

# Research Proposal

Research Project “Properties”, submitted to the SNF

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Lengths of sections:

1. 1 page for Summary
2. 1 page for presentation of the project
3. 4 pages for subproject A, 1 for Summary, 0.25 for Schedule and Conclusion, 1.5 for each individual project
4. 4 pages for subproject B, 1 for Summary, 0.25 for Schedule and Conclusion, 1.5 for each individual project
5. 4 pages for subproject C, 1 for Summary, 0.25 for Schedule and Conclusion, 1.5 for each individual project
6. 3 pages for subproject D, 0.75 for Summary, 0.25 for Schedule and Conclusion, 1 for each individual project (we also have the full Boninchi project in the appendix)
7. 1 page for subproject E
8. 1 page for Conclusion
9. 2 pages for bibliography

## **Summary**

## **Presentation**

### **A network of young researchers**

In recent years, philosophy in Switzerland, especially in its French-speaking part, has known something like a 'boom'. Never have so many international philosophy conferences taken place, so many colloquia been organised, has the collaboration between researchers of different universities and fields have been so intense and its output as promising as in the last five or six years. As a result, Swiss philosophy has become much more widely known and appreciated than before.

This boost was mostly due to a network of young Swiss researchers, both within and outside Switzerland, many of which are collaborating in this project. In December 2003, they founded *sequitur*, the Swiss association of graduate students in philosophy ([www.sequitur.ch/sequitur.html](http://www.sequitur.ch/sequitur.html)), which has secured substantial financial support from the Beer Brawand foundation in Berne and organised a total of eight highly successful meetings, offering graduate students in Switzerland the opportunity to present their research to their peers. At different universities and often in close collaboration, PhD students started to organise graduate seminars. The graduate seminar in Geneva (cf. <http://www.asso-etud.unige.ch/phileas/>) has succeeded in obtaining more than 11000 CHF for a total of 25 talks during summer term 2006. An equally important rôle has been played by the development of *dialectica* ([www.dialectica.ch](http://www.dialectica.ch)), which has grown from a rather modest, low-key and 'local' journal capitalising on its glorious past into one of the (perhaps the) most important philosophy journal edited on the European continent. With the number of submissions doubling from 2003 to 2004, from again from 2004 to 2005, it has now reached an acceptance rate of 7%, which is only slightly higher than those of the best journals in the field. It has concluded a publishing contract with Blackwell Publishing ([www.blackwellpublishing.com/dialectica](http://www.blackwellpublishing.com/dialectica)) which allows it to invest considerable resources into the furthering of Swiss and European philosophy.

Despite its past successes and its promising future, this network established during the last years is now in danger of dissolution. Many of the key protagonists find themselves at a crucial stage in their career and confronted with the question of where to pursue it further. As the institutional situation at Swiss universities does not offer them many perspectives, there is a real danger of a brain-drain to the anglosaxon world. The proposed project aims at remedying this situation, offering a unique chance of institutionalising and tightening the successful collaboration of these young researchers, providing them with an opportunity to reinforce their ties with Switzerland, where they see their professional future.

### **Proposed collaboration**

The main aim of the project is to intensify and institutionalise the collaboration between the members of this network of young Swiss philosophers. As the following research proposals clearly show, the philosophical interests of the project members overlap considerably and they defend different, and sometimes conflicting, positions on a wide range of topics. Even more importantly, the project members have a shared past of intense and productive philosophical collaboration, and are very much interested in learning from each other. More even than in the single unifying topic, the project's cohesion lies in its members' mutual mutual interest and their willingness to engage in continued and intense philosophical exchange.

The collaboration will take place mostly at meetings where the project members present their research and learn from each others' comments and criticism. These meetings are of crucial importance to the research project's success and take a considerable part of its resources (almost 10 %). Regular interchange will also take place through an electronic forum, to be installed at the university of Fribourg.

Kevin Mulligan, the project leader, has a long history of directing successful research projects and an outstanding record of academic achievements. He is uniquely suited to guide and supervise the research of his younger colleagues, many of which he has known for a long time. As an established senior figure, he will take an active part in the achievement of the ambitious aims of the project and put it on a firm institutional and scientific footing. In this task, he will be assisted by a scientific supervisory board that further tightens the link between the research project and Swiss universities. NAMES

### **Benchmarks**

Within three years, the project aims at publishing a total of XX articles and two monographs. Such a considerable output is possible only because a considerable amount of work on the project has already been done, most importantly in the different dissertations project members are in the process of completing. These publications will not only boost the careers of the project's members, but also the international standing of Swiss philosophy.

# Subproject A: Metaphysics of Properties

researchers: Philipp Keller, Stephan Leuenberger

## Summary

The aim of the second part of the project is to clarify the debate about the modal profile of properties, and to connect it with other debates in metaphysics. The broad position advocated might be called “Profile Pluralism.” Put very simply, it says that the answer to the question whether properties have their roles essentially depends on what properties you are talking about, and what roles you are talking about. To spell that out as a plausible and non-trivial claim, new conceptual tools will have to be developed. Profile Pluralism is in opposition to certain versions of Structural Realism, which is a prominent topic of subproject B. It is to be assessed partly through its implications for various topics in metaphysics.

## The Exemplification Relation (Philipp Keller) Properties of Properties (Stephan Leuenberger)

### The State of the Debate

The nature of an individual, what it is, is often characterized by its modal profile. What I essentially am is captured by how I could have been like. Two questions need to be distinguished: First, are any properties necessary for me to be who I am? Second, are my properties sufficient for me to be who I am? Essentialism is characterized by a positive answer to the first question; and haecceitism by a negative answer to the second.

Questions about the nature of individuals are thus phrased in terms of properties. If we talk about properties, we implicitly recognize them as entities in their own right. Then it is natural to ask what their nature is. An answer to that question will appeal to their properties – properties of properties, or second-order properties. Examples abound: being a property; being identical to the property of being blue; being instantiated by Napoleon; being instantiated somewhere on the equator; being the cause of Rasputin’s death; obeying Newton’s laws; being my favourite property. If a property has any of these second-order properties, we can ask whether it has it necessarily.

Often a certain subclass of the properties that a property has in a given world is called its “role” in that world. Analogous to the case of individuals, essentialism is the view that a property has the same role in all worlds. Quidditism corresponds to haecceitism: it is the view that its role is not sufficient to determine what a property is.

Questions about essentialism and quidditism are of prime significance to metaphysics. It is typical of contemporary metaphysical theorizing to quantify over properties, and to use modal idioms. Combining these two things leads us straight into questions about the modal profile of properties.

It seems that in the contemporary debate, the main battle-line is between anti-essentialists and quidditists on the one side, and essentialists and anti-quidditists on the other. Combining essentialism with quidditism or anti-essentialism with anti-quidditism results in positions that are logically consistent, but do not seem to enjoy wide appeal among metaphysicians.

The most prominent contemporary representatives of the anti-essentialist-cum-quidditist camp are David Lewis (1986a: 162-163) (cf. also Lewis forthcoming) and David Armstrong (1989a: 44). The motivation is mainly metaphysical: distinct properties are distinct existences, and there ought to be no necessary connections between distinct existences. From this it seems to follow that an actual property could have played a different role (anti-essentialism), and, less obviously, that its actual role could have been played by a different property (quidditism).

Leading representatives of the essentialist-cum-anti-quidditist camp are Sydney Shoemaker (1980) and Chris Swoyer (1982). Part of their motivation is epistemological: if quidditism were true, we could not know what properties there actually are, because what we have epistemic access to are only their roles. The view is further motivated by a dose of irrealism about facts of transworld-identity: it appears mysterious how there could be something in virtue of which properties in different worlds are identical even if their roles are different; or in virtue of which properties are distinct even though they have the same role.

It is customary in this debate to distinguish between different types of roles. It is part of the causal role of being knife-shaped to cut bread in appropriate circumstances; it is part of the nomic role of charge to obey Maxwell’s equations; it is part of the locational role of being an electron to be instantiated in the outlying parts of atoms (Lewis forthcoming). However, though these distinctions are acknowledged, they typically do not play a crucial role in the debate.

### A Framework for Talking about Roles

The debate about properties and roles suffers from a lack of precision in the notion of a role. I propose a framework in which it can be made precise.

Second-order properties are abstractions from sentences with a free property variable; second-order relations are abstractions from sentences with a free relation variable. The question whether two properties can share their roles is elliptical as it stands. To have a determinate answer, it needs to be relativized to a class of open sentences. That class may be, for some language, the class of all open sentences in that language. A causal role can then be characterized

as a subset of all open sentences in a language in which “cause,” applicable to property terms, is the only non-logical expression. Analogously for functional roles and the expression “serves to.” A nomic role can be characterized as a subset of open versions of sentences expressing possible laws of nature.

The framework allows us to see that causal and nomic roles are just special cases. Any class of open sentences  $\Phi$  in any language specifies a type of role. The particular roles are just subsets of  $\Phi$ . A property  $P$  has  $\Phi$ -role  $\Psi$  in world  $w$  iff in  $w$ ,  $P$  satisfies  $X$ , for all  $X$  in  $\Psi$ , and does not satisfy  $Y$  for any  $Y$  in  $\Phi \setminus \Psi$ .

What I call the  $\Phi$ -repertoire of a property is the class that contains every  $\Phi$ -role that is played by the property in some world. Some questions about the modal profile of properties are better stated in terms of repertoires than in terms of roles. Further, the framework allows us to distinguish, in a precise way, the role of a property from its role relative to another property.

While the framework does not offer answers to substantive questions about what the role of a given property is, it facilitates discussion of such questions. Due to the advanced stage of logic, we understand the relationship between sentences very well, and we can now bring that understanding to bear on questions about roles. Moreover, the framework invites relating questions about repertoires to questions about supervenience. A great deal of formal and philosophical work has been done on supervenience, and it would be good to make that fruitful for our understanding of roles and repertoires.<sup>1</sup>

### **Role Essentialism and the Debate about Universals**

Clarifying the relationship between properties and their roles may shed light on a more traditional debate about the nature of properties: are they universals, or classes of tropes, or simply classes of things that satisfy a certain condition, typically resemblance among their members? In the current literature, the debates about role essentialism and about universals are rarely connected explicitly, although a comprehensive theory of properties ought to do that. Prima facie, it may seem that denying role essentialism only makes sense if properties are understood as universals. The identity of universals across possible worlds is primitive and determinate. Just as one individual might play different roles in different worlds, so could universals, for all logic tells us; it thus becomes a substantive metaphysical question whether they do. In the framework as described above, I take properties as entities with primitive identity across worlds, and the question is whether thereby I implicitly take them to be universals.

I would also like to argue that resemblance nominalism (Rodríguez-Pereyra 2002), the view that defines properties as classes satisfying certain resemblance conditions, cannot allow roles to recombine freely with properties. If two things resemble each other, they will partly satisfy the same predicates. It will then be part of the role of a resemblance class that its members are things satisfying those predicates. I want to ask whether this verdict can be avoided by only considering roles involving relational predicates. Furthermore, I would like to investigate whether resemblance nominalism is able to make sense of the debate about quidditism, and I hope that the framework set out ought to enable me to engage the critique of resemblance nominalism in subproject D. Finally I plan to examine the corresponding questions that arise for the view that properties are equivalence classes of tropes (Campbell 1990).

### **Intrinsic versus Relational Roles**

The answer to the question whether trope theory and resemblance nominalism are compatible with anti-essentialism involves the distinction between intrinsic and relational roles. It is thus important to understand that distinction properly. A great deal of work has been done on that, and increasingly stronger recombinatorial principles have been invoked. The most sophisticated attempts to date are due to Brian Weatherston (2001) and David Lewis (2001). But there is room for progress. No extant theory adequately deals with a counterexample by Hawthorne (2001). I plan to attempt to meet this challenge by generalizing combinatorial principles to apply to relations as well as properties. Since I want to distinguish between intrinsic and relational roles, and since roles are classes of open sentences, I will need to formulate these principles in terms of predicates rather than properties.

In fact, the combinatorial principles need to be generalized further, to apply to predicates standing for vectorial and tensorial properties, as they are postulated in modern physics. In recent unpublished work, Tim Maudlin argues that since fundamental physical theories are gauge theories (examined in subproject B), the notion of an intrinsic property ought to be abandoned. Against this, I want to argue that what ought to be given up is the interdefinability of the notions of intrinsicness and duplication. Properties that are not gauge-invariant might still fulfill the combinatorial definition of intrinsicness, even though the notion of duplication has no application to their bearers.

### **Roles and Revelation**

The question how tightly properties and roles are linked also involves an epistemological debate. It is often said that all we can epistemically access about fundamental properties is their role. The idea is that bare facts of identity and distinctness, or quiddities, which are to properties what haecceities are for particulars, are not something we can

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<sup>1</sup>It is a distinctive feature of the method proposed here that it only appeals to intensional rather than hyperintensional differences among properties: properties that are necessarily coinstantiated cannot be distinguished. The benefit of such a method is that it brings structure to the discussion, and allows for a much tighter theory. Its use ought not to be taken as an expression of skepticism about the intelligibility of hyperintensional distinctions. They may well be needed for some philosophical purposes outside the scope of this framework, particularly in the philosophy of mathematics (Fine 1994). The framework is not intended to be universally applicable.

perceive. If roles do not determine the properties of which they are roles, it follows that we are in some sense ignorant of what the fundamental properties in our world are. The view that this cannot be achieved is called “Humility” (Lewis forthcoming).

Another side in the debate grants that science can only determine the roles of properties, but insists that some properties are given to us in their intrinsic nature; qualia are supposed to be the prime examples. This view is called “Revelation.” The success of some important anti-physicalist arguments might be at stake in this debate.

One of my aims is to use my framework to argue that this debate rests on a false presupposition, namely that if we know their roles, we still do not know, in some interesting sense, the properties of which they are roles. I want to explain in what way roles may give us access to properties, and thus start to supplement the metaphysics of properties with a suitable epistemology.

### **Roles and Physicalism**

Physicalism is the view that mass and charge and suchlike properties are sufficient to give rise to the world as it is. It ought to be a substantive question whether it is true, for it is not obvious that a world with no non-physical properties could be anything like our world. This presents a problem for the view that the role does not just give us epistemic access to properties, but that it gives the only access. For suppose we assume that we identify mass and charge and their cognates via their role, roughly on the model suggested in Lewis (1970); and suppose further that the role is specified in a language describing macroscopic and mental phenomena. It is then likely to turn out that mass and charge are whatever gives rise to the macroscopic and mental phenomena mentioned in their role specification. This would make physicalism true by stipulation, while it ought to be a substantive claim. In response to this problem, I want to give up the idea that our only epistemic access to fundamental properties is via their role, and begin to articulate an alternative conception.

### **My Own Previous Research and Plan of Work**

In “Humility and Structure” (currently under review at the *Australasian Journal of Philosophy*), I broach the topics described above under “Roles and Revelation” and “Roles of Physicalism.” The paper has two main parts: first, a detailed examination of the argument David Lewis presents in “Ramseyan Humility,” and a critique of a tacit premise I call “Structuralism”; secondly, programmatic remarks about what positive conclusions can be drawn from the critique I offer. I am planning on articulating this positive alternative to Structuralism in the third year of this project, drawing on the conceptual spadework of the first two years.

My plan is to write and publish one article corresponding to each of the five headings after “The State of the Debate” above. Tentative titles: “Varieties of Roles”; “Modal Commitments of Nominalism and Trope Theory”; “Intrinsic Properties without Duplication”; “Revealing Roles”; and “Theoretical Terms and the Problem of Trivial Reductions.”

### **Schedule**

months	Philipp Keller	Stephan Leuenberger
1-8		Elaboration of the Framework
9-16		Role Essentialism and the Debate about Universals
17-24		Intrinsic versus Relational Roles
25-30		Roles and Revelation
31-36		Roles and Physicalism

**Benchmark:** Five published articles.

**After two years:** Two articles published or accepted for publication; one further article submitted for publication.

# Subproject B: Fundamental Properties in Physics

researchers: Christian Wüthrich, Vincent Lam

## Summary

In order to elaborate a metaphysics of nature that is coherent with contemporary physics, one of the main issues is to investigate the nature of the properties involved in the physical descriptions of the world. Contemporary fundamental physics challenges in many aspects the “traditional” views on properties. In particular, we will focus in this subproject on the way fundamental physics describes the properties of basic physical entities in space and time. In the first part, we will address the so-called “problem of time” in the Hamiltonian formulation of the theory of general relativity – currently our most fundamental theory about space and time – according to which any physically meaningful notion of “change” becomes problematic. We will consider whether fundamental properties as described by physics can ground this everyday notion and if not, we will evaluate the possible metaphysical consequences. The second part of the subproject will consider the challenge posed by fundamental physics – and in particular by the theory of general relativity – to the widespread metaphysical view of individuals possessing intrinsic properties located in space and time. This traditional, indeed Aristotelian, view finds a modern expression in the description of the world at the fundamental level as a mere distribution of intrinsic properties over space-time points, the so-called thesis of Humean supervenience, also studied in subprojects A and D. Structural realism is studied as a common metaphysical framework that may constructively answer these challenges posed by contemporary fundamental physics to the “traditional” metaphysics of nature.

## Fundamental Properties in Gauge Theories (Christian Wüthrich)

### The basic issue and the state of the field

Contemporary fundamental physics is dominated by the idea of so-called gauge theories. The currently available most fundamental theories in physics, the standard model of particle physics as well as the general theory of relativity, are gauge theories – at least on a sufficiently liberal reading of the term. Attempts to go beyond these received theories and to find a unification of all fundamental interactions into one theory, among them the most important unificatory effort known as “string theory,” are typically cast as gauge theories (to be discussed also in subproject A). Gauge theories are governed by an “action principle” which stipulates how a given “action” determines the trajectories of physical bodies under the influence of the fundamental force(s) described by the theory. In general, this action is invariant under certain transformations. In the case of gauge theories, the action respects *local symmetries* – i.e. invariances under transformations *not* identically performed at every point in space-time – over and above whatever *global symmetries* it may afford.

The received interpretation of gauge theories maintains that all those mathematical models related by such a local gauge symmetry correspond to one single physical possibility. In this sense, the mathematical representation of the underlying physical reality is not unique. A gauge theory thus suffers from a mathematical “surplus structure,” to use Michael Redhead’s now entrenched words (cf. e.g. Redhead 2003). In his seminal recent articles, John Earman (2002a, 2003) has argued that this interpretation of gauge theories receives critical support from our unwillingness to unnecessarily sacrifice the ideal of deterministic physics. The basic idea of the *reductio* argument for the received interpretation runs as follows. If we accepted different mathematical models related by a local gauge symmetry as representing physically different situations, then we would also have to admit that the same initial conditions at a given time  $t$  appear in models which diverge for times later than  $t$  due to a local gauge transformation which only affects these later times. This would imply that a given set of initial conditions together with the dynamical equations no longer uniquely determines the future states of the physical system and that therefore, gauge theories fail to be deterministic.

Any quantitative property (or any exemplification of such) with a claim to qualify as a fundamental property must hence be invariant under gauge transformations. In accordance with the above line of reasoning, (the exemplification of) a quantitative properties not so invariant will not enjoy a deterministic evolution, i.e. the fact that a particular physical system or entity carries such-and-such property today, does not determine whether the same physical system or entity will still carry the same property tomorrow.

A formidable challenge to this view arises from Hamiltonian general relativity, a classical gauge theory of gravity. The general theory of relativity must be recast in the so-called Hamiltonian formalism in order to render it amenable to one of the most successful recipes for cooking up a quantum theory from a classical theory called *canonical quantization*. Although strictly speaking neither necessary nor sufficient for unification, such a quantization is believed by many to constitute an ineliminable step toward the final unification in fundamental physics. But this Hamiltonian formulation of general relativity requires that time, qua inextricable aspect of “space-time,” be itself part of the structure subjected to quantization. This means that there exists no longer a fiducial external time with respect to which any evolution could be understood. This feature is captured in the mathematical fact that reparametrizing (space-)time is a gauge symmetry of the theory. But if time reparametrization invariance is a gauge symmetry, then change itself is pure gauge: any assignment of fundamental properties must be gauge-invariant and thus invariant under time reparametrizations. This means, however, that this assignment must be the same for all times and thus be constant over time. Parmenides

strikes back: there is no change at the most fundamental level of nature.

The philosophical analysis of gauge theories in general and of the issue of the frozen dynamics has only recently been initiated. Some philosophers like Earman have argued that the radical consequence of the preceding paragraph must be accepted, while others like Tim Maudlin and Richard Healey have tried to resist it.<sup>2</sup>

### **State of own research and plan of work**

The proposed research project builds on and extends my doctoral thesis, which is about to be concluded. In my thesis (*Approaching the Planck scale from a generally relativistic point of view: a philosophical appraisal of loop quantum gravity*), I analyse foundational and philosophical issues in loop quantum gravity, the main approach to quantum gravity in the canonical camp. More specifically, the two most important strands of my dissertation investigate in detail the classical theory on which the quantum theory is based on the one hand and cosmological models based on loop quantum gravity on the other. An important aspect of my study of these cosmological models focuses on the problem of time, and of change, in the context of these models. The cosmological models offer a much simplified “toy theory” with many of the features of the full theory. A detailed analysis of these models, therefore, is believed to yield valuable lessons for the interpretation of the full theory of loop quantum gravity. For me, the study of the above explicated problem of change in the full theory thus naturally extends work from my dissertation, which I hope to publish soon.

The subproject, just like Gaul, is divided into three parts. The first goal, to be reached during the first summer, is to appraise the merits of Maudlin’s and Healey’s resistance vis-à-vis the force of the neo-Parmenidean argument. The second objective of the project, to be worked out during the second summer, seeks to determine what the costs of accepting the neo-Parmenidean conclusion would be. It is clear that the neo-Parmenidean owes an explanation why it is that we incessantly perceive the booming, buzzing confusion of perpetual change when in reality, there is absolutely no change at the most fundamental level of physical theories.<sup>3</sup> The third summer of the proposed research project will explore wider philosophical issues in the context of gauge theories, most particularly its claimed support of a structural realist point of view in fundamental physics.<sup>4</sup>

## **Relational properties in space-time physics (Vincent Lam)**

### **The basic issue and the state of the field**

The standard mathematical representation of space-time within contemporary physics in terms of a set of points endowed with certain topological and smooth differential properties plays an important but also ambiguous role in the recent philosophical debate about the nature and the ontological status of space-time. On the one hand, this so-called manifold model of space-time seems to constitute a mandatory framework for our currently best fundamental theories about matter (quantum (field) theory (QFT)) and about space-time (the theory of (classical) general relativity (GR)). While such a framework is rather successful for doing physics, it may also lead to some confusion when it comes to the ontology of space-time. Indeed, in a scientific realist perspective, one could be tempted to interpret space-time as a set of points or regions possessing some intrinsic properties together with some space-time relations. This comes actually very close to the mainstream position in the metaphysics of nature represented by David Lewis’ contemporary thesis of Humean supervenience (cf. Lewis 1986b: ix–x, cf. also subproject A). According to this thesis, all there is to the world is the distribution of intrinsic properties over space-time points (or pointlike bits of matter) together with space-time relations. This metaphysical thesis is challenged by fundamental physics. It is widely recognized that quantum physics involves non-separability (and some kind of holism) that clashes with the Humean supervenience thesis.<sup>5</sup> But the very metaphysics of intrinsic properties and in particular the view of space-time as a set of points with some intrinsic properties (and space-time relations) – both conceptions that are involved in the Humean supervenience thesis – may be challenged by contemporary space-time physics as well. Indeed, within the framework of GR, a wide range of philosophers of physics and physicists agree on the fact that, due to the fundamental gauge symmetry of the theory, space-time points cannot be considered as individuals possessing intrinsic properties independently of the space-time relations.<sup>6</sup> Moreover, the description of space-time within this theory seems to involve some non-local (non-pointlike) features, like the gravitational energy (Hoefer 2000), which rely neither on any particular local entities like space-time points nor on local (intrinsic) properties that could be ascribed to particular space-time points. The ambiguous status of the space-time point is here evident. On the one hand, its very individuation is dependent on space-time relations (or relational properties) and it seems that its very existence is neither necessary nor sufficient to account for some non-local features of space-time. Field theories (like QFT and GR), however, define physical fields over space-time points, which seem therefore to be mandatory (and primary indeed).<sup>7</sup> This subproject mainly aims to provide a coherent interpretation of space-time that accounts for

<sup>2</sup>Cf. Belot and Earman (2001), Earman (2002b), Maudlin (2002) and Healey (2004).

<sup>3</sup>Carlo Rovelli (2002) offers an important ansatz.

<sup>4</sup>Holger Lyre (2004a,b) has most prominently argued for this claim. See also Stachel (forthcoming).

<sup>5</sup>For instance, see Teller (1986) and Healey (1991).

<sup>6</sup>For instance, see Stachel (1993) and Dorato (2000).

<sup>7</sup>This second part is an argument by Hartry Field (1985).

such fundamental features. More broadly and precisely because of these features, the metaphysical framework of such an interpretation would actually strongly contrast with the mainstream one.

Structural realism could be considered as offering a metaphysical account for such fundamental features of space-time as described by GR. The structural realist conception is originally based on the widespread view that scientific theories only reveal the relations between physical objects, but not (at least not directly) their fundamental intrinsic properties. But in order to overcome the above mentioned difficulties of the traditional view of individuals possessing intrinsic properties, structural realism has recently been developed in a radical (ontic) version that only recognizes relations in its ontology and completely eliminates the category of objects (and therefore intrinsic properties as well) (French and Ladyman 2003). Such a position seems obviously too parsimonious in the sense that relations instantiated in the physical world require relata, that is, objects between which the relations obtain. The moderate version of structural realism proposes in contrast a metaphysics of structures, which are considered as networks of relations among objects (relata) that do not possess any intrinsic properties. This position does recognize objects in its ontology, where the relations (or the relational properties) constitute all the properties of objects. Such a metaphysics has been recently proposed as a convincing interpretation of quantum objects and their properties (Esfeld 2004).

### **State of own research and plan of work**

This subproject is a complementary extension of the research pursued in my doctoral thesis, where I investigate the general relativistic and field theoretic description of space-time in view of the debate about the relationship between space-time and matter. I focus in particular on the fibre bundle (and gauge-theoretic) and algebraic formulations of GR. The former provides the mathematical framework for an explicit interpretation of the central GR-principle of active general covariance, freed of the ambiguities inherent to the standard formulation. The algebraic framework may shed some new light on the puzzling problem of space-time singularities, which is linked in cosmology to the fascinating issue of the “initial” state of our universe and to the fundamental structure of space-time. Since these fundamental aspects of space-time may well be accounted for within a structural realist framework, it is necessary to investigate in details the coherence of the metaphysics of relations proposed by structural realism. This is the aim of this subproject.

Indeed, the first aim of this subproject (1st and 2nd year) is to evaluate to what extent such a metaphysics of relations (or of relational properties) that does not admit intrinsic properties, but that recognizes objects, may constitute a coherent metaphysical position. In particular, it has to be carefully considered whether a meaty conception of “purely relational” or “purely structural” objects can be sustained. The consequences of a structural view of objects should also be determined, that is, whether this view is bound to the conception of objects as bundles of properties or whether they can still be considered as substances (with modes). Moreover, the exact relationship between objects and properties should be explained within this metaphysical framework. Second, this project aims to work out a moderate structural realist interpretation of space-time as described by GR in terms of structures and without any intrinsic fundamental properties, which contrasts with the mainstream “pointlike view” about space-time – like the one involved in Lewis’ Humean supervenience thesis (2nd and 3rd year). A possible structural interpretation, which seems to account for the fundamental features of GR, is to consider space-time as a network of space-time relations among space-time points that do not possess any intrinsic properties over and above bearing the relations. Moreover, other possible structural conceptions of space-time should be investigated, in view of recent (theoretical) developments in space-time physics that go beyond GR (the so-called “quantum gravity” theories). These structural conceptions of space-time should then be considered in the broader framework of the debates about the ontological status of space-time and about the relationship between space-time and matter.

### **Conclusion**

Both parts of this project accept as a vantage point the belief that the general theory of relativity offers to date the most successful account in fundamental physics of describing the structure of space-time. They also equally accept that this classical theory will have to be supplanted by a quantum theory of gravity and study what the metaphysical consequences of this supersession might be. We investigate in detail the roles of gauge theories, the fate of time and change, the metaphysics of relations, and the ontological status of space-time in this endeavour. These issues are of high philosophical interest for elaborating a metaphysics of nature that is coherent with contemporary fundamental physics. Moreover, they are also believed by many working physicists to be of necessary complementarity for further developments in fundamental physics (this especially true as regards physicists working in quantum gravity or physicists working on the foundations of quantum (field) theory). Our project draws on the cross-disciplinary and mutually beneficial inspiration and fertilization that fundamental physics and metaphysics enjoy from one another. The results of the first two stages of the subproject on fundamental properties in gauge theories will be published partly in the commissioned review article for Blackwell’s *Philosophy Compass* (working title: “The problem of time in canonical quantum gravity”) and partly in a longer article taking a stronger stance on the issue. Possible journals for submission of this second article include *Studies in History and Philosophy of Modern Physics*, *British Journal for the Philosophy of Science*, and *Philosophy of Science*. The results of the second part of the subproject will be published in two main articles. The first one about structural realism as a coherent metaphysical position successfully facing

the identity and individuality questions can be submitted to journals such as *Synthese*, *Erkenntnis* and *Philosophy of Science*, where reference papers on this topic have been published. The second one about the interpretative issues of space-time within GR – including some necessary technical arguments – and within this structural realist framework can be submitted to journals such as *Studies in History and Philosophy of Modern Physics* and *British Journal for the Philosophy of Science*.

## Schedule

months	Christian Wüthrich	Vincent Lam
1–12	Maudlin and Healey on Earman’s challenge	Metaphysics of relations
13–24	Costs of the neo-Parmenidean resolution of the paradox	Structural conception of objects, identity and individuality questions in GR
25–36	Gauge theories and structural realism	Structural realist interpretation and ontological status of space-time within GR

**Benchmark:** four (OR FIVE, OR SIX?) articles

**After two years:** two articles published or accepted for publication, one (OR TWO?) additional article in circulation

# Subproject C: Evaluative Properties

researchers: Fabian Dorsch, Gian-Andri Töndury

## Summary

Values are certainly among the properties which are of most importance to us. The specific significance of values for our lives arises primarily out of three widely recognized aspects of their nature. First, values are possessed by entities (persons, things, actions, mental phenomena, etc.) intimately related to us. The non-evaluative features of these entities provide us with reasons to value their bearers; and the respective evaluative properties supervene, or otherwise depend on, the relevant non-evaluative features (Goldman 1995 Zangwill 2001). Second, values exist only because human beings or communities exist. This is often spelled out in terms of the thesis that values are response-dependent: objects instantiate values just in case and because humans would, under appropriate circumstances, respond to them in a distinctive way (Wright 1988). And third, values are inseparably linked to norms: instantiations of value imply that we ought to treat their bearers or related entities, and thus to think or act, in certain ways (Scanlon 1999).

In this research, we aim to contribute to a better understanding of these three aspects of values and, hence, their significance for us. More specifically, we will be concerned with four important and interrelated issues: (a) the value-theoretical question of what, if anything, constitutes a reason for why entities possess value; (b) the epistemological question of how, if at all, we come to know of instantiations of value; (c) the metaphysical question of whether values are really dependent on our responses to, or on other values or features of, their bearers; and (d) the normative question of which kinds of norm are inseparably linked to value. Our main focus will thereby be on non-practical values, notably on aesthetic and certain epistemic values. There is already a very rich, diverse and well-developed debate concerning the nature of practical values (Darwall et al. 1992: cf.). In contrast, accounts of non-practical values have often neglected some or all of the four issues just mentioned, or simply presupposed without much debate certain standard answers to them. Our hope is to remedy part of this lack of discussion. This sub-project consists of three parts. The first seeks to provide answers primarily to the epistemological and the normative questions regarding aesthetic value. The second intends to address mainly the value-theoretical and the epistemological question regarding the epistemic value of justification, as it pertains to the reliance on MP and to the application of concepts in reasoning. The third part is concerned with answering the metaphysical question regarding the relationships between the values of wholes and the values of their parts, and between evaluative properties and the underlying non-evaluative features.

## Aesthetic Values (Fabian Dorsch)

### State of the Art

This part of the sub-project aims to formulate a rationalist account of the epistemology and normativity of aesthetic value and to defend it against the orthodox sentimentalist view.

There is wide agreement in aesthetics on how to answer the value-theoretical and the metaphysical questions. We value artworks aesthetically because of certain facts about their appearance, content, history, and so on. These facts, or our experiences of them, provide us with evidence for aesthetic worth. Whether objects possess a certain aesthetic value depends then on our responses to their non-evaluative features. And aesthetic value is intrinsic in the sense of not being instrumentally linked to non-aesthetic values (Budd 1995 Goldman 1995 Dorsch 2000 Zangwill 2001). With respect to the epistemological question, there exists a similarly orthodox answer, namely sentimentalism (Budd 1995 Goldman 1995 Levinson 1995a: cf. e.g.). According to this view, it is our emotional responses which provide us with primary access to aesthetic merit, figure as grounds for, or constituents of, our aesthetic evaluations, and determine, under appropriate circumstances, which objects instantiate which aesthetic values. Sentimentalism is often motivated by the following considerations: (i) it can make sense of the fact that emotional reactions play a central role in aesthetic experience; (ii) it promises to explain the fact that the relevant emotional responses show some sensitivity to evidence for aesthetic worth - for instance, that our feeling of admiration may be heightened by the recognition of originality; and (iii) it supplements very well the uncontroversial particularist insight that aesthetic assessment is typically not the matter of deductive inference on the basis of judgements about non-aesthetic features (Sibley 1965 Budd 1999 Dorsch 2000).

However, sentimentalism does not combine very easily with the idea of the intersubjectivity of aesthetic evaluations, another thought widely endorsed both by sentimentalists and in aesthetics in general (Budd 1995 Levinson 1995b). The problem is that experienced judges seem to be able to differ in their appropriate emotional reactions to artworks, despite being equally highly sensitive to marks of aesthetic worth. But since appropriate emotional responses determine the aesthetic values of objects, the differences in response would lead to a relativization of aesthetic values to particular subjects (Budd 1999 Dorsch 2000).

Traditional answers to this relativist challenge argue that the satisfaction of high enough standards (e.g., demanding full information, high expertise, great discriminatory ability, etc.) or, alternatively, the proper use of the rationality and cognitive faculties common to all human beings can ensure sameness in emotional disposition among critics (Hume (1985); Kant (1987)). More recently, it has also become common to seriously entertain the acceptance of the possibility of faultless disagreement, and to question the extent of its threat to intersubjectivity - for instance because

it is seldomly or never actually realized; or because it applies only to a few aesthetic values or evaluations (Goldman 1995 Budd 1999 Hopkins 2001). The debate about the normative question focusses almost exclusively on the idea that the normativity of aesthetic values consists primarily in the demand that we should make or accept aesthetic evaluations just in case they are appropriate (e.g., have the right emotional grounds). The justification of this demand is thereby typically derived from the intersubjectivity of aesthetic judgements (Budd 1999 Zangwill 2001) and hence, too, faces the relativist challenge.

### **Previous Research and Research Plan**

The research culminating in my MPhil thesis (Dorsch 2000) on aesthetic experience and value concentrated on some of the metaphysical and value-theoretical issues mentioned above. My main results have been that aesthetic value is: (i) response-dependent; (ii) supervenient on the non-evaluative features which provide us with reasons for aesthetic assessment; and (iii) closely linked to the intrinsic value of the experiences that its bearers offer us. In my PhD dissertation (Dorsch 2005), I defended the Wittgensteinian view that imaginative phenomena (e.g., visualizing, supposing, or daydreaming) are mental actions allowing us to voluntarily control what, and how, they represent. In the light of this result, I have more recently begun to argue that many of the aspects of aesthetic experience often held to be imaginative - such as our awareness of what music expresses or paintings depict - in fact do not involve imagining.<sup>8</sup> Currently, I am trying to show that the imagination nonetheless plays a central role in aesthetic appreciation - for instance, by providing us with valuable access to significant experiences portrayed in artworks (e.g., concerning the death of a beloved person), without the cost of having to actually undergo them.

In the first year of my research, I will try to show that sentimentalism and related views cannot answer adequately the epistemological question. On the one hand, I will defend the intersubjectivity of aesthetic assessments and therefore reject relativism, which conceives aesthetic values to be relativized to (groups of) subjects - for instance, those with the same set of emotional dispositions. I shall argue that this approach cannot explain why we often take our disagreements to be genuinely concerned with who is at fault, and not merely with expressions of differing preferences; and why sufficient scrutiny and discussion often leads to a convergence in aesthetic opinion, irrespective of emotional differences.

On the other hand, I will argue that both the traditional and the more recent sentimentalist replies to the relativist challenge are unsuccessful. The traditional answers are untenable because they cannot demonstrate how the invoked factors (e.g., rationality, expertise, etc.) can have such an impact on emotional dispositions as to rule out any divergence under appropriate conditions (Dorsch 2000). And the more recent attempts founder because there is no good reason to restrict the possibility of faultless divergence in emotional responses only to certain cases. My diagnosis will be that both these failures are due to the partial responsiveness of our emotional dispositions to non-rational, causal factors. I maintain that this fact undermines the capacity of emotional responses, postulated by sentimentalism, to ground or constitute aesthetic evaluations. The second year is reserved for the development and defence of my own answer to the epistemological question. I will argue for the rationalist view that aesthetic assessment is a matter of true or false judgements about the aesthetic worth of artworks, made on the basis of inductive considerations and inferences to the best explanation concerning the non-aesthetic features of the objects. My contention is that this approach fares much better than sentimentalism or relativism in explaining why our aesthetic evaluations often converge, and why competent judges can vary in their responses to artworks (Bender 1995: cf.). On this view, we determine the aesthetic merit of artworks in the same way in which we, say, estimate the number of spectators in a stadium just by looking and guessing, or judge someone's talent for basketball by taking into account his bodily features and sporting skills. Warranted opinions about the latter issues may differ considerably, but are still liable to converge under favourable circumstances. I shall argue that the same is true of aesthetic evaluations.

In the third year, I aim to argue that the rationalist approach is also best placed to answer the normative question, that is, the important, but often ignored challenge to identify the distinctive norms arising from aesthetic values. Following tradition, I shall argue that aesthetic worth does not establish norms governing our actions towards the evaluated objects (e.g., that we should create or preserve valuable objects; Kant (1987)). But contrary to tradition, I maintain that the same is true of norms governing our treatment of our own and others' aesthetic evaluations, or of the underlying experiences of the respective objects (e.g., that we should seek or prolong appropriate or otherwise worthwhile responses). For both stem from values distinct from, and not instantiated by the bearers of, aesthetic value, namely the appropriateness of judgements or the values of experiences. I shall thus argue for the conclusion that aesthetic value is best understood as giving rise to norms demanding certain emotional responses towards the assessed objects (Scanlon 1999: e.g., that we should admire or respect valuable objects).

The problem for sentimentalism is now that it can account for such norms only in close connection to the not specifically aesthetic demand for appropriateness in judgement. Once sentimentalism is assumed, the demand, say, to admire an artwork becomes inseparably linked to the fact that such admiration would constitute or support an appropriate appraisal of the artwork. The rationalist view, on the other hand, has no problem in keeping the two kinds of norms separate. Moreover, it can account for the centrality of emotions in aesthetic experience by assigning to them the role to draw our attention to those features of artworks which are evidence of their aesthetic merit. I

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<sup>8</sup>I explore this further in two papers currently under review, "Imagination and Depiction" and "Richard Moran on Imagination and Fictional Emotions".

shall argue that this is the best explanation of why our emotional responses to artworks, despite not constituting aesthetic grounds, are sensitive to reasons for aesthetic assessment (cf. the value-theoretical question) and subject to norms intimately linked to aesthetic value.

## **Epistemic Values (Gian-Andri Töndury)**

### **State of the Art**

In recent years epistemologists have appealed to the idea of intuition in connection with two problems: the first is the problem of explaining why we are justified in using modus ponens MP (or a similar basic rule of deduction) (Bonjour 1998), the second is to account for the justification of certain modal claims made in philosophical contexts, such as that it is not necessarily the case that justified true belief is knowledge (Goldman and Pust 1998 Bealer 1998: and many others). My main thesis is that both problems can be solved by identifying the epistemic value in these cases with a certain practical value and by explaining the justification in question by appeal to a value judgment.

Principally, there are two possible explanations of why we are justified in using MP: either we have some reason to rely on MP; or we do not, but are nevertheless entitled to its use. If a reason is invoked, there are again several possibilities of what may constitute such a reason: (i) a certain feeling potentially accompanying our use of, or being otherwise related to, MP; (ii) the potential judgement that MP possesses a certain feature *F*; or (iii) the fact that MP possesses a certain feature *F*. Option (iv), the entitlement view, maintains that there is no need to assume a reason in order to explain our justification to rely on MP (Boghossian 2003 Wright 2004).

Options (i) and (iii), although they have champions (Hookway 2003), are flawed by the following defects, the former must – falsely, or so I argue – assume that feelings can play a justificatory role, the latter face the range of objections against externalist accounts of justification. The plausibility of the entitlement view, on the other hand, strongly depends on the failure of views which appeal to reasons. It is recognized that – if available – justification (having supporting reasons) would be the better achievement than entitlement, and furthermore the view may explain why the subject is entitled partly by appeal to the subject’s incapability to acquire supporting reasons (Wright 2004).

Kind (ii) views face the following two circularity objections: first, that a kind-(ii) judgment can only be reached via a MP (Field 2000: and many others), second, that the judgment that MP is justified can only be reached from such a kind-(ii) judgment via a MP (Boghossian 2003). While the appeal to intuitions avoids the first circularity, it runs into the second. Furthermore, it is argued that the notion of rational insight remains unexplained and clashes with naturalism (Wright 2004).

Concerning the justification of “philosophical” modal claims, the only non-sceptical views defended are either entitlement views (Peacocke 1999) or appeals to intuitions.

### **Research Plan**

In the first part of the research project (1 year) I elaborate a reason-based account of the justification of MP that presents an alternative to the dominant entitlement view and that avoids the two circularity objections mentioned above. The first guiding idea of the account is to take *F* as an evaluative feature, in particular the instrumental value of MP in reaching practical ends. It is then argued that evaluative judgments can be reached by abductive or inductive inference. Provided the premises of this inference are not justified via a MP, this answers the first circularity objection. The second guiding idea of the proposal is that justifiedness of the MP can be identified with the practical value of MP. This provides a solution to the second circularity objection, because no inference from the judgment that MP has the practical value to the judgment that it is justified is required. There are different considerations which speak in favor of such an identification. First, it has been argued that the instrumental value of MP for practical ends prevents a MP inference from being epistemically irresponsible (Enoch and Schechter unpublished). Second, justification always partly depends on pragmatic reasons (along with evidential reasons) (Owens 2000), the MP case can therefore be seen as a limiting case where there are no evidential reasons. In order to avoid that MP can, depending on the context, be justified or not, I argue that the practical value in question always obtains for all subjects.

In the second part of the project (1 year) I argue, first, that at least certain modal judgments are best understood as evaluations of the proper use of concepts and, second, that their epistemology is the same as that concerning MP. The modal claims are taken to have an evaluative content, in particular they judge it to be practically valuable to employ the involved concepts in a given manner. In this part I argue in more detail, but in principle for the reasons given above, against intuitions. What has been identified as intuitions is seen as evaluative judgments which are themselves based on reasons. The account can both explain them in a naturalistic fashion and explain their importance. Such an account, if correct, has interesting consequences on the normative issue of how much weight should be given to intuitions in philosophical disputes.

In the third part of the project (1 year) I intend to draw a general lesson from the previous parts. In the case of MP and the case of certain modal claims, the value judgments take the form of modal claims (the judgment that MP is necessarily truth-preserving) and in both cases they attribute practical value to concepts, since the practical value of MP can be seen as the practical value of using the conditional in accordance with MP. I argue that the proposed epistemology of these cases is the epistemology of the knowledge of our own concepts in general and investigate to

what extent other categories of modal judgments, for instance about mathematics, can be treated in this manner.

### Previous Research

While in my MA thesis (Töndury 2002) I argue that the Kripkean contingent a priori is not a priori, I argue in my PhD thesis (to be completed by September 2006) against the thesis that knowledge of meaning is (the normal kind of) empirical knowledge. The present research project is intended to be (a step towards) the elaboration of the remaining middle position: knowledge of meaning is grounded in reasons, but not in the way usual empirical beliefs are. The view defended in the project, namely that knowledge of meaning is knowledge of practical value, presents such a middle way.

### Axiological Properties and their Mereology

The third part of the sub-project tries to answer certain aspects of the metaphysical question for evaluative (i.e., axiological) properties in general. It aims to elucidate how the values of objects relate to the values of their parts and their non-evaluative properties by defending a certain axiological logic and mereology.

A large philosophical literature is devoted to the relation between natural properties on the one hand and evaluative properties on the other hand (Oddie 2005: cf. e.g.). In this literature, the relations of goodmaking, badmaking, wrongmaking and supervenience play a central role. Many logics for the betterness relation exist and some attempts have been made to develop axiological logics. Finally, a number of theories have been developed in the area of axiological mereology, studying how the intrinsic value of a whole is determined by the intrinsic value of its parts. Axiological mereology is a relatively little studied topic which is still not well understood. Indeed, it seems that the intrinsic value of a whole is not just the mere sum of the intrinsic values of its constituents. On the one hand, wholes which are intrinsically good may contain parts which are intrinsically bad. On the other hand, not only the intrinsic values of the parts, but also the non-evaluative relations holding between the latter may affect the intrinsic value of the whole. Understanding these issues may substantially contribute to a theory of ethical and aesthetical judgements, in areas like law, literary studies and art history. This research will propose a new approach to axiological mereology, drawing upon intuitions from Oddie (2005). Representing evaluative properties as values in an axiological quality space (Gärdenfors 2000: after, cf. also subproject D) may be an elegant and appropriate way to calculate the intrinsic value of a whole from the intrinsic values of its parts. Finally, an extensively discussed problem is the exact relation between non-evaluative and evaluative properties and relations. Most philosophers agree on the fact that evaluative properties and relations cannot be defined through non-evaluative ones (the denial of this fact being the so-called “naturalistic fallacy”). However, a relation of right/wrong-, good/bad- or beautifully-making may well hold between non-evaluative attributes and evaluative ones. Defenders of the strong supervenience thesis even claim that there cannot be an evaluative difference without there also being a non-evaluative or purely factual one (Jackson 1998). Hence a complete non-evaluative description of some thing or fact would necessarily imply an evaluative one: the badness of a murder or the beauty of a statue would supervene on their respective physical properties. In close collaboration with subproject D, this subproject will rephrase and discuss this thesis in the framework of axiological and non-axiological conceptual spaces, thus offering an innovative perspective on an old debate.

### Conclusion to all three projects

To sum up, we aim to provide and defend (i) a rationalist account of our knowledge of aesthetic and certain epistemic values (cf. the epistemological question). This approach is furthermore designed to accommodate and explain the following facts: (ii) that non-evaluative features figure both as reasons for evaluations and as supervenience bases for evaluative properties; (iii) that values are dependent on our judgemental responses to the non-evaluative features; and (iv) that the intrinsic values of a whole depend on the intrinsic values of its parts and the non-evaluative relations between them (cf. the value-theoretical and the metaphysical questions). In addition, we intend to argue (v) that, while aesthetic values are essentially non-practical in their normative dimension, the epistemic values considered are closely linked, if not reducible to, certain practical values (cf. the normative question). And finally, we aim to show (vi) that modal claims are best understood as evaluations of the sort discussed. What still remains to be seen is whether the proposed view can be extended to other epistemic and to practical values.

### Schedule

months	Fabian Dorsch	Andri Töndury
1-12	sentimentalism and similar views	reason-based account of MP
13-24	the rationalist approach	reason-based account of MP / modal judgments as evaluations
25-36	normativity of aesthetic value	modal judgments as evaluations

**Benchmark:** three articles, forming the base of a monograph and two other articles

**After two years:** three articles

# Subproject D: The Formal Ontology of Properties and Relations

researchers: Luc Schneider, Ghislain Guigon

## Summary

In close collaboration with the other subprojects, subproject D aims at penning and publishing a monograph which provides a fully general account of the formal ontology of relations and properties.

Properties and relations play a central role in every-day and scientific descriptions of the world. Typically, an attribute (a property or a relation) is expressed by a predicate (like “walks”, “lovesoo”, “equals to”, “is greater than”, etc.); properties are expressed by one-place predicates (such as “is almond-shaped”), relations by many-place predicates (such as “is on the top of”). Agents (whether natural or artificial) need to gather information about their environment in order to act upon it. They use properties and relations not only to describe, classify and measure the denizens of the world they are embedded in, but also to evaluate the changes in this world brought about by their actions. More specifically, natural and human sciences rely on descriptive properties and relations (such as weight, mass, IQ, size, spatial connection, posteriority) in order to classify, measure, explain and forecast natural, social and psychological phenomena. Logical and ontological issues concerning properties and relations have a major importance in various branches of computing science, such as conceptual modelling, software engineering, information systems design and artificial intelligence (Guarino 1998).

The projected monograph will evaluate issues and results regarding the ontology of properties and relations that until now have been scattered in various subdisciplines of philosophy, logic and cognitive science. Its main goal is to provide a general account of properties and relations that is both innovative and comprehensive, for the benefit not only of academic philosophers, but also for that of scholars and scientists in other areas like artificial intelligence, software engineering, cognitive science, linguistics, mathematics, physics, medicine, law, art history, and literary studies. The book will be divided in three parts. The first part will deal with foundational – ontological and logical – issues regarding attributes. We will discuss and improve upon an existing (second-order) logic of properties, relations and their instances (Mertz 1996). Furthermore, we will establish the constitutive role of attributes in general ontologies, proposing a new “qualitative” approach to objects, events and facts. The second part deals with issues specific to either relations and properties, giving particular attention to the question whether relations supervene on properties or vice-versa. In particular, it will gather new insights into the nature of relational order on the one hand and quantitative (dis)similarity on the other hand. Regarding the latter issue, the book will provide an innovative contribution to and critical appraisal of nominalist accounts of natural properties in terms of resemblances. Such accounts have become popular in cognitive science (Gärdenfors 2000). The third part will concentrate on two case studies, focussing on the ontology of quantities and axiological (evaluative) properties and relations. A close collaboration with subproject C is planned. The ontology of quantities is central for the philosophy of science and mathematics. The mereology (theory of parts and wholes) of axiological attributes will be of foremost importance for clarifying the question whether wholes are mere sums of their parts, in particular whether the ethical or aesthetical value of a whole is determined by the mere values of its parts. Insight into this problem will foster a better understanding of ethical and aesthetical judgements in law and literary studies.

## General Ontology of Properties and Relations (Luc Schneider)

### Attributes as Kinds and Instances

In order to set the stage, we will review the debate about whether attributes (properties and relations) should be regarded as repeatables or as non-repeatables. For the sake of general applicability, we think it is fruitful to leave this question open and to opt provisionally for moderate realism (Husserl 1900-1901 Hering 1921 Mertz 1996 Lowe 2005), according to which attributes can both be referred to as repeatable kinds (or natures) and as non-repeatable instances. Moderate realism corresponds best to common practice in everyday discourse and scientific inquiry. It does not preclude the possibility of a nominalist or reductionist stance on either properties or relations, an issue that will be separately discussed in the second part of the book.

An elegant and provably consistent higher-order predicate calculus has recently been proposed as a logic of moderate realism under the name of Particularised Predicate Logic (PPL) (Mertz 1996). In this logic, reference is made both to kinds (called “intensions”) and to instances; moreover, only instances apply to the relata, while any quantification over kinds by extension also binds variables ranging over their instances. We will show that PPL provides a framework for a formal semantics of natural language (which relies on an implicit reference to “events” or “situations”, in other words “cases” of universals like *Mary’s liking Edgar* or *Paul’s running to the train station*). Furthermore, the calculus includes a very liberal abstraction scheme which allows for innocuous forms of circular properties (like the property of all and only the properties that apply to themselves). The study and critique of this abstraction principle is therefore of great interest and we will discuss possibilities to improve this principle while securing consistency of the resulting logic of attributes.

## **Properties and Relations as the Backbone of Foundational Ontologies**

Attributes constitute the backbone of a foundational ontology. Foundational ontologies are top-level ontologies in the sense of general systems of categories; they have been proposed as a potential solution to the problem of semantical interoperability between communicating information systems (Gangemi et al. 2002).

Attempts to reduce all ontological categories to a single one enjoy a certain popularity in philosophy. One approach is to account for everything that exists in terms of (bundles of) properties and relations. Such views, however, are committed to a partial identity or containment model of attribution (attributes literally overlap or are parts of their bearers) which does not do justice to relational attribution and encourages monadism (see below). Bundle theories catch on because they are seen as a way to avoid the commitment to “bare” particulars in the sense of qualitatively undetermined bearers of attributes. However, one can also escape this position by adopting the principle that the particulars that are the ultimate bearers of attributes have natures or essences which are repeatables. Just like relation instances, particular substances are qualitatively determined by kinds that constitute their essences as their non-predicative content (Loux 1998). The kind as the essence of a particular (whether a substance or a relation instance) and the thisness or particularity of the latter are notionally distinct, but ontologically unseparable aspects of the same entity (Martin 1980). This essentialist-cum-quidditist position (cf. subproject A) accounts for instantiation, the tie between an instance and its kind, in terms of essence. Instantiation is a non-relational tie of partial identity between the kind and its instance; it is no addition to being, but supervenes on its terms.

Universals do not intervene on the level of attribution. Attribution, which is to be distinguished from instantiation but also an internal relation, occurs at the level of tokens, not of types: the token attribute is itself a copula qualified by a type (Mertz 1996), an incomplete state of affairs (Armstrong 1989b) that is saturated by the entities that fill its “blanks”. The conception of attribute instances as typed copulas also allows us to give a formally exact restatement of an account of change in terms of temporal modifications of the copula (Johnston 1987 Haslanger 1989). Time is not expressed by an additional argument of the attribute, but by a higher-order property, a property of the token attribute as a copula. As a natural and direct consequence we get an account of events as temporally qualified attribute instances.

## **Relations and the Question of Monadism**

We said that relations are what many-place predicates express. This naïve definition has its drawbacks, obfuscating serious ontological problems that have never been dealt with in a rigorous and general way. The book has the purpose to fill this gap and to offer a general account of relations.

The first fundamental problem concerning relations is the existence of relations of variable adicity. In the particularised higher-order logic we will employ in the proposed book, no axiom prevents relations of different adicity to be identical. In PPL it is possible to distinguish the kind from the instances that apply to the relata. Hence, PPL offers some leeway for a more adequate treatment of relations of variable adicity. The second fundamental problem concerning relations is the fact that some relations (so-called neutral relations) do not have a fixed order (Fine 2000). PPL distinguishes the relation-kind from its instances; only the latter apply to relata and evidence any kind of order. Hence, PPL seems to escape from difficulties regarding neutral relations. The third basic issue with respect to relations has to do with the distinction between formal and material relations (Husserl 1900-1901). Formal relations are not only those of logic and mathematics, but also certain basic relations of ontology, such as parthood, similarity, spatial connection, etc. One way to put the difference is to say that material relations are domain specific, while formal have instances in all possible worlds. However, any relation may turn out to be formal under a sufficient restriction on the notion of possible world. The book will offer a comprehensive discussion and evaluation of existing attempts to motivate the formal-material distinction and answer the question whether it makes any sense at all. The fourth fundamental issue regarding relations is whether they supervene on monadic properties or characteristics. The affirmative answer to this question is called monadism; monadism has been popular among philosophers that favour a bundle view of objects (Fisk 1972 Campbell 1990). Indeed, irreducible relations would represent a major challenge to bundle theory, inasmuch as it is difficult to see how relations could be split up and distributed over their relata without losing the direction of the relation (if any). The topic of monadism is related to the distinction between internal and external relations; internal relations are necessitated by their relata, external relations are not. While it seems implausible that all relations are internal (one obvious example being spatial connection or parthood), one could imagine relations that supervene on contingent characteristics of their relata (Campbell 1990). We will argue with Mertz (1996) that any attempt to do away with relations is hopeless, inasmuch some relations would have to be assumed to be basic in any proposed reduction.

## **Resemblances and Quantities (Ghislain Guigon)**

### **Properties and the Question of Resemblance**

While relations seem to be pretty much resistant to any reduction to properties, it seems plausible to regard properties as supervening on relations. This part explores whether all properties are basically relational, abstractions from relations, foremost the similarity relation(s). According to the classical theory of Resemblance Nominalism (studied also in subproject A), the so-called natural properties can be defined in terms of similarity: natural properties consti-

tute classifications that cut up reality at its joints (Lewis 1983a).

A property is, according to resemblance nominalism, a class of resembling things. Not any class of resembling things, however, is a property. Following classical resemblance nominalism (Carnap 1967) a class *A* is a property iff (i) every two of *A*'s members resemble each other, and (ii) nothing outside *A* resembles every one of its members. This view has been the target of conclusive objections. Very recently, two versions of resemblance nominalism have been proposed in order to avoid these objections (Lewis 1983a Rodríguez-Pereyra 2002). Rodríguez-Pereyra defines natural properties by means of a dyadic relation of similarity, whereas Lewis's account uses a multigrade relation of similarity. The present project will argue for the superiority of the multigrade version of resemblance nominalism.

While resemblance nominalism accounts for resemblance between things by taking it as a primitive, it does not explain higher-order resemblances between properties such as red's being more similar to orange than to blue. Universalism analyses higher-order similarity between properties in terms of partial identity between complex universals. This analysis is insufficient because it cannot explain the similarity between simple properties (Heil 2003). Particularism, on the other hand, accepts as primitive the relations of perfect and imperfect similarity between property-instances; but this is not satisfactory for it does not explain why properties are more or less imperfectly similar – it does not account for the order-relations between properties.

It is possible to account for higher-order resemblance in a way which is neutral with respect to the rival theories of properties: Gärdenfors's theory of conceptual spaces defines natural properties as regions of conceptual spaces (Gärdenfors 2000). Conceptual spaces are representations of concepts; they are geometrically defined as sets of connected quality dimensions; Gärdenfors's theory of conceptual spaces provides a powerful tool for the description of relations between properties. In particular, recent accounts of axiological properties are grounded on this theory (Oddie 2005). However, Gärdenfors's analysis of similarity data are based on a geometrical model, in which stimulus objects are viewed as points in some metric space that preserves the ordering of the real numbers. Logical objections have been raised to such an analysis of similarity data (Williamson 1988). The projected book will propose an alternative to the conceptual space analysis based on the logic for comparative similarity.

## Quantities

Quantities such as numbers, forces, lengths, intensities, masses are of utmost importance in mathematics and empirical sciences. Their characteristic is that they can take different values which enter in order relations and can be, in most cases, represented in some metrical space (Bigelow and Pargetter 1990). From a metrical point of view, scalar, vectorial, tensorial quantities, and non-dimensional quantities are distinct kinds of quantities. An account of the following elements must be provided: physical dimensions, unity of measurement, and functions of quantities. Recently, an ontology of mathematics has been developed by mathematicians at Stanford University which uses these elements. In this ontology, values of quantities are real numbers, higher-order vectors and tensors (Gruber and Olsen 1994). It is still an open question to determine if these values are themselves properties. The projected book will give an account for quantities and their values within a general theory of properties. In particular, the book will deal with the following issues regarding quantities: (i) Are physical and psychical quantities real properties of things? Naïve realism is the view that they are. Operationalists argue for the essentially relational character of quantities: the existence of a quantity is logically dependent upon the existence of a set of linear ordering relationships (Ellis 1966). We will try to determine the direction of the dependence relation: do quantities depend upon linear ordering relationships or do the linear ordering relationships depend upon the quantities? (ii) Are quantities repeatable kinds or non-repeatable instances? Some philosophers maintain that quantities are universal properties, i.e. kinds of property instances. It is well-known that in order to be measurable, quantities must be conceived as wholes which are divisible into parts. This is highly problematic, however. Unlike repeatable universals, non-repeatable instances can be conceived as wholes composed of parts in many cases. (iii) Is any quantity a whole composed of parts? We will show that some relations are quantities and that relations are not wholes composed of parts. An account of such indivisible quantities and of their measurement will be provided (cf. Guigon 2005).

## Timetable

months	Luc Schneider	Ghislain Guigon
before 1.10.06	modification of Mertz' logic of particularised properties	quantities
1-6	the ontology of a PPL: relations as kinds and instances	resemblance nominalism
7-12	order, multigrade relations	higher-order resemblances
13-18	substances as ultimate attribute-bearers	conceptual spaces
19-24	a second-order account of time and modality	Alternative to conceptual spaces
25-36	Elaboration of the monograph	Elaboration of the monograph

**Benchmark:** publication of the monograph

**After two years:** Two-thirds of the monograph

# **Subproject E: Interrelations of the Subprojects**

researcher: Philipp Keller

## **Summary**

### **A General Metaphysics of Properties**

#### **Schedule**

months	
1-12	
13-24	
25-36	

#### **Conclusion**

#### **Conclusions**

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