a focused and practical appeal. Readers in pursuit of a more tendentious approach might prefer William and Srnicek's *Inventing the Future: Postcapitalism and a World Without Work* (2015), or Peter Frase's *Four Futures: Life After Capitalism* (2016). Where *Give People Money* excels is as a carefully constructed and persuasive argument for Universal Basic Income (UBI) as a practical solution to the timely problems of precarious employment, poverty, and socioeconomic injustice. Anyone seeking to understand what UBI is, why it's gaining the support of prominent public figures, and why it might be our future would benefit from reading Lowrey's book.

Readers familiar with the concept of UBI have most likely been introduced to the idea in the context of the threat posed by technological unemployment. In a 2013 study by Oxford University it was predicted that 47% of the US workforce could be automated by 2034. The issue was further publicised by highly-readable bestsellers like Andrew McAfee and Erik Brynjolfsson's *The Second Machine Age* (2014), and Martin Ford's *Rise of the Robots* (2015). According to these books the acceleration of digital technologies and artificial intelligence threatens large swathes of the population with economic redundancy. If nearly half of all jobs disappear in the advanced economies, the resulting upheaval would make the Great Recession look mild by comparison. Anecdotally, the exchange between Henry Ford II and union leader Walter Reuther on the automation paradox illuminates the potential outcomes:

Henry Ford II: Hey Walter, how are you going to collect union dues from all these machines?

Walter Reuther: How are you going to get them to buy your cars?

In the event of the rapid automation of a sizeable chunk of the labour market, the loss of earned income from employment would translate into lower consumer spending, resulting in a generalised crisis of capitalism. It is in this hypothetical context that UBI has been suggested, both as a means of compensating losers, and providing the needed income to prop up aggregate demand. Proximity to the digital revolution has made Silicon Valley a hot-bed of support for UBI – a number of tech-billionaires such as Elon Musk, Mark Zuckerberg, Peter Thiel, Marc Andreessen and Bill Gates have declared their support for the idea.

Interestingly Lowrey, unlike UBI proponents Paul Mason and Nick Srnicek, prefers not to base her contention on hypothesised scenarios of mass technological unemployment. In her exploration of UBI Lowrey calmly dismantles pessimistic projections of a workless future. She reminds the reader that this is not the first time that 'wolf!' has been called over the impending robot apocalypse. At the start of the industrial revolution textile workers, led by the apocryphal Ned Ludd, smashed machines which threatened their livelihoods. In the midst of the Great Depression the now-forgotten Technocracy movement gained millions of followers for its futuristic post-scarcity plan based on full automation, leisure and basic income. In the 1960s the rise of cybernetics and robots provoked further anxiety. Public figures like Martin Luther King and members of the Johnson administration identified automation as a critical threat. Each time commentators believed that 'this time would be different'. These predictions have been consistently confounded by rising incomes and

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labour participation rates. Lowrey suggests that in practice the introduction of new technologies tends to create employment in new industries as old ones die off, making technological change a form of what Joseph Schumpeter labelled 'creative destruction'.

Cold water is poured on the idea that we are living in a 'Third Industrial Revolution' which is poised to transform our way of life. If we really are in the middle of labour-saving revolution, as some authors suggest, then one would expect to see productivity rates skyrocket as we produce more stuff with less man-hours. In fact productivity has been relatively stagnant for decades, leading economist Robert Solow to remark that 'you can see the computer age everywhere but in the productivity statistics.' Furthermore the return to unemployment levels of around 4% in the UK and USA suggests that the economy is capable of continuing to fabricate more jobs than are lost through the process of disruptive innovation.

Lowrey is shrewd not to base her argument for UBI on speculation about the hypothetical consequences of future developments in Artificial Intelligence. Instead she argues that UBI is necessitated by undeniable existing problems. The essential premise of *Give People Money* is that some form of unconditional and universally inclusive provision of income is the best means of tackling three major issues: declining standards of employment, extreme and relative poverty, and the socioeconomic consequences of patriarchy and racism.

Lowrey accepts that there is a general tendency for new jobs to replace old ones, but she denies new forms of employment are necessarily of better quality. She rehearses the personal stories of hard-working people trapped in precarious underpaid jobs in the developing 'gig-economy', and details the stagnation of incomes and decline in employment standards. In this context Lowrey conceives of UBI as a permanent and universal strike fund which would allow workers to withdraw from the labour market in order to hold out for better conditions. By eliminating the necessity to work a UBI could help boost the share of national income available to labour, helping to reduce or reverse the worrying trend towards increasing inequality.

In addition to boosting the bargaining power of labour and reversing the slow decline in employment standards, Lowrey presents a convincing argument for UBI as a means of tackling poverty. Drawing on

statistical data and heart-wrenching case studies of impoverishment in the developed and developing world, Lowrey highlights the current deficiencies in our approach to welfare. UBI has three major benefits when compared to conventional welfare policies: its simplicity reduces the need for large bureaucracies, its universality eliminates stigma, and because it comes in the form of money rather than goods it allows people to exercise self-determination in meeting their own needs. The idea that UBI is preferable to bureaucratic and intrusive practices of welfare has appealed to libertarian thinkers like Charles Murray and Milton Friedman. Lowrey is sceptical of libertarians who would scrap all existing welfare expenditure and replace it with a UBI, apprehensive that this transition might drive some households even deeper into poverty. As ever in the realm of welfare policy, the devil is in the detail.

Where *Give People Money* is at its most bold and original is in its discussion of how UBI intersects with issues of race and gender, aspects of the debate which are often neglected by other accounts of UBI. Focusing on her own country, the United States, Lowrey describes how structural racism has left black and latino populations holding just 5% of national wealth, despite comprising a third of the total population. UBI, unlike existing social expenditure, would be racially neutral and therefore more socially equitable in its effects. In the context of gender, Lowrey suggests that UBI would help compensate the unpaid and underpaid domestic care-work overwhelmingly performed by women. Drawing on compelling statistics compiled by the OECD, Lowrey informs the reader that unpaid care-work has a value between 15-80% of GDP, and that a UBI would be a relatively minor form of compensation.

*Give People Money* is a persuasive manifesto for an imaginative and far-reaching idea, conceived in full awareness of the potential difficulties accompanying the implementation of UBI. Three prominent objections are foregrounded: Who would continue to work if all their needs were met by the state, with no strings attached? What impact would a national system of universal payments have on the vexed issue of immigration? How could such a generous welfare system ever be paid for? Lowrey's answers to these questions range from convincing to flimsy. It is undoubtedly true that most people rely on their work for a sense of meaning and satisfaction, and that the majority of us would prefer to work if the al-

ternative was relying on a basic income set just above the poverty line. It is hard to doubt that if a UBI was implemented in any particular nation, it would increase the incentive for people to immigrate to that country, adding to the number of UBI claimants and undermining the affordability of the policy. Lowrey's assertion that immigrant workers would pay more into the system in tax than they would receive in benefits may be true under our current welfare system, but this would be unlikely to hold true if UBI was to be implemented. This implies that progressives may face a difficult choice between commitment to open borders and support for an unconditionally generous welfare system.

Most problematic of all is the issue of how to pay for a national UBI, something Lowrey estimates to cost \$3.9 trillion annually in the American case, a figure which is roughly equivalent to the US federal government's entire expenditure. A number of suggestions are put forward, which include cutting military expenditures (something Lowrey sees as made feasible by the contemporary shift from conventional conflict to less expensive cyberwarfare). Massive tax increases on everything from financial transactions, to carbon, and robots is another candidate, although the economic effects of this are not discussed. It is astutely pointed out that government budgets unlike household budgets can be kept in a state of constant deficit, as the sovereign state always reserves the ability to print money to pay back its debts. The idea of using the printing press to produce money out of thin air may hold some associations with the monetary mismanagement that results in bouts of hyperinflation, as seen in Zimbabwe a decade ago. However the practice of simply manufacturing new money was among the main policy responses of Central Banks in the US and Europe to the financial cri-

sis, a policy dubbed 'quantitative easing' which injected many trillions of dollars in an effort to reflate beleaguered economies. *Give People Money* is full of ideas about costing, but sketchy on the details, perhaps necessarily considering that the enormity of the issue probably demands its own book-length solution.

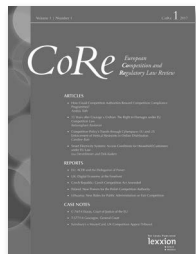
In the postscript to the book Lowrey acknowledges the more far-fetched arguments made on behalf of UBI, as a kind of capitalist road to communism. Finally, we are called on to imagine, what the world might look like after many decades of exponential technological acceleration. If our mastery over nature finally abolishes the condition of scarcity, then some kind of basic income becomes a logical social adaptation. Such a future would resemble our most optimistic science fiction scenario, like the Star Trek Universe where 'replicator' technology erodes the foundation of paid-employment and the price-system itself by providing all goods at no cost. It seems likely that Lowrey chose to include these speculations in the postscript in order not to dilute the realism of the other chapters.

Like its title, *Give People Money* is punchy, unconventional, and bold. It challenges us to reconsider preconceived notions about the nature of work, as well as our entitlements and responsibilities. It dares us to propose simple solutions to seemingly irresolvable problems. Despite its radical conclusions, Lowrey's line of reasoning prefers the known to the speculative, focussing on case-studies and relevant statistics. Charting a middle-course between idealistic-utopianism, and technocratic pedantry, Lowrey devises a powerful polemic for the ideals of unconditionality, universality and inclusiveness as necessary answers to the most pressing concerns of our time.

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27 February 2019 | University of Basel

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- The Regulator's Viewpoint
- Using Data to Reduce the Number of Clinical Trials
- Artificial Intelligence, Data Protection and Data Ownership of Clinical Data
- 'Open Source' Pharma
- Blockchain and Data Sharing in the Pharma Sector

#### Chair:

**Claudia Seitz**  
*University of Basel*

#### Speakers:

Speakers will include lawyers with expertise in the pharma field, representatives of the pharma industry, consultants and academics.

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**Ciano Aydin, Editor-in-Chief:**

Our lives are saturated by technology. Technology is no longer a factor among other factors and it is increasingly present in our professional and personal lives. Not only does it play a role in research institutes and labs but it also influences our personal and group identities, social relations, and even our values and norms. With such a wave of technological advancement it is perhaps no surprise that people and societies have a hard time keeping up with developments.

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