A COMPANION TO

THINK3

INTRODUCTORY WORDS

The THINK conference serves as a platform for interdisciplinary exchange and informal discussion about the sciences and their social and political context. Young researchers from all over Europe give lectures centred around the question what science is today and engage in a critical discourse on the foundations of science. We hope in this way to provide an occasion where students can address critical questions, which seldom find room (and time) in current academic teaching and research. We maintain that providing this platform for open and creative discussions will foster our personal development and could lay the foundations for an enduring network of young scientists.
This is a *Gefördertes Sonderprojekt der Österreichischen Hochschüler_innenschaft*.

For more information, see https://thinkconference.net/

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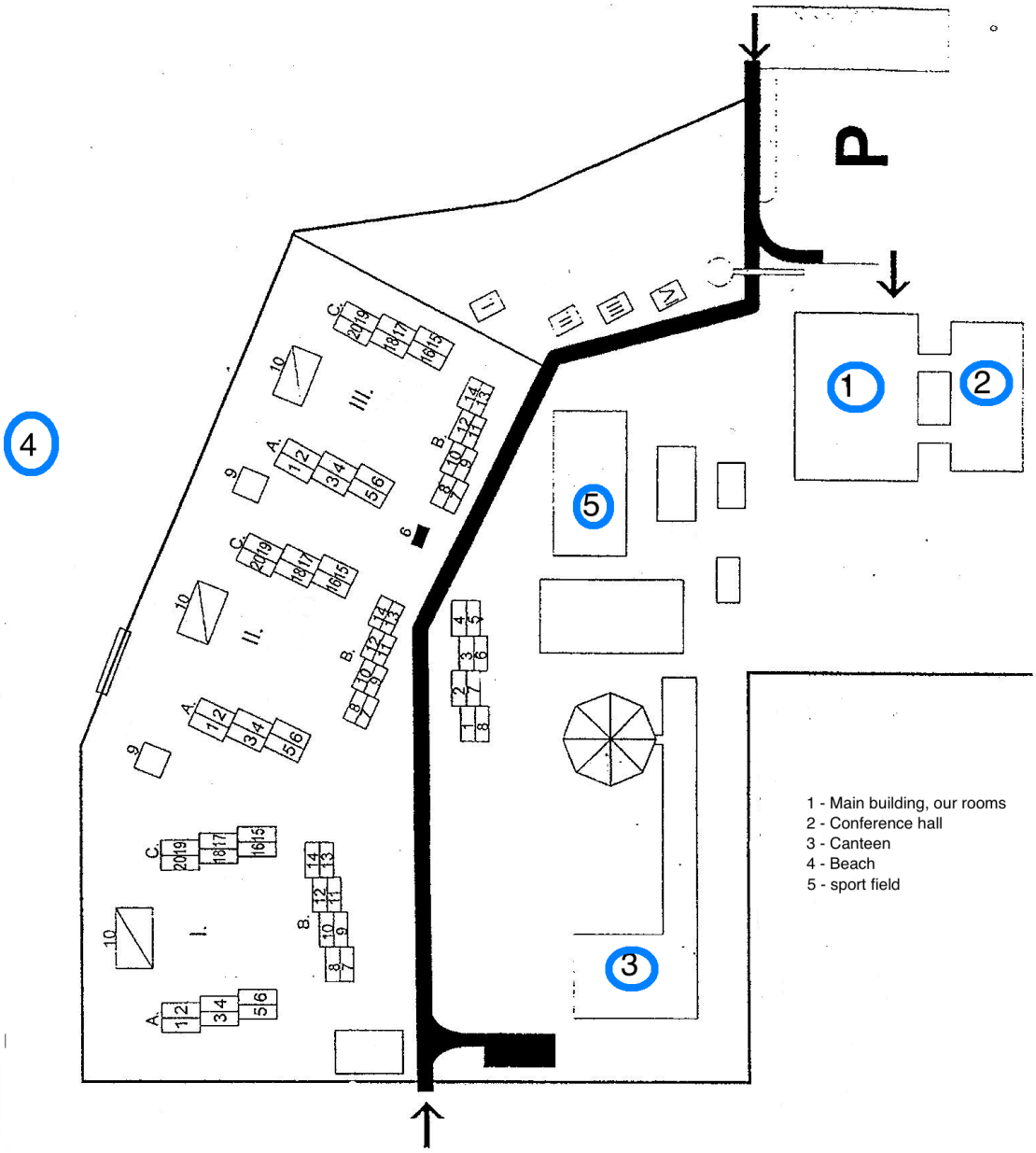
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Thomas Zauner

Should we go to Mars? A case study of science in society

Current development of projects to go to Mars, most prominently Elon Musk's SpaceX, raise the question of which science should be done? For and by whom? Who profits and who loses?
Starting from a provoking and speculative article [1] on the future society of Mars colonists I am contemplating these questions using both political and scientific insights and frameworks developed in science and technology studies [2].
I will start with a short introduction to the current status of SpaceX' endeavours and its plans for future missions to Mars [3]. From there, I will try to raise societal questions about the people and structures involved and whether these are taken on or not by the company. Finally, I will use the remaining time for discussion with the audience members, which I hope continues further and stimulates them to ask such crucial questions in their own fields.

[1] *Keep the Red Planet Red, Jacobin Magazine.*
https://www.jacobinmag.com/2017/02/mars-elon-musk-space-exploration-nasa-colonization, 2.5.2017.
[2] *Stilgoe, Owen, Macnaghten.*
Developing a framework for responsible innovation, 13.6.2013, Research Policy, Elsevier.
[3] *Waitbutwhy Blog, 6.7.2017.*
https://waitbutwhy.com/2015/08/how-and-why-spacex-will-colonize-mars.html/3#part3

Márton Gömöri

Probability without probability

There is a consensus in the philosophy of probability literature that the notion of probability cannot be given a satisfactory definition. How is it possible that physics and other sciences are able apply the notion of probability without noticing this fundamental problem? In this talk I shall outline a new interpretation of probability (based on [1],[2]) that may shed light on this question. The basic idea will be that probability is a notion that is completely eliminable from the scientific discourse.

[1] *Szabó, L. E.*
Objective probability-like things with and without objective indeterminism, Studies in History and Philosophy of Modern Physics 38, pp. 626-634, 2007.
[2] *Gömöri, M.*
Monty Hall on the Humean Mosaic, manuscript, phil.elte.hu/gomori/gomori-montyhall.pdf

Barbara Riegler

Free partner choice in human cooperation

Cooperation is very important in human everyday life and it seems that people are very aware of whom they would like to cooperate with and whom not. Many studies have investigated human cooperation behavior, but didn´t take into account the influence of free partner choice. In this study we investigated the influence of free partner choice on cooperative behavior and studied if rather attractiveness or trustworthiness is the main factor. In addition we measured if there are differences in testosterone levels, if the partner was free chosen or not. The study is a project of three PhD students of the University of Vienna from the department of Biology and Psychology. Together with three study colleagues I helped them in the course of a lecture to realize the project and started with data collection, which is still in progress.

Emanuel Schwarzhans

Informal hierarchies in the context of grassroots organisations

The main aim of this talk will be, to introduce the concept of informal hierarchies and it's consequences. This will be realized on the example of grassroots organisations. To introduce and rectify this kind of organization, the historical development of grassroots democracy will be discussed [1]. Furthermore methods of decision making will be viewed, especially the concept of consensus. Finally the dangers that informal hierarchies impose on grassroots organizations will be considered [2] and examined on examples in the past [3].

[1] *Burnicki, Ralf.*
Anarchismus und Konsens. Edition AV, Francfurt (2002).
[2] *Lackner, Manuel and Sargant, Benedikt.*
Informelle Hierarchien in basisdemokratischen Strukturen am Beispiel des „Roten Börsenkrach".
[3] Booklet ÖH: Universität Wien und Geschichte der ÖH.

Chiara Cardelli

Science4People: a European-Arab network for science communication

Modern society is characterized by important scientific achievements, leading to technological progresses that are improving the everyday quality of life. However, this development affects especially the richest areas of the world, while million of human beings are facing humanitarian crisis leading to a poor quality of life. In such a context the potential of a scientific and technological know-how transfer to populations with poor living conditions is striking. In such situations, the outcomes of a scientific development might become the key for an innovative and life changing path for the local population, bridging the gap between the existing difficulties and possible solutions. Hence science communication can play a central role to fill the gap between scientists and final users, teaching a common language to the two communities to speak of problems and simple solutions, in order to make scientific knowledge a central component of culture and of social awareness. As scientific team of the NGO Sunshine4Palestine we are promoting the creation of a science communication European-Arab network: Science4People. The project aims at creating an independent platform for science communication and sustainable development formed by University students and/or science teachers from various countries in the European and Mediterranean region and encourage scientific exchange between them. The first nodes that we are working to include to the network are: Bethlehem with science communication to kids through ecological experiments, Morocco with the knowledge of building cheap solar lamps, ICTP Trieste with the construction of an open source cheap 3D printer, Malta with science communication through arts. We aim at encouraging and provide fund for knowledge exchange between these nodes and activities of know-how transfer from the students members of the nodes and the local population.

Roberto Amabile

Horizon 2020 from Axiocracy to Ischy(r)ocracy: a Reverse Robin-Hood Paradigm for European Union Research Fundings

The European Union (EU) has been living the worst period in terms of popularity since its foundation [1]. After the 2007 U.S. subprime mortgage crisis, most EU countries chose bank system bailing out to the detriment of sovereign debts and welfare state, so initiating the s.c. *Age of Austerity* [2]. After years of relative quiescence, the opposition to the EU has therefore recently being spreading among the population. EU-scepticism and anti-EU-ism are hegemonised by xenophobic and racist parties, which exploit the migrant crises to boost otherwise-low party approval rating [3]. On the other side, there exists EU criticism on solidarity bases that addresses the flaws of the EU in guaranteeing respectable lives to deprived people and equal consideration among EU members [4] [5][6]. Cognitarians (knowledge workers dispossessed of their independence) [7] are suggested to be among the least social groups to adhere EU criticism, (UK based) [8] [9] although relevant aspects of EU policies may affect their socio-economic conditions. One of these most relevant aspects is Horizon 2020 [10] the 80-billion-euro EU framework programme for research and innovation. Grant information is publicly available through the CORDIS datasets [11]. Comparisons between the imbalance of grants and macroeconomic indicators suggests the structural funding asymmetry between peripheral and central countries. Furthermore, the work intends to open the discussion about „meritocracy“ and class cooptation of cognitariat, two very tight phenomena that obfuscate the inherent imbalance in the funding framework.

[1] 40 years of Eurobarometer, Effects“ (2013).
(1973-2013 temporal series, subtracting negative to positive perception) Other Eurobarometer surveys available online.
[2] *Ortiz, Isabel and Cummins, Matthew.*
The age of austerity: a review of public expenditures and adjustment measures in 181 countries (2013).
[3] *Werts, Han; Scheepers, Peter and Lubbers, Marcel.*
Euro-scepticism and radical right-wing voting in Europe, 2002-2008: Social cleavages, socio-political attitudes and contextual characteristics determining voting for the radical right. European Union Politics 14.2 (2013), pp. 183-205.
[4] Alex Callinicos.
The internationalist case against the European Union. International Socialism 155 (2015).
[5] *Snowdon, Alex.*
Debunked: 12 left-wing reasons for remaining in the European Union. Counterre (2016).
[6] *Kavanagh, Tom.*
The problem with the EU: a Leftist critique“. Ceasere (2011)
[7] *Berardi, Franco Bifo.*
Info Labour and Precariousness (2003). Web: http://www.generation-online.org/t/tinfolabour.htm
[8] *Morgan, John.*
EU referendum: is it graduates v non-graduates? The Times Higher Education (2016).
[9] *Brennan, John et al.*
The eect of Higher Education on graduates‘ attitudes: Secondary Analysis of the British Social Attitudes Survey. The Times Higher Education (2015).
[10] Horizon 2020, The EU Framework Programme for Research and Innovation“ (2014).
Web: https://ec.europa.eu/programmes/horizon2020/
[11] Comminity Research and Development Information Service“ (2013).
http://cordis.europa.eu (Datasets up-date: May 19th 2017).

Katharina Rogenhofer

Why is Biodiversity Important?

Today, it seems that the persistent destruction of habitats, biomes and the ecosystem earth is unstoppable and a growing number of people paint our future in dark colours. As Sylvia Earle put it at the latest IUCN Conference, we witness "the greatest era of discovery and the greatest era of loss" in earth's history. Hearing of human-induced destruction of nature through deforestation, land use and greenhouse gas emissions makes people uneasy and leads to a sense of powerlessness. But, if reframed, the insights become motivational: being responsible for these actions also means that we have the ability to change our course! We can change it by developing knowledge and awareness, along with introducing and implementing conservation strategies. For conservation to be sustainable, scientists have to work together effectively with decision makers all over the world.

Biodiversity conservation initiatives frequently address morality or an inherent responsibility of human beings for the world surrounding us. While conserving biodiversity for its own sake is vital and is regularly the driver of conservation initiatives, more people might relate to an anthropocentric viewpoint. Biodiversity loss directly affects us and we will pay high costs, if we let it continue. How we benefit from biological diversity and why we should act now to save it will be the key-topics of my talk.

[1] *Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Fronseca, G. A. B. & Kent, J.* Biodiversity hotspots for conservation priorities. Nature 403, 853–858 (2000).
[2] *Myers, N. Biodiversity Hotspots Revisited. Bioscience 53, 916 (2003).*
[3] *Willis, K. J., Gillson, L. & Knapp, S.* Biodiversity hotspots through time: an introduction. Philos. Trans. R. Soc. Lond. B. Biol. Sci. 362, 169–174 (2007).
[4] *Marchese, C.* Biodiversity hotspots: A shortcut for a more complicated concept. Glob. Ecol. Conserv. 3, 297–309 (2015).

Artemis Papadaki-Anatasopoulus

Embracing complexities: Plastics and Pollution.

My talk is not meant to give many answers but rather evoke questions; questions about environmental pollution, about plastics, about scientific evidence and their entanglements. My presentation will be based on literature within the field of Science and Technologies Studies placed in conversation with literature from the field of Marine Biology. I specifically will draw upon the work of Max Liboiron (2015). My starting point for this presentation will be that every environmental issue is not solely defined by science; environmental issues are embedded in complex sociocultural backgrounds. One of the most complex environmental issues in the 21st century is chemical environmental pollution. Currently the way we conceptualise and deal with chemical pollution is by using the idea of 'allowable limits', namely setting a threshold of acceptable levels. And although this might work in some circumstances we have come to the point to recognise that chemical pollution can be more complex than that. The 'allowable limits' contain the assumption of a linear way to look at pollution: one chemical that causes one problem that can be measured in a causal and statistical significant way and therefore a threshold limit can be set. But the interactions between materials, chemicals and the environment can be much more complex than that (Liboiron,2015). I will use the case of plastics (with a focus on microplastics) in order to illustrate the complexities we have to deal with when thinking about pollution in our contemporary societies.

[1] *Liboiron, M.*
Redefining pollution and action: The matter of plastics (2015). Journal of Material Culture,21(1), 87-110.

Patrick Braun

Poultry Production in Austria today

This will be a talk about the situation in modern poultry farming, involved techniques, the problems and also the legal environment. While the original talk dealt with turkey-farming only, time will allow to also extend to chicken production (laying and mast).
The talk aims at essentially 2 goals
–To give a broad picture of the methods of modern poultry production, the involved technology and also changes due to economical and environmental requirements.
In short: To better understand how one's lunch is produced.
–To dispel persistent myths about practices of animal cruelty and drug overuse that have been abolished, sometimes for decades.
At the same time of course we want to present current problems in animal welfare and environmental protection, of which there are quite a few.
Disclaimer: The especially strict laws (much stricter than the EU requires) that position Austrian meat as expensive and high quality will also be part of the talk. The speaker is very much biased in favor of Austrian food and especially poultry production due to taste and well known family ties.
Thus this section may partly sound like the honest heartfelt endorsement of tasty poultry products no advertiser could artificially produce.

Sonja Schobesberger

Stealing concepts of physics and astrophysics to investigate their usefulness in sociology and psychology

Ever heard of the human free-falling time into society? Probably nobody has. That is why this talk tries to describe my recent thoughts about the meaningfulness of exploitation of for example astrophysical concepts like time-scales in order to provide new insight in the impact of society on the individual. In general, the aim is to consider "thinking concepts and methods" of physics and try to find an answer to the question "Does it make sense to analyze the interaction between the society and the individual with the help of concepts like for example a Taylor series?"

Pablo Ancochea

Feeling the beat

Humans can hardly help but tap, sway, and bob their heads in response to rhythmic sound. In no other species is this auditory-motor connection so widely expressed and flexibly realized. This talk will dive into the curious phenomenon of rhythm, dance and groove, tackling it from different angles to give the bigger picture.

Leonardo Miele

The emergence of life cycles in social microbes: a mathematical model

The emergence of multicellular lives is considered one of the major transition in evolution [1]. It led to a burst of complexity among living systems, as well as to new forms of organization such as life cycles, that from the physicist perspective can be studied as examples of complex collective behaviors. The achievement of the transition to multicellularity relies on the resolution of a „social conflict“ among unicellular entities endowed with different interests and survival strategies. In the framework of Evolutionary Game Theory, such conflict is typically cast in terms of cooperators versus cheaters playing a Public Good Game [2]. However, if social interactions among players are random, cheaters will always outperform cooperators, leading to the so called Tragedy of the Commons. In order to avoid this tragedy several solutions have been proposed. but rarely the ecological context and the demography of the problem have been taken into account [3,4]. Starting from an example of social conflict inspired by the microbial world, I will introduce a novel approach based on the coupling between evolution and ecology. I will show how our mathematical model is able to resolve the Tragedy of the Commons, as well as how it leads to the emergence of complex collective behaviors such as life cycles. Finally, I will discuss the relation of these theoretical life cycles with those observed in microbial populations such as the social amoeba Dictyostelium discoideum, and how our theoretical study can help to shed light on the emergence of cooperation in the microbial world [5].

[1] *Maynard Smith, J. and Szathmary, E.*
The Major Transitions in Evolution. Oxford University Press, 1997.
[2] *Tarnita, C.*
The ecology and evolution of social behavior in microbes. Journal of Experimental Biology, 220(1):18–24, 2017.
[3] *Weitz, J.S. et al.*
An oscillating tragedy of the commons in replicator dynamics with game-environment feedback. Proceedings of the National Academy of Sciences, 113(47):E7518–E7525, 2010.
[4] *Hauert, C. et al.*
Replicator dynamics for optional public good games. Journal of Theoretical Biology, 218(2):187–194, 2002.
[5] *Rainey, P.B. and Rainey, K.*
Evolution of cooperation and conflict in experimental bacterial populations. Nature, 425(6953):72–74, 2003.

Nino Lauber

Do small evolutionary systems innovate faster?

A recent path to understand the dynamics of evolutionary systems is „combinatorial evolution“. The essence of this approach is, that an evolving system can be formulated as a set of objects, which can be combined to pairs to form new objects that are in turn added to the set and can be again combined to form yet new objects and so forth [1]. In general the dynamics of this pair interaction is governed by so-called catalytic equations, which have been shown to have a strong connection to classical thermodynamics [2]. Simple combinatorial models can not only be used to describe biological evolution, where the objects in the system are species which reproduce to create new ones, it can also describe chemical reaction networks, where objects are molecules reacting with each other to create new, more complex compounds [1]. Even technological evolution can be described, where the objects
are existing goods or technologies which can be combined to form new goods or technologies [1]. Measuring the number of distinct objects that are present in the system at a given time gives the so-called „diversity“ of the whole set. The creation of new objects through recombinations is what we call „innovation-rate“ and it increases the diversity of the ensemble in a non-linear way. This dynamics is influenced by the choice of model parameters. In particular there are indications that the size of the system directly governs the innovation-rate at which the diversity of the system unfolds. This was directly seen in an implementation of a simple combinatorial evolution model by Liu Yu[3], where in systems with a small size the diversity increased faster than in larger systems. The aim of this Talk is therefore to give an overview of this model and provide some further investigations of this behaviour done by myself.

[1] *Hanel, R., Kauffman, S.A. and Thurner, S.*
Phase transition in random catalyticsets. Physical Review E, 72:036117, 2005.
[2] *Hanel, R., Kauffman, S.A. and Thurner, S.*
Towards a physics of evolution:critical diversity dynamics at the edges of collapse and bursts of diversification.Physical Review E, 76:030101, 2007.
[3] *Liu Yu.* personal communication.

Ella Felber

Making Ideas Touchable

In architecture the field of research and science is directly linked to practice. As architects we are always connected to other disciplines. Our profession is built on interdisciplinary and transnational collaborations.
My work is located on the border region between architecture, art and psychology of perception. I´m questioning the predominance of the visual aspect of architecture, but also in today´s culture in general, by stressing the importance of the multi-sensory nature of spaces and atmospheres. My Bachelor Thesis Project examines the aural dimension of architecture, particularly in the urban environment on Copa Cagrana, Vienna. Urban sound design has a big influence on human behaviour, their well-being and the acceptance of spaces, as well as their quality of stay. By playfully raising awareness of how we perceive urban space, three architectural interventions should transform the spaces into amplified versions of themselves.
Architecture´s main agenda is to make ideas visible, audible, touchable and perceptible. It is through architecture that ideas get the opportunity to speak spatially. As our main task lies in making knowledge accessible, and raising questions to tackle complex problems, research in architecture is meant to be shared.

[1] *Felber, Ella Melina.*
Urbaner Dreiklang, Vienna 2016.
[2] *Rahm, Philippe*.
Jade Eco Park, Taichung 2012-2016.
[3] *Eliasson, Olafur*.
The Mediated Motion, Bregenz 2001.

Fabian Arno Dietrich

The Systems Theory and its potential use in Architecture

The Systems Theory of Niklas Luhmann is a sociological interaction-focused attempt to explain the functional differentiation of the modernist society. Here, intertwined functional systems and their respective environments are introduced to describe empiric processes of increasing mutual dependency. In my talk I want to show the benefits of applying the theoretical layer of the Systems Theory on processes or research in other fields than Sociology. I will try to demonstrate this on the practical example of the Architecture System.

1 Introduction into Luhmann´s Systems Theory
a Theoretical assumptions of the Systems Theory (interaction, functionally differentiated society)
b Visual example of a functional system
c Overview about the terminology of Luhmann´s Systems Theory
2 The Architecture System
a Modelling of the Architecture System
b Examples of possible “programs” of the Architecture System (ESL, Pattern Langua ge)
c Potential of the Systems Theory for practical socio-spatial research
3 Key questions for open discussion
a Systems Theory as a tool to visualize economization and juridification of the Science System
b Adequacy of Systems Theory for qualitative research

Mark Strempel

Random Numbers

From algorithms in computer science, cryptography, physical simulations, artificial intelligence or bio informatics, many algorithms rely on random numbers. But what constitutes randomness? Is the sequence 1,2,3,4,5 less random than 2,1,5,4,3? Can we measure the randomness of a sequence of numbers? How can completely deterministic machines create random numbers? The talk aims to give an introduction into the topic of random number generators. In the first part this talk presents different ways to define and test the randomness of a sequence of numbers. In the second part examples of algorithms to create random numbers on deterministic machines are shown and discussed.

[1] *Goldreich, Oded, and Oded Goldreich.*
A primer on pseudorandom generators. Vol. 55. Providence, RI, USA: American Mathematical Society, 2010.
[2] *Tezuka, Shu.*
Uniform random numbers: Theory and practice. Vol. 315. Springer Science & Business Media, 2012.

Claudia Heindler, Florian Schlederer

Fact or Fiction // Science or Non(sci)ense // Alternative Facts

Science has reached a level of detail, where only experts can reasonably doubt the outcome of experiments or challenge the results of theoretical work. We tend to get accustomed to not understanding research of other fields, where we should sharpen our attention even more to reveal unscientific research or simply alternative facts. Together we want to present several pairs of facts, one scientifically relevant, one a mere lie, either made up or proven to be incorrect. After giving a short introduction to both cases, the auditory is encouraged to vote, which of the two presented cases is science and which one is nons(ci)ense.

Nikolaus Kandolf

The Wiggly Table Problem

With summer approaching, the problem of wiggly tables in e.g. beer gardens or on uneven terraces is again causing stirs all over the northern hemisphere. Yet, there is relief: In this talk, I will present a mathematically sound proof that for any four-legged table on an uneven (yet continuous) ground a position can be found which will end the nerve-wracking that is caused by a shaky table. Moreover, it will be shown that this position of stability can be reached simply by rotating the table around an axis perpendicular to the ground. The proof is easily understandable and provides a great occasion for non-mathematicians to become familiar with the concept of a mathematical proof.

Flavio Del Santo

A Prolific Collaboration between Physics and Philosophy: Karl Popper's Contribution to the Foundation of Quantum Mechanics.

Quantum Mechanics (QM) has been referred to as "the most successful theory that humanity has ever developed; the brightest jewel in our intellectual crown [1]. Sir Karl R. Popper (1902-1994) is regarded as "by any measure one of the preeminent philosophers of the twentieth century" [2] and no doubt one of the greatest philosophers of science of his time. However, it is not very well known that Popper and QM had an intense and controversial relationship, which lasted for about 60 years. Popper, indeed, "fought a lone battle against the Copenhagen interpretation at a time at a time when anyone attempting to criticize orthodoxy was liable to be labelled at best an ‚outsider' or at worst a crank" [3]. In fact, it is not well known, that in 1980s Popper gave active contribution to FQM, effectively becoming part of the physics community. In particular, also thanks to the interaction with French physicist J. P. Vigier, he designed a new version of the EPR thought experiment [4] alleged to put to the test the Heisenberg Uncertainty Principle, and the whole Copenhagen interpretation along with it. I will analyse Popper proposal and its resonance in the community concerned with foundation of quantum physics in different periods.

[1] *Styer, Daniel.*
The Strange World of Quantum Mechanics. Cambridge: Cambridge University Press.
[2] *Shields, William M.*
A Historical Survey of Sir Karl Popper's Contribution to Quantum Mechanics. Quanta 1(1), 1-12, 2012.
[3] *Redhead, M*.
Popper and the quantum theory. Royal Institute of Philosophy Supplement 39 (1995): 163-176.
[4] *Del Santo, F.*
Genesis of Karl Popper's EPR-Like Experiment and its Resonance amongst the Physics Community in the 1980s.Accepted for publication in Studies on History and Philosophy of Modern Physics. arXiv preprint arXiv:1701.09178 (2017).

Johannes Lahnsteiner

Dimensional Reduction in Quantum Gravity

For more than half a century, people have tried to find a consistent theory of quantum gravity. Apparently, nobody has succeeded yet, but there is a whole lot of exciting by-products.
One of the conceptually most intriguing ones is dimensional reduction – by popularizers also called holographic principle. It is expected to be manifest in any future theory of quantum gravity. As such it establishes a relation between the concepts of geometry and information. I will present some of the motivation, such as black hole thermodynamics, entropy bounds and mention AdS/CFT.

[1] *Bousso, Raphael.*
The holographic principle. Reviews of Modern Physics 74.3 (2002): 825.
[2] *Hooft, Gerard 'T.*
Dimensional reduction in quantum gravity. arXiv preprint gr-qc/9310026 (1993).
[3] *Wald, Robert M.*
The thermodynamics of black holes. Living reviews in relativity 4.1 (2001).