Overview of Invited Talks and Sessions
(Lecture room: SPA SR22)

Plenary Talks most notable for AGPhil

PV VI Wed 8:30– 9:15 Audimax Sharp versions of Heisenberg’s error-disturbance trade-off — •Reinhard Werner
PV IX Wed 20:00–21:00 Audimax Wege durch die Quantenwelt – neue Experimente zur Welle-Teilchen Dualität massiver Materie — •Markus Arndt
PV XIV Fri 9:15–10:00 Audimax Quantum networks based on diamond spins: from long-distance teleportation to a loophole-free Bell test — •Ronald Hanson

Invited Talks

AGPhil 2.4 Wed 18:00–18:45 SPA SR22 Properties Are ... — •Antigone Nounou, Harris Anastopoulos
AGPhil 4.1 Thu 14:00–14:45 SPA SR22 Quantum Flesh on Classical Bones: Semiclassical Bridges across the Quantum-Classical Divide — •Alisa Bokulich
AGPhil 5.1 Thu 16:15–17:00 SPA SR22 Entropy, entanglement and utility — •Jos Uffink
AGPhil 5.2 Thu 17:00–17:45 SPA SR22 Collapsing to classicality: on the ontology of dynamical collapse theories — •Wayne C. Myrvold
AGPhil 6.1 Fri 10:15–11:00 SPA SR22 Asymptotic theory reduction, spontaneous symmetry breaking, and the measurement problem — •Klaas Landsman

Invited talks of the joint symposium SYQC
See SYQC for the full program of the symposium.

SYQC 1.1 Thu 10:30–11:00 Audimax Experimental tests of quantum macroscopicity — •Markus Arndt
SYQC 1.2 Thu 11:00–11:30 Audimax From classical instruments to quantum mechanics and back — •Reinhard F. Werner
SYQC 1.3 Thu 11:30–12:00 Audimax Correlations and the quantum-classical border — •Dagmar Bruss, Alexander Sretlso, Hermann Kampermann
SYQC 1.4 Thu 12:00–12:30 Audimax Why Physics Needs a Classical World...and How It Can Get One — •Tim Maudlin

Sessions

AGPhil 1.1–1.4 Wed 14:00–16:00 SPA SR22 Wissenschaftstheoretische Perspektiven
AGPhil 2.1–2.4 Wed 16:30–18:45 SPA SR22 Quantum-Classical Divide I
AGPhil 3.1–3.4 Thu 10:30–12:30 Audimax Symposium Quantum-Classical Divide
AGPhil 4.1–4.3 Thu 14:00–15:45 SPA SR22 Quantum-Classical Divide II
AGPhil 5.1–5.4 Thu 16:15–19:00 SPA SR22 Quantum-Classical Divide III
AGPhil 6.1–6.5 Fri 10:15–13:15 SPA SR22 Quantum-Classical Divide IV
AGPhil 7.1–7.6 Fri 14:15–17:30 SPA SR22 Quantum-Classical Divide V
AGPhil 8.1–8.2 Fri 17:30–18:30 SPA SR22 Classical Electrodynamics
Mitgliederversammlung der Arbeitsgruppe Philosophie der Physik

Donnerstag 19:15–20:00  SPA SR22

- Bericht
- Wahl
- Planung 2014/15
- Verschiedenes
Die physikalische Welt und mögliche Welten — Johannes Thürigen — Albert Einstein Institute, Potsdam, Germany

The idea of the absolute space had been introduced by Newton in the 1680s to combat Cartesian relativism and to establish the laws of mechanics. The complete theory was eventually published in the Principia by 1687. Already in the 1670s, Leibniz discussed, however, independently just the same model of the absolute space and absolute motion, but used it as a counterexample in order to confirm and improve Cartesian relativism and to demonstrate that "space and motion are really relations". Newton started from the position that "the nature of the body is to fill the place which is considered as a part of the space", i.e. the absolute space. In Leibniz’s anticipated reply from 1677 it is demonstrated that "space is not such a thing and motion is not something absolute", an assertion which he renewed and underlined later in his correspondence with Clarke in 1716. Leibniz’s earlier interpretation had been only published in the 20th century. It follows that the elaboration of the model of the absolute space is a decisive intermediate step towards a relational theory of space and motion. Thus, it can be concluded that Einstein’s summary from 1953 is in conformity with the historical development: "It required a severe struggle to arrive at the concept of independent and absolute space, indispensable for the development of theory. It has required no less strenuous exertions subsequently to overcome this concept – a process which is probably by no means as yet completed."

AGPhil 2: Quantum-Classical Divide I

AGPhil 2.1 Wed 16:30 — SPA SR22

Convergence in theories of quantum gravity? — Johannes Thürigen — Albert Einstein Institute, Potsdam, Germany

Theories in (empirical) science can be considered epistemically justified not only by empirical content but also by systematization power and uniformity. In the light of these concepts we present an analysis of the basic structure and intertheoretic relations of some approaches to quantum gravity each starting from quite different assumptions. These are -- Loop quantum gravity, Spin foams, Causal dynamical triangulations, Regge calculus and Group field theory. The aim of this analysis is to critically discuss an argument of physicists working on quantum gravity, stating that there is some kind of convergence of the mentioned approaches which (at least partially) justifies them. Such an argument would be of high relevance since neither the precise relation to the established theories (and thus the phenomena described by those) nor the derivation of original phenomena might be achievable in the foreseeable future, leaving uniformity as the only epistemological criterion in favor for them. We find that intertheoretic relations can be found mainly at the level of the conceptual framework of the theories, rather than regarding the actual dynamical laws. Therefore a weaker notion of theory relation is needed. The recent concept of theory crystallization is a good candidate and we analyze to what extent the approaches to quantum gravity meet its conditions.

AGPhil 2.2 Wed 17:00 — SPA SR22

On the Significance of the Gottesman-Knill Theorem — Michael Cufarho — Ludwig-Maximilians-Universität München, Munich Center for Mathematical Philosophy, München, Deutschland

This paper addresses the question of the quantum-classical divide from the perspective of quantum computation, as well as the relevance of this for our understanding of the limitations of local hidden variables theories, and thus for our understanding of the quantum-classical divide more generally. According to the Gottesman-Knill theorem, quantum algorithms utilising operations chosen from a particular restricted set are efficiently simulable classically. Since some of these algorithms involve entangled states, it is commonly concluded that entanglement is not sufficient to enable quantum computers to outperform classical computers. It is argued in this paper, however, that what the Gottesman-Knill theorem shows us is only that if we limit ourselves
to the Gottesman-Knill operations, we will not have used the entangle-
ment with which we have been provided to its full potential, for
all of the Gottesman-Knill operations are reducible
in a local hidden variables theory. It is further argued that consid-
ing the Gottesman-Knill theorem is illuminating, not only for our
understanding of quantum computation, but also for our understand-
ing of what we take to be a plausible local hidden variables theory, as
well as for our understanding of the relationship between all-or-nothing
inequalities such as GHZ, and statistical inequalities such as CHSH.

AGPhil 2.3 Wed 17:30 SPA SR22
Quantum and Classical Computation: Foundational Issues
besides the Speed-up — Filippo Annovi — Department of Phi-
losophy, University of Bologna, Italy
The divide between quantum and classical computation does not con-
cern which tasks can be performed, but the amount of resources nec-
essary to achieve them. Does this entail that the computational divide
is only relevant from a practical point of view, but not from a founda-
tional one? No, because both the formal structure of quantum comput-
ers (based on the properties of Hilbert spaces) and the physical tools
used by them (e.g. entangled states) are not classically available, thus
the differences between quantum and classical computation go beyond
completeness questions: the divide would remain in place even in the
extremely unlikely case that the discovery of new classical algorithms
were to nullify the quantum speed-up.
Moreover, there exist alternative equivalent models of quantum com-
putation, some of which, like the cluster-state model, make an essential
use of classical resources. Then, while the “where does the quantum
speed-up come from?” question can satisfactorily receive a different an-
swer for each model, the “where does the quantum-classical computa-
tional divide lie?” question requires an unified answer. This could be
the first step towards a “representation theorem” for quantum com-
putation, which would turn out to be very fruitful for the debate over
the foundations of quantum mechanics.

Invited Talk
AGPhil 2.4 Wed 18:00 SPA SR22
Properties Are ... — Antigone Nounou1 and Harris Anastopoulos2 — University of Athens, Athens, Greece — 2University of Patras, Patras, Greece
The object of this paper is the notion of property and its objective is
to study the different nuances that manifest as we transition from the
classical to the quantum. Of the many questions that might—in our
view need—be addressed, only one has been discussed thus far, namely
whether properties in non-relativistic QM can be viewed as categorical
or dispositional but the answers have been given in the context of par-
ticular interpretations only. The dispositional-categorical distinction
constitutes the backdrop of the present discourse also as it bears on a
more comprehensive discussion of the metaphysics of quantum physics
and the question whether QM is amenable to a Humean construal or
not. Given the nature of quantum probabilities and the possibility
of entangled states, we acknowledge that in order to be able to talk
about properties of microscopic systems (presumed determinate and
single-valued) additional elements are required, such as the Copen-
hagen inspired mechanisms for wavefunction collapse, Bohmian pilo-
weaves or GRW spontaneous localizations. Committing to any one of
them implicates the adoption of a certain interpretation or rendition
of the QM formalism and this has an effect on how properties can be un-
derstood. But by offering as exhaustive an analysis as we possibly can,
we attempt to propose a satisfactory general account of how quantum
properties may be understood in the context of non-relativistic QM.

AGPhil 3: Symposium Quantum- Classical Divide

Time: Thursday 10:30—12:30

Invited Talk
AGPhil 3.1 Thu 10:30 Audimax
Experimental tests of quantum macroscopicity — Markus Arndt — Faculty of Physics, VCU, University of Vienna, Boltzmanngasse 5, A-1090 Vienna, Austria
Quantum physics is often said to be the theory of the microscopic world, whereas classical physics is associated with our macroscopic ex-
perience. But what is actually the criterion for an experiment to be
microscopic or macroscopic [1]? Are quantum superposition and coher-
ence limited to small systems, in size, particle number, mass, state sepa-
ration in real or phase space? We suggest that experimental matter-
experience. But what is actually the criterion for an experiment to be
world, whereas classical physics is associated with our macroscopic ex-
périence. But what is actually the criterion for an experiment to be


Invited Talk  
AGPhil 4.1 Thu 14:00 SPA SR22  
Quantum Flesh on Classical Bones: Semiclassical Bridges across the Quantum-Classical Divide — ●Alisa Borulich — Center for Philosophy and History of Science, Boston University, Boston, MA, USA

Traditionally quantum mechanics is viewed as having made a sharp break from classical mechanics, and the concepts and methods of these two theories are viewed as incommensurable with one another. A closer examination of the history of quantum mechanics, however, reveals that there is a strong sense in which quantum mechanics was built on the backbone of classical mechanics. As a result, there is a considerable structural continuity between these two theories, despite their important differences. These structural continuities provide a ground for semiclassical methods in which classical structures, such as trajectories, are used to investigate and model quantum phenomena. After briefly tracing the history of semiclassical approaches, I will show how current research in semiclassical mechanics is revealing new bridges across the quantum-classical divide.

AGPhil 4.2 Thu 14:45 SPA SR22  
Umdeutung: The Development of Quantum Mechanics as a Process of Reinterpretation. — ●Christoph Lehner — Max-Planck-Institut für Wissenschaftsgeschichte, Berlin

In 1925, Werner Heisenberg famously entitled his first paper on what was soon to be known as matrix mechanics "On the quantum theoretical reinterpretation (Umdeutung) of kinematic and mechanical relations." In my talk, I will analyze the centrality of this reinterpretation for the development of the new theory and for understanding the relation of matrix to classical mechanics. I will also consider the development of wave mechanics by Erwin Schrödinger in 1926 and analyze it as a parallel process of reinterpretation.

I will argue that this model offers a more realistic picture of the change of foundational theories than Kuhn’s model of paradigm change.

AGPhil 4.3 Thu 15:15 SPA SR22  
Experimental tests of the quantum superposition principle — ●Hendrik Ulbricht — Physics and Astronomy, University of Southampton, Southampton S017 1BJ, United Kingdom

New technological developments allow to explore the quantum properties of very complex systems, bringing the question of whether also macroscopic systems share such features, within experimental reach.

The interest in this question is increased by the fact that, on the theory side, many suggest that the quantum superposition principle is not exact, departures from it being the larger, the more macroscopic the system. Testing the superposition principle intrinsically also means to test suggested extensions of quantum theory, so-called collapse models. We will report on three new proposals to experimentally test the superposition principle with nanoparticle interferometry, optomechanical devices and by high resolution spectroscopy.

Invited Talk  
AGPhil 5.1 Thu 16:15 SPA SR22  
Entropy, entanglement and utility — ●Jos Uffink — Department of Philosophy, University of Minnesota, Minneapolis, MN, USA

This talk explores a formal analogy between the study of entanglement in quantum theory, entropy in classical thermodynamics, and utility in decision theory. Roughly speaking, I will argue that in all three cases, the mathematical problem arises of finding and characterizing those functions that respect a given pre-ordering relation, subject to certain auxiliary conditions. Moreover, theorems have been obtained in these three separate areas that might be applied to them in common. It is my main purpose to draw attention to these analogies, and argue how they might be useful in thermodynamics and quantum theory.

Invited Talk  
AGPhil 5.2 Thu 17:00 SPA SR22  
Collapsing to classicality: on the ontology of dynamical collapse theories — ●Wayne C. Myrvold — Department of Philosophy, University of Western Ontario, London, ON, Canada

Dynamical collapse theories are intended to yield, at the macroscopic level, a world of objects that act appropriately like classical objects. There has been extensive discussion of late about the ontology appropriate to collapse theories, much of it focused on the question of whether the wave function needs to be supplemented by primitive ontology that goes above and beyond the wave function. This paper will examine the question: "What does it take to be an object?" and will argue for the claim that collapse theories can yield a world of classical objects, with nothing other than wave functions, properly construed.

15 min. break

AGPhil 5.3 Thu 18:00 SPA SR22  
Physical Reality, Explanation and the Nomological Interpretation of the Wave Function — ●Federico Laudisa — Department of Human Sciences, University of Milan-Bicocca, Piazza Ateneo Nuovo 1, 20126 Milan, Italy

One of the most controversial issues in the area of the foundations of quantum mechanics is the status of the wave function. According to a recent result, denying the wave function a certain degree of reality leads to contradictions with quantum predictions (Pusey, Barrett, Rudolph 2012); the PBR result, however, gives no hint as to what a wave function is supposed to mean as ‘part of reality’. In the present talk, I will turn to the nomological interpretation of the wave function according to the Bohmian mechanics (Goldstein, Zhang 2013). In order to investigate its status and to see whether it can make justice to the role of the wave function in quantum mechanics, I will rely on two points: 1) the reading of the ‘nomological’ according to the primitivist approach to laws (Maudlin 2007); 2) the defense of the claim according to which a nomological entity can be part of the natural world even if it is not a concrete and causally efficacious entity (Psillos 2011). Finally, on the basis of the above reading of the nomological role of the wave function, we will see whether this claim can also bring to bear on its explanatory virtue (Lange 2013).

AGPhil 5.4 Thu 18:30 SPA SR22  
The Role of the Wave Function in the GRW Matter Density Theory — ●Matthew Egg — University of Lausanne, Switzerland

Every approach to quantum mechanics postulating some kind of primitive ontology (e.g., Bohmian particles, a mass density field or flash-like collapse events) faces the challenge of clarifying the ontological status of the wave function. More precisely, one needs to spell out in what sense the wave function “govers” the behaviour of the primitive ontology, such that the empirical predictions of standard quantum mechanics are recovered. For Bohmian mechanics, this challenge has been addressed in recent papers by Belot (Eur. J. Phil. Sci. 2 (2012), 67-83) and Esfeld et al. (Brit. J. Phil. Sci. forthcoming, doi:10.1093/bjps/axt019). In my talk, I attempt to do the same for the matter density version of the Ghirardi-Rimini-Weber theory
about how we could come to express the physical differences those of the permutation arguments of Quine and Putnam to raise concerns it is epistemically undetectable. Then, I consider a novel adaptation

This paper looks at how ideas from the philosophy of language can symmetries and the philosophy of language

15 min. break

AGPhil 6.2 Fri 11:00 SPA SR22
In search of a primitive ontology for relativistic quantum field theory — ●VINCENT LAM — University of Lausanne, CH-1015 Lausanne, Switzerland

There is a recently much discussed approach to the ontology of quantum mechanics according to which the theory is ultimately about entities in 3-dimensional space and their temporal evolution. Such an ontology postulating from the start matter localized in usual physical space or spacetime, by contrast to an abstract high-dimensional space such as the configuration space of wave function realism, is called primitive ontology in the recent literature on the topic and finds its roots in Bell’s notion of local beables. The main motivation for a primitive ontology lies in its explanatory power: the primitive ontology allows for a direct account of the behaviour and properties of familiar macroscopic objects. In this context, it is natural to look for a primitive ontology for relativistic quantum field theory (RQFT).

The aim of this talk is to critically discuss this interpretative move within RQFT, in particular with respect to the foundational issue of the existence of unitarily inequivalent representations. Indeed the proposed primitive ontologies for RQFT rely either on a Fock space representation or a wave functional representation, which are strictly speaking only unambiguously available for free systems in flat spacetime. As a consequence, it is argued that these primitive ontologies constitute only effective ontologies and are hardly satisfying as a fundamental ontology for RQFT.

15 min. break

AGPhil 6.3 Fri 11:45 SPA SR22
Symmetries and the philosophy of language — ●NEIL DEWAR — University of Oxford, Oxford, UK

This paper looks at how ideas from the philosophy of language can shed light upon the conceptual significance of symmetries in physics. I begin by reviewing and summarising the case in the literature for believing that unless a quantity is invariant under such symmetries, it is epistemically undetectable. Then, I consider a novel adaptation of the permutation arguments of Quine and Putnam to raise concerns about how we could come to express the physical differences those quantities supposedly signify. This argument also helps to clarify the structure of those permutation arguments, and plausibly provides a clearer example than those considered by Quine and Putnam.

Finally, I turn to the question of what we should say instead. I reject the consensus view that we must seek an alternative theory in which those quantities do not figure; rather, I claim, it is appropriate simply to stipulate that the theory is to be interpreted so that such models are taken to represent the same physical state of affairs. The remainder of the paper is given over to a defence of this claim against objections; and in particular, to exploring an intriguing analogy between models related by a symmetry transformation and synonymous sets of sentences.

AGPhil 6.4 Fri 12:15 SPA SR22
On the Invariance Principle — ●THOMAS MOLLER-NIELSEN — University of Oxford (graduate student), UK

Physicists and philosophers have long claimed that the symmetries of our physical theories — roughly speaking, those transformations which map solutions of the theory into solutions — can provide us with genuine insight into what the world is really like. According to this ‘Invariance Principle’, only those quantities which are invariant under a theory’s symmetries should be taken to be physically real, while those quantities which vary under its symmetries should not. Physicists and philosophers, however, are generally divided (or, indeed, silent) when it comes to explaining how such a principle is to be justified. In this paper, I attempt to spell out some of the problems inherent in other theorists’ attempts to justify this principle, and sketch my own proposed general schema for explaining how — and when — the Invariance Principle can indeed be used as a legitimate tool of metaphysical inference.

AGPhil 6.5 Fri 12:45 SPA SR22
The Internal/External Distinction in the Light of Supersymmetry — ●RADIN DARDASHI — Munich Center for Mathematical Philosophy, Munich, Germany

Several physicists in the 1960s tried to combine internal symmetries with external or spacetime symmetries in a non-trivial way leading to many theorems culminating in the famous Coleman-Mandula theorem of 1967. The theorem proves the impossibility, under certain physical and mathematical assumptions, of combining internal and spacetime symmetries in any but the trivial way, i.e. as a direct product. However, allowing for spinorial generators one can generalize the theorem (Haag-Lopuszanski-Sohnius theorem) leading to Supersymmetry as the only possible extension of the algebra. Although the result is mathematically clear one finds many differing statements regarding the interpretation and consequence of this result for the relation between internal and external symmetries.

We will discuss both the historical and conceptual issues involved in the discussion of the internal/external distinction in the light of supersymmetry and its relevance for the philosophy of physics literature on symmetry.

AGPhil 7: Quantum-Classical Divide V

Time: Friday 14:15–17:30

AGPhil 7.1 Fri 14:15 SPA SR22
Big bang causality as quantum-classical transition — ●RÜDIGER VAAS — bild der wissenschaft, Ernst-Mey-Str. 8, D – 70771 Leinfelden

Explaining the beginning of our universe is a delicate and difficult task, not only from a cosmological point of view, but also from an epistemological, conceptual, and philosophy of science perspective. To search for a causal explanation of the big bang could even be meaningless, if causality is understood only as a kind of regularity, or in terms of counterfactuals, interventionism, or (dispositional) perturbation pragmatism, or indeed just as a feature of human cognition (cf. Schaffer 2007, Hüttemann 2013). My talk argues that a physical notion of causality — if any — associated with a transfer of conserved quantities such as energy or momentum (as proposed, e.g., by Salmon 1998, Dowek 2007, 2009) is needed for a causal big bang explanation, and that this is consistent with at least some recent big bang models in physical cosmology. This is closely related to the hypothesis of a cosmological
origin of the arrow(s) of time, i.e. irreversibility. If pseudo-beginning models are correct – in contrast to models of an absolute beginning of time or a past-eternal time –, the big bang can be causally explained as a quantum fluctuation within a time-reversible quantum vacuum, creating quasi-classicality along with an arrow of time. My talk argues that such models can be interpreted in the framework of physicalistic causation mentioned above. However, there could be a paradox lurking here: If the big bang created causality and classicality in the tic causation mentioned above. However, there could be a paradox that such models can be interpreted in the framework of physicalistic causation mentioned above. However, there could be a paradox lurking here: If the big bang created causality and classicality in the first place, how can it itself have a causal and classical explanation? – L. Mersini-Houghton, R. Vaas (eds.): The Arrows of Time. Springer, 2012.

AGPhil 7.2 Fri 14:45 SPA SR22
The Quantum-Classical Divide and the Kochen-Specker Theorem: A Case for the Nonlocality of Time? — Martin Schüle — IHST, 13, rue du Four 75006 Paris

In quantum physics, the properties of two systems can exhibit long-range correlations although there is no direct contact between the systems. Bell's analysis of the situation led to his famous no-go theorem which says that it is not possible to introduce additional variables that would explain these correlations. The additional variables must thereby satisfy certain intuitive constraints such as "locality". The impossibility of such a "hidden" or additional variable theory thus firmly established the issue of nonlocality in physics and philosophy of physics, which may be seen as a central characteristic of the quantum-classical divide.

In my contribution, I will discuss the no-go theorem by Kochen and Specker and claim that it is in a certain sense more fundamental than Bell's theorem, providing some evidence that Bell's theorem is historically and conceptually based on the Kochen-Specker theorem. Interpreted this way, the Kochen-Specker theorem does not only allow for a Bell-type argument implying nonlocality in space, but possibly also "nonlocality" in time, that is, correlations between time-like separated events that cannot be causally connected. I will then discuss some experimental evidence of this "nonlocality" and its conceptual and philosophical implications.

AGPhil 7.3 Fri 15:15 SPA SR22
Decoherence and the Many Worlds Interpretation — Carsten Thomas Wegelt — University, Bonn, Germany

The theory of decoherence gives us a good account (at least for open systems) of how classical properties emerge from the quantum world. Recent experiments based on decoherence offers strong arguments against the quantum-classical division proposed by the early Copenhagen Interpretation.

But even if decoherence may support the view that quantum mechanics can be considered as fundamental theory the question remains if this sheds new light to the question of how a realistic interpretation of quantum theory can be achieved? In the last years proponents of decoherence pointed out that the theory fits perfectly into the framework of many worlds interpretations. (Zurek 2003, Wallace 2012).

The question that I will address is, in what sense these interpretations can be considered as realistic interpretations? To answer this question I will argue that in the context of decoherence we have strong reasons to interpret quantum states in a realistic sense. A problem for many worlds interpretations arises when the meaning of Everett's relative states is considered since these interpretations strongly depend on the interpretation of relative states. I will show that einselection proposed by the decoherence theory will determine Everett's relative states in an objective sense but these states must be interpreted as epistemic states. I will conclude that this ambiguity between realistic interpreted quantum states and epistemic relative states limits the strict realistic character of many worlds interpretation.

AGPhil 7.4 Fri 15:45 SPA SR22

AGPhil 7.5 Fri 16:30 SPA SR22
The quantum-classical divide understood in terms of Bohm's holographic paradigm — Vera Matarese — The University of Hong Kong, Hong Kong

This paper aims to interpret the problem of the quantum-classical divide following Bohm's holographic model and to reformulate it as an indication of a new physical order.

First of all I will briefly outline the differences between the classical world and the quantum one (such as locality against nonlocality, determinism against indeterminism and continuity against discontinuity); then I will claim that in order to understand the divide between the two domains we should start from what is common, and regard them as two abstractions and limiting cases of a general theory.

In particular, following Bohm, I will show that the central notion of this new theory is an undivided whole characterized by a general order consisting of a holomovement from an implicate order - the quantum domain - to an explicate order - in the classical domain. This part will be explained with the aid of the structure of the hologram and will be supported by a reflection on some key terms such as 'order', 'structure', 'implicate' and 'explicate'.

Finally I will propose that this movement of unfoldment and enfoldment can explain the apparent incompatibility of the two physical domains and the passage from one to the other.

AGPhil 7.6 Fri 17:00 SPA SR22

We discuss the consequences it has for classical physics if one includes the measuremen process in the theory. The terms measurement and error thereof are explained and it is argued that every measurement can be reduced to a measurement of position and/or time. The statement that every measurement carries a finite inaccuracy implies that, also in classical mechanics, only probabilistic predictions are possible. Hence we find a similarity between classical and quantum physics that is mostly misconceived: By including measurements in the theory itself, one can view the former exactly like the latter as an indeterministic theory, as well as both theories can be formulated deterministically without including measurements.

AGPhil 8: Classical Electrodynamics

Time: Friday 17:30–18:30

AGPhil 8.1 Fri 17:30 SPA SR22
The Elimination of Fields in Classical Physics — Mario Hutter — University of Lausanne, Switzerland

Newtonian Mechanics was originally formulated as an action-at-a-distance theory. With the advent of electrodynamics in the 19th cen-
AGPhil 8.2 Fri 18:00 SPA SR22

The radiation arrow of time is not a statistical arrow —
- WOLFGANG PIETSCH 1 and MATTHIAS FRISCH 2 — TU München, Germany — 2University of Maryland, College Park, USA

We comment on the debate concerning the radiation arrow of time in classical electrodynamics starting with the Ritz-Einstein debate at the beginning of the 20th century up to more modern considerations involving among others Earman, Rohrlich, and Frisch. We first identify and distinguish several asymmetries, which have often been confused: between retarded and advanced fields, retarded and advanced poten-
tials, converging and diverging fields, converging and diverging poten-
tials, converging and diverging electromagnetic waves. Furthermore, a crucial issue regards whether we consider point or extended charges as sources. Some, but by no means all of these asymmetries can be shown to coincide. Various reasons are discussed for a non-statistical asym-
metry concerning the way potentials or fields are generated by point charges or point charge elements. Most importantly, the main clas-
sical derivations of the radiation reaction either presuppose retarded solutions and would yield wrong results using advanced solutions or at least presuppose an asymmetric role for retarded and advanced poten-
tials. The usual counterarguments are shown to employ other notions of symmetry that are compatible with the described non-statistical asymmetry, which by the way was already identified a century ago by Walther Ritz.

AGPhil 9: Alternative Ansätze I

Time: Tuesday 14:00–16:00

AGPhil 9.1 Tue 14:00 SPA SR22

Grenzen menschlicher Erkenntnis — PROFESSOR DR. KLAUS HOFER — Uni Bielefeld

Trotz unseres hohen Wissensstands über die evolutionäre Verwech-
zung von Energie, Masse und Information zu Materie und Leben kommen
unsere Vorstellungen zum Mikro- und Makrokosmos über Theorien und
Spekulationen nicht hinaus. Dies gilt bei der Erforschung des Weltalls
mit riesigen Teleskopen und Raumsonden ebenso wie bei der Spal-
tung von Nukleonen mit überdimensionalen Teilchenbeschleunigern.
Ein Grund dafür liegt in den gewaltigen technischen und finanziellen
Anstrengungen, die heutzutage schon für den kleinsten Erkenntnis-
zuwachs erforderlich sind. Und darum wird unsere aufwändige Suche
nach hypothetischen Gesteinssteinen und galaktischen Außerirdischen
auch weiterhin Unsummen verschießen, ohne tieferen Erkenntniss
vorzubringen. Dieser Beitrag will die Grenzen menschlicher Erkennt-
nisfähigkeit mittels der Relativität alles Stofflichen aufzeigen. Denn
aus evolutionärer Sicht sind wir Menschen codierte Massehaufen aus
c.a. 10 hoch 27 Atomen, die von einer übergeordneten Schwarmtelli-
genaus formatiert und gesteuert werden. Aus dieser begrenzten Codie-
 runghöhe des Menschen folgt, dass unsere Beobachtung der Galaxien
ebenso ungenau ist wie die Beschreibung von Gegenständen aus der
Wahrnehmungsebene eines Atoms. In beiden Fällen ist der Beobach-
ter ca. 10 hoch 23 mal kleiner als das Objekt und kann dieses lediglich
als einen ungeordneten und chaotischen Massenhimmel wahrnehmen. Sämtliche Zusammenhänge darüber hinaus sind für den Betrachter
nicht erkennbar.

AGPhil 9.2 Tue 14:30 SPA SR22

Physik in Literaturform — HELMUT HILLE — Fritz-Haber-Straße
34, 74081 Heilbronn

Dicker Wäler in einer schwer verständlichen Sprache sind wenig ge-
eignet, das Anliegen der Physik nicht nur den Laien verständlich zu
machen. Ich mache den Versuch, meine Überlegungen dem Publikum in
ihm vertrauter Literaturform und Sprache mitzuteilen. So veranschau-
liche ich im Feuilletonstil und auf einer Seite, was unter Verschränk-
ung von Nukleonen mit überdimensionalen Teilchenbeschleunigern.
Diese Eigenschaften müssen nicht als gegeben hingenommen werden,
sondern ergeben sich.

AGPhil 9.3 Tue 15:00 SPA SR22

Physik in Literaturform — HELMUT HILLE — Fritz-Haber-Straße
34, 74081 Heilbronn

Dicker Wäler in einer schwer verständlichen Sprache sind wenig ge-
eignet, das Anliegen der Physik nicht nur den Laien verständlich zu
machen. Ich mache den Versuch, meine Überlegungen dem Publikum in
ihm vertrauter Literaturform und Sprache mitzuteilen. So veranschau-
liche ich im Feuilletonstil und auf einer Seite, was unter Verschränk-
ung von Nukleonen mit überdimensionalen Teilchenbeschleunigern.
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AGPhil 10: Alternative Ansätze II

Time: Tuesday 16:30–18:00

AGPhil 10.1 Tue 16:30 SPA SR22

Beyond Quantum Gravity and Its GUT Extension: Problems
Still Open in Comprehending Our World — CLAUS BIRKHOLZ
— D-10117 Berlin, Seydelstr. 7

QG opens totally new horizons. Its group-theoretical approach is trig-
gering the theoretician to reconsider his aged arguments having led
into the current state of stagnation in fundamental physics. A "New
Physics" is avoiding the short-cuts of the old one.
The current string models "beyond" the "standard" model are blamed to be "irrelevant" for physics. QG/GUT are shown to represent "string" models as well, but working ones, in accord with experiment. Their "exotic" force type is suspected to trigger the creation of black holes and, possibly, new organic structures.

The Copenhagen interpretation is corrected to respect irreducibility. Then, physics will be totally deterministic, with its "parallel-world" scenarios becoming mere fiction.

The crucial new challenge is to reconcile "motion" with a static, deterministic world. A key role might play the human notion of a "memory", which is unilaterally directed towards past events.

For more information on QG and GUT see www.q-grav.com.

Physics of the Hilbert Book Model — Hans van Leunen — Heerbaan 6 Asten 5721LS Netherlands

The Hilbert Book Model is the name of a personal project of the author. The model is deduced from a foundation that is based on quantum logic and that is subsequently extended with trustworthy mathematical methods. What is known from conventional physics is used as a guideline, but the model is not based on the methodology of contemporary physics. In this way the model can reach deeper into the basement of physics. The ambition of the model is rather modest. It limits its scope to the lowest levels of the physical hierarchy. Thus fields and elementary particles are treated in fair detail, but composites are treated marginally and only some aspects of cosmology are touched. Still the model dives into the origins of gravitation and inertia and explains the diversity of the elementary particles. It explains what photons are and introduces a lower level of physical objects and a new kind of ultra-high frequency waves that carry information about their emitters. It explains entanglement and the Pauli principle. Above all the HBM introduces a new way of looking at space and time. Where contemporary physics applies the spacetime model, the HBM treats space and progression as a paginated model.

One interpretation for both Quantum Mechanics and General Relativity — Ewoud Halewijn — Voorburg, Netherlands

In reconciling General Relativity with Quantum Mechanics, it is challenging to resolve the combined mathematical equations and to find an interpretation that makes sense ontologically.

Such an interpretation has been developed by quantizing descriptive components in both the theories and other views. The resulting micro-components have been re-integrated within the scope of known gaps between science and the real world*. The odd peculiarities in these theories have been made look *normal* by fully untraditionally answering fundamental questions.

The interpretation is suggesting that we define time as a discrete operator and its eigenvalues as constraints on space-time manifolds, in order to reconcile the mathematical equations. Outside the mathematical arena we suggest reconsidering the concepts of Black Holes, the Big Bang, the epistemological problem of perception in philosophy and the supposed clash between scientific and the spiritual worldviews.

It is concluded that developing one consistent ontological interpretation for both theories is possible. It is a weird story, but it is making powerful suggestions for reviewing some of our fundamental convictions.