



**THINK**

Map and Companion



## VI

Thick walls, tall door gates, narrow spiraling staircases, a warm dull light shining into the inner yard. Rays that meet your face. Ghostly echoes of discussions hallow through the corridors, transcending times, reaching your ears. The bell announces the next talk.

We are thrilled to welcome you at the 6th edition of the THINK Conference - where VI think hextrapolated. After a year of pause the THINK Conference is back with 21 exciting talks and workshops, ranging from the foundations of science all the way to the applications and their importance in the societal context. In a year long cultivated spirit of interdisciplinarity, the topics of this years edition touch ground in the fields of biology, physics, computer science, psychology, history, social sciences, philosophy, climate science, chemistry and many more.

This years hot topic *Relations* will be present on all days, rushing like a whispering breeze through the talks and discussions. What is the interplay between the newest love technology and our societal demands? What can scholars in quantum physics learn from old Buddhist traditions? How do scientific findings in positive psychology relate to our own lifes? In a series of workshops we will experience hands on methods to better understand the relationships we build among each other, our project partners and ourselves. The climate crisis, the prime challenge of our time and a particularly multi-headed issue, will be illuminated from various scientific stand points.

This companion will serve you as a map for our journey across these bridges.

We are looking forward to insightful discussions, inspirational talks, engaging workshops, mobilizing break-time activities, delightful chats over dinner and knitting new relationships together.

The THINK Team

Claudia  
Daniel  
Michèle  
Santiago  
Simon  
Tobias

# VI THINK *Hextrapolated* Timetable

Wednesday		Thursday		Friday		Saturday		Sunday	
07:30-08:00		Getting Ready		Getting Ready		Getting Ready			
08:00-08:50		Breakfast		Breakfast		Breakfast		Getting Ready	
09:00-09:30		Ants: From Rags to Riches (Max Aubry)		Producing Relations and the Self (Moritz Kriegleder)		Open Source Software and Why You Should Care (Mark Strempel)		Breakfast, Tidying up & Departure	
09:40-10:10		A Short Primer in Anarchism and Social Ecology (Thomas Zauner)		Unequal Incentives to Fight Climate Change (Sreyam Sengupta)		Can a Perfect Clock Even Exist? (Emmanuel Schwarzhans)			
10:30-11:00		Diversity Is Our Problem. It Could Also Be the Answer (Simon Rella)		Limits (Katharina Rogenhofer)		Green Gases (Florian Schlederer)			
11:10-11:40		The Middle Way to Quantum Physics (Matthias Huebner)		Why You Should Care How Clever the Schnitzel on Your Plate Once Was (Kimberly Brosche)		Democracy Education in Mathematics Lessons During Times of Corona (Claudia Heindler)			
11:40-14:00	Arrival + Bring along lunch	Lunch Break		Lunch Break		Lunch Break			
14:00-14:30	Opening	Activation		Activation		Activation			
14:40-15:10	Joint Talk: Cyber Toy Stories (Azadeh Badiejaryani, Ekaterina Osipova)	Workshop: Questionnaire on Our Relation to Diverse Topics (Andreas Ehrmann)		Breaking the Black Box of AI (Diego De la Cal)		Questioning the Scientific Publishing System (Flavio Del Santo)			
15:20-15:50				A Problem of Classical Electrodynamics (Tobias Slowiak)		Workshop: Alien Species as Actants in the Climate Crisis (Sabrina Buehn)			
16:00-16:30	Happiness and What It Means for the World (Daniel Gratzner)	Workshop: Suspending Judgment (Suyin Kuijk)		Workshop: Embrace Complexity in Projects with different Stakeholders (Ciara Cardelli)					
16:40-17:10	Free time			Free time					
19:00-20:00	Dinner	Dinner		Dinner		Dinner			
	Game Time	Attendant suggestions		Variety Program		Party and Open Mic			

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## Cyber Toy Stories - (Re)scripting technosexual utopias in marketing teledildonics

BADIEIJARYANI & EKATERINA OSIPOVA

Remote-controlled sex toys, or so-called teledildonics, affect relationships, bodies, and identities, ranging from notions of gender and sexuality to intimacy and even health, in multiple ways. They thus, bring along larger ramifications regarding the social discourses and practices of how these are negotiated. We focus on the Dutch sex tech company Kiiroo and their various practices of framing, advertising, marketing, discussing, and designing their products through a theoretical lens of ontological politics [7, 8] and technosexual scripts [11]. Our research shows that by portraying a technologized utopia, Kiiroo presents its technology as an innovative and avant-garde local and global good – both optimizing sexual relationships, and improving the health and safety of their customers. While teledildonics have a potential of queering and crippling sexual interactions and, thus, fostering empowerment and inclusivity, Kiiroo’s enactments and inscriptions of the technology (re)enforce cis-hetero-normative concepts of sex, intimacy, and relationships, including the coital imperative. Thereby a range of identities and practices are marginalised, ignored and effectively excluded. Contrary to the company’s promises, we show how such enactments potentially result in a dystopia characterized by security nightmares around intimacies and dire consequences for mental and physical health, safety, and consensual sexual interactions. We close on a speculation on how such technology could look like so that it offers and promotes inclusive and caring forms of living together [1].

- [1] Note: This talk is based on a work in progress paper written in collaboration with Katta Spiel (TU Wien)
- [2] Bardzell, J., & Bardzell, S. (2011). Pleasure is your birthright: Digitally enabled designer sex toys as a case of third-wave HCI. *Proceedings of the 2011 Annual Conference on Human Factors in Computing Systems - CHI '11*, 257.
- [3] Faustino, M. J. (2018). Rebooting an Old Script by New Means: Teledildonics—The Technological Return to the ‘Coital Imperative’. *Sexuality & Culture*, 22(1), 243–257.
- [4] Kiiroo Website: <https://www.kiiroo.com/>
- [5] Kiiroo - Miss Christmas (Ad): <https://youtu.be/meSsndQsDNA>
- [6] Liberati, N. (2017). Teledildonics and New Ways of “Being in Touch”: A Phenomenological Analysis of the Use of Haptic Devices for Intimate Relations. *Science and Engineering Ethics*, 23(3), 801–823.
- [7] Mol, A. (1999). Ontological politics. A word and some questions. *The Sociological Review*, 47(S1), 74–89.
- [8] Mol, A. (2002). *The Body Multiple: Ontology in Medical Practice*. Duke University Press.
- [9] Teledildonics 101 Series: <https://youtu.be/MVvbARjOwac>
- [10] Virtual Intimacy, Toon Timmermans: <https://youtu.be/LMGmzy7P3oI>
- [11] Waidzunas, T., & Epstein, S. (2015). ‘For men arousal is orientation’: Bodily truthing, technosexual scripts, and the materialization of sexualities through the phallometric test. *Social Studies of Science*, 45(2), 187–213.

## Happiness and what it means for the world

DANIEL GRATZER

The aim of being happy is one that might accompany sentient beings since their emergence, happiness working as a motivator for behavior beneficial to species survival [1]. However, the questions of what actually makes humans happy has only since relatively recent times been explored in science: The new field of positive psychology – having emerged in the 1990ies – does precisely that. Among the many theories are Seligman’s Flourishing, Ryff’s theory of psychological wellbeing and Fredrickson’s broaden-and-build-theory [2]. In an age where our basis of living on this planet is increasingly threatened by materialistic happiness-recipes that lead to exploitation of humans and nature [3], findings in this field are more relevant than ever before.

In my talk, I will present a few of the main found factors increasing happiness, and explore their role in the context of the great transformation towards sustainability [4]. To conclude, I will share a few interventions to directly strengthen happiness and contentment in our lives.

- [1] Grinde, B. Happiness in the Perspective of Evolutionary Psychology. *Journal of Happiness Studies* 3, 331–354 (2002).
- [2] Seligman, M.E.P. (2012). *Flourish. Wie Menschen aufblühen. Die Positive Psychologie des gelingenden Lebens*. München: Kösel.
- [3] Polak, E.L., McCullough, M.E. Is gratitude an alternative to materialism?. *J Happiness Stud* 7, 343 (2006).
- [4] Corral Verdugo, V. The positive psychology of sustainability. *Environ Dev Sustain* 14, 651–666 (2012).



## **Ants: From rags to riches**

MAX AUBRY

It can be hard to define evolutionary and ecological success, but generally social insects are considered very successful. To family Formicidae, ants, in particular, it is difficult to deny the title of very successful organism. Over a hundred million years, ants have diversified and secured a major place in the vast majority of our world's ecosystems. Using a grand variety of morphological, chemical, and behavioral tools, they have been engineering and bending the world to their advantage for many years. This talk will tell their incredible evolutionary story, explain how ants came to be so important, how important they are now, and what place we can expect for them in the future in the face of the climate & biodiversity crisis.

## **A short primer in anarchism and social ecology**

THOMAS ZAUNER

In my talk I want to give a short introduction to the concepts and history of Anarchism and its specific form of Social Ecology [1, 2] as they provide an alternative way to organize our relations within society and with nature. Anarchism has many historical roots, but it began to gain traction in the latter half of the nineteenth century. Both cooperating and competing with Communism and Socialism, a plethora of flavors of Anarchism developed over time. What unifies most of them is the fight against (unjust) hierarchies and the radical democratization of all aspects of society. The philosophy of Social Ecology was first developed in the 1960's and combines both Anarchist perspectives on social hierarchy and the localization of humanity within and not separated from nature. As a form of political ecology it links social and environmental struggles with its core tenets being that society should be organized along principles of interdependence, decentralization, democracy, and communalism as found in nature while at the same time not falling into the traps of a primitivist and anti-technological standpoint.

[1] <https://social-ecology.org/wp/1986/01/what-is-social-ecology/>

[2] Murray Bookchin. *The Ecology of Freedom: The Emergence and Dissolution of Hierarchy*. 1982. Cheshire Books.

**Diversity is our problem. It could also be the answer.**

SIMON RELLA

Since December 2019 the Sars-Cov-2 Pandemic is having a tight grip on the daily life of almost every human. Vaccines seem to be our best bet to get rid again of the bug. However, ever evolving variants and the potential danger of emerging vaccine resistant virus strains challenge this hope. In this talk I will review the biochemistry, evolutionary biology and epidemiology involved in a race between an adapting disease and our efforts to beat it. I will argue that the key to an eventual end of our misery could be found when we look back at 2019, when it all began.

- [1] Day, T., Gandon, S., Lion, S., & Otto, S. P. (2020). On the evolutionary epidemiology of SARS-CoV-2. *Current Biology*, 30(15), R849-R857.
- [2] Moya, Andrés, Edward C. Holmes, and Fernando González-Candelas. "The population genetics and evolutionary epidemiology of RNA viruses." *Nature Reviews Microbiology* 2.4 (2004): 279-288.
- [3] Rella, Simon A., et al. "Rates of SARS-CoV-2 transmission and vaccination impact the fate of vaccine-resistant strains." *Scientific Reports* 11.1 (2021): 1-10.

## The Middle Way to quantum physics

MATTHIAS HÜBNER

“According to Buddhist philosophy, happiness is the result of an enlightened mind whereas suffering is caused by a distorted mind. This is very important. A distorted mind, in contrast to an enlightened mind, is one that is not in tune with reality.”

(Dalai Lama [1])

But how to define “reality”? And what tools should we use to infer it? These questions have plagued the minds of philosophers, scientists and religious practitioners, since and before Aristotle. According to Christian Thomas Kohl we could learn a lot from the reality definitions of Buddhism - presented in his book “Buddhismus und Quantenphysik”. In particular the words of the philosopher Nagarjuna have great insights into the concept of reality.

One can separate Nagarjuna’s scriptures in two parts: The definition of the word “Sunyata” - the dependent creation of objects - and his “Tetralemma”, which is the rejection of all four extreme realities [2]. Nagarjuna turned out to be the founding stone for the Tibetan branch of Madhyamaka Buddhism, the “Middle Way” [3].

In my talk I will try to demonstrate what scientists can learn from the approaches of a 2000 year old philosopher. The meta-physical relations in between the objects could lead to a better understanding of the revelations of quantum physics.

- [1] [www.dalailama.com/messages/religious-harmony-1/religious-harmony](http://www.dalailama.com/messages/religious-harmony-1/religious-harmony)
- [2] “Buddhismus und Quantenphysik - Die Wirklichkeitsbegriffe Nagarjunas und der Quantenphysik” by Christian Thomas Kohl
- [3] [www.wikipedia.org/wiki/Nagarjuna](http://www.wikipedia.org/wiki/Nagarjuna)
- [4] “Die Welt in einem einzigen Atom”, Dalai Lama
- [5] “Buddhismus für Dummies” by Jonathan Landaw, Stephan Bodian

## Questionnaire on our relations to diverse topics (Workshop)

ANDREAS EH RMANN

What are you missing for happiness? Are you convinced of your self-criticism? Can you think without hope? What are you grateful for? Are you afraid of death and if so since what age? Stimulated by Max Frisch's questionnaires on diverse topics such as the preservation of mankind, hope, humor, friendship, and death, published in his second diary [1] and later separately in [2], we will begin the workshop by going through a subset of his intriguing questions, aiming for reflections and stimulating discussions. Then, we will move on towards questions at the interface of science and philosophy, specifically the notion of free will and advances in neuroscience, scientific realism, as well as relationships and identity.

This workshop aims to offer participants the opportunity for stimulating (self-)reflections, enriching discussions, and thinking about our relations to diverse topics. The audience will be divided in small groups at the beginning for reflections and discussion on the first part, which is followed by reports to the whole audience and discussions, also about the meaning of these questions. Then, we will move on to questions considering other topics, which will be discussed in the audience. Every participant will also have the possibility to contribute own questions.

- [1] Max Frisch, *Tagebuch 1966–1971*, Suhrkamp Verlag, 1st edition (1979).
- [2] Max Frisch, *Fragebogen*, Suhrkamp Verlag, 19th edition (1998).

**Suspending judgment: How to use generalisations to our advantage.  
(Workshop)**

SUYIN KUIJIK

Human beings generalise. It's how we learn about gravity and how we know that insulting someone is probably not going to make them like us. Throughout our lives we gather information, process it and then apply the things we've learned. We look for patterns and generalise those into rules to predict future outcomes. Predicting that a glass will fall and possibly break if we let go of it mid-air is objectively useful, yet theorising about another person's character and values before having half a conversation is often seen as a bad thing. Nevertheless, we rely on our generalisations all the time, choosing a seat on the metro or picking different registers of language when we talk to people we've only just met.

A lot of these decisions happen largely subconsciously, so first we need to become aware of when and how we use our assumptions. Once we obtain that awareness, we can start figuring out why we use them and where these generalisations came from in the first place. Getting to know ourselves, our background and the beliefs we hold as a result, is paramount to avoid jumping to conclusions prematurely. This workshop presents various tools and models that can help analyse interpersonal and intercultural situations, minimise confirmation bias and create interactions from a place of mutual understanding and genuine curiosity.

## **Producing relations and the Self: Perspectives from atoms, organisms, brains and planets**

MORITZ KRIEGLER

“I’m constantly being reconfigured. Or rather the ongoing reconfigurings of the world are iteratively remaking ‘me.’”

(Karen Barad, 2007)

Relations with others and our environment constitute how we perceive ourselves. Our perception of “the Self” dynamically changes what we perceive as the environment. In this talk I will present four different layers of the self from the perspective of atoms, organisms, brains and planets. From the perspective of atoms and quantum theory I introduce ideas from Niels Bohr about complementarity and Karen Barad’s relationality of quantum physics. Taking the organisms perspective I discuss the notion of autopoiesis of biological systems from Humberto Maturana and Francisco Varela and how constructing a membrane between internal and external states is an inherent feature of life. Considering the autopoiesis of cognition I talk about how brains construct the self and subjective experience. And finally I take the perspective of a whole planet by using the GAIA hypothesis developed by James Lovelock and Lynn Margulis. Inspired by recent new materialism philosophies I argue that all these perspectives are equally valid and productive in science even though or because of their subjective qualities. These arguments contradict the possibility of an objective realism or a third-person perspective of nature, but highlight the possibilities of scientific models if they are understood as coherent formulations of perspectives instead of approaching a reductionist theory of everything. This is a feminist and post-humanist perspective of science that has strong political implications as well. It enables us to frame climate change and its multi-layered complexities as a problem of relational ecologies between different perspectives of human and non-human agents such as atoms, organisms, brains and planets.

- [1] Barad, Karen (2007). *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham, North Carolina: Duke University Press.
- [2] Bohr, Niels (1963). *The Philosophical Writings of Niels Bohr*. Vol. 1, *Atomic Theory and the Description of Nature*. Woodbridge, Conn.: Ox Bow Press
- [3] Haraway, Donna (1988). "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective". *Feminist Studies*. 14 (3): 595–596.
- [4] Lovelock, James and Margulis, Lynn (1974). "Atmospheric homeostasis by and for the biosphere: the gaia hypothesis". *Tellus*, 26(1-2): pp.2-10. Rouse, Joseph (2004). "Barad's Agential Realism". *Hypatia*. 19 (1): 142–161.
- [5] Varela, Francisco, Maturana, Humberto and Uribe, R. (1974). "Autopoiesis: The organization of living systems, its characterization and a model". *Biosystems*, 5(4): pp.187-196.



## **Unequal incentives to fight climate change**

SREYAM SENGUPTA

We all agree human-made climate change is real, and is a real threat to human societies. However, the effects of climate change will not be felt equally across all nations. According to a recent nature paper [1], some nations will bear the worst impact, while some others will actually benefit from warming. I argue that while the world is politically divided into nation-states, there can be no united international effort to fight climate change, and to effectively fight it we need to radically change the political structure of the world.

- [1] Ricke, Katharine, et al. "Country-level social cost of carbon." *Nature Climate Change* 8.10 (2018): 895-900.

## Limits

KATHARINA ROGENHOFER

In a world that worships increasing stuff (consumption, GDP, production, economic wealth) and going beyond, limits are often seen as the opposite of progress. At the same time, natural systems and cycles are never indefinite and limits seem to be a vital part of earths functioning. Inspired by Giorgos Kallis book *Limits. Why Malthus was wrong and why environmentalists should care* [1]. I will explore the notion of limits in society and nature and provide food for thought with key-arguments in the book. Goal of this talk is not to present a set answer on how to bridge this divide, but to provoke discussion and explore how possible futures will look like.

- [1] Kallis, G. 2019. Limits: Why Malthus was wrong and why environmentalists should care. Stanford: Stanford University Press.

## Why you should care how clever the Schnitzel on your plate once was

KIMBERLY BROSCHE

Although humanities and science might be viewed as contrasting or incompatible poles at the first glance, the ties between philosophy – particularly ethics – and biology are manifold, or: The two are connected by countless relations. Not only should ethics play a crucial role in (animal) research, but empirical knowledge generated in science ought to feed back into philosophical considerations and frameworks. A prime example for this necessity is cognitive biology's indispensability for the ability-based approach in animal ethics (represented, for instance, by Peter Singer or Tom Regan) [1, 2], especially when it comes to the ambivalent and somewhat hypocritical relationship [3] existing between humans and (farm) animals. Not only might it make an intuitive, pre-theoretical difference to most of us to know whether creatures we slaughter, experiment on or adopt as family members are to some degree self-aware [4], meta-conscious [5] or endowed with a rich emotional life [6, 7], but crucially, cognitive abilities are inextricably intertwined with welfare and hence our moral foundations can be shaken by every novel breakthrough in animal cognition research. These advancements allow us to demystify how our moral standards come about, justify our actions or adjust them to achieve a higher degree of equality among equals.

I therefore want to use this talk as an opportunity to share and discuss ideas with the audience on how relations affect relations: How can interdisciplinarity contribute to a less speciesist [8] ethics?

- [1] Singer, P. (1990). *Animal liberation*. New York: New York Review of Books.
- [2] Regan, T. (1984). *The case for animal rights*. Routledge.
- [3] On this ambivalent relationship between humans and non-human animals see for example: Joy, M. (2011). *Why we love dogs, eat pigs and wear cows : an introduction to carnism ; the belief system that enables us to eat some animals and not others*. Conari.
- [4] To get an idea what research on modules of awareness might look like: Dale, Rachel, & Plotnik, Joshua M. (2017). "Elephants know when their bodies are obstacles to success in a novel transfer task". *Scientific Reports*, 7(1)
- [5] For an introduction see for example: Kornell, Nate. (2009). "Metacognition in Humans and Animals". *Current Directions in Psychological Science : a Journal of the American Psychological Society*, 18(1), 11–15.
- [6] Regarding animal emotion research see for example: Mendl, Michael, Burman, Oliver H. P, & Paul, Elizabeth S. (2010). "An integrative and functional framework for the study of animal emotion and mood". *Proceedings of the Royal Society. B, Biological Sciences*, 277(1696), 2895–2904.
- [7] Paul, Elizabeth S, Harding, Emma J, & Mendl, Michael. (2005). "Measuring emotional processes in animals: the utility of a cognitive approach". *Neuroscience and Biobehavioral Reviews*, 29(3), 469–491.
- [8] For a definition of "speciesism" see for example: [www.britannica.com/ topic/speciesism](http://www.britannica.com/topic/speciesism)

## Breaking the black box of AI: how it learns to create stuff like humans

DIEGO DE LA CAL

How ‘intelligent’ is Artificial Intelligence (AI)? Wait, first, how exactly does a machine learn? It can detect diseases as good as humans or drive cars more safely, but do you know how?

In this talk, you will understand why AI is getting a lot of attention these days. I want to show you how it sees the world, learns, and the differences between computer and human intelligence. You will learn how deep learning models use data to achieve such things as facial recognition, writing a book in the style of your favorite author, or even creating music. This will lead us to see how generative models can make artificial intelligence more creative than ever. We will also explore the current ethical issues we are facing and some of the coolest applications that have been created. Finally, we will end with some philosophical questions that will give much food for thought. Are you ready?

## **A problem of classical electrodynamics**

TOBIAS SŁOWIAK

In this talk, I will discuss a problem of classical electrodynamics, that has received some media attention lately. As the entertaining quality of this talk lies partly in the surprising basic facts underlying it, I don't want to give too much away beforehand. Sit back, relax and enjoy this rather nonsensical talk!

## **Embrace complexity in projects with different stakeholders (Workshop)**

CHIARA CARDELLI

In this workshop, we will experiment and learn together how to create a complex innovation project (e.g. a social health or urban development or environmental monitoring project) involving different stakeholders outside of academia, such as organisations or groups from civil society, local policy makers or business. The workshop participants will be separated into working groups, each group will analyse an imaginary practical example of a complex social innovation project which would benefit from a diversity of involved stakeholders. The workshop participants will identify key stakeholders and play the part of one of them, in order to reflect on the aims and issues for each one. The participants will also reflect on the benefit to the project success of having a diversity of stakeholders and how this might increase the chance of having a positive impact on society. This social game will allow participants to reflect on the benefits of cooperation but also its challenges from different points of view.

[1] For more information on methods: <http://riconfigure.eu/>

## **The cathedral and the bazaar - Open source software and why you should Care**

MARK STREMPER

Software applications, or in short apps, are created based on a textual representation that is human readable. The textual representation of a software application is called the source code of a software application. The source code is used to create a data file that is the software application. While this final form can be executed by a computer it is usually not human readable – at least not easily. Software applications whose source code can be accessed by the user is called open source software.

In the early days of computing the complexity of software applications was insignificant compared to the physical complexity of computing hardware. Hence it became standard practice to distribute the source code of software applications alongside the hardware which was used for running the application.

Ever growing computing power allowed the introduction of evermore complex software applications. Manufactures realized that they could use software to differentiate themselves from competitors. In essence this ‘monetization’ of software application led manufactures to limit access to an application’s source code. In a lot of cases only the final software application, without the source code, was delivered. This prevented users from modifying the software applications for their own needs. Instead users were at the mercy of a manufacture to modify the software application for them.

These developments resulted in the free and open source software movement. Free and open source software acknowledges the users right to study and modify software. As a result large parts of the applications we use today are in fact open source and every user can at least study the source code these applications.

In this talk I will give a brief introduction into the history, ideas, and concepts behind open source software. I will start by giving a brief historical background of open source. I will also present the different approaches to open source and discuss different approaches to ensuring the users freedom of modifying software applications.



## Entropy & time - Can a perfect clock even exist?

EMANUEL SCHWARZHANS

Time is a weird thing. Whenever we try to understand it, to grasp its essence, it seems to slip away. Time appears in physical laws as a parameter, that is, as a kind of control knob that allows us to see the world evolve either to the "future", or to the "past". At least that is a naive notion of this parameter, but there is something with that statement that is wrong. In fact neither quantum theory, nor the theory of relativity can distinguish between "future" and "past". For example, think of a movie of a swinging pendulum being played either forwards or backwards. You can't tell the difference. However, this intuitive idea of time having a direction is recovered by a theory that is older than both quantum mechanics and general relativity, namely by thermodynamics. In this talk we will discuss the role of thermodynamics for the concept of time. In particular we will look at the way we measure time, i.e. about clocks. What is a clock fundamentally, and what makes a good clock? Are there fundamental limitations to the performance of clocks, and can a perfect clock exist? I am looking forward to discussing these questions with you. THINK, it's about time!

- [1] Carlo Rovelli, The order of time, Allen Lane; 1. Edition (2018)
- [2] Paul Erker, Mark T. Mitchison, Ralph Silva, Mischa P. Woods, Nicolas Brunner, and Marcus Huber, Autonomous Quantum Clocks: Does Thermodynamics Limit Our Ability to Measure Time? Phys. Rev. X 7, 031022 (2017)
- [3] Emanuel Schwarzhans, Maximilian P. E. Lock, Paul Erker, Nicolai Friis, Marcus Huber, Autonomous Temporal Probability Concentration: Clockworks and the Second Law of Thermodynamics. Phys. Rev. X, 11, 011046 (2021)

## **Green gases: The fuels dreams are made of**

FLORIAN SCHLEDERER

The combustion of fossil fuels has directed humanity into the climate crisis. While societal and systemic solutions are well-researched and known, they have not been rolled out, often due to a reference to technological solutions. As such green gases have been subjected to extensive lobbying and financial backing. It is worthwhile to summarize the scientific results concerning their role in preventing climate collapse and analyze the mechanisms that pushed them into the public debate.

- [1] K. Rogenhofer, F. Schlederer: Ändert sich nichts, ändert sich alles. Wien: Zsolnay, 2021.

## Democracy education in mathematics lessons during times of Corona

CLAUDIA HEINDLER

The demands on mathematics education in Austria are manifold. On the one hand, the curriculum must be fulfilled, and on the other hand, students must achieve certain mathematical competencies. On top of that, democratically responsible citizens should be educated and trained:

"Adolescents should be trained to become generally educated (constructive, engaged and reflective) citizens with the knowledge and skills necessary for life in society and be able to discuss issues with experts."

(from [1])

The talk will discuss the Corona pandemic as a recent example of the importance of the latter and how this aspect can be implemented in the classroom.

- [1] Curriculum for High School in Austria: RIS - Lehrpläne – allgemeinbildende höhere Schulen - Bundesrecht konsolidiert, Fassung vom 04.09.2021 ([bka.gv.at](http://bka.gv.at))
- [2] Mathematical competencies for the High School degree in Austria: Die standardisierte schriftliche Reifeprüfung in Mathematik (AHS) ([matura.gv.at](http://matura.gv.at))

## Old habits die hard: questioning the scientific publishing system

FLAVIO DEL SANTO

Scientific knowledge becomes valuable only insofar as it is archived and made accessible for the posterity. This statement is exemplified by the loss of the legendary Library of Alexandria, which indeed set back scientific progress *ante litteram* for several centuries.

Since the mid-17th century, thus from the early days of modern science, a systematization in the way of disseminating and assessing scientific work took place. It was the rise of scientific journals. Already at that time, Henry Oldenburg, the secretary of the Royal Society and editor of the first scientific journal in English language, identified four key functions of the new scientific publishing system [1]: (i) registration of the intellectual property and priority, (ii) certification of the quality, (iii) dissemination in the contemporary research community and (iv) preservation in the long run.

Scientific journals have come a long way from that time. Perfectly embedded in the capitalistic system, journals are today run by a handful of for-profit private companies (the so called “big five” account together for more than half of the scientific papers published in any discipline [2]), which have annual margins of up to 40% that tops those of giants the likes of Google, Apple or Amazon [3, 4]. This has been called a “triple-pay” system, in which “the state funds most research, pays the salaries of most of those checking the quality of research, and then buys most of the published product” [4].

While the needs of the scientific community have remained virtually unchanged from the above-mentioned Oldenburg’s list, it has become manifest that other, less costly and more efficient means can account for them instead of traditional journals: foremost the internet. In this talk we will discuss what are the main problems of a crystalized scientific publishing system, and try to understand why it is still so powerful despite its apparently obsolete role.

- [1] Robert K. Merton. 1962. *The Sociology of Science: Theoretical and Empirical Investigations*. University of Chicago Press.

- [2] Angeli Metha. 2019. [www.chemistryworld.com/news/75-of-european-spending-on-scientific-journals-goes-to-big-five-publishers/4010616.article](http://www.chemistryworld.com/news/75-of-european-spending-on-scientific-journals-goes-to-big-five-publishers/4010616.article)
- [3] Larivière, V., Haustein, S. and Mongeon, P. 2015. The oligopoly of academic publishers in the digital era. *PloS one*, 10(6), p.e0127502.
- [4] Stephen Buranyi. 2017. Is the staggeringly profitable business of scientific publishing bad for science?. *The Guardian*: [www.theguardian.com/science/2017/jun/27/profitable-business-scientific-publishing-bad-for-science](http://www.theguardian.com/science/2017/jun/27/profitable-business-scientific-publishing-bad-for-science)

## **Invasive walk - Alien species as actants in the climate crisis (Workshop)**

SABRINA BÜHN

This workshop will take place as a walk through the woods. With the help of input elements, such as talks and sensory exercises in the woody terrain, an integrative draft of vegetational ecology will be presented. Please bring along sturdy shoes and a water bottle. Invasion Biology deals with the phenomena of extremely successfully reproducing species. Every species which is read as non-endemic underlies herein special attention. In the majoritarian ways of thinking nature conservation and ecology the binary of native and alien species is a parked concept. Alien species get accounted as spreading uncontrollably, generating damage and costs along the way and are therefore currently being fought by different institutions. During the Invasive Walk we move ourselves as an invasive entity through the woods and work out through deep immersion and plant encounters ideas of reciprocal enabling. Participants will learn about how to identify an alien, current conservation practices, their effects on ecosystems and invasion management issues. In this workshop, however, we will get known to alien species as powerful actants in the ecological crisis of the Anthropocene. The ecosphere, with its complex biomes, is changing rapidly, being overformed and reshaped multiply and constantly. The accelerating speed of the climate crisis compresses timely scales down to thinkable consequences. Those green conquerors could be helpers, hope or destroyers on the paths of successful survival in the Anthropocene.

- [1] S. Nehring, F. Essl, F. Klingenstein, C. Nowack, W. Rabitsch, O. Stöhr, C. Wiesner, C. Wolter; 2010; “Schwarze Liste invasiver Arten: Kriteriensystem und Schwarze Listen invasiver Fische für Deutschland und für Österreich”, BfN-Skripten 285
- [2] Wolfgang Nentwig; 2010; “Invasive Arten”; 9783825233839 R. Guiasu; 2016; “Non-native Species and Their Role in the Environment: The Need for a Broader Perspective”
- [3] Fred Pearce; 2015; “The New Wild”; 0807033685 N. M. Correa, R. Guiasu, D. Boltovskoy; 2021; “Invasion biology: evidence, assumptions, and conservationism”
- [4] J. Radkau, F. Uekötter; 2003; “Naturschutz und Nationalsozialismus” (p. 169 ff); 9783593373546

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