Hypo-Realism with Respect to Relations

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Abstract Relations such as *longer than* and *heavier than* play a basic role in natural-scientific measurements. Nonetheless a majority of philosophers seem to think that such relations have no real mind-independent existence. This paper argues that they have. But since these relations are not as ontologically fundamental as property instances are, they are called 'hypo-real entities'. Crucial to the argumentation is a distinction between *thin relations* and *thick relations*, and the introduction of a new kind of instantiation relation: *scattered instantiation*. On the linguistic level, this relation is mirrored by what I call 'many-place copulas'. The classical objection to relation realism is that relations such as *longer than* and *heavier than* cannot possibly be localized anywhere. If the phenomenon of scattered instantiation is accepted, there is an answer: such relations are localized in the scattered collection of their relata.

1 Introduction

The thoughts giving rise to this paper were triggered by the conference "The Metaphysics of Relations" (Aix-en-Provence, 9-11 December, 2009). At the conference, I talked under the title "How the Analysis of Order Depends on Ontological Presuppositions," now the paper (Johansson 2010b), and took it for granted that most of the participants should ascribe relations some degree of reality; at least so much that the question of how to explain from where the order of non-symmetric relations such as *larger than*, *before*, and *loves* comes, should be regarded as a serious philosophical issue. To my surprise, however, my very point of departure was strongly questioned.

E. Jonathan Lowe, who once wrote "I should say that I also admit *relations*, both as universals and as particulars (Lowe 2001, p. 203)," and some years later repeated "At this stage, something should perhaps be said about *relations*, for I don't want to imply that there are only 'monadic' ways things can be (Lowe 2006, p. 91)," had now become suspicious of this view. His talk was called "Why There Might Really Be No Relations," and he said in the handout:

> But why, it may now be asked, should we have any compelling concern to eliminate all putatively 'real' relations? What is *wrong* with them? My basic answer is that they seem to be ontologically *weird*. This is especially apparent if one assumes that real universals require real *tropes or modes* as their particular instances, as I do. [...] I think we should be skeptical about the very notion of a relational mode or individual accident. But since it appears, from our foregoing considerations, that they would in any case serve no useful ontological purpose, maybe we should not spend too much time trying to demystify them. (Lowe 2009, pp. 14-15)

A handout from Philipp Keller had the straightforward title "Fundamentally, There Are No Relations" (Keller 2009). Here, he developed and strengthened views from of his doctoral dissertation (Keller 2007, ch. 9), and argued against the reality of relations.

Being less drastic in his title, "Relations and Relational Truths," and being completely loyal to earlier writings (Heil 2005, 2009a), John Heil argued for the claim:

- The truthmakers for relational judgments are [only] non-relational features of the world. (Heil 2009b, pp. 11, 20)

This view, which Heil calls 'modest realism', I will contest: *relational judgments have also a relation among their truthmakers*. However, I will rest content with arguing for the reality of a certain kind of internal relations to which relations such as *larger than* and *heavier than* belong, even though I think modest realism is false for other kinds of relations, too. But I think realism with respect to relations is harder to defend for relations such as *larger than* and *heavier than* than for any other kind.

The view I contest can also be found implicit in papers such as Peter Simons "Why There Are No States of Affairs" (2009). If there are no states of affairs, there can be no internal relations either, since, as will become clear, an internal relation can only exist as part of a state of affairs.

The kind of spatiotemporal reality that I ascribe to cases of some internal relations has such a character that I have chosen to label my position 'hypo-realism' (about the term 'cases' used, see the eighth paragraph from the end). The prefix 'hypo-' is intended to indicate that internal relations of the kind I am interested in are so to speak 'below' and less fundamental than what is truly fundamental in our spatiotemporal reality. Let it not be misunderstood, I regard these cases of internal relations as really existing in a sense of 'exist' that does not allow of any degrees, either an entity exists spatiotemporally or not. Nonetheless, it can be consistently claimed that some relations are not as spatiotemporally fundamental as the property instances or simple tropes that they relate are.[1] Entities can be more or less fundamental, i.e., take degrees of fundamentality, and in this very sense be said to take degrees of existence. Hypo-realism for a certain kind of internal relations must not be conflated with David Armstrong's famous view that there are internal relations, but that they constitute "no addition of being (1997, p. 12)." The central claim of this paper is that there are hypo-real internal relations that add something to spatiotemporal being.

The term 'relation' must by no means be conflated with that of 'relational property'. In predicate logic, a monadic property *F* of the individuals *a* and *b* is symbolized *Fa* and *Fb*, and a two-term relation *R* between them is symbolized *aRb*; a relational property predicate such as 'has the relation *R to b*' might then, when ascribed to *a*, be symbolized (*Rb*)*a*. Such a formula can be given different ontological interpretations. One possibility is to claim that from an ontological point of view there are no relational properties, only the relation *R* and the relata *a* and *b*. Another is to claim that '(*Rb*)' represents what Aristotle called 'relative' ('*pros ti*'), i.e.,

[1] For the sake of stylistic simplicity, the term 'property instance' is in the paper understood in such a wide sense that even philosophers such as David Armstrong (1978, 1997) and Reinhardt Grossmann (1983, 1992) can be said to accept the existence of property instances. Both deny the existence of what is normally called instances, but Armstrong posits a relation of *instantiation* and Grossmann posits a relation of *exemplification*. That is, I allow myself to say that there is a property instance where Armstrong has a state of affairs consisting of the union (*instantiation*) of a monadic universal and a particularity that "is closer than relation (1978, II: p. 3)," and where Grossmann has a spatiotemporally localized individual that *exemplifies* a completely non-localizable property universal; see also note 4 below. Property instances may be called *complex* tropes, since they are property particulars that in some sense contain a universal and so are not simple. For my own detailed views on universals and particulars, see (Johansson 2009a).

represents an accident that *inheres* in *a* but in some sense is *toward b*; about this possibility, see (Henninger 1989) and (Jansen 2006).

In relation logic, two-term internal relations appear in the sentence form *aRb*, and here the relation *R* is not "toward" anything in the sense used above; and if cases of *R* inhere in anything at all, then they inhere simultaneously in both the relata, *a* and *b*. This being noted, I would like to say that I regard the quotation below from Aristotle as being just as true for internal relations as for his relatives. He could, I think, have called the relatives 'hypo-real entities'; they make up a category of being, but are not as real ("substantial") as some other categories are:

> the great and the small, etc., are relative terms; they belong to *the least substantial* of all the categories and are posterior to quality and quantity. (Aristotle 1907, p. 281, italics added; *Metaphysica* book 14: 1088a)

2 Seduced by Language?

In medieval philosophy, the question of the ontological status of the category of relatives was quite an issue. In contemporary philosophy, the discussion of the ontological status of relations has not been met with a similar interest, but it does exist. According to Russell, philosophers before him had not been able to realize that relations make up a unique non-reducible category, because they had been seduced by ordinary language. If it is true (contrary to Russell's view) that every proposition at bottom has to consist of a number of subject-predicate propositions, then seemingly relational propositions must be reducible to combinations of such propositions. And he thought that the mistaken view that propositions must be subject-predicate propositions was fostered by the subject-predicate grammar of the Indo-European languages (Russell 2004, pp. 331–333).

A sentence such as Plato's (in *Phaedo*) 'Simmias is taller than Socrates', which Russell wants formalized into *aRb* ('Simmias *taller-than* Socrates'), can in ordinary English be taken as having the form *S is P* ('Simmias is (*taller than Socrates*)'). Many of Russell's arguments in favor of the existence of relations are grounded in his belief that without them it is impossible to explain the order displayed by asymmetric relations (Russell 2006, 1992). I think he makes mistakes in these analyses (Johansson 2010b, 2011), so I do not use them for the purposes of this paper. However, one of Russell's arguments in favor of the view that *R* can represent a pure relation entity is an argument from the use of measurement scales in the sciences. Russell takes it for granted that the empirical sciences tell us something about the world they investigate, and then he says:

> I do not believe, for instance, that those who disbelieve in the reality of relations [...] can possibly interpret the numerous parts of science which employ asymmetrical relations. (Russell 2004, p. 337)

In other words: how can the usefulness of the scales of physics, chemistry, and technology be explained if in the mind-independent world there are no relations at all? Call this 'Russell's Challenge'. This question ought to disturb extreme nominalists and strong social constructivists who think that all structure comes from language. But this paper is not written with the intent of making these two brands of philosophers face the question. The intended target group is philosophers who think that in the world there are mind-independent property instances or simple tropes (see again footnote 1), but who nonetheless subscribe to a modest realism or anti-realism for the kind of internal relations that this paper highlights.

Interestingly enough, John Heil turns Russell's remark about the bad influence of ordinary language upside down (Heil 2006, 2009a). He suspects that non-modest relation realists are seduced by language; he suspects that they/we think that 'taller' in the relational sentence 'Simmias is taller than Socrates' (*R* in *aRb*) must, because of the grammatical similarity with 'the ball is round' (*P* in *S is P*), have the same kind of direct correspondence with reality as 'round' has. Therefore, I need to make the following statement: whatever kernel of truth there is in Russell's and Heil's accusations in relation to the philosophers they have had in mind, I am fully aware of both the possibilities of language seduction mentioned. As I hope will become obvious, I will not move directly from features of either ordinary English or formal logic to ontology.

In fact, I think that the grammatical and formal-logical structures that best mirror the views I put forward, are ones that so far do not exist in any natural or formal-logical language. Beside the ordinary copula 'is', I introduce a two-place copula 'is—is' for two-term relations, which will be presented more at length in the last section. It gives rise to grammatical and logical structures such as:

- Simmias ^{is}*taller-than*^{is} Socrates
- *a* $^{is}R^{is}$ *b*.

If we do not simply hide or take away the copula in *a is F*, as is done in the *Fa* of predicate logic, but write ^{is}*Fa*, we should write the relation logic formula *aRb* as *a* $^{is}R^{is}$ *b*. That is, in *aRb* there is a two-place copula hidden; *R* is predicated of two subjects, *a* and *b*, not only one. Although I have not seen it explicitly stated by Russell himself, his view implies, that whereas a *relational property predicate* such as 'taller than Socrates' needs only the traditional one-place copula, a two-place *relation predicate* such as 'taller than' needs a two-place copula (Johansson 2010b, sect. 1; 2011, sect. 5).

The notion of 'two-place copula' can easily be generalized. A three-place predicate such as 'between' needs a three-place copula, a four-place predicate needs a four-place copula, and so on. In general, we can speak of 'many-place copulas'.

A many-place copula must not be conflated with the copula used in sentences that contain a distributive plural subject term, i.e., sentences such as '*the planets* are moving around the sun', and '*these books* on the shelf are philosophy books'. Here, the copula 'are' represents an iteration of the ordinary copula 'is'; each planet *is* moving around the sun, and each book on the shelf *is* a philosophy book. Even many-place copulas can be connected to plural subject terms and take the grammatical form 'are'. For instance: 'the basket players are taller than the jockeys', 'the basket players ^{are}*taller-than*^{are} the jockeys'.

3 Thin and Thick Relations

Since the time of Russell's and Moore's criticism of British Idealism (Russell 1910, Moore 1960), relations and relational properties have often been divided into internal and external ones. Traditional prototypical examples of external relations are spatial (*at a distance*), temporal (*before*), and causal (*because*) relations; typical examples of internal relations are *taller than, heavier than, larger than, more than, faster than, warmer than, harder than*.

In contemporary analytic metaphysics, the mainstream definition of *internal relation* stems from Armstrong, who allows himself to extend the notion of *entailment* from propositions to universals and instances of universals:

- An internal relation is one where the existence of the terms entails the existence of the relation. (Armstrong 1997, p. 87)

I shall, however, discuss only a specific kind of such internal relations; I shall put aside not only external relations, but also relations such as *instantiation*, *exemplification*, *inherence*, and *ontological* (*existential*) *dependence*, which might be argued to fit the definition.[2] This group of relations relates their relata *a* and *b* in such a strong way that it holds true: '*a* cannot exist unless *b* exists', and they might be called 'strongly internal relations'. The kind of internal relations that I shall focus on are such that their relata are able to exist independently of each other, and they might be called 'weakly internal relations'; I will, however, call them 'grounded relations'. The definition looks like this:

- A relation *R* in *aRb* is grounded iff (i) the relata *a* and *b* collectively entail *R*, and (ii) the relata *a* and *b* can exist independently of each other.

According to this definition (and even Armstrong's), a grounded relation (or internal relation in general) can exist spatiotemporally only if it is part of a spatiotemporal state of affairs, namely that constituted by the relation *R* and the relata *a* and *b* that entail the relation, i.e., no spatiotemporal case of a grounded relation *R* without a spatiotemporal state of affairs, *Rab*.

A state of affairs, I should perhaps add, I define as an entity that has at least three constitutive parts: two objects and a relation between these objects; both the objects and the relation can be either simple or complex. Some states of affairs are constituted by grounded relations, some by other kinds; there may be states of affairs even if there are no grounded relations, but not vice versa.

It has to be noted that whether or not a specific relation *R* is grounded is, according to the definition, made dependent on what kinds of entities the relata are. For example, the relation *larger than* is grounded with respect to the size instances or tropes of a mother and her new-born child, but external with respect to the same persons as persons; in the future, the child may become larger than its mother. That is, the relata mother and child do *not* collectively entail the relation *larger than*, but the relata size-instance-of-mother-at-birth-giving and size-instance-of-child-at-birth do.

In 1998 Kevin Mulligan shed new light on the peculiarities of relations by importing into the philosophy of relations the distinction between *thin* and *thick* concepts, entities, and phenomena. He introduces this distinction by means of examples, but he is of the opinion that "all the thin relations [...] can be characterised as internal relations (1998, p. 327)." I am not here interested in this characterization, since Mulligan presupposes Armstrong's wide definition of internal relations, which makes him regard *exemplification* and *entailment* as relations that are internal (and thin); among his examples of thick relations one finds *loves*, *hits*, *north of*, and *happier than*. I regard the distinction as important, but in a way that Mulligan himself does not explore. Let me explain. He puts forward the following thesis:

- All relational sentences, even those with thick relation concepts, have as truthmakers "only thin relations plus monadic tropes or properties and their bearers (1998, p. 327)."

My view, in contrast, is that some relational sentences can as truthmakers also have *thick relations* ("plus monadic tropes or properties and their bearers"). However, the kind of thick

[2] For overviews about *dependence*, see (Lowe 2005) and (Correia 2008); my own detailed views are in (Johansson 2004, chs. 8–9).

relations I have in mind cannot be found among Mulligan's examples of such. There is a kind of thick relations that he overlooks. Given my definition of grounded relation (weakly internal relation), it ought to be called 'thick grounded relation'.

Three of Mulligan's examples in his first list of thin relations (p. 327) conform to my definition of grounded relation: *greater than*, *resemblance*, and *between*. All three he regards as being thin relations, and in a way that should soon become clear I agree with him. But I also think there are a number of thick relations related to each of these thin relations. I call them (using a variable): *greater-than-with-respect-to-X*, *resemblance-with-respect-to-X*, and *betweenness-with-respect-to-X*, respectively. Let me explain.

It has often been remarked that resemblance is always resemblance in a certain respect. There can be meaningful talk about resemblances between weights, between areas, between temperatures, between colors, between shapes, and so on, but not of resemblances across these "respects," "determinables," or "qualitative values of the variable *X*." For instance, no weight resembles a temperature, and no color a shape. To this view, it is often objected that we do distinguish between warm and cold colors, and that therefore one should be a bit cautious in making such a claim. But I think not; no one has ever seriously tried to start to measure the warm-cold dimension of color hues in degrees Celsius, Fahrenheit, or Kelvin. Rather, one should be semantically cautious, and not be too quick in thinking that there is no distinction at all to be made between literal (prototypical) meaning and metaphorical (non-prototypical) meaning of words. I think one should say that only temperatures can resemble temperatures, and only colors can resemble colors, but that some colors can become associated with some temperatures; the relations of *resemblance* and *association* are different relations.

Let me call all entities such as universals, propositions, concepts, numbers, and pure sets that seem to be non-spatiotemporal and causally inert 'abstract entities'. Abstract entities so defined can easily be divided into two fundamentally different kinds, even though I have never seen it being done in the way I will do; I will label them 'impurely abstract entities' and 'purely abstract entities', respectively. Impurely abstract entities can have, but purely ideal always lack, a direct connection to spatiotemporal reality, be it a mind-independent physical such reality or a mind-dependent spatiotemporal perceptual field; and be they so connected by means of a relation *exemplified-by*, *instantiatiated-in*, or *having-as-a-class-member* (as trope theorists, who regard universals as classes of simple tropes, have to say).

Universals are impurely abstract; natural kinds (subatomic particles, molecules, etc.) and properties (roundness, a certain most specific color hue, etc.) can have instances or exemplifications in spatiotemporal reality, and these need not be causally inert. Mathematical numbers, on the other hand, are purely abstract. We can point at instances of properties, but it is impossible to point at numbers. If asked "please, point at the abstract entity that is the mathematical number 1," one does not at all know what to point at. We can, though, point at unities and quantities (one blue spot, two circles, etc.), i.e., a number united with an instance of some universal (or a trope); therefore, unities and quantities should in contradistinction to numbers be regarded as impurely abstract entities. Furthermore, propositions and concepts come out as impurely abstract entities, since they seem to be able to be instantiated in speech acts and reading acts, in writing and reading acts, and in acts of thinking. The sets of pure set theory are purely abstract entities, whereas sets such as the set of the five chairs in my kitchen should be regarded as impurely abstract entities.[3]

The distinction being accepted, I make two claims (*X* is a variable for determinables):

[3] Gonzalo Rodriguez-Pereyra (2008: Sect. 2) makes a distinction between *abstract objects* and *universals* that comes close to mine between purely and impurely abstract entities. He never, however, tells whether universals should be regarded as a certain kind of abstract object or as something quite distinct. Furthermore, he seems to classify propositions as abstract objects, whereas I regard them not as purely, but as impurely abstract entities.

- The thin relation *resemblance-as-such* is a purely abstract entity.
- The thick relation *resemblance-with-respect-to-X* (with a definite "value" for *X*) is an impurely abstract entity.

If one is asked "please, point at two relata between which there is an exact resemblance," one cannot fulfill the wish until one has chosen a resemblance *respect* in which two relata can be resemblance-related. From an ontological point of view, *resemblance-as-such* and mathematical numbers are on a par; whatever their true ontological status is, Platonist, constructivist, or something else.

The point made about *resemblance* is equally true of the relation *greater than*.[4] The relation *greater-than-as-such* is a purely abstract entity, whereas *greater-than-with-respect-to-X* is an impurely abstract entity. It is impossible to understand what it means that something in the world is *greater than* something else, if one is not told in what respect the relation is meant to hold. Is it, for example, a matter of greater or lesser heights, greater or lesser weights, greater or lesser areas, greater or lesser temperatures, or something else? Even though these relations are normally referred to by means of different words such as 'taller than', 'heavier than', 'larger than' and 'warmer than', all can be referred to also by means of 'greater-than-with-respect-to-height/weight/area/temperature'; as is done in list 2 below.

What has now been said of both *resemblance* and *greater than* is true of *betweenness*, too. *Betweenness-as-such* is a purely abstract entity, whereas the relation *betweenness-with-respect-to-X* is an impurely abstract entity that can have spatiotemporal cases, e.g., the one described by the sentence 'this area has a size in-between those of *A* and *B* over there'.

A bit below come three lists. They show that there can be quite a number of thick grounded relations (impurely abstract entities) related to one single thin relation (purely abstract entity). They also make another thing clear: what I have so far called 'respect' is the same as what in basic measurement terminology and metrology concerned with the International System of Units (the SI system) is called 'dimension'. Furthermore, the lists show the overall importance of Russell's Challenge presented in the first section. Ontologists who cannot make sense of scientific scales are in a bad position.

My main point can be stated thus:

- Between property instances (or simple tropes) and the corresponding thin relations – which Mulligan thinks are the only truthmakers for relational sentences – there are sometimes also *respects* (dimensions[5]) that connect the property instances and the thin relations to each other; and a thin grounded relation plus a respect amounts to a thick grounded relation.

[4] A philosopher such as Grossmann accepts the existence of the relation *greater than*, but denies the existence of resemblance relations altogether. This follows from his views that, strictly speaking, there are no property instances (see note 1). The relation *greater than* can as a universal exist as a relation between two specific weight universals, but the relation (exact) *resemblance* can as a universal only be *identity*; one specific weight universal cannot resemble only be identical to itself. Where there seems to be a relation of resemblance between two individuals of equal weight; there is according to Grossmann only the identity of the twice exemplified specific weight universal. Since this weight universal is regarded as a non-localizable entity, there cannot be two localized instances of the weight that resemble each other. The oddity of Grossmann's view that properties have no instances has to my mind been made sufficiently clear by J. P. Moreland (2010).

[5] In much philosophical literature they are also called 'determinables'; see e.g. (Johansson 2000, 2009b, 2010a, sect. 2).

That this mediation is sometimes necessary explains why, for example, a weight instance (trope) cannot possibly be greater or lesser than a velocity instance (trope); and so on for all the possible combinations of the different respects.

The relationship between a thin relation (purely abstract entity) and "its" thick relations (impurely abstract entities) is *not* that of ordinary subsumption. When *A* subsumes *B both A* and *B* have to be universals, concepts, or classes/sets of spatiotemporal particulars. Therefore, I say that a thin relation *subordinates* the thick relations. Here are the lists:

1. Thin Grounded Relation: *Resemblance*

Subordinated thick relations	Corresponding linguistic expressions (*Rab*)
resemblance-with-respect-to weight (mass)	'*a* and *b* have the same weight'
resemblance-with-respect-to length	'*a* and *b* are equally long'
resemblance-with-respect-to area	'*a* and *b* are equally large'
resemblance-with-respect-to volume	'*a* and *b* are equally large'
resemblance-with-respect-to density	'*a* and *b* have the same density'
resemblance-with-respect-to duration	'*a* and *b* last equally long'
resemblance-with-respect-to velocity	'*a* and *b* have the same velocity'
resemblance-with-respect-to light intensity	'*a* and *b* are equally bright'
resemblance-with-respect-to electric charge	'*a* and *b* have the same charge'
resemblance-with-respect-to energy	'*a* and *b* have the same amount of energy'
resemblance-with-respect-to temperature	'*a* and *b* have the same temperature'
resemblance-with-respect-to hardness	'*a* and *b* are equally hard'
resemblance-with-respect-to color	'*a* and *b* have the same color hue'
resemblance-with-respect-to shape	'*a* and *b* have the same shape'

Now and then there are synonyms to the expressions in the right column, but I have found no reason to write them down; the same goes for the lists below. In the next list, one might say that the linguistic relation expression has built into it the 'respect' mentioned in the left column.

2. Thin Grounded Relation: *Greater Than*

Subordinated thick relations	Corresponding linguistic expressions (*Rab*)
greater-than-with-respect-to weight	'*a* is heavier than *b*'
greater-than-with-respect-to length	'*a* is longer than *b*'
greater-than-with-respect-to area	'*a* is larger than *b*'
greater-than-with-respect-to volume	'*a* is larger than *b*'
greater-than-with-respect-to density	'*a* is more dense than *b*'
greater-than-with-respect-to duration	'*a* lasts longer than *b*'
greater-than-with-respect-to velocity	'*a* moves faster than *b*'
greater-than-with-respect-to light intensity	'*a* is brighter than *b*'
greater-than-with-respect-to electric charge	'*a* has more charge than *b*'
greater-than-with-respect-to energy	'*a* has a larger amount of energy than *b*'
greater-than-with-respect-to temperature	'*a* is warmer than *b*'
greater-than-with-respect-to hardness	'*a* is harder than *b*'

The last two rows in the first list have disappeared. This is because color (i.e., perceived color, not electromagnetic wavelengths) and shape have not so far been (and perhaps cannot be) linearly ordered along a line.

3. Thin Grounded Relation: *Betweenness*

Subordinated thick relations	Corresponding linguistic expressions (*Rabc*)
betweenness-with-respect-to weight	'*b* has a weight between that of *a* and *c*'
betweenness-with-respect-to length	'*b* has a length between that of *a* and *c*'
betweenness-with-respect-to area	'*b* has an area between that of *a* and *c*'
betweenness-with-respect-to volume	'*b* has a volume between that of *a* and *c*'
betweenness-with-respect-to density	'*b* has a density between that of *a* and *c*'
betweenness-with-respect-to duration	'*b* has a duration between that of *a* and *c*'
betweenness-with-respect-to velocity	'*b* has a velocity between that of *a* and *c*'
betweenness-with-respect-to light intensity	'*b* has a brightness between that of *a* and *c*'
betweenness-with-respect-to electric charge	'*b* has a charge between that of *a* and *c*'
betweenness-with-respect-to energy	'*b* has an energy between that of *a* and *c*'
betweenness-with-respect-to temperature	'*b* has a temperature between that of *a* and *c*'
betweenness-with-respect-to hardness	'*b* has a hardness between that of *a* and *c*'

The three grounded relations that Mulligan has focused attention on are basic to all scales in physics, chemistry, and technology. Without relations *greater-than-with-respect-to-X* there would be no metrical or ordinal measurement scales; without them, only classifications by means of names would be possible. And without relations of *resemblance-with-respect-to-X*, it would be impossible to use a measurement scale on two different occasions and claim that the measurement results are the same and the measurement values equal. All books in the philosophy of scales and measurements make in some way or other this two-kinds-of-relations requirement clear. With respect to the relations *betweenness-with-respect-to-X*, there is no similar consensus, but my view is that this three-term relation cannot be reduced to a number of two-term relations, and that betweenness relations are needed in order to explain from where, at bottom, scales receive their order (Johansson 2010b). Anti-realists and modest realists have to explain scales without bringing in any of these three relations; this is the specific content of Russell's Challenge.

Let it be clear that, like Mulligan, I think that there are three kinds of entities, *thin resemblance*, *thin greater-than*, and *thin betweenness*, that are distinct from each other; and also distinct from their subordinated thick counterparts. However, since I regard them as being purely abstract entities, and as not having any ordinary kind of spatiotemporal existence, they fall outside of the scope of this paper; the aim of which is to show that cases of thick grounded relations can be hypo-real entities. Nonetheless, the fact that they exist as purely abstract entities is important in other respects. Let me sketch why.

Look at preference logic (Hansson 2006). It has as its core a number of axioms for the two relations *better* (strict preference) and *equal in value to* (indifference). In my opinion, both these relations should be regarded as purely abstract entities and as thin relations. Conversely, axioms can be, and has been, put forward for the thin relations *resemblance*, *greater than*, and *betweenness*; some of them state features such as symmetry, asymmetry, and transitivity. Therefore, terms such as 'the logic of resemblance', 'the logic of greater-than', and 'the logic of betweenness', are as adequate as that of 'preference logic'. The first two logics are pretty simple, but betweenness logic has more structure. Here are its axioms (Gärdenfors 2000, pp. 15–17):

(0) if *Babc*, then *a*, *b*, and *c* are distinct points;
(1) if *Babc* then *Bcba*, i.e., if *b* is between *a* and *c*, then *b* is between *c* and *a*;
(2) if *Babc* then ¬*Bbac*, i.e., if *b* is between *a* and *c*, then *a* is not between *b* and *c* (rules out betweenness on a line that is a loop);

(3) if *Babc* & *Bbcd* then *Babd*, i.e., if *b* is between *a* and *c* and *c* is between *b* and *d*, then *b* is between *a* and *d* (the consequent can just as well be *Bacd*);
(4) if *Babd* & *Bbcd* then *Babc*, i.e., if *b* is between *a* and *d* and *c* is between *b* and *d*, then *b* is between *a* and *c* (the consequent can just as well be *Bacd*).

These axioms about thin betweenness are not subject to empirical investigations, but all thick betweenness relations are. However, if a presumed thick betweenness relation does not conform to the formal features laid down by the axioms, then it is not even a thick betweenness relation. The difference between thin and thick betweenness is analogous to the much more discussed distinction between (pure mathematical) numbers and (physical-chemical) quantities (Johansson 2009b). Thick relations relate to superordinated thin relations as quantities relate to superordinated numbers.[6]

Since, in the way explained, I regard thin grounded relations as being purely abstract entities, they have a realism problem that is distinct from that of the present being-real-in-the-spatiotemporal-world problem. Should thin relations be regarded as Platonic entities or as something else? The hypo-realism I am arguing for is only meant to apply to cases of thick grounded relations. If some critics of (non-modest) relation realism have had only thin grounded relations in mind, then they have captured a truth, but only a partial truth; one that they mistakenly believe to be the whole truth.

4 Hypo-Realism versus Other Positions

John Heil has distinguished and characterized seven ontological positions with respect to relations; without, though, claiming that they are mutually exclusive (Heil 2009a). The position that I shall defend is not to be found among these (Mulligan's might be a specific sub-version of position three or five). However, a good way to make clear the position I want to defend is to say how it differs from the traditional ones as characterized by Heil. I will use his classification only in relation to thick grounded relations.

The first position, (1) *Flat-out anti-realism*, claims that all beliefs of the form '*a* bears *R* to *b*' are false. That is, it holds that there are no truthmakers at all for such beliefs. As far as I can see, only extreme nominalists who deny the existence of property instances and simple tropes can adhere to this position. To repeat, I leave such philosophers outside the scope of my paper. The next two positions claim that all grounded relations are some sort of projections onto pre-existing entities. The second, (2) *Projectivism*, claims that the projected grounded relations are purely mental comparison constructs; whereas the third, (3) *Constrained projectivism*, claims that the mental constructions in question are constrained by non-relational features of the world. Position (2) can accept relational truthmakers in the sense that the projections are regarded as their own truthmakers, and position (3) can claim that the constraints in question function as the only needed truthmakers. I think that thick grounded relations can very well exist as projections in both these senses, but my position is that this cannot be the truth for all thick grounded relations.

The next position, (4) *Reductionism*, claims that relations can be identified with non-relational features of objects. Constrained projectivism may fit in here, and so may the medieval view that all relations at bottom are accidents. Heil defines (5) *Supervenience* as follows: relations exist, but are somehow "dependent on and determined by" the relata and

[6] The same point can be made in relation to mereology, too. Every spatiotemporal part-whole relation has to be some specific *kind* of part-whole relation, be it a purely spatiotemporal, a physical-chemical, or a functional part-whole relation; see (Johansson 2008). Formal mereology, on the other hand, is about a purely abstract (and thin) part-whole relation.

their monadic properties. He bypasses the question of how the notion of 'supervenience' should be understood. In my opinion, if the term 'supervenience' is taken in its reductive sense, then the fifth position is a case of the fourth, Reductionism. This is the view of Armstrong, who writes:

> Given our definition of supervenience, it follows that the [internal] relation supervenes on the existence of the terms. [...] If, as I further contend, what supervenes is not something ontologically more than what it supervenes upon, then, once given their terms, internal relations are not an addition to the world's furniture. (Armstrong 1997, p. 87)

But Armstrong's definition is merely one of several definitions of supervenience (Johansson 2002). If one uses 'supervenience' in the non-reductive sense in which it was once introduced (into moral philosophy) by R. M. Hare, then my hypo-realism implies that thick internal relations do (Hare-)supervene, and *are* "something ontologically more than what [they] supervene upon," the relata.

Heil's own position is (6) *Modest realism*. He claims that all truthmakers for relational predications are non-relational features of the world. As far as I can see, this position is compatible with both constrained projectivism and reductionism, but it makes a distinctly weaker claim, since it simply is silent on the issues of the existence of possible projections and reductions.

For some reason, Heil does not give any position the straightforward name 'realism'; instead he calls the seventh and last position (7) *Hyper-realism*. According to this view, relations are *ontologically fundamental*; the world includes, in addition to objects and their properties, relations. This characterization, I would like to stress, allows two sub-positions. It may mean that relations are either (7a) *more* fundamental than or (7b) *equally* fundamental as objects and monadic properties are. The former position is that of the so-called 'ontic structural realists' (Ladyman 2009), and the latter that of Donald M. Mertz (1996, 2006). For good criticism, see (Heil 2009a, pp. 310–312).

Now, even though I think that thick grounded relations can be real in the sense of having a mind-independent existence, I do not think that they can be as ontologically *fundamental* as property instances (or simple tropes) are; not to speak of being *more* fundamental than these. Therefore, instead of either 'realism' or 'hyper-realism', I label my position 'hypo-realism'. Here comes the definition:

> (8) *Hypo-realism*: in addition to property instances (or simple tropes), the mind-independent spatiotemporal world includes cases of thick grounded relations – such relations are ontologically real but not ontologically fundamental; they are dependent on and determined by property instances (or simple tropes), and are because of this necessarily parts of states of affairs.

So defined, thick grounded relations are epiphenomena (because "they are dependent on and determined by property instances"), i.e., they exist, but they have no direct causal power themselves. Indirectly, however, they may be indispensable parts of causal chains. It can make a difference to people's behavior whether they perceive a certain thick grounded relation or not. The perception of differences in height is a good example. Traditionally, many men thought that they had to be taller than the woman they married.

At last, let me compare what modest realism and hypo-realism have to say about truthmaking. According to modest realism, a sentence such as '*a* is taller than *b*' is made true only by the length instances (or tropes) *a* and *b* together, whereas according to hypo-realism,

it is made true by *a* and *b* plus the thick grounded relation *taller than*. At first, there seems to be a clear difference in these accounts: hypo-realism posits a relation as one of the truthmakers, but modest realism does not. The difference, however, diminishes radically when it is remembered that hypo-realists think that the relation in question is entailed by the relata. From only a knowledge of the existence of *a* and *b*, even the hypo-realist can draw the conclusion that '*a* is taller than *b*' must be true. The hypo-realist's opposition to modest realism can be stated thus:

- If, counterfactually, the relation *taller than* had not been entailed by *a* and *b*, then *a* and *b* would *not* have been able to make the sentence true.

The difference between the positions is small, but the difference is there; the relations cannot be taken away from the ontological picture.

Having now defined the notions of 'hypo-realism' and 'thick grounded relation', it is time to argue for my view that cases of thick grounded relations are hypo-real entities. I have compiled four arguments.

5 Four Arguments in Favor of Hypo-Realism for Thick Grounded Relations

First Argument: Russell's Challenge

No philosopher can start from scratch. I find it quite natural that a philosopher's contemporary culture to some extent dictates on whom the first burden of argument in a controversy is to be put. If in ancient Greece or medieval Europe a non-modest relation realist with a relation logic à la Russell had popped up, then I think the burden of argument for the existence of thick grounded relations would have fallen upon him. In those days, there was no mathematical physics with all its measurement scales around. But today, after many centuries of extremely successful mathematically impregnated natural science and science-based technology, I think it should be exactly the other way round. And I am surprised that most anti-realists and modest realists do not seem to feel this way. In my opinion, the default position today is that of relation realism. Philosophers who think that there are no thick grounded relations should not only have to provide strong arguments against such relations, and some strong arguments in favor of their preferred alternative; they should also have to put forward a really good explanation of why and how natural-scientific scales can be useful despite the (presumed) absence of thick grounded relations in the mind-independent world.

Second Argument: Grossmann's Impossibility Argument

Reinhardt Grossmann, who has been called 'the relation police' by Heil (2009a, p. 320), has turned Russell's scale challenge into a positive argument for the un-reducibility and un-eliminability of relations, which, in my terminology, he regards as purely abstract entities; however, the argument goes through even when relations are regarded as impurely abstract entities that have exemplifications, instantiations, or cases in the spatiotemporal world. Grossmann claims, convincingly to my mind, that it is impossible to make a ranking or ordering of the heights of, for instance, four people without introducing relations (Grossmann 1983, pp. 155–164, 1992, pp. 51–54). Every time one tries to use only properties when creating the ranking, relations are in some way implicitly brought in, for instance, as subscripts to the monadic predicates used.

Heil (who, despite his own labeling, might be called 'the relation killer') admits that there is a kernel of truth in Grossmann's argument, but that this partial truth is restricted to the linguistic level. According to Heil, Grossmann has only showed that it is impossible to

translate *talk* of relations into talk with only non-relational terms. And this, Heil says, "cuts no ontological ice (2009a, p. 320)." I am not so sure about that. This untranslatability thesis should not be looked upon in isolation; it should be connected with the fact that scales are extremely useful. One might then reason as follows: (a) since most modern successful technological devices rely on natural-scientific theories, which presuppose scale talk, which in turn presupposes thick grounded relations, then the existence of the devices is dependent on relation talk; and (b) if such technological devices with their causal mechanisms are dependent on relation talk, then probably some such talk has real referents in the world.

Third Argument: The Argument from Perception

Everything that exists in perception has to be given some place in a complete ontological system. Look at the following two round black spots [● •], and let the square brackets mark a boundary for what is to count as interesting states of affairs. I claim that I can here perceive at least four states of affairs that involve the two spots (called *a* and *b*) as constituents. One of the states of affairs can be described by the sentence '*a* and *b* lie beside each other'. This one I will leave out of account now, since its constituting relation is an external relation; but I have reason to return to it in the next section. The other three states of affairs have a grounded relation as their constituting relation. They can be described by the following sentences: '*a* and *b* have the same color', '*a* and *b* have the same shape', and '*a* is larger than *b*'. My first claim now is that I can perceive *that a* and *b* have the same color, *that a* and *b* have the same shape, and *that a* is larger than *b*.

From this premise, the argument proceeds in two steps. First, when I perceive the states of affairs mentioned, I must in some sense also perceive their constituent parts; and among them are the three thick grounded relations mentioned. All parts of a perception need not be perceived in the same way. In particular, the foreground is perceived differently than the background, and a so-called 'Gestalt quality' is not perceived the way its constituting parts are perceived. Conclusion: I can perceive cases of thick grounded relations.

The second step can be presented by means of a rhetorical question: if thick grounded relations grounded on property instances (or tropes) of shape and areas can be perceived, is there any reason to believe that these relations cannot exist also independently of perceptions? If shapes and areas can exist in both the mind-independent world (as properties of material things) and in the mind-dependent world (as properties of objects in illusions, dreams, and hallucinations), why should not then the grounded relations they entail be able to exist both ways, too? In illusions such as the Müller-Lyer illusion we seem to have it both ways at once. We perceive one line as being longer than the other, but we nonetheless more or less spontaneously think that they can't be.[7] Conclusion: there are cases of mind-independent thick grounded relations.

The critics have mainly focused on the first step, and their reply is straightforward: I cannot perceive thick grounded relations, because if I could, I should be able to tell exactly where in the perceptions they are located, but this is impossible. This objection is crucial; it will be the topic of the last two sections (6 and 7), and I will call it 'the main objection'.

Fourth Argument: The Anti-Projectivism Argument

Assume, again, in spite of the main objection, that in some way or other we do perceive cases of thick grounded relations. Independently of the main objection (which is directed at the first step of the Argument from Perception), the anti-realists and modest realists can criticize the second step of the argument. True, they can say, there are cases of thick grounded relations in perceptions, but none has a counterpart in the mind-independent world. It is just a matter of

[7] The example was handed over by Jan Almäng.

the ordinary human projection mechanism. If, for example, all language users disappear from the world, then there would be no linguistic meaning at all around. Linguistic meaning is a human creation, but in our perceptions of texts and speech acts we (falsely) perceive linguistic meaning as existing outside of us and independently of us. It is exactly the same with thick grounded relations, or so the argument continues. We perceive them as being outside of us, but this is because we have the ability to project some of our mental creations out into the world.

My reply is this. With respect to linguistic meaning it is in thought possible to make a distinction between linguistic meaning and the purely acoustic or visual patterns that bear the meaning. Sometimes, actual perceptions together with memories of old perceptions easily bring home the distinction. When we first meet a completely new language, we perceive in a sense only noise, but after a while things start to change; and if we learn to speak the language fluently, the sound patterns become a mere background for the linguistic meaning in the foreground. But this does not prove that the same things can truly be said about thick grounded relations; and I think they cannot. As far as I can see, it is impossible that there could be relata *a* and *b* (corresponds to pure sound patterns) but no relation *R* (corresponds to linguistic meaning), and no state of affairs *aRb* (corresponds to meaningful talk). In fact, what I have now said is a mere rephrasing of the traditional wisdom that language signs are conventional, whereas internal relations are entailed by their relata. This difference, however, undercuts Projectivism with respect to thick grounded relations.

6 The Main Objection to Hypo-Realism

Let us now take a look at what is generally – and rightly so – taken to be the hardest problem for non-modest relation realists. Leibniz is often quoted when the problem is presented, sometimes also McTaggart (Grossmann 1992, p. 52), but here it comes in Heil's words:

> *Where* is this [*taller than*] relation? Not in Simmias, it seems, nor in Socrates, nor in both Simmias and Socrates. If the relation is located "between" Simmias and Socrates, it must either be a substance itself, not an accident, or to be located in some other substance. Neither option appears viable. (Heil 2009a, p. 315)

I think the problem is best understood when it is realized that it is not necessarily a problem for an external relation such as *at a distance*; whether it is depends on what conception of space one presupposes. Look at the state of affairs below, identified by means of the description written beneath (where the symbolism stems from the end of sect. 2):

a $^{\text{is}}$*at-a-distance-from*$^{\text{is}}$ *b*.

If space is conceived of in Newtonian fashion as a real individual entity that because of its essential emptiness can, so to speak, house material things within itself, then there is a real spatial region between the spots named *a* and *b*. Now, the relation *at-a-distance-from* can of course not be located in *a* or in *b*, but it can (given the Newtonian container conception of space) be located in the spatial region between *a* and *b*. But this fact does not cancel Heil's point. It merely means that the relation *at-a-distance-from* is regarded as being *an accident located in a substance*, a spatial region. However, the same thing can never be true for cases of grounded relations. Look at the next state of affairs:

a [is]*larger-than*[is] *b*.

Here, Heil's question is certainly to the point: *Where* is the relation *larger than*? Referring to a *naturalist* as someone who does not accept abstract entities, but only entities in space and time, Grossmann writes:

> I think that part of the reason [why so many philosophers become relation deniers] is that relations do not comfortably fit into the ideology of naturalism. *They do not seem to be located in space and time.* [...] As we have noted repeatedly before, the only half-way coherent answer of the naturalists has been that the relation is 'where the structure is that consists of the three objects in relation with each other'. (Grossmann 1992, p. 55)

Grossmann's own solution is to claim that grounded relations are abstract entities that lack exemplifications, i.e., that they are purely abstract entities. This presumed solution is of course not available to me, since I am arguing that as ontologists we should posit spatiotemporally existing cases of thick grounded relations. I think, by the way, that Grossmann's answer evades Russell's challenge; Russell took it for granted that relational universals have instantiations. As pointed out by Armstrong (2010, p. 65), it is a curious asymmetry to posit, as Grossmann does, an exemplification relation between properties and individuals in space and time, but no corresponding exemplification relation between relations and spatiotemporal individuals. Either there should be no exemplification relation at all (which Armstrong would prefer) or there should be an exemplification relation both for properties and relations (which comes closer to my views). This absence of a good solution makes still another section necessary.

7 Answer To the Main Objection

The main objection as applied to the state of affairs described by '*a* [is]*larger-than*[is] *b*' consists of the question below, and a rejection of its four logically possible answers:

> Where is the *larger than* relation of [● •]? (i) Not in *a*, it seems, (ii) nor in *b*, (iii) nor in both *a* and *b*; and (iv) there is no other possible grounded relation bearer around.

For brevity's sake I will represent *larger than* by *R*, and then use the symbolism introduced at the end of the second section, i.e., the *Fa* of predicate logic is turned into [is]*Fa*, and the relation logic formula *aRb* is written *a* [is]*R*[is] *b*. There is no need to discuss statement (iv); it is true.

Statement (i), i.e., '*R* cannot possibly be in *a*', becomes in my symbolism 'not possibly: [is]*Ra*'; and statement (ii), '*R* cannot possibly be in *b*', becomes 'not possibly: [is]*Rb*'. So far, nothing of interest appears, and the statements (i) and (ii) can be regarded as being just as true as statement (iv). But in relation to statement (iii), '*R* cannot possibly be in both *a* and *b*', my symbolism opens up new possibilities of thinking. Statement (iii) can be given three different representations:

(iii a) not possibly: [is]*Ra* and [is]*Rb*
(iii b) not possibly: [is]*R*(*a* and *b*)
(iii c) not possibly: *a* [is]*R*[is] *b*.

The statements (iii a) and (iii b) contain only the ordinary copula, whereas statement (iii c) contains the two-place copula 'is—is' introduced in the second section. Since neither Leibniz, nor McTaggart, nor Heil, have ever talked about the possibilities of a two-place copula, the main objection must be interpreted as being formulated by means of only the ordinary copula used in (iii a) and (iii b). Let us now look at the three alternatives one by one.

First (iii a), since I have already accepted the truth of both 'not possibly: ^{is}Ra' and 'not possibly: ^{is}Rb', I do of course regard 'not possibly: ^{is}Ra and ^{is}Rb' as being true, too. The word 'and' is here identical with the ordinary logical conjunction sign, and it cannot represent anything that would turn the impossibilities stated in the conjuncts into a possibility for the conjunction as a whole.

Second (iii b), the traditional copula represents the traditional instantiation (or exemplification) relation, but 'and' cannot here be the logical conjunction sign; the expression '*(a* and *b)*' represents the collection (or aggregate or mereological sum) of *a* and *b*. In the statement '$^{is}R(a$ and *b)*' it is claimed that the relational universal *larger than* is instantiated in the collection of the particulars *a* and *b*; moreover, in the collection *as a collection*. Otherwise we are back in alternative (iii a). But if *larger than* is instantiated in the collection as a collection, it is a property of the collection and not a relation between the members of the collection. Therefore, if *R* is a relation, (iii b) holds true: 'not possibly: $^{is}R(a$ and *b)*'.

Third (iii c), what then are we to say about the remaining two-place copula alternative? Note, a two-place copula is not a one-place copula iterated twice (see sect. 2).

If a two-place copula should be more than a symbolic plaything and be of ontological interest, it must represent a special kind of instantiation (or exemplification). I will call it '2-scattered instantiation'; a three-place copula will of course represent a 3-scattered instantiation, and so on. I am trying a solution that consists in introducing a new kind of instantiation relation: *scattered instantiation*. This relation must not be conflated with the *scattered localization* of the instances of property universals. Scattered instantiation means that one single instantiation (or exemplification) relation has a scatter as one of its relata (the other relatum being a universal). If this relation can be made sense of, then the linguistic admittance of many-place copulas will be a mere side-effect.

Since thick grounded relations can exist only as parts of states of affairs, a scattered instantiation of a grounded relation can come into being only together with the existence of what might be called a 'spatially disconnected state of affairs'. That is, a state of affairs (*aRb*) whose objects *a* and *b* are not spatially connected, e.g., Simmias and Socrates in the state of affairs that Simmias is taller than Socrates.

To argue in favor of scattered instantiations, spatially disconnected states of affairs, and concomitant many-place copulas, must be, I think, like it was – once upon a time – to argue for the existence of seemingly absurd entities such as irrational numbers and non-Euclidean geometrical structures. For a while one has simply to assume the existence of the entities, start to talk about them, think of all kinds of possible consequences, and check whether any contradictions appear. If not, the entities in question can (and probably will) be accepted. So far I haven't found any contradictions in relation to scattered instantiations and spatially disconnected states of affairs. Here are three brief lines of thought in favor of these two kinds of ontological entities.

First, if 2-scattered instantiation really is a matter of fact, then the question where the relation *larger than* is to be found rests on a category mistake. The question 'where is the relation?' should be exchanged for 'where is—is the relation?' And then it does not seem odd to answer: in the scattered collection of *a* and *b*. In other words, if the question 'where can we find the ^{is}*larger-than* relation?' is exchanged for 'where can we find the ^{is}*larger-than*^{is} relation?', then we can answer 'in the collection *a* and *b*'.

Second, if 2-scattered instantiation exists, then it is no mystery but a natural outcome of our spatiotemporal life situation, that everyday language is replete with talk about states of affairs that are disconnected in space. Here come two of an infinite number of possible examples: 'the Sun is larger than the Earth' ('the Sun ^{is}*larger-than*^{is} the Earth'), and 'Simmias is taller than Socrates' ('Simmias ^{is}*taller-than*^{is} Socrates'). We talk this way because thereby we can talk about and discuss really existing entities.

Third, if 2-scattered instantiation exists, then it makes good sense to substitute all tokens of '*cases* of grounded relations' that I have used in the text above by '*the scattered instantiations* of grounded relations'. My claims 'we can perceive cases of thick grounded relations' and 'there are cases of mind-independent thick grounded relations' can be written 'we can perceive the scattered instantiations of thick grounded relations' and 'there are scattered instantiations of mind-independent thick grounded relations', respectively.

Lowe nowadays (see quotation on the first page) finds relations "ontologically *weird*." I must say that today I don't know whether or not I find the connected ideas of 'thick grounded relations', 'scattered instantiations', 'spatially disconnected states of affairs', and 'many-place copulas' weird. Once I did, but I have become accustomed to them; the idea of scattered instantiation was first put forward in passing in (Johansson 1998). However, this question – weird or not? – is in a sense irrelevant; our problem is to find *the least weird view* of thick grounded relations. If there is a view that is not weird at all, so much the better; but this can by no means be taken for granted. Next I will state why I regard the alternatives to hypo-realism (for thick grounded relations) as being even weirder than hypo-realism.

To claim that in the world there are no thick grounded relations is to make all natural-scientific scales an unexplained mystery. Thereby, in effect, the natural scientists become sorcerers. When saying this, I have neither neglected nor forgotten the fact that physics has undergone conceptual revolutions, or that it might do so in the future. Let me make a thought experiment. Assume that one day the physicists have to say about electric charge what was once said in chemistry about phlogiston: 'excuse us, but it does not seem to exist, it is a mere fiction'. Thereby, also all the thick grounded relations between different amounts of electric charge would have to be deemed fictions. But then, surely, instead of electric charge one or several new kinds of physical entities would be posited, and with them new scales with new kinds of thick grounded relations. One kind of thick grounded relations would only be exchanged for one or several other kinds.

Armstrong, who really wants his ontology to conform to the natural sciences realistically conceived, does in a sense not deny the existence of grounded (internal) relations. He claims that they are entailed by and supervene on pairs (or n-tuples) of property instances, which makes them ubiquitous. He says: "An internal relation is one where the existence of the terms *entails* [italics added] the existence of the relation (Armstrong 1997, p. 87)." But he also says: "What supervenes is no addition of being. Thus, internal relations are not ontologically additional to their terms (1997, p. 12)." Together, these two statements are for me on the brink of stating a contradiction: internal relations are claimed both to exist and not exist. When two *propositions* entail a third proposition, then the entailed proposition has to have the same ontological status as the two premise propositions. But, according to Armstrong, two spatiotemporally *real existents* (the relata *a* and *b*) can entail a third entity (the relation *R*) that has quite another ontological status than the premise entities. I find such a view of entailment very weird.

Grossmann is the one who comes closest to the view I have tried to explicate and defend. What makes his view weird is that he denies that any relation can have instantiations or exemplifications. Perhaps this oddity has to do with the fact that Grossmann makes no distinction between thin and thick relations.

Assume now that I am right, and that in the mind-independent part of the world there are cases (scattered instantiations) of hypo-real thick grounded relations. What then does the world, seen from this perspective, look like? On my account, such relations are epiphenomena that in a non-reductive (and non-Armstrongian) sense are supervenient entities. They are additions to being that contain no direct causal power, and they are dependent on and determined by their relata. The example of shadows is sometimes used to explain what it means to be an epiphenomenon. You can see shadows, but you can't move them or make them disappear in any other way than by doing something with the things that create them, i.e., the light source, the shadowing thing, and the surface on which the shadow exists. And the same goes for cases (scattered instantiations) of thick grounded relations. One can change them or take them away only by changing or taking away one of the things that create them, their relata.

Hypo-real thick grounded relations are ubiquitous in the strongest sense possible. They supervene everywhere, and they can relate not only property instances that are close to each other, but instances that have any possible spatial distance; the relata can even be in completely opposite corners of the universe. However, since these relations are epiphenomena, this fact doesn't make any difference to what happens in the world as long as there are no beings with minds around, i.e., beings whose behavior can be affected by perceptions and thoughts of thick grounded relations.

Thick grounded relations can exist both in the mind-independent and the mind-dependent part of our spatiotemporal world. In the mind-independent part they are entailed by mind-independent relata, and in the mind-dependent part they are entailed by mind-dependent relata. And I would like to end by venturing the following hypothesis: if the mind-independent entity a causes a corresponding mind-dependent entity a^m, the mind-independent b causes a corresponding mind-dependent b^m, and if a and b collectively entail the mind-independent R, then a^m and b^m do collectively entail a corresponding mind-dependent R^m. In this indirect way, a mind-independent thick grounded relation can be said to cause a mind-dependent thick grounded relation.

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References

Aristotle. 1907. *Metaphysics, trans. and notes A. E. Taylor*. Chicago: Open Court.
Armstrong, D. M. 1978. *Universals & Scientific Realism I-II.* Cambridge: Cambridge University Press.
Armstrong, D. M. 1997. *A World of States of Affairs*. Cambridge: Cambridge University Press.
Armstrong, D. M. 2010. "Letters to Grossmann," in: J. Cumpa, E. Tegtmeier, eds., *Phenomenological Realism Versus Scientific Realism. Grossmann – Armstrong, Metaphysical Correspondence*. Frankfurt: Ontos Verlag.
Correia, F. 2008. "Ontological Dependence," *Philosophy Compass* **5**, 1013–1032.
Grossmann, R. 1983. *The Categorial Structure of the World.* Bloomington: Indiana University Press.
Grossmann, R. 1992. *The Existence of the World*. London: Routledge.
Gärdenfors, P. 2000. *Conceptual Spaces*. Cambridge, Mass.: The MIT Press.
Hansson, S. O. 2005. "Preferences," in: *Stanford Encyclopedia of Philosophy*. < http://plato.stanford.edu/entries/preferences/ >
Heil, J. 2005. *From an Ontological Point of View.* Oxford: Clarendon Press.
Heil, J. 2006. "The Legacy of Linguisticism," *Australasian Journal of Philosophy* **84**, 233–244.
Heil, J. 2009a. "Relations," in: R. Le Poidevin, et al, eds., *Routledge Companion to Metaphysics.* London: Routledge, pp. 310–321.

Heil, J. 2009b. “Relations and Relational Truths,” handout at the conference “The Metaphysics of Relations” in Aix-en-Provence, 9-11 December.
Henninger, M. G. 1989. *Relations. Medieval Theories 1250-1325*. Oxford: Clarendon Press.
Jansen, L. 2006. “Aristoteles’ Kategorie des Relativen zwischen Dialektik und Ontologie,” *Logical Analysis and History of Philosophy* **9**, 79–104.
Johansson, I. 1998. “Pattern as an Ontological Category,” in: N. Guarino, ed., *Formal Ontology in Information Systems.* Amsterdam: IOS Press, 86–94.
Johansson, I. 2000. “Determinables as Universals,” *The Monist* **83**, 101–121.
Johansson, I. 2002. “Critical Notice of Armstrong’s and Lewis’ Concepts of Supervenience,” *SATS – Nordic Journal of Philosophy* **3**, 119–122.
Johansson, I. 2004. *Ontological Investigations* (2 ed.). Frankfurt: Ontos Verlag.
Johansson, I. 2008. “Natural Science and Mereology,” in: H. Burkhardt, G. Imaguire, J. Seibt, eds., *Handbook of Mereology* (forthcoming). < http://hem.passagen.se/ijohansson/index.html >
Johansson, I. 2009a. “Proof of the Existence of Universals—and Roman Ingarden’s Ontology,” *Metaphysica* **10**, 65–87.
Johansson, I. 2009b. “Mathematical Vectors and Physical Vectors,” *dialectica* **63**, 433–447.
Johansson, I. 2010a. “Metrological Thinking Needs the Notions of *Parametric* Quantities, Units, and Dimensions,” *Metrologia* **47**, 219–230.
Johansson, I. 2010b (forthcoming). “Order, Direction, Logical Priority and Ontological Catgories,” in: J. Cumpa, E. Tegtmeier, eds., *Ontological Categories*. Frankfurt: Ontos Verlag.
< http://hem.passagen.se/ijohansson/index.html > “On Relation Order”
Johansson, I. 2011 (forthcoming). “On Converse Relations – What we can Learn from Segelberg’s Controversies with Russell and Moore,” in: H. Malmgren, ed., *Botany and Philosophy. Essays on Ivar Segelberg.*
< http://hem.passagen.se/ijohansson/index.html > “On Converse Relations”
Keller, P. 2007. ∈, dissertation, Department of Philosophy, University of Geneva.
Keller, P. 2009. “Fundamentally, There Are No Relations,” handout at the conference “The Metaphysics of Relations” in Aix-en-Provence, 9-11 December.
Ladyman, J. 2009. “Structural Realism,” in: *Stanford Encyclopedia of Philosophy.*
< http://plato.stanford.edu/entries/structural-realism />
Lowe, E. J. 2001. *The Possibility of Metaphysics*. Oxford: Clarendon Press.
Lowe, E. J. 2005. “Ontological Dependence,” in: *Stanford Encyclopedia of Philosophy.*
< http://plato.stanford.edu/entries/dependence-ontological/ >
Lowe, E. J. 2006. *The Four-Category Ontology*. Oxford: Oxford University Press.
Lowe, E. J. 2009. “Why There Might Really Be No Relations,” handout at the conference “The Metaphysics of Relations” in Aix-en-Provence, 9-11 December.
Mertz, D. W. 1996 *Moderate Realism and Its Logic.* New Haven: Yale University Press.
Mertz, D. W. 2006. *Essays on Realist Instance Ontology and its Logic*. Frankfurt: Ontos Verlag.
Moore, G. E. 1960 (1922). “External and Internal Relations,” in his: *Philosophical Studies.* London: Routledge & Kegan Paul, 276–309.
Moreland, J. P. 2010. “Grossmann on Existence and Property-Instances,” in: J. Cumpa, ed., *Studies in the Ontology of Reinhardt Grossmann*. Frankfurt: Ontos Verlag, 177–190.
Mulligan, K. 1998. “Relations: Through Thick and Thin,” *Erkenntnis* **48**, 325–353.
Russell, B. 1910. “Some Explanations in Reply to Mr. Bradley,” *Mind,* New Series **XIX**, 373–378.
Russell, B. 2006 (1903). *Principles of Mathematics*. London: Routledge.
Russell, B. 1992 (1984). *Theory of Knowledge. The 1913 Manuscript.* London: Routledge.
Russell, B. 2004. *Logic and Knowledge.* London: Routledge.
Simons, P. 2009. “Why There Are No States of Affairs,” in: E. Reicher, ed., *States of Affairs*. Frankfurt: Ontos Verlag, 111–128.