Arbeitsgruppe Philosophie der Physik (AGPhil)

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Übersicht der Hauptvorträge und Fachsitzungen

(Hörsaal GW2 B2900)

Hauptvorträge

AGPhil 3.1	Do	13:30–14:15	GW2 B2900	**Data-driven hypothesis generation using deep neural nets** — •Balázs Kegl
AGPhil 3.2	Do	14:15–15:00	GW2 B2900	**How can we learn useful things from big data? Data mining from the perspective of Meno's problem** — •Claus Beisbart
AGPhil 4.1	Do	15:45–16:30	GW2 B2900	**Exploratory data selection and theory-ladenness in the ATLAS experiment at CERN's Large Hadron Collider** — •Koray Karaca
AGPhil 5.1	Do	17:15–18:00	GW2 B2900	**Combining theory with Big Data to predict trends in extreme weather and impacts** — •David N Bresch, Reto Knutti, Gertrude Hirsch Hadorn
AGPhil 6.2	Fr	11:00–11:45	GW2 B2900	**Causation, probability and all that: Data science as a novel inductive paradigm** — •Wolfgang Pietsch
AGPhil 6.3	Fr	11:45–12:30	GW2 B2900	**Do the Beads Still Need a String? Old and New Challenges for Turning (Big) Data into Evidence** — •Johannes Lenhard

Hauptvorträge des fachübergreifenden Symposiums SYCC

Das vollständige Programm dieses Symposiums ist unter SYCC aufgeführt.

SYCC 1.1	Mo	16:30–17:00	HS 1010	**Determinism, strong cosmic censorship, and the strength of singularities inside black holes** — •Jan Sbierski
SYCC 1.2	Mo	17:00–17:30	HS 1010	**Quasi-stationary collapse scenarios support cosmic censorship** — •Reinhard Meinel
SYCC 1.3	Mo	17:30–18:00	HS 1010	**Approaching the Event Horizon of the Galactic Center Black Hole** — •Frank Eisenhauer
SYCC 1.4	Mo	18:00–18:30	HS 1010	**48 Years of Cosmic Censorship, and Still We Do Not Know What It Is** — •Erik Curiel

Fachsitzungen

AGPhil 1.1–1.4	Mi	16:30–18:30	GW2 B2900	**Philosophie der Physik I**
AGPhil 2.1–2.5	Do	8:30–11:00	GW2 B2900	**Philosophie der Physik II**
AGPhil 3.1–3.3	Do	13:30–15:30	GW2 B2900	**Symposium: Epistemology of Big Data in Physics I**
AGPhil 4.1–4.2	Do	15:45–17:00	GW2 B2900	**Symposium: Epistemology of Big Data in Physics II**
AGPhil 5.1–5.3	Do	17:15–19:00	GW2 B2900	**Symposium: Epistemology of Big Data in Physics III**
AGPhil 6.1–6.3	Fr	10:30–12:30	GW2 B2900	**Symposium: Epistemology of Big Data in Physics IV**
AGPhil 7.1–7.2	Mi	9:30–10:30	GW2 B2900	**Alternative Ansätze I**
AGPhil 8.1–8.4	Mi	14:00–16:00	GW2 B2900	**Alternative Ansätze II**

Mitgliederversammlung Arbeitsgruppe Philosophie der Physik

Mittwoch, 15.3.2017 18:35–19:00 GW2 B2900

- Bericht 2016/17
- Planung 2017/18
- Verschiedenes

AGPhil 1: Philosophie der Physik I

Zeit: Mittwoch 16:30–18:30 Raum: GW2 B2900

AGPhil 1.1 Mi 16:30 GW2 B2900

On Evidence — •Alexander Unzicker — Pestalozzi-Gymnasium Müchen

The notion of experimental evidence is crucial for our understanding of physics as a natural science. However, as several authors (e.g. Andrew Pickering, Harry Collins, Peter Galison) have pointed out, the concept is not easy to define: in complex experimental setups, experimental facts and theoretical interpretation are often hard to disentangle.

History has shown that many concepts that were backed by 'experimental evidence' failed to be an appropriate description of reality. The objective of the talk is to discuss criteria for scientific evidence that are resilient under future paradigm shifts, that is, facts that can be considered 'real' without any reasonable doubt.

AGPhil 1.2 Mi 17:00 GW2 B2900

Esoterischer Quantenquark: Zerrbilder der Physik durch verunglückte Wissenschaftskommunikation — •Holm Gero Hümmler — Bad Homburg

Die Quantenheilung ist eine Form der Geistheilung, soll aber auf moderner Physik beruhen. Unternehmensberater beziehen ihre Informationen angeblich aus dem Nullpunktfeld. Ein Fußballtrainer soll eine quantenmechanische Verschränkung zwischen seinen Spielern erzeugen. Von Quantenhomöopathie über Quantenastrologie bis Quantenakupunktur wird Pseudophysik in allen Spielarten angeboten. Wer sich auf die moderne Physik beruft, schützt sich vor kritischen Fragen, und fundierte Kritik von Physikern ist eher selten. Oft kann man sogar prominente Wissenschaftler oder Pressemeldungen seriöser Institute zitieren, die den absurden Behauptungen verblüffend ähnlich klingen.

Der Eindruck vieler Laien, mit der modernen Physik ließen sich fast beliebige übernatürliche Phänomene erklären, entsteht tatsächlich oft durch gutgemeinte Kommunikation aus der Wissenschaft. Physik-Didaktiker erklären in Schülerprojekten, es spuke bei den Quanten. Experimentatoren behaupten, ein Lebewesen an zwei Orte gleichzeitig versetzen zu können. Laien erkennen kaum, wenn mit einer Schrödinger-Katze nur ein verschwindend schwaches Mikrowellensignal gemeint ist. Artikel über Quantenteleportation erwecken oft den Eindruck, Wissenschaftler seien kurz davor, Captain Kirk auf einen anderen Planeten zu beamen. Was können, was müssten Wissenschaftler und ihre Pressestellen tun, um der Mystifizierung der modernen Physik entgegenzuwirken?

AGPhil 1.3 Mi 17:30 GW2 B2900

Newton-Voltaire-Goethe: Ärger um zwei kontradiktorische Theorien — •Harald Goldbeck-Löwe — Universität Hamburg

Voltaire (1694-1778), Vordenker und Philosoph der Aufklärung, musste als junger Liebhaber aus Frankreich nach England fliehen. Er verließ ein Frankreich, das erstarrt war: sozial in absolutistisch-höfischen Ritualen, naturwissenschaftlich-philosophisch unter dem Wahrheitsanspruch der Cartesianer und religiös im Allmachtsanspruch der katholischen Kirche. Voltaire gelangte in ein durch Philosophen wie John Locke (1632-1704) schon liberalisiertes England. Zweieinhalb Jahre später brachte er bei seiner Rückkehr 1728 nach Paris die dort nur wenig bekannte Philosophie Newtons mit sich. Sie bestand für ihn aus der Mechanik und der auf die Mechanik zurückgeführten Optik Newtons. Mit den zuerst in England und 1734 auch in Paris publizierten Lettres philosophiques provozierte Voltaire sowohl die cartesianischen Naturwissenschaftler als auch die Staatsmacht und die Kirche. Er musste wieder fliehen, seine Schriften wurden verboten. Da er aber bereits berühmt war, wurden sie dennoch viel gelesen und hatten eine enorme Wirkung. Anders als von Newton formuliert führte die völlig auf die Gravitation zurückgeführte Naturwissenschaft in ganz Kontinentaleuropa zur Entstehung des Mechanizismus, der Überzeugung, dass sich ausnahmslos alle Naturphänomene auf mechanische Grundgesetze zurückführen lassen. Diese falsche Überzeugung wurde endgültig erst zu Beginn des 20. Jahrhunderts als desolat erkannt.Der Vortrag wird untersuchen, ob der berüchtigte Farbenkrieg Goethes gegen Newton hier seine Ursache haben könnte.

AGPhil 1.4 Mi 18:00 GW2 B2900

Is Physics Truly Empirical, Currently? — •Ravi Gomatam — Institute of Semantic Information Sciences and Technology, Mumbai, India

Is Physics Truly Empirical, Currently?

Physics at present treats observations, not as our experiences, but as objective physical events in the external world. This reduction, achieved via the assumption of naïve realism (NR), has served well both in the classical physics and microscopic quantum mechanics (QM). However, when the same QM is extended to the macroscopic regime, naïve realism drastically breaks down at the point of observations, as shown by the famous cat paradox. This is because historically QM developed by presupposing the classicality of the macro world via NR. The measurement problem is a direct result of assuming NR. The Schrodinger equation demands superposition of the wave function, but the classical macro world of determinate pointer states cannot become superposed. Eschewing NR will immediately render the observations to be just our experiences. This step confers two further benefits: physics will become truly empirical; and experiences can superpose. The only mystery in QM then would be: how to objectivize our observations qua experiences, without NR, for doing physics. I motivate a new conception of quantum information called Objective Semantic Information, that could help solve this mystery.

AGPhil 2: Philosophie der Physik II

Zeit: Donnerstag 8:30–11:00 Raum: GW2 B2900

AGPhil 2.1 Do 8:30 GW2 B2900

Actual Causation and the Discovery of the Cosmic Microwave Background (CMB) — •Enno Fischer — Institut für Philosophie, Leibniz Universität Hannover

In the 1960s radio astronomic measurements yielded intensity values that exceeded the expectations constantly by 3.5 °K (Penzias and Wilson 1965). The excess temperature was eventually attributed to the CMB which is the signature of a very early period of the universe. The case of the discovery of the CMB suggests some important conclusions about causal modelling in experimental physics. It is a paradigm case for situations where physicists are confronted with some unexpected measurement result that gives rise to the question for causes. When the radio astronomers built causal models for the measured intensity value they had to put forward a range of hypotheses of actual causation. This indicates that such hypotheses are essential in building causal models. I will argue that this reverses the relation between causal models and statements of actual causation as it is commonly understood: in situations with unknown causes, causal models are not the basis of judgements of actual causation, but causal models are generated through the evaluation of hypotheses of actual causation.

Reference: Penzias, Arnold and Robert Wilson: A measurement of excess antenna temperature at 4080 Mc/s. *Astrophysical Journal*, 142:419-421, 1965.

AGPhil 2.2 Do 9:00 GW2 B2900

Versuch einer Ontologie der physikalischen Welt — •Ingo Steinbach — Universiaetsstrasse 150, 44801 Bochum

Erste Schritte zu einer Ontologie der physikalischen Welt werden vorgestellt, die versucht mit rein logischen Annahmen zu arbeiten. Zunächst wird mit Hilfe eines Gedankenexperiments eine Kritik des vorherrschenden dualistischen Weltbildes der Physik formuliert. Aus der Forderung der Unmöglichkeit der Erschaffung einer fundamentalen Substanz folgt das Prinzip der Energieerhaltung (1ter Hauptsatz der Thermodynamik) und der Neutralität, d.h. dem Wert '0' der Gesamtenergie der physikalischen Welt. Als einziges phänomenologisches Element wird die Möglichkeit der gerichteten Veränderung (2ter Hauptsatz der Thermodynamik) benutzt. Der fundamentalen Substanz 'Energie' wird eine mathematische Ordnungsstruktur zugeordnet, eine Menge soge-

nannter 'Quanten-Phasen-Felder'. Mit Hilfe dieser Struktur werden die relevanten Grundprinzipien unseres gegenwärtigen Verständnisses der physikalischen Welt abgeleitet, siehe [Steinbach, Z. Naturforschung A, im Druck]. Der Zwiespalt lokal realistischer und nichtlokal probabilistischer Interpretationen wird diskutiert und im Rahmen des vorgestellten Versuchs aufgelöst.

AGPhil 2.3 Do 9:30 GW2 B2900

Erklärungsmuster in der Physik: ein Vergleich von philosophischen und experimentalphysikalischen Argumentationspfaden — •Irena Doicescu — Fachrichtung Physik, TU Dresden, 01069 Dresden

Die wissenschaftliche Erklärung ist ein zentraler und komplexer Begriff der philosophischen Reflexion respektive der logischen Rekonstruktion der Einzelwissenschaften, so auch der Physik. In der philosophischen Literatur wird sorgfältig auf den Unterschied zwischen Erklärung und Begründung geachtet, insb. was die Rolle der Kausalität anbetrifft, deren Rolle in der Physik nicht unumstritten ist. In diesem Vortrag möchte ich, anhand von experimentalphysikalischen Fallbeispielen, zeigen, dass zwischen den bereits ausgearbeiteten physikalischen Erklärungstexturen bzw. Theorien, so wie diese z.B. in der Fachliteratur präsentiert werden, und den vorläufigen und mitunter punktuellen Erklärungsansätzen der experimentellen Arbeit, einen philosophisch auflösbaren Unterschied gibt. Gerade in der Experimentalphysik lässt man sich oft von pragmatischen Überlegungen leiten, bei denen sowohl die Wechselwirkung mit dem gemessenen System eine wichtige Rolle spielt, als auch die kritische Beurteilung soweit bestehender Erklärungsmodelle angesichts der aufgenommenen Daten.

AGPhil 2.4 Do 10:00 GW2 B2900

The vacuum approach to the problem of motion in general relativity — •Dennis Lehmkuhl — Einstein Papers Project and HSS Division, Caltech.

The problem of motion in general relativity is about how exactly the gravitational field equations, the Einstein equations, are related to the equations of motion of material bodies subject to gravitational fields. This paper compares two approaches to derive the geodesic motion of (test) matter from the field equations: 'the T approach' and 'the vacuum approach'. The latter approach has been dismissed by philosophers of physics because it apparently represents material bodies by singularities. I shall argue that a careful interpretation of the approach shows that it does not depend on introducing singularities at all, and that it holds at least as much promise as the T approach. I conclude with some general lessons about careful vs. literal interpretations of scientific theories.

AGPhil 2.5 Do 10:30 GW2 B2900

Dualities in physics: A conceptual discussion — •Keizo Matsubara — Department of Philosophy, University of Illinois at Chicago

It is often difficult to interpret what a physical theory is supposed to tell us about reality. For instance when dealing with so-called "dualities" in modern physics. When a duality is at hand there exist dual descriptions, which may seem to describe completely different worlds with different and conflicting accounts of what the world is like. Despite this they entail the same empirical predictions. A standard view among physicists is that dual descriptions portray the same underlying reality. While this can be contested, I will defend this standard view for a large class of dualities and articulate what it entails regarding what kind of ontology we might infer from them. Given the prevalence of dualities in modern physics it is important to try to better understand how we should interpret what these theories - if taken seriously - tell us about the world. In the case of the dualities here considered a key aspect of making sense of them is to clarify how the classical and quantum formulations of the theories are connected and how different classical pictures may arise in relevant limits. Thus different effective ontology may arise in different solutions.

AGPhil 3: Symposium: Epistemology of Big Data in Physics I

Zeit: Donnerstag 13:30–15:30 Raum: GW2 B2900

Hauptvortrag AGPhil 3.1 Do 13:30 GW2 B2900

Data-driven hypothesis generation using deep neural nets — •Balázs Kegl — CNRS / Université Paris-Saclay

Generating and testing a large number of low-probability hypotheses in certain scientific fields lead to the so called p value controversy. From the point of view of hard sciences this seems as an abnormal misuse of the scientific method. In the first part of the talk I will argue that the scientific method, as it is understood today, does not prevent these aberrations. In tomorrow's world where computational tools can generate scientific hypotheses automatically, fixing this issue is of uttermost importance. Solving this problem will require putting hypothesis generation back into the center of the scientific method.

The goal of computational creativity is to design methods that can generate valuable novelty. One major debate within this community is whether generation is mostly random (only the evaluation process has a strong notion of value of novelty), or we should include knowledge already in the generative process. I will show how this issue is related to the p value controversy and automatic hypothesis generation. I will present a constructive framework in which data- and knowledge-driven novelty generation can be studied and evaluated. I will finish the talk by showing some of our latest results using deep neural nets as the knowledge representation and novelty generation engine.

Hauptvortrag AGPhil 3.2 Do 14:15 GW2 B2900

How can we learn useful things from big data? Data mining from the perspective of Meno's problem — •Claus Beisbart — University of Bern, Switzerland

In modern physics, many data sets arise not because there is theoretical motivation to study a set of variables, but rather because new instruments allow for the speedy accumulation of huge sets of measurements. An important challenge then is to make scientific use of the data. As L. Floridi puts it, the challenge is to find small patterns in big data. The aim of this talk is to understand how methods of data mining may meet this challenge.

I approach this topic from the perspective of a puzzle presented in Plato's "Meno". There, it is argued that we cannot search for something yet unknown (nor investigate something yet unknown). For to claim success, we would have to have a criterion of success, and such a criterion may only be given if we knew what we are searching for, which we do not. Whereas the paradox can be resolved in a rather trivial way for many searches, it has more plausibility in the context of big data, because scientists are there looking for something they don't have any clue about.

My philosophical project thus is to explain how data mining may produce new knowledge despite the paradoxical conclusion from "Meno". I do so by presenting a case study from astrophysics and by analyzing representative examples of methods of data mining. My focus is on the aims of, assumptions behind, the methods.

AGPhil 3.3 Do 15:00 GW2 B2900

Collaborative scientific practice, epistemic dependence and opacity: the case of space telescope data processing — •Jebeile Julie — Université catholique de Louvain, Belgium

A great part of scientific knowledge is the outcome of a collective enterprise supported by technologies, mainly instruments and computers. Astrophysical images, in particular, are today built from data whose measure and digital processing involve competent teams of astrophysicists, including instrumentalists, experts in computer programming and specialists in data analysis, as well as technologies, including telescopes and computers, at different steps of the processes. Here scientific knowledge crucially depends on the trust agents place on their co-workers and on the required technologies.

In such a scientific context, an agent cannot trust one another by merely appealing to her intellectual authority, contrary to what epistemologists sometimes suggest for more ordinary epistemic situations. The agent rather must have sufficient evidence for the trustworthiness of her colleague's inputs. However, based on the case study of Herschel space telescope data processing, I argue that such evidence is sometimes not accessible to her for several reasons on which I elaborate. In this case, she more or less opaquely depends upon her collaborator epistemically. Yet opaque epistemic dependence is certainly not desirable in the process of producing scientific knowledge. As I show, the same holds for the use of instruments and computers. The scientists who actually rely on instruments and computers do not all have access to evidence for the trustworthiness of the outputs.

AGPhil 4: Symposium: Epistemology of Big Data in Physics II

Zeit: Donnerstag 15:45–17:00 Raum: GW2 B2900

Hauptvortrag AGPhil 4.1 Do 15:45 GW2 B2900

Exploratory data selection and theory-ladenness in the ATLAS experiment at CERN's Large Hadron Collider — •Koray Karaca — University of Twente, Department of Philosophy

Unprecedentedly large amounts of data are produced and analyzed at CERN's Large Hadron Collider (LHC), thus presenting a paradigm case of big data in the context of present-day high-energy physics experiments. In this talk, I will discuss the data selection procedure in the ATLAS experiment currently running at the LHC, where the Higgs boson was discovered in 2012. I will argue that the data sets relevant to the objectives of the ATLAS experiment are acquired through what I shall call an exploratory data selection procedure. I will also argue that this data selection procedure is theory-laden, in the sense that the data selection criteria are determined by considering the conclusions of the theoretical models that the ATLAS experiment is aimed to test. Based on this case study, I will suggest that, contrary to previous studies, theory-ladenness can play an essential role in experimentation being exploratory, and that experimental exploration can serve to test theoretical predictions.

AGPhil 4.2 Do 16:30 GW2 B2900

The discovery of elementary particles as a diagnostic causal inference — •Adrian Wüthrich — Technische Universität Berlin

Using the discovery of the W and the Higgs boson as my case studies, I will propose to interpret the essential part of the discovery of an elementary particle as a diagnostic causal inference. In a diagnostic causal inference, the researchers infer the instantiation of a type of cause from the instantiation of a type of effect. In the case of elementary particles, the type of effect is a characteristic pattern of reactions in the detector material, and the type of cause is the presence of a certain elementary particle, which, often through a long chain of intermediate causes and effects, brought about the reactions under consideration. The interpretation of the discovery of elementary particles as a diagnostic causal inference sheds new light on several issues in the philosophy of science. I will address, in particular, the role of data selection and the role of theoretical predictions as well as the reliability of the discovery claim that results from a diagnostic causal inference.

AGPhil 5: Symposium: Epistemology of Big Data in Physics III

Zeit: Donnerstag 17:15–19:00 Raum: GW2 B2900

Hauptvortrag AGPhil 5.1 Do 17:15 GW2 B2900

Combining theory with Big Data to predict trends in extreme weather and impacts — •David N Bresch, Reto Knutti, and Gertrude Hirsch Hadorn — ETH Zurich, Switzerland

We combine theory-based simulation with statistical analysis of large volumes of unstructured data (Big Data) to predict trends in extreme weather and impacts. In collaboration with MeteoSwiss, we develop a prototype application of such an impact model. The natural science part investigates how data of unknown quality can be used to validate and calibrate weather and climate impact models. We analyse whether such data reduce the uncertainties in impacts. We identify the hurdles for such an approach to be implemented in an operational model. The philosophy part further develops uncertainty typologies in decision support to include uncertainty in Big Data. We apply argument analysis to the predictive inferences in the scientific part. We develop prerequisites to classify impacts from extreme weather to be applied to datasets from mobile communication. The synthesis part analyses conditions for transferring results to other fields, and implications from how the role of theory changes with Big Data for scientific methodology and understanding.

AGPhil 5.2 Do 18:00 GW2 B2900

The automated discovery of physical laws — •Nico Formanek[1] and Ryan Reece[2] — [1]Höchstleistungsrechenzentrum Stuttgart (HLRS) — [2]University of California, Santa Cruz (UCSC)

In the recent past there have been several attempts to automatically infer known and new laws of physics from large empirical data sets. Machine learning methods are employed to some success in solid-state physics and materials science to predict electronic properties (Schütt et al.; Physical Review B 89, 205118 2014) but there is also the far reaching claim of Schmidt and Lipson concerning the inference of free-form natural laws from experimental data (Schmidt and Lipson; Science 324, 3 2009). Both points give rise to important philosophical questions: How do physical laws derived in such a way differ from humanly generated ones? How do they methodically differ from classical statistical correlations? What is the role of the physicist in studying those laws – is she becoming a mere interpreter of machine generated knowledge? The answer to these questions is by no means clear and depends on our preconceived notion of physical law. In this talk I point out how computer inferred physical laws pose a challenge to some traditional views of natural laws and how this affects the answer to the questions above.

N.B: This talk is complementary to the talk titled 'Machine learning and realism' which looks at automation in science from a physicist's perspective.

AGPhil 5.3 Do 18:30 GW2 B2900

Machine learning and realism — •Ryan Reece[1] and Nico Formanek[2] — [1]University of California, Santa Cruz (UCSC) — [2]Höchstleistungsrechenzentrum Stuttgart (HLRS)

Machine learning is bringing new methods for taming the torrents of big data facing today's scientific projects and businesses. Not only is machine learning bringing new ways of automating the processing of data, but also automating processes of making inferences on that data, including unsupervised classification, model selection, and model fitting (regression). We argue here that philosophers should be interested in these developments because they offer provocative ways of framing classic philosophical questions concerning the problem of induction, realism, and natural kinds, among others. Drawing on examples of uses of machine learning in particle physics analysis, we introduce and discuss the following questions: How does statistical hypothesis testing address the problem of induction? How can machine learning be used in statistical inference? Can the scientific method be automated? And if so, what does that imply about the objectivity of science? How is clustering related to natural kinds?

N.B.: This talk is complementary to the talk titled "The automated discovery of physical laws", which looks specifically at automated inference of physical laws.

AGPhil 6: Symposium: Epistemology of Big Data in Physics IV

Zeit: Freitag 10:30–12:30 Raum: GW2 B2900

AGPhil 6.1 Fr 10:30 GW2 B2900

Data science and explanatory power — •Sergey Titov — Institute of Philosophy, Russian Academy of Sciences, Moscow

The analysis-available data has grown immensely in the past decades, it has lead us to the new type of research called "data-intensive". This research design mostly relies on vast amounts of data and use of complicated (commonly non-parametric) statistics. Such data analysis techniques show impressive results in predicting phenomena or it*s characteristics (for example, climat models) but suffer from serious loss in explanatory power (Calude & Longo, 2015). In some cases, models which are generated by nonparametric methods on given data are so complex, that it is nearly impossible to understand its structure. This problem is contemplated from philosophical and mathematical points of view. From philosophy's standpoint authors provide new structures of science which either take data-intensive research into account (Pietsch, 2015) or are fully based on it (Napoletani & Panza, 2011). Second approach attempts to explore mathematical foundations of this loss in explanation power. Calude and Longo in their work (Calude & Longo, 2015) use Ramsey theory and demonstrate that some of the patterns found in data-intesive research may be caused only by size of dataset and nothing else.

This work gives all-round view on this problem and tries to analyse some of the data-intensive researches in the manner described above.

Hauptvortrag AGPhil 6.2 Fr 11:00 GW2 B2900

Causation, probability and all that: Data science as a novel inductive paradigm — •Wolfgang Pietsch — Munich Center for Technology in Society, TU München, Germany

Some have claimed that genuine data science is impossible since inductivism has allegedly long been refuted as a sound scientific methodology. Instead, I argue that data science stands in an old and venerable empiricist tradition which includes highly influential scientists and methodologists like Francis Bacon, Isaac Newton or John Stuart Mill. An inductive methodology is sketched that could serve as a fundamental conceptual framework for data science. On this basis, I disentangle the conceptual muddle behind the claim that correlation replaces causation in data science, which is often held to be one of the central tenets in this discipline. By contrast, causation remains the crucial concept to distinguish between meaningful and accidental correlations, i.e. between those that allow for prediction and manipulation and those that do not.

Hauptvortrag AGPhil 6.3 Fr 11:45 GW2 B2900

Do the Beads Still Need a String? Old and New Challenges for Turning (Big) Data into Evidence — •Johannes Lenhard — University of Bielefeld

How are data turned into evidence? Finding answers to this question is a central endeavour of epistemology and methodology of the sciences. One classic 19th century locus is the dispute between John Stuart Mill and William Whewell about the nature of scientific knowledge. Does it grow with the amount of data available, or is it of a general character that is based on something different than data? Whewell remarked that collecting observational data is not sufficient, since *the beads still need a string.

Recent claims about data-driven research (DDR) seem to challenge this viewpoint. DDR allegedly heralds a new paradigm in which the data themselves can replace also the string.

My talk critically assesses recent disputes and claims about DDR and big data. One strategy is by historical comparison to earlier, pre-computer examples.

AGPhil 7: Alternative Ansätze I

Zeit: Mittwoch 9:30–10:30 Raum: GW2 B2900

AGPhil 7.1 Mi 9:30 GW2 B2900

A physical-ontologic view of being "To be or not To be" — •Sadler Norbert — Wasserburger Str, 25a ; 85540 Haar

"In the beginning was the symmetry and the symmetry was broken and the gravitation and the bright physical reality got energent and created for us".

At the "genesis of the universe" the fundamental entities and elements as the cosmic energy density distributation, the natural constants, the elementary particles and fields were not primary.

Ontologic primary was the CP-infraktion of the E8-symmetry group at the generation of two bright baryonic energy equivalents (2 x 4.6%) bright matter energy)in the mutual gravitative reflection; ontologic "To be".

"(To be")=4Pi x alfa(QED)=2 x Omega(bar.energ.density 4.6%).

Further Information: www.cosmology-harmonices-mundi.com

AGPhil 7.2 Mi 10:00 GW2 B2900

***Experimentally proven*: An argument used to justify mythological concepts and entities.** — •Osvaldo Domann — Stephanstr. 42, D- 85077 Manching

Established theoretical models were adapted over time introducing fictitious entities to explain new experimental data that didn*t fit with the prevailing theory. Examples are gluons, gravitons, dark matter, dark energy, time dilation, length contraction, etc. The result is a monumental patchwork without a strict internal logical structure and with paradoxes. A very often used argumentation to justify mythological entities is that they are experimentally proven, based on measurements which indirectly show consistency with the characteristics that were previously assigned to the mythological entities. The argument *Experimentally Proven* avoids that new models build on well proven physical interaction laws are pursued by scientists, models which can explain the new experimental data without fictitious entities. Fictitious concepts or entities can be the result of mathematical approaches (time dilation) or are directly introduced with the required characteristics (dark matter) to explain the new experimental data that doesn*t fit. This shows the necessity to recognise when the argument *Experimentally Proven* is a real justification or simply a fallacy to justify mythological concepts. More at www.odomann.com

AGPhil 8: Alternative Ansätze II

Zeit: Mittwoch 14:00–16:00 Raum: GW2 B2900

AGPhil 8.1 Mi 14:00 GW2 B2900

Die Rolle von Prinzipien und Symmetrien in der Physik — •Albrecht Giese — Taxusweg 15, 22605 Hamburg

Die heutige theoretische Physik ist bestimmt von Prinzipien und Symmetrien.

Diese Vorgehensweise ist jedoch nicht wirklich neu, sondern wurde im Grundsatz vom Philosophen Plato entwickelt. Sie wurde später von Newton ersetzt durch den Bezug auf tiefer liegende Gesetze. Die Verallgemeinerung dieser Vorgehensweise ist das reduktionistische Weltbild, welches die Grundlage des heutigen Wissenschaftsverständnisses ist.

Vor etwa einem Jahrhundert, in der Zeit der Neuorientierung durch Relativitätstheorie und Quantenmechanik, entstand daneben eine Rückbesinnung auf den platonischen Ansatz, der - vor allem gefördert durch Heisenberg - bis heute die sog. "moderne Physik" beherrscht.

Es ist die Frage zu stellen, ob dieser Bezug auf Prinzipien und Symmetrien hilfreich ist oder gar notwendig. Dazu werden Beispiele aus Relativitätstheorie und Quantenmechanik vorgestellt, welche zeigen, welchen Weg die Physik hätte nehmen können, wenn sie bei Newtons Reduktionismus geblieben wäre.

AGPhil 8.2 Mi 14:30 GW2 B2900

Die gesicherten Befunde zur Gravitation und Kosmologie — •Helmut Hille — Heilbronn, Fritz-Haber-Strasse 34

"Gerade in Zeiten, in denen die Physik nicht einmal fünf Prozent des Universums zu beschreiben scheint, während der Rest im Dunklen liegt, kann es lohnen, die Grundlagen einer Wissenschaft auf den Prüfstand zu stellen und zu revidieren." (Meinard Kuhlmann, Juni 2016 im "Physik Journal") * Bevor man damit beginnt, halte ich es für wichtig sich klar zu machen, was es abseits aller Ideologie und Hypothesen an gesicherten Befunden zur Gravitation und Kosmologie heute bereits gibt. Wie ich zeigen kann, dürften diese Befunde und ihre Konsequenzen ausreichend sein, um mit Hilfe der Quantenphysik, deren Potential nutzend, ein kosmologisches Weltbild von großer Einfachheit, Klarheit und Schönheit zu entwerfen. Auf diesem Weg wird durch die Quantenphysik die Einheit der Physik wieder hergestellt und der Stillstand in der Theoretischen Physik überwunden, den der amerikanische Physiker Richard Feynman "die Melancholie des 20. Jahrhunderts" nannte.

AGPhil 8.3 Mi 15:00 GW2 B2900

Aufbau und Funktion der Welt — •Klaus Hofer — Campus Bielefeld

Die Geheimnisse des Universums und des Lebens zu lüften, prägen das Sinnen und Trachten der Menschheit seit Anbeginn. Aufgrund ihres niedrigen Wissenstandes konnten unsere Vorfahren allerdings keine plausiblen Erklärungen auf ihre existentiellen Fragen finden, weshalb sie sich Abertausende Götter und Paradiese im Jenseits erfunden haben. Aus heutiger Sicht hingegen stellt sich unsere Welt als eine gigantische Verwebung kleinster energiegeladener Massefäden (Strings) dar, welche über ihre rhythmischen Bewegungen Informationen austauschen und damit alles Stoffliche um uns herum bestimmen. Diesem komplexen Zusammenspiel von Energie, Masse und Information liegt die Handschrift der Evolution zugrunde, welche die Strukturierung von Materie ebenso bestimmt wie die Codierung von Lebensformen aller Art. Dieser Beitrag zeigt, dass unser Kosmos alles andere als ein chaotischer, brodelnder Sternenhaufen ist, sondern auf allen Evolutionsebenen von lebender Materie durchsetzt wird. Mit diesem erweiterten Blickwinkel ist die Existenz von Leben in und auf Atomen ebenso wahrscheinlich, wie außerirdisches Leben auf anderen Planeten oder wie ganze Galaxien und Universen als organische Lebewesen wachsen und sterben müssen. Selbstverständlich sind bei solch überdimensionalen Betrachtungen die Grenzen menschlicher Erkenntnisfähigkeit zu beachten. Denn alle unsere Aussagen zum Universum sind ebenso unscharf, wie die Beschreibung irdischer Gegenstände aus der Wahrnehmungsebene eines Atoms.

AGPhil 8.4 Mi 15:30 GW2 B2900

Ingredients for a worldview in which space-time is emerging out of something else — •Ewoud Halewijn — TU Delft, Netherlands

The development of new scientific models has been a critical enabler for changing worldviews, but never the only one. Stories have been instrumental too, telling society how these models relate to non-scientific observations and to existing fundamental convictions. This talk will provide an overview of three worldview changes, aimed at identifying ingredients for a worldview in which space-time is emerging out of something else, as is suggested in recent quantum gravity research. An overview will be given of ingredients used in three worldview changes: from flat to spherical earth, geocentric to heliocentric universe and from static to Big Bang based universe. Based thereon, suggestions will be given for ingredients of a worldview in which quantum gravity looks "normal". These include the use of Zeno's paradox to describe the uncertainty principle, Democritus void to describe non-locality and Parmenides "way of opinion" to describe the emergence of space-time. It will be shown that these ingredients, under some assumptions about the quantum gravity model, can be combined to a worldview that might be acceptable for a larger audience.