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Preface

Many philosophers have held, explicitly or implicitly, that any comprehensive survey of the world's constituents would include the *cases* of qualities and relations that occur at particular places and times as the qualities and relations of particular objects. It is not so common to affirm that such cases are themselves particulars in their own right, rather than deriving their particularity from their association with a substance, but this was G. F. Stout's distinctive claim (Stout, 1905).

D. C. Williams took another step: these cases, or *tropes* as he called them, not only form a distinct and independent category of existent, they are the very alphabet of being, the simple, basic, primal items from which all else is built or otherwise derives (Williams, 1966). In presenting his view, Williams acknowledged that it 'calls for completion in a dozen directions at once'. This work is my attempt to press ahead towards that completion. The great, liberating insight which Stout and Williams offer us is this: properties can be particulars, so the denial of universals need not be the denial of properties. In other words, Particularism (which is economical, plausible and appealing) does not have to take the form of Nominalism (which is economical, but neither plausible nor appealing).

While the principal inspiration for this book is Williams' work, I have also gained a great deal from discussions with David Armstrong, who remains a Realist about Universals, but whose successive publications in this area provide sympathetic treatments of the trope or abstract particularist view (Armstrong, 1978, 1989).

Another colleague, John Bacon, has pursued the trope idea in

a more formal way (Bacon, 1988, 1989), while David Lewis treats it as a serious option for dealing with certain intractable problems facing Realism over universals (Lewis, 1983, 1986). Wilfrid Sellars recognized tropes by another name, although not, I think, as the sole fundamental category.

Frank Ramsey counselled that when a philosophical dispute presents itself as an irresolvable oscillation between two alternatives, the likelihood is that both alternatives are false and share a common false presupposition. It is my contention that Realism and Nominalism in the problem of universals exhibit precisely this pattern, their common, false presupposition being that any quality or relation must be a universal.

This book explores the implications of this position. It also argues for theses about relations (Foundationism) and basic physical properties (field theory), which are particularly congenial to a trope philosophy, but are in large measure independent of it. They have merits irrespective of the truth about properties in general.

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A One-category Ontology

1.1 ONTOLOGICAL ASSAYS

Metaphysics is an ambitious subject; it aspires, among other things, to give an account of the fundamental constituents of any reality and an exposition of how these constituents mesh to give us the reality in question. Indeed, some metaphysicians aim to deal not just with the actual but with all of possibility as well. I myself think actuality is enough to be going on with.

To offer a description of the basic constituents in a real situation, and of the relations between them, is to furnish an *ontological assay* of that situation. The ontological assay of any real situation uncovers its ontic structure.

Fundamental to the ontological impulse is what we might call the *Axiom of Uniformity*, the conviction that some one basic pattern pervades the universe; the proper ontological assay of any one region or sub-part of the whole will mirror the assay elsewhere. There are pervasive basic constituents and pervasive basic structures in which they play always the same roles. At the ultimate level, the universe has a common structure throughout. The pervasive elements, the constantly recurring items in ontological assays, are the categories.

The Axiom of Uniformity is deeply appealing and something of that sort is probably a methodological imperative. But I see no reason to suppose it is a necessary truth. Why should the world not be disjoint and ultimately diverse? Attempts to make ontological assays with universal application – that is, attempts to find categories – must give up the old metaphysical ambition to find necessary truths in ontology. There is no ground for the old claim that there is only one self-consistent ontology, and there-

fore no ground for the claim that metaphysics is a body of *a priori* quasi-logical truth. Metaphysics is the most general department of a common enquiry into both the particularities and the generalities of existence, which is a seamless web from the particular claims of natural history onwards through ever-increasingly general theses in the theoretical and mathematical sciences.

Metaphysics has a long and rich history, so for any real situation there are several different and competing ontological assays on offer. I find it very unlikely that all but one of these contain fatal inner incoherencies. Consistency is a necessary first requirement, but we must expect more than one proposal to surmount this first hurdle. Like rival theories anywhere in the realm of learning, the proposals must be assessed by inchoate, indecisive and uncertain methods, which epistemologists have not yet fully explicated.

1.2 TROPES

Consider the peas in a pod. They are all very much alike – proverbially so. Suppose in this pod there are half a dozen peas which are all the very same shade of green and all the same near-spherical shape. They differ slightly in size from one another and, of, course, have different locations.

Any assay of this situation will have to recognize the presence of colour.[1] But colour occurs here both as type (what all the peas have, a certain shade of green) and as token (the particular case of colour which each different pea has, peculiar to itself). There are six tokens of that shade of green present in the pod.

In the same way there are six tokens of the near-spherical shape, but only one case each of the sizes involved, since in our example each pea is a different size from every other.

Let us concentrate on the particular cases, the tokens, of the qualities present in the pea-pod: the green of *this* pea, the shape of *that* one. They are cases of kinds, or instances of properties, to use familiar ontic terms. They are, as Donald Williams so eloquently insisted, *abstract particulars*.[2]

The colour of this pea, the temperature of that wire, the

solidity of this bell, are *abstract* in this sense only: that they (ordinarily) occur in conjuction with many other instances of qualities (all the other features of the pea, the piece of wire or the bell), and that, therefore, they can be *brought before the mind* only by a process of selection, of systematic setting aside, of these other qualities of which we are aware. Such an act of selective ignoring is an act of abstraction. Its result is that we have before the mind an item which (as a matter of fact, in general) occurs in company with others.

But the pea's colour, the wire's temperature, the bell's solidity, are *not* in any sense *products of* the discriminating mind. They exist out there, waiting to be recognized for the independent, individual items, that they have been all along.[3]

For Williams, and for us following his usage, *abstract* does not imply *indefinite*, or *purely theoretical*. Most importantly, it does not imply that what is abstract is *non-spatio-temporal*.[4] The solidity of this bell, here and now, is a definite, experienceable and locatable reality. It is so definite, experienceable and locatable that it can knock your head off, if you are not careful.

Abstract here contrasts with *concrete*: a concrete entity is the totality of the being to be found where our colours, or temperatures or solidities are. The pea is concrete; it monopolizes its location. All the qualities to be found where the pea is are qualities of that pea.[5] But the pea's quality instances are not themselves so exclusive. Each of them shares its place with many others. Our ordinary common nouns – 'knife' and 'fork', 'apple' and 'pear', 'walrus' and 'carpenter' –, for the most part, pick out classes of concrete particulars. There are pragmatic reasons for this, relating to our ways of making a living in the world. But these reasons cast no sort of shadow on the reality and importance of the abstract particulars, the cases of qualities. Nor do they show that abstract qualities are unable to exist as independent beings.

And our abstract particulars are *particulars* because they have a local habitation, even if no name. They exist as individuals at unique place–times. The case of colour which belongs to this pea is the colour of this pea and no other. Unlike the quality *type*, it cannot be instantiated in many different situations simultaneously. They are particular in just the same way and for just

the same reasons that the pea, or the wire or the bell are particular. Six peas, all of the one kind *pea*, six cases of green, one to each pea, all of the one shade *green*.

Williams had little difficulty in showing that his abstract particulars needed to be given *some* place in everyone's ontological assays. If you are burnt by a hot wire it is, after all, not heat in general, or wires in general, or the other characteristics of this wire, but *the heat of this wire* which does the burning. If you fail to recognize this, you will not take appropriate measures to stop such a thing happening again.

Williams showed also that, indeed, other philosophers had recognized such a category.[6] G. F. Stout had explicitly argued for it. Scholars are, on the whole, inclined to think that Aristotle held that qualities in objects were particular, and that such qualities have a universal nature only in thought. Provided their subjectivist interpretation is set aside, Locke's *ideas* and Hume's *impressions* are abstract particulars. Again, neglecting the idealism involved, Leibniz' *individual accidents* are in the same situation.

What was novel and bold in Williams was the proposal that abstract particulars were not just *a* category, but a fundamental and irreducible one; and that they formed not just *a* fundamental category, but the *only* one. Such a basic and ubiquitous sort of being needs a short and handy name. For various poor reasons, Williams chose *trope*.[7]

The purpose of this book is to explore the idea that every real situation consists precisely in the presence of one or more *tropes*, no more and no less.

1.3 THE CLASSIC 'ARISTOTELIAN' TWO-CATEGORY ONTOLOGY

Along with many other peoples, we operate a language whose basic subject–predicate structure both encourages and expresses a two-category ontological assay of common situations: there are objects (things), and these objects or things have features (characteristics) and modes of action. The fire is hot, for example; the dog barks. Our subject terms typically stand for

one or more concrete particulars and our predicates for a quality of, or relation between, those particulars.

A dualism, encouraged if not expressed by Aristotle, has grown up.[8] According to this dualism, there are concrete particulars and, at least in basic cases, these are *substances*, true individuals capable of independent existence. Secondly, there are abstract *universals*, characteristics that have many instances. The presence of a characteristic (or kind or feature) is marked in language by the use of a general term in predicative position. And precisely because a general term can be used with the same import on indefinitely many occasions to describe indefinitely many different substances, the dualistic theory holds that the correct use of a general term must imply the presence of a universal entity, the very same in each of the substances so described.

Ontology may recapitulate philology,[9] but the reverse is also the case. Our experience, not just our language, is involved. Indeed, it offends credibility to suppose that the structure of the world we live in has no bearing on the fact that our language has the dualistic structure it does. Our common experience as active beings is characteristically one in which we exploit the fact that concrete particulars have many characteristics. Knives must be both solid and sharp if they are to be useable. The nutritive value of the pea must keep company with its solidity, else successful feeding from it will be impossible. We get weatherproof houses not by manipulating weatherproofness itself, but such other features as extended solidity, with which, fortunately, weatherproofness is and remains associated.

Civilized life is one long round of manipulating Austin's 'moderate-sized specimens of dry-goods'.[10] No wonder terms for them figure in subject position in our sentences. No wonder their desired and desirable features are spoken of by the use of predicates whose role is to attribute those features.

Our manifest world, the world of active life, is a three-dimensional spatial array of items, which display a certain amount of cohesive *unity*, a certain amount of *complexity* and many and varied patterns of *recurrence* of similarities across space and through time. This world develops from day to day in coherent, if not always manageable, ways.

The dualistic language scheme of subject and predicate is a serviceable tool for describing that world. I do not suppose it is the only workable one.

The two-category ontology of Substance and Property can be used to give an account of how subject–predicate sentences work, and it is sometimes recommended for just this reason. But it is not primarily a metaphysical engine developed for semantic purposes. It is more interesting than that. The two-category view is a plausible ontic assay; it should be seen as an account of the structure of the manifest world that is presented to us in ordinary active life.

Its essentials are these: there are substances, which are particular and are the only true particulars; and there are properties, which are universals. These exist, in this world at least, not on their own but as the properties *of* the substances to which they belong. Every situation consists in one or more substances and one or more properties. The properties occur only as the properties of those substances, *inhering* in them.

To put it another way: in every real situation we find two 'moments'; there is particularity, the fact of being one definite object rather than any other, and rather than no one object in particular. The particularity is provided by the substance or substances whose role is that of particularizer. Secondly, there is the *nature* of those particulars; objects are not of no kind at all, nor of any indeterminate kind. Each has a definite nature that it can share with other things. A particular's nature consists in properties whose role it is to determine the kinds to which the particular belongs. Two particulars belong to the same kind just in case they share a common, universal property.

Two roles, and two categories of item, with an item from each category filling just one of the roles.

A neat division of labour; no idle constituents and no demarcation disputes.

1.4 THE EMBARRASSMENTS OF THIS ONTOLOGY

Despite its intuitive appeal, and despite its being the 'standard position' towards which many a metaphysician tends to gravi-

tate, the classic two-category ontology has never been able to deal triumphantly with certain perennial embarrassments.[11]

Troubles with Substance

Four problems about substances have never been quite satisfactorily resolved.

First, how much of the whole object is the substance? There must be a particularizing element in addition to the qualities. For the qualities are universal, the same in many objects. We therefore need an element to particularize each case of a quality to its own object. Let us call this particularizing element the *substratum*. Now, is the substance the substratum only, or is it the substratum plus (some of the) properties? If the former, then our substance is a *bare particular*. And the trouble with bare particulars is that they have no properties. But if they have no properties they must be absolutely indistinguishable from one another. So how is it possible for there to be more than one of them? (Remember how there can be only one null class.) Specifically, if bare particulars are really bare, they will lack even relative position, which is the clearest of our ways of envisaging a multiplicity of exactly resembling objects.

If bare particulars are truly bare, they will lack capacities as well as properties. If they lack *all* capacities, they will lack the capacity to have properties. But that is exactly what they need to fulfil their role. If they are granted that capacity, why not others?

Granting substrata even one capacity leads us across to the other horn of the dilemma. If the substance is the substratum *plus* (some of) the properties, then according to the dualist ontology, it is a composite of items from two utterly distinct categories, that which particularizes and that which furnishes the nature. Such a composite cannot be basic; it admits of further analysis. The substance now resolves into particularizing substratum and nature-furnishing properties *just as the original object did*. We have made no progress.

If, to avoid this, we settle on the bare substratum, we inherit problems already canvassed. Naked or clothed, the *substratum* is in an embarrassing situation.

Second, the substance/property ontology has an attractive

account of change, but only up to a point. When a door is painted, for example, it undergoes a change of colour. What has happened? The substance has exchanged one of its inhering properties for another. The properties themselves are changeless, of course. An instance of one of those properties gives way to an instance of the other. So far so good. But what of more radical change? What if the door is destroyed? What if its component timbers are burnt or vaporized with a laser? At least so far as an analysis within the manifest world will take us, the substance or substances that were the door no longer exist. In the jargon of the tradition, substantial change has occurred. And this possibility, of substances going out of existence (or becoming some quite *different* substance), must be allowed for. Yet the ontology has no room for such events. How can that which particularizes become a different particular?

Reflections of this sort lie behind the search for imperishable substances, particulars which perdure, with identity intact, through all the changes in which they are involved. The corpuscles of classical atomism meet this requirement, at least so far as natural events are concerned (i.e. neglecting the Creation and the End of the World). To avoid admitting that substantial change has occurred in the case of our door, we would claim that a door, or its gross parts, are not genuine substances after all, but complexes of the genuine substances, the atoms, to whom only changes of relative position have occurred.

A second option is available: to undercut the whole problem by introducing the idea of temporal parts. The real simple particulars on this view are not perduring things at all, whether familiar like doors or esoteric like atoms. Such things are *ordered sequences* of the real particulars, which are continually being replaced and have no perduration.

Process philosophies such as Whitehead's, and theories of the diachronic identity of familiar things which deny that there is any strict identity between the boy of ten and the admiral he becomes, show that the notion of temporal part allows us to uncouple particularity and perduration. Substantial change, in the sense of substances replacing other substances, is on such a view not impossible but ubiquitous.

Temporal parts theories have their own troubles, of which the chief is to specify a non-arbitrary duration for them.

Let us focus again on a substance at a particular time. All causal action is exerted by way of the properties of things and all effects are effects on the properties of things. The substratum, precisely because it is without properties, including passive powers, ought to be *totally immune* to all causal activity. *A fortiori*, it ought to be unscathed by every destructive process. Yet if we introduce metaphysically indestructible substrata, we are undertaking *a priori* natural philosophy of a most discreditable kind. What items can you produce or postulate, belonging to the natural order, that are *necessarily* immune from destructive alteration?

There are troubles with substance even more recondite. The substance is the particularizer; its role is to give the object in which it occurs a particular reality, as a definite object. But it is not enough to be *a* definite object. Something more is required. This object must be not just some particular or other. It is not just any old particular; it is this very one and no other. So we need not only a particularizer but an *individuator* as well. Substrata particularize, but they do not seem able to individuate, precisely because they are indistinguishable from one another.

One way to see the distinction between particularizer and individuator, if we deal with ordinary objects rather than their temporal parts, is this: volumetric location in space is often proposed as the particularizer. It is by being bound to place that properties become instances and objects get their unrepeatable, and hence particular, character. But even if location particularizes, it does not individuate, for in that case nothing could move without thereby becoming a different object.

Nor can this difficulty be overcome by moving to location in space–time, for then every object *would* have been a different substance if it *had* moved slightly further or slightly faster in any direction over any time, which is equally at odds with any commonsensical conception of this world's substances.

If we introduce individuators as well as particularizers a possible account of substantial change suggests itself: the substitution of individuators for one another might permit one substance to transform into another substance while remaining, thanks to the particularizer, substantial throughout.

But the introduction of individuators brings a further dilemma. If individuators are distinct from particularizers, we do

not have a two-category but a three-category ontology, and when will it end? On the other hand, if individuation and particularizing can *both* be performed by the *one* item, the substance, then (i) we lose any prospect of accounting for substantial change, but worse (ii) if one item can perform two roles, then what is to prevent a single entity from performing both the particularizing role and the nature-providing role whose distinction generated the two-category ontology in the first place?

The claim that those two roles do not call for two items from constrasting categories lies at the centre of the trope philosophy, in which just such a dual (or even triple) role is proposed for the individual tropes.

Third, substances are unities if anything is. A single substance is a genuine, literal, case of *one thing*. Everyday objects are substances by a kind of courtesy; it suits us, for practical purposes, to *treat* as single things knives and forks, whether they are of uniform stainless steel or have bone handles and blades of silver plate. Similarly for all the the multitude of manifestly complex natural objects and artefacts which make up the familiar world.

Philosophers, however, should not be guided by this practical courtesy. In strictness of language, every object having proper parts which are themselves substances is not a substance but a collection of substances.

Now what seems to superficial observation to be a true unity can dissolve into complexity upon closer approach. We have, as a culture, witnessed the dissolution of the grain of sand, the grain of flour, the invisibly tiny molecule, the atom, the sub-atomic particle. There is no guarantee that *any* nominated candidate is indeed a true unity. So there can never be more than a provisional identification of the world's real substances.

That is not in itself a serious matter. Such a deep issue is just the sort that humans are ill-equipped to settle definitively. But it raises the thought that *there may be no atoms*. Perhaps it is complexes all the way down. In that case, unless point-substances are acceptable, there will be no substances at all. (If complex objects, at some level, have proper parts that are not capable of independent existence, then their complexity will be, in this context, a matter of courtesy, and they will be our true, simple unities.)

Even the possibility of point-substances does not seem to me to be a serious problem. But what it dramatizes is this: we have many quasi-substances – chairs, tables and automobiles, for example – that have no genuine metaphysical unity as objects. This does not matter in the slightest. The metaphysical unity of a true substance is not essential for being an object in good standing in the manifest world. So why should such unity be essential for objects to be in good standing in the real world which appears as the manifest one? The need to postulate substances is thus made to seem less pressing.

Think of a diamond. What could be more coherent, more thoroughly bound together into an effective unity? What could be more tenacious in its hold on its own characteristics? Yet, as we have discovered in the past 200 years, a diamond has *no* one single substance at all. It is a crystal lattice. If diamonds can lack substance, why not molecules or atoms? Why suppose anything needs a unifying particularizer?

Fourth, one final piece of unfinished business for substance theory is the relation of substances to space. Are the substrata of spatial objects themselves spatial? If so, then they do have spatial characteristics and in that case they are not genuinely bare. But the whole *rationale* of the substance/property ontology is to distinguish that which furnishes particularity (substance) from that which provides nature (property). Yet here the duality is being confused by crediting the substance *qua* substratum with at least enough relational properties to furnish location and different locations for different substrata.

On the other hand, if the substrata of spatial objects are not spatial, we are being asked to believe that at least one, and in all likelihood many, utterly mysterious extra-spatial items are required in order for this quotidian chair on which I sit to be a thing at all. This leaves us completely in the dark as to how the non-spatial substratum links with this chair rather than some other. When the substratum links to one chair rather than another, it takes on spatial properties, and thereby it becomes spatial. But how can what is inherently extra-spatial take on a spatial character?

Troubles with Universals

In the classic two-category ontology the properties that furnish the natures of things are universals; that is, items that can be literally fully shared by indefinitely many objects. A universal can be in many places at once *without being divided.* If rabbithood is a universal, then it is neither increased by increases in the rabbit population, nor adversely affected by attempts at rabbit control, no matter how effective.

Those who accept that properties are universals (the realists, i.e. those that hold that at least some universals are real constituents of the universe) are not unanimous about the zero case. It is agreed that one rabbit or a million makes no difference to rabbithood. Even *no more rabbits ever* makes no difference, since there have been some. But if there never is at any stage in the world's history any rabbit, what then? Platonists say even *that* does not affect the reality of rabbithood. Others, especially Armstrong, hold that all genuine universals must be instantiated at least once.[12] That is a domestic dispute among realists and one we shall not attempt to adjudicate. Platonists endure incredulous stares from their opponents, whom they accuse in turn of lacking the courage of their universalist convictions.

The great stumbling-block in the way of realism about universals is that it is so difficult to frame an idea of such items which seems to be at all plausible. This reaction – that there must be *something* dubious about items that can be simultaneously completely present in indefinitely many objects, items that are not affected by the vicissitudes of the objects to which they, perhaps temporarily, belong – is an old one, as old as the theory itself.

'Table and cup I see; but your tablehood and cuphood Plato I can in nowise see', Diogenes is reported as saying.[13]

Locke, the embodiment of common sense in approaching philosophical issues, expressed this view in his *dictum: All things that exist [are] particulars.*[14]

Many philosophers, myself included, find themselves spontaneously and deeply in agreement with Locke. Even many realists embrace their view only because they cannot see how a systematic Particularism can work. Armstrong, for example, develops his argument through a critique of those Nominalisms that attempt ontological assays without universals.

The present book proposes to develop particularist assays that avoid the classic criticisms of nominalism. Here, it is enough to point out that *if* universals can be dispensed with, then they should be avoided.

Apart from their inherently dubious character, universals are subject to further difficulties. Once admitted, there seems to be no putting bounds to their number. Take temperature for example. Let us suppose, as physics does, that temperature has a lower bound at 0°K, no upper bound and continuous variation above the minimum. Each distinct temperature is a universal, capable of multiple instantiation, and each is of course different from every other. Thus there are continuum-many ($2^{\aleph_0}$) different temperature universals. If you are a Platonist then clearly there are that many. Even for those who insist on instantiation, the number will be $2^{\aleph_0}$ provided only that something somewhere has heated up smoothly from T° to T+δ°.

Here is a non-denumerable infinity over and above the one that all ontic assays of such a continuous change as smooth heating must admit. There are continuum-many distinct states of the object being heated. The realist has those and, further, the same number of universals.

There are many continuous quantities. So a universe with universals in it is exceedingly highly populated. This is not a knock-down objection, but it should give those with a taste for desert landscapes pause before embracing realism about universals.

Another line of difficulty concerns the determinables. Realism holds that whenever there is a resemblance between objects, the resemblance arises from, and is explained by, the presence in each of the objects of some one identical universal. Now consider the colours. Orange objects all resemble one another, and all orange objects of exactly the same shade have in common the universal that is responsible for that shade. But orange objects also resemble green ones, though not so closely. Orange and green objects resemble one another *in being coloured.* So they should share the appropriate universal, *colouredness.* But this has never seemed quite right. If the colours were species of a genus, then we should be able to discern in coloured objects that respect in which they are alike, and that other respect or respects in which they differ. Think of the relationship between tigers and

lynxes. They share a budget of *feline* characteristics that we can apprehend (and explore through the chromosomes), and a distinct and distinguishable budget of characteristics (size, colour, habitat) that sets them apart from one another.

The colours, however, do not seem to fit that pattern at all. What should be done with the resemblances among items having different determinates under a common determinable is 'unfinished business' for realists about universals.[15]

Troubles with Inherence

Right from the start, with Plato's *Parmenides*, the substance/property ontology has had difficulty with the question of the relation between the two constituents in the assay, the substance and the property (or substances and relation). There are problems involved in finding a model for the relationship between particular and universal – Plato toyed with resemblance, remember, and with universals covering objects as a sail might cover sailors. Metaphors have failed, but that is of no great moment. The *inherence* of propety in substance can well be expected to be as unique as it is ubiquitous.

The real trouble is rather more formal: properties include both qualities and relations. The classic assay proposes that for one object O_1 to be of kind K is for an appropriate universal to inhere in O_1. And for the two objects O_1 and O_1 to stand in relation R is for an appropriate, usually relational, universal to inhere in O_1 and O_2.

So, to be consistent, it would seem that the *inherence* of property P in object O requires that the universal Inhering should inhere in both P and O. This at once faces two crushing objections:

1) It sets up an infinite regress, since the inhering of Inhering in P and O will be a relation between P and O on the one hand, and the universal Inhering on the other, calling for an inhering analysis. The world may be infinitely complex, but if we can avoid assays that make *every* situation, even the simplest, of infinite complexity, we should do so.
2) The scheme now fails as an explanatory analysis of what it is for a chair, say, to be orange. *Inherence* is supposed to be that

basic mode whereby qualities and relations belong to objects. But this development just makes inherence one relation among others.

For these reasons adherents to the classic scheme of substance and universal property are more or less bound to conclude that Inherence is indeed *sui generis*. They mark this by describing it as a *non-relational tie*.

One's first response to this is naturally extremely negative: are there two constituents involved or not? If so, how can they fail to be distinct terms? If they are distinct terms, how can they be 'tied' together except by a relation? It is no good simply *talking* about non-relational ties: or, to put it another way, one philosopher's solution is another philosopher's problem.

Although tempting, it would be premature to dismiss the substance/property ontology out of hand over the non-relational tie. For it remains to be seen whether alternatives, and in particular the trope alternative, have any comparable embarrassment. While what is a problem for everyone is indeed a problem, it is not a problem that can be used, dialectically, to discredit just one of the alternatives. Nevertheless, we do well to remember that *any* two-category ontology is going to be bedevilled by a *non-relational tie* problem. Having set out to account for relatedness, it will have to resort, at some point, to a quasi-relatedness that must sit as an inexplicable primitive in the system.

Troubles with Mutual Dependence

Most modern philosophers tend to be patronizing towards the Platonism that affirms that universals exist, whether instantiated or not, in their own realm of being. It is not credible to them that the existence of down-to-earth objects with familiar, sometimes resembling, natures, could carry such colossal ontological implications. Similarly, bare particulars are not widely favoured. They are too bizarre for an ontological taste fashioned by theoretical physics where qualities abound but featureless particularizers have no role.

Most modern versions of the classic ontology therefore deny

that either constituent, substance and universal, ever exists on its own. They follow Aristotle, proposing that the least that ever actually exists is a complex of particularity and property, a 'this-such'.

Why should this be so? What peculiarly metaphysical necessity binds the one to (some or other of) the other? There is no necessity that a substance should be blue or green, or indeed any colour. No *specific* quality or relation is required to be the 'such' in the 'this-such'. But if every property can, singly, be absent, why can they not all be absent together? No natural law covers the case, since all natural laws specify relations *among properties* and not between properties and substances.

We are being presented with a metaphysical version of 'Nature abhors a vacuum' – in this case, 'Nature abhors a property-vacuum'. And it is not provided with a convincing rationale.

David Hume declared that 'whatever objects are different are distinguishable and whatever objects are distinguishable are separable.'[16] We know this principle does not hold in its full generality. A part, for example, is distinct from the whole of which it is a part, yet not separable from it (while leaving the whole as it was). Determinables do not conform either. Shape and size are distinguishable, and while determinate size and shape can vary independently, it is not possible to separate determinable shape and size to achieve an item with shape but no size at all. Likewise with the pressure, volume and temperature of a body of gas or the voltage and current of an electric flow in a wire.

Nevertheless, while not a valid principle, Hume's dictum is a valuable *onus-fixer*. If distinguishable items are distinct, we need an explanation if they are not also (in principle) separable. With the pressure, volume and temperature of a gas and with the voltage and the current in the wire such explanations are forthcoming. A deeper understanding of the phenomena in question shows them to be various manifestations of a single underlying real situation – gas molecule momentum or flux of electrons.

But for the inseparability of substance and property no such explanation by appeal to underlying mechanism is available. And if one were to be provided, it would at once undercut the notion that we are dealing with *two* basic categories.

The classic ontology thus leaves us with a mystery at the world's heart: two elements, whose status as distinct items is clouded with doubt, linked by a non-relational tie, which defies analysis. No wonder there has been a perpetual undercurrent of dissatisfaction with the classic view.

1.5 EARLIER ONE-CATEGORY ASSAYS

The difficulties facing the two-category scheme are sufficient to motivate the search for an alternative. There are Occamite motivations too; it is always a fault in theorizing to use more in the way of basic materials where less will suffice; metaphysics is no exception. So the search for ways of reducing the category of substance, or that of universal property (or even of both), is perfectly appropriate.

The simplest reductive schemes take one of the classic pair and propose to exhibit the other as derivative from the first. And both possibilities have indeed been proposed: that universals can be constructed out of particulars, and that particulars can be constructed from universals. The reduction of universals bears the unfortunate name of nominalism. The elimination of substantial particulars in favour of universals is the core of Russell's Bundle Theory of objects. Unhappily, neither of these proposals is a success.

Nominalism

There are only concrete particular objects – rabbits and foxes, chairs and tables, and so forth. These objects fall into groups resembling one another more or less closely. Such objects have in common their membership of sundry classes, but no genuinely common universal element. In a medieval version, all that rabbits have in common is that they are described using the same *common name* 'rabbit' – hence the label 'nominalism' for this group of doctrines.

To have a property reduces to belonging to appropriate classes or glorying in appropriate descriptions. *To be a property* is to be an open class of concrete particulars.

Predicate Nominalism and Class Nominalism, as Armstrong (1978) has called them, have been subjected to his devastating critique, and there is no need to rehearse his points here. Such nominalisms involve either the grotesquely anthropocentric consequence that no kinds of thing existed before we discerned, classifed and labelled them, or the equally bizarre idea that it is membership in the Rabbit class that makes something a rabbit, rather than vice versa.

Resemblance Nominalism, favoured by Carnap, developed by Price, approved by Quine, avoids these gross errors.[17] This theory takes likenesses and differences among objects as primitive and attempts to construct a theory of properties on that basis. The difficulties that it encounters in its standard form are instructive in leading us to a trope version of that theory. This is given extended discussion in chapter 2 below.

We can sum up the failure of ordinary nominalism thus: it is not true that there are no properties, only classes of objects. For the classes are classes of objects *with properties*. It does not follow from this, however, that the properties in question are universals. The trope theory is exactly a theory according to which the properties of things are themselves particulars, and there are no universals.

Bundle Theory

What of the reverse reduction? No matter how far into an object we delve, all we ever uncover are more and more qualities and relations. Substances, especially bare particulars, are not given to enquiry. The senses detect cases of properties. Instruments are designed to detect imperceptible quantities, which are properties, not metaphysical substances. There is no penetrating the qualitative and/or relational 'veil' to reach the alleged innermost substance.

So, if the substance is thus systematically and in principle elusive, why not exclude it from our theorizing? What work can it do if it can take no part in causal transactions? Why not limit our postulations to our discoveries? When we find an object, whether it be natural or artefactual, we find a *nexus* of qualities and relations, a centre for causal operations, both active and

passive. And that is all we find. Why not suppose that is all there is? A thing, a concrete particular, on this assay is not a union of substance with a multiplicity of inhering properties. It is the bundle of properties itself, 'bound' together only by coinciding in space–time. A totality of compresent properties: that is a thing or concrete particular.[18]

Both nominalism and bundle theory are attractive as hard-headed and no-nonsense, empiricist in spirit. People have emerged from courses of study in philosophy adhering to both these views, despite the fact that they are completely mutually incompatible.

Bundle theory's incompatibility with the standard forms of nominalism I take to be not a fault but a virtue. However, there are other overwhelming objections to Russellian bundle theory.

In Russellian bundle theory, the items in the bundle are *universal* properties. If bundles contain nothing but properties, then there cannot be two exactly alike. For the universal property P_1 in bundle B_1 is, because it is universal, the very same item as the P_1 in bundle B_2. Likewise for P_2, P_3 and all the properties in the bundles. *Ex hypothesi*, the 'two' bundles contain just the same properties. But if B_1 and B_2 contain all and only exactly numerically identical items, they are not two different bundles at all, but the same one.

Bundle theory, with universal properties, makes the Identity of Indiscernibles a necessary truth. But the Identity of Indiscernibles is *not* a necessary truth. There are sundry celebrated counter-examples: the two-sphere world, universes with complex mirror symmetries and my favourite – the Stoic *cum* Nietzschean *cum* Einsteinian eternal recurrence of a cyclic or concertina cosmos.[19]

If, to avoid this commitment to the Identity of Indiscernibles, bundle theory gives up a strictly relational account of location in space–time and proposes to distinguish otherwise indistinguishable bundles by their places, then what has happened is in fact the abandonment of a *bundle* theory in favour of a much more traditional *particularizer* (space–time place) to which properties are compresently attached (a version of inherence).

Attempts to reach a one-category ontology by choosing one of the classic pair as basic are either standard nominalisms or

Russell bundle theories. Since both of these fail, we cannot reach a successful one-category view in either of these ways.

To pursue the one-category strategy, we need to make a start with a category that is not either of the classic pair, neither concrete particular nor abstract universal, but from which both of these can be constructed. That is what the trope theory sets out to do.

1.6 TROPES AND THE ASSAY OF COMMON SITUATIONS

At the core of the trope ontology is this thought: the basic items, the 'alphabet of being', in Williams' phrase, are cases of kinds. They are entities that are particulars, but not bare particulars. Each of them, if truly basic, has a simple nature. (There are complex derivative tropes. But the basic ones are single in character.) So a basic trope – a case of electric charge, shall we say for sake of illustration – is not a union of distinct elements, one particularizing and the other furnishing a nature. It is a single item, a particularized nature. The different mutually independent properties which, in ordinary speech, we say are all properties of the same (complex) thing, are on the trope scheme distinct items, each a trope in its own right, each a particular, each with its own nature.

We can see quite quickly how promising this scheme is by looking at the assay it proposes for the existence of common objects. Think of a diamond. The trope theory of diamonds is a bundle theory. This diamond is a compresent bundle of tropes, i.e. of particular cases of qualities. It combines in a compresent collection hardness, transparency, brilliance, many-facetedness, a carbon constitution, an inner crystal lattice, inner electromagnetic and other sub-atomic forces, mass, solidity, temperature, and so on.

Because the items in the bundle are particulars, there is no problem at all with the Identity of Indiscernibles. A second diamond is a bundle of quite different particulars that resemble, more or less closely, the particulars in the first diamond bundle. Even if we adopt a thoroughly relational analysis of place in

space–time, exactly similar diamonds, with exactly similar space–time relations to exactly similar other tropes, will *not* be identical. So far from having all their bundle membership in common, as with Russell's universalist account, these bundles are completely disjoint. The solidity of diamond D_1 is a different case of solidity from that in diamond D_2, D_1's transparency is not D_2's transparency, and so forth.

Moreover, there is no need to invoke any metaphysical substance. Aristotle got us all off on the wrong foot when he treated qualities as existing only as *inhering in a substance*.[20] It became a matter almost of definition that qualitative things could have no independent being, and that without a substance to support them, they could not occur. But this is an issue of substantive metaphysical truth, not to be settled by definition or fiat. The question is whether the natures or properties of things are essentially ontically secondary and dependent. The classic ontology takes it that they are: without a diamond, there could be no temperature, or solidity or other property of the diamond.

But this, it is important to realize, *is* an assumption, an assumption that admits of coherent denial. Moreover, it is an assumption that has played a large role in generating the embarrassments of the two-category scheme. If that assumption is challenged, we can take the tropes to be the basic primary items. It is *a matter of fact*, and not a metaphysical necessity, that tropes commonly occur in compresent groups. These compresent groups are recognized and manipulated by us, they are the familiar concrete particulars of life. But these concrete particulars are the complex derivative entities. Without the solidity, hardness, temperature, etc. there could be no diamond: that direction of dependence accurately reflects the ontic situation.

An ordinary object, a concrete particular, is a total group of compresent tropes. It is by being the complete group that it monopolizes its place as ordinary objects are ordinarily thought to do.

There is no substratum and no 'non-relational' inherence to cause trouble. The trope assay of ordinary objects is both elegant and economical.

1.7 OTHER STRUCTURES

Events

When we view the characteristics of objects as distinct entities in their own right, we move to a situation extremely favourable for the treatment of several otherwise intractable problems. Take *events*, for example. Events are particulars; they occur at specific places at specific times. Similar events at other places and times are indeed *similar* events and not the same event twice over.

Yet events are inherently qualitative and/or relational. They involve a happening that results in *change* of *property* in one or more objects. Our diamond scratching a piece of glass or catching fire in a laser beam, for example.

So events have seemed to call for a substance or substances to take care of their particularity, and for properties also, to handle their qualitative character. Hence attempts, such as Quine's, to eschew them altogether.[21] But we have seen, in the work of Davidson and Barry Taylor,[22] that events must be recognized. They are needed, at least, to provide a smooth semantics for natural languages. But, more seriously, they are needed if we are to give an account of the ontic constitution of *happenings*, which constitution must be given expression in any adequate language.

Now on the trope scheme, events fit in without difficulty. Since the tropes are themselves particulars, a succession of tropes at a place will be itself a particular occasion. And since tropes have natures, trope succession will involve that transformation of quality or relation which every event consists in.

Chains of events are *processes*. We only bother to identify as processes those chains of events that are significant and that recur in ways sufficiently orderly for us to take heed of. But they present no new ontological problems within the trope assays of the real.

Causes

The terms of the *causal* relation are always tropes. It is the heat of this stove, here and now, that burns you, on the finger, here and now. The casual agent is a state, or event, or process, always

particular and always qualitative. It is not the stove, the whole stove, that burns you; not even the whole stove here now. For its solidity, iron structure, enamel surface and smoothness have nothing to do with it. It is the *temperature* that does the damage. Moreover, it is not any temperature, or temperature in general, but *this* particular case of temperature, among the myriads in the world, and even among the many the stove has during its life. Yesterday's stove temperature is quite innocuous. It is *today's* that burnt you.

Again, accommodation of the ontology of causes into the trope scheme is so smooth because what is required is an element that combines particularity with a very restricted qualitative character, since causes are always features (almost always a small selection from the host of features present) and every particular cause is a particular feature or constellation of features.

Cambridge Changes

The trope theory offers us a straightforward way of distinguishing genuine from merely 'Cambridge' change. On a nominalist philosophy, there are changes just in case a predicate comes to apply, or ceases to apply, to a subject. But this is too undiscriminating. When we consider what is actually going on, some predicates gain their applicability through a change in the subject itself, as when I put on weight, while others depend entirely on changes in other items to which the subject is related, as when I become an uncle. Or think of the two very different ways in which you can become the fastest gun-slinger in town. The incapacity of nominalism to make this distinction is one more on the heavy list of indictments against it.

On a trope scheme, all is well. Real change is located in those complexes of tropes that are different from what they were. Cambridge changes are all those consequential alterations in the applicability of predicates that radiates out through the world, from any real change, through the relations among the world's denizens.

We have not a semantic but an ontic theory of real change: in real change, the total trope distribution in the world is different at time t_2 from what it was at t_1.

In a four-dimensional cosmology, the time dimension is treated as analogous in ontic status to the spatial dimensions. Just as all points on a space dimension are equally real, so are all points on the temporal one. The past and the future are as real as the present. On such a view, there is no real becoming or passing away. And an item viewed as filling intervals on spatial and temporal dimensions does not, in strictness of language, change during its life. What we think of as change is analogized to variegation: if a leopard were to change its spots, this would correspond, on the time dimension, to the tiger's stripes across one of its spatial dimensions.

Even if we adopt a four-dimensional cosmology, although no four-dimensional trope complex actually changes, the specification of real change in terms of trope distribution is acceptable.

The trope philosophy's vision of the cosmos is thus one of the occurrence, at places at times, of particular cases of kinds or particular natures. These tropes are distributed, often into rich complexes – our familiar ordinary objects – sometimes into ethereal simplicities – the electromagnetic and gravitational fields of deep space or the blue of the sky.

These, together with their parts and their sums, comprise reality. The distribution of the tropes is in constant flux, as the causal links among states, events and processes bring forth real changes and their Cambridge shadows.

1.8 A SPARSE THEORY OF TROPES

Trope theory is first and foremost a theory of the ontic constitution of the cosmos. It is a scheme to account for the patterns of variety, resemblance and order to be found there. That this world is a world of tropes is a thesis advanced quite independently of the existence of human thinkers that have developed language.

Only in a very subsidiary way is the theory involved in accounting for language. The possibility of predication, and the multiple applicability of general terms, do indeed rest on the existence of appropriate, resembling tropes. But the tropes

should in no way be seen just as ontic counterparts of, or shadows thrown by, general terms used predicatively. Tropes are not, in the first instance, part of any semantic theory. In particular, they are not involved automatically in every attempt to establish meaningfulness, or synonymy and its converse. For

a is F

to be meaningful, it is neither necessary nor sufficient for there to be F tropes. Each different F thing may be F on the basis of collections of component tropes that by no means exactly match, as Wittgenstein claimed for family resemblance situations, among games for example. There need be no *game* tropes over and above those components. So such game tropes are not necessary for the significance of the predication '*a* is a game'.

That the existence of F tropes may not be sufficient for '*a* is F' to be significant can be seen from those 'category' accounts of singular terms, which restrict the significance of predications to those cases where there is a subject term appropriate to the predicate. Some philosophers hold, for example, that if *a* is the smallest prime number greater than 10,000, and F is the trope of enjoying cucumbers, then

a is F

is not significant.

Again, if two predicates F and G are not synonymous, it does not follow that there must be two different tropes or trope-clusters F and G. *Being the sunrise of 27 September 1989* can involve the very same tropes as *being the three millionth sunrise*, let us suppose, although these predicates are not synonymous.

And conversely, any predicate synonymous with 'game' would no more guarantee that both predicates apply in virtue of tropes proprietary to those predicates, than the predicate 'game' alone can guarantee this.

There is, in short, no one-to-one correspondence between significant predicates and tropes. There can be fewer, or more, varieties of tropes than of predicates. Real patterns of resem-

blance, rather than the significance of discourse, call the tune. You cannot establish an expanded ontology just by constructing new meaningful predicates.

This view of the situation derives from and parallels Armstrong's discussion of the issue as it concerns the relationship between predicates and properties conceived as universals. (See Armstrong, 1978, chs 13, 14 and 17, especially). Lewis's tag for the view is 'sparse'.[23] This present work advances a sparse theory of tropes.

2

The Problem of Universals

The Problem of Universals, though the traditional title for one of the classic problems of philosophy, is not a very felicitous one. For the issue we must now confront would be better described as the problem of whether there are any universals, or even the problem of showing that there are in fact none. For the trope philosophy is Particularist. It accepts Locke's thesis that all things are always only particular. It denies that there are any literally common elements present in all members of a group of resembling particulars.

Some writers use the label 'nominalist' for every denial of universals, but this blurs a crucial distinction: ordinary nominalisms, in denying universals, deny the existence of *properties*, except perhaps as shadows of predicates or classifications. They recognize only concrete particulars and sets: in Quine's case, space–time points as well; in Goodman's case, not even sets, let alone properties.[1] But the trope philosophy emphatically *affirms* the existence of properties (qualities and relations). Indeed, it holds that there is *nothing but* properties (or nothing but properties and space–time). However, it insists that these properties are not universals but, on the contrary, particulars with a single, circumscribed occurrence.

2.1 GETTING THE PROBLEM IN FOCUS

Universals are introduced into ontological assays as the only, or at least the best, way to solve a manifest problem: the problem of accounting for resemblance among the world's realities, of accounting for the recurrence of repeated characters.

The world is not a chaos, with every aspect, at every minute, unique in character. Nor is it an undifferentiated blancmange. It is a diverse and orderly cosmos displaying patterns of recurrence.

No responsible ontology can evade this very general fact; and no responsible ontology can avoid offering its assay of this situation. Universals are proposed as the solution to the question: what is it, in the ontic structure of reality, that accounts for those facts of orderly resemblance across space and recurrence through time which we encounter? The answer is given: resembling objects, at least in the fundamental cases, resemble one another in virtue of the presence in them all of the *very same item*, a universal property. This gives to each of them that aspect of their nature in which they resemble each other.

In the first instance, the issue is entirely ontological. It concerns objects in the world and the properties they share with one another. The problem of universals is only secondarily a semantic issue. There is something *about language* that does need to be explained, namely, how is it possible to use the same word correctly in describing indefinitely many different situations? And if you are a Realist about universals, they will be ready to hand to appeal to in developing a semantics for general terms: a general term can be used to describe each situation in which the universal property it indicates is present. Since there is no restriction on the multiple instantiation of the universal there can be no objection to multiple use of a general term.

But this semantic issue is secondary and derivative: if universals are not required for the ontic problems of resemblance and recurrence, they are not going to be needed for what is essentially a special case of that problem, the phenomenon of resemblance and recurrence among uses of the general terms in a language. Conversely, even if we succeed in developing a semantics for general terms that avoids appeal to universals, this is not itself enough to despatch the whole issue: the questions of resemblance and recurrence *among real situations* must be confronted.

2.2 THE ISSUES DISTINGUISHED

Let us suppose, for purposes of illustration, that if there are any universals, the colours are among them, and that if there are any tropes, cases of the various shades of colour are among them.

Now we can pose two very different questions about, say, red things. We can take *one* single red object and ask of it: what is it about this thing in virtue of which it is red? We shall call that the *A question.*

Secondly, we can ask of any *two* red things: what is it about these two things in virtue of which they are both red? Let that be the *B question.*

Discussions of the problem of universals invariably take it for granted that the two questions are to be given parallel answers. Indeed, realists about universals have their answers ready. The A question's answer is: it is in virtue of the presence in the object of the universal redness, that the thing is red. And the B question's answer is parallel: it is in virtue of the presence in each of them of the universal redness, that they are both red.

The conflation of the A and the B questions is responsible for making the realist position seem much more inevitable than it really is.

Let us disentangle them. Introducing universals to account for the A problem is gratuitous – unless we *assume* that the nature or character of an item can never be particular, which is precisely the point at issue. If we adopt a scientifically influenced approach to the A question, we shall seek a substantial explanation, typically in terms of underlying structure. What is it in virtue of which this thing is red? This invites replies of the type: the selective reflectance of the surface across three overlapping wavebands in the electromagnetic spectrum. Wherever the characteristic we are enquiring about is not basic but derivative, we can, in principle, provide a reply to our A question about one property by referring to others.

This, of course, only postpones the evil day when we raise our question about a basic character of an object. At that point there is no *substantial* answer to be had. Suppose electric charge is basic. Then the answer to the A question:

> What is it about this object in virtue of which it has electric charge?

is:

> Its having electric charge.

This can be dressed up if you wish: the presence at that place of an instance of electric charge. What is it *about charge* in virtue of which it is charge? Its being what it is.[2]

It is critical to the trope vision of the world that particulars can be natures, that something can just *be* a case of charge, or colour, or whatever. Philosophers are rightly suspicious of tautological-seeming answers to questions – Plato stigmatized such replies as 'safe but stupid' (*Phaedo*, 105C) – but it is important to remember that such answers arise at some point in *every* system. The realist about universals has a substantial-seeming answer to our A question, even in the case of basic properties. But the rock-bottom is not far away. What is it about *electric charge* in virtue of which the presence of this universal is necessary and sufficient for something's having charge? Its being what it is.

So the existence of true but uninformative answers in a theory does not of itself count against that theory. All theories include such answers. In realism about universals, they are delayed by one step for A questions. The issue is whether that is a gain worth paying for, if universals are not otherwise required in an ontology.

2.3 RESEMBLANCE AND THE SECOND ISSUE

Let us turn to the B question: what is it about several objects in virtue of which they are all red (or all rabbits, or whatever)? This is where the intuitive appeal of realism about universals is at its highest. All the red things must have *something* in common, they plainly share a common nature, which we recognize and mark by having a multiply-applicable term, 'red', which applies to each of them equally and fully. Each of these objects is fully and

completely red. So redness must be a multiply-instantiable universal.

Despite the appeal of this move, there is in fact no need to introduce any universals. Tropes are all we need, tropes that resemble one another more or less closely. What is it about two objects in virtue of which they are both red? Each includes a red trope. What is it about those tropes in virtue of which they are both red tropes? Their likeness to one another is what makes them tropes of the same kind. Their natures make this the red, rather than the blue, or oblong, kind. It is in virtue of the likeness of the tropes in question that it is appropriate to use resembling word *tokens*, each a case of 'red', in describing these objects or, more specifically, their colour tropes.

What is being offered here, of course, is a Resemblance theory of resemblance and recurrence, an assay in terms of resembling particulars, in place of one involving identical universals. It takes resemblance to be ultimately, in basic cases, unanalysable. Here we take for granted, as plainly correct, that resemblance is entirely objective. The world is full of a myriad of tropes. These resemble one another more or less closely, forming countless loose or tight-knit families, the *natural kinds*. Of the very many natural kinds, mankind is sensitive to some small proportion, some smaller proportion of which he dignifies with classification and labelling.

In this process errors and misallocations occur, so there is a human contribution to the sorting categories we use. But for the great bulk of properties, the primary qualities and relations, resemblance in general is no human artefact. Neither in respect to what resembles what, nor in respect of how close such resemblances are, are mankind's classifying tendencies what settles matters. Special human interests do intrude in *weighting* resemblance, and in thus settling issues of degree of resemblance among complex items which have many dimensions of likeness and difference. But with tropes, which are of minimal complexity, and in metaphysics, where tropes are all of equal natural weight, resemblance is an objective primitive.

Resemblance theories have to take care which questions they accept. To the question: what is the *common nature* in two resembling things? they are bound to reply: they have no common

nature, only resembling natures. To the question: what is it for the two objects to share a common property? the reply must be: there is no such sharing, except joint membership in a natural kind, which is not a universal but a collection of tropes. To the urging: but you must concede that there is *something the same* about these two objects? the reply must be: no, there is no numerically identical item present in both. The similarities between the objects create an illusion of a genuinely common feature.

2.4 OBJECTIONS TO A RESEMBLANCE THEORY

Except in the loosest of languages, Resemblance theories are not theories *of universals*; they are theories which offer assays of the real situation in which relations among particulars are *substitutes* for universals. Resemblance theories are particularist.

H. H. Price proposed one in which natural kinds cluster around *paradigms*. All and only those objects that sufficiently resemble the paradigms belong to the kind.[3] Quine's account in terms of paradigms and foils is a close relative,[4] although he is not unambiguous on the anthropocentricity of resemblance.

The Possibility of Unique Cases

The first and simplest objection to Resemblance theories has been this: there could have been a world with only one single case of redness. It would have been *sui generis*. It would not have resembled anything else, paradigmatic or otherwise, in the appropriate way. Yet it would still, surely, have been red?

Yes, it would have been red. This objection is decisive against any proposal to use Resemblance theory to answer the A question. Resemblance theory cannot provide a correct answer to what it is about *one* thing in virtue of which it is red. I have urged above that the only correct answer to that question, in the basic case, is the unilluminating one: its (particular) nature.

The Carnap–Goodman Problems

Carnap, in *Logische Aufbau der Welt*(1927), proposed to 'construct' universals as *similarity circles* of particulars. The particulars he

had in mind were ordinary concrete objects. Each member of a circle would resemble, not a paradigm this time, but *every* other member of the circle more closely than any of them resembled any non-member. All members of the circle are equally 'standard' in such a construction.

Goodman, in *The Structure of Appearance* (1966), pointed to two weighty objections to any such theory – the *coextension* difficulty and the difficulty of *imperfect community*. The coextension problem is this: suppose all and only pandas eat bamboo. Then the circle of pandas and the circle of bamboo eaters will coincide. In which case, according to the theory, the property of being a panda is the same as the property of being a bamboo eater, which is absurd.

The problem of imperfect community arises in this way: objects can resemble one another in different respects. So we could proceed to construct a similarity circle, starting with a wooden red square, moving to a wooden blue circle, then on to a metallic blue square. Each item resembles both the others, and we can suppose they are equally like one another where their properties do match up. Yet it offends all intuition to conclude that any one property corresponds to this similarity circle. As we might unguardedly put it: but those three have nothing in common.

Now both these problems, of coextension and imperfect community, only arise if the members of the similarity circles are *complex*, concrete particulars. It is because complex objects have many different properties that the pandas and bamboo eaters can coincide. It is only because the objects have many properties that the imperfect community problem can be generated. If the terms of the resemblance relation are not ordinary objects but tropes, these difficulties disappear. The conjunction of tropes that amounts to panda-hood is circumscribed. It does not include the bamboo-eating trope conjunction. The members of the panda-circle are one lot of tropes. The members of the bamboo-eater circle are another quite distinct lot of tropes. We are supposing that in this world, as it happens, these two disjoint trope groups are regularly compresent. But that is of no consequence. It does not reduce being a panda to being a bamboo eater, or vice versa.

So what is a serious problem for any resemblance theory

which appeals to concrete particulars – the inability to distinguish different but coextensive properties – does not arise where it is not concrete particulars, but tropes that are involved.

Similarly, if the members of our similarity circles are *tropes*, the red ones will form one group, the blue a second, the wooden a third, the metallic a fourth, and so on. There will not be any similarity circles with hybrid members, and it is only hybrid members that allow the construction of similarity circles exhibiting imperfect community. Resemblance theory with tropes does not manufacture the spurious 'properties' that emerge from resemblances among concrete particulars.

Küng's Objection

There is a regress objection to the resemblance theory, developed by Guido Küng,[5] that is not affected by whether it is concrete or abstract particulars which are the terms of the comparisons.

Suppose we have three similar items, *a*, *b* and *c*, each of them red. Then each of these resembles the other two. We could depict the situation by a triangle, with *a*, *b* and *c* at the vertices, each joined to the other two by a side representing the resemblance relation between them.

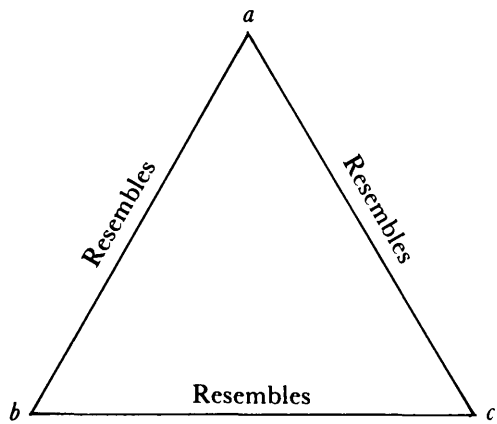


Figure 2.1

Now, not all properties are monadic qualities. Relations are properties too. In particular, resemblance relations must be recognized. If cases of red are tropes, then cases of resemblance are too. They then enter relations with one another. In particular, these resemblance relations between *a*, *b* and *c* are themselves much alike: each is a colour-resembling: more than that, each is a colour-resembling-in-virtue-of-red-in-the-terms.

Let these cases of resemblance be *d*, *e* and *f*. They can be joined by lines representing the likeness that each of these bears to the other two.

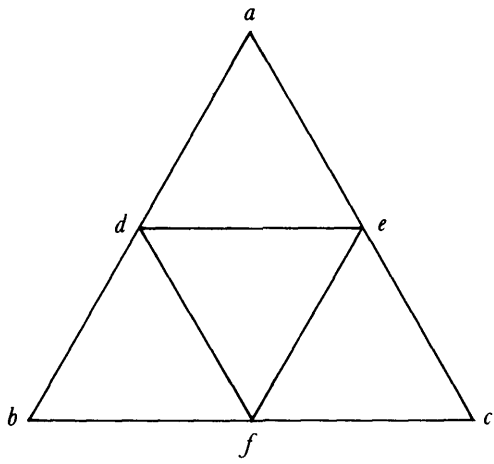


Figure 2.2

But why stop with *d*, *e* and *f*? The cases of resemblance among *them* will also be alike, and so on, *ad infinitum*. (See Figure 2.3)

So, the argument runs, to appeal to resemblances among particulars, rather than common universals in those particulars, generates an infinite regress which is either vicious or, at the very least, massively uneconomical.

To this objection there are three points to be made in reply. First, the regress is not vicious. It proceeds in a direction of greater and greater formality and less and less substance. In this it is rather like ascending from species through genus to family, and so forth. No one is disturbed by the reflection that in taking on a pet cat they are undertaking the care of a feline, a placental,

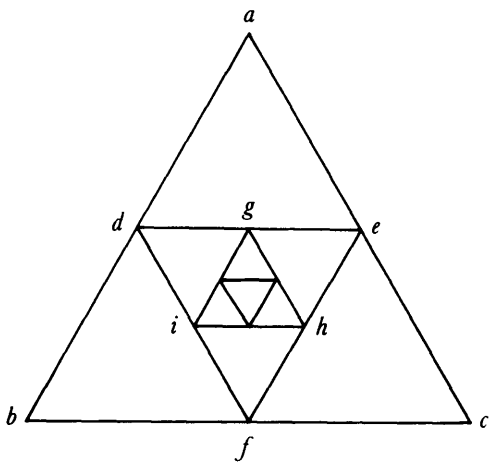


Figure 2.3

a mammal, a vertebrate, etc. That regress does not go on for ever, but even if it did it would not be a matter for concern.

In a somewhat similar vein, everyone who has not yet celebrated their centenary labours under an infinitude of characteristics, those of being not yet 100 years old, not yet 101, not yet 102, not yet 103 . . . We take such infinities in our stride, and the resemblance regress is no more burdensome.

Second, if this is a problem it is one that the realist about universals does not escape. The realist is tarred with the same brush. For realists, like everyone else, have to acknowledge that their universals are instantiated, and it is in and through their instantiation that they 'meet particularity' and actually have a presence in the real world.

So let us return to *a*, *b* and *c*. They each have redness and therefore each resembles the other two. So we have three cases of colour-resembling. But these cases of colour-resembling instantiate *resemble with respect to colour, in particular, red.* So they each instantiate a universal and, therefore, they each must resemble the other two. This gives us three more resemble-instances, *d*, *e* and *f*. And the regress is well under way.

Hence, if the regress is a serious problem for resemblance theory, the parallel regress of instantiated universals is an equally serious problem for realism.

But in fact, thirdly, I think it is no real trouble for either.[6] Notice how the later terms in the regress arise by a smooth piece of logical reflection. These are entities won too easily. Once the first trio is granted, all the rest follow by an automatic inevitability. And the later terms are what they are entirely because the earlier ones are as *they* are. Later ones cannot vary unless earlier ones do.

You will recognize this pattern of dependence: the later terms are *supervenient upon* the earlier ones. In the realist case, the base terms are the three exemplifications of the universal redness in *a*, *b* and *c*. These exemplifications guarantee supervenient resemblances, which are the basis for supervenient resemblances among the resemblances, and so forth.

On the resemblance theory, if resemblance is truly primitive and ungrounded, the terms *d*, *e* and *f* will be the starting-point from which all subsequent supervenient terms flow. If, as this work favours, resemblance is an internal relation grounded in particular natures in the terms, then the red tropes *a*, *b* and *c* will generate the whole edifice of supervening resemblance triples.

Either way, there is a manifestly finite base for this effloresence of dependencies. And I take it as a cardinal principle in ontology that *supervenient 'additions' to ontology are pseudo-additions*. No new being is involved. In the Creation metaphor, to bring supervenients into being calls for no separate and additional act on God's part. Let Him create the three red items *a*, *b* and *c*. That *by itself* will suffice to generate Küng's regress.

So a supervenient burden is no real burden at all. That is why we are so untroubled by being simultaneously less than an infinite number of different years old.

To establish that something supervenes on what we have already recognized is to establish our right to include it as no true ontic expansion. This is a principle to which appeal will be made in subsequent chapters.

I conclude that Küng's regress has no power to damage a theory that proposes to deal with Question B by appeal to resemblances among tropes.

Russell's Objection

Russell, in his *Problems of Philosophy*,[7] argued that the resemblance theory's attempt to do without universals was a failure since resemblance itself would have to be recognized as a universal. And if we admit one universal, why not others? The number of items within an accepted category is not a highly significant issue; it is the existence of the category as a whole that is important. Donald Williams stigmatized an interest in reducing the number of items in a category as a matter of mere 'gross tonnage' economy.

Russell's argument was that, to revert to Küng's diagram, *a*, *b* and *c* are certainly particulars, but there must be the *same resemblance* between *a* and *b* as there is between *a* and *c*, since *a*, *b* and *c* are all, *ex hypothesi*, of just the same shade of red. But then if we have the same resemblance between these two pairs of items, this is a multiply-instantiated entity, in short, a universal.

The only reply this calls for is strongmindedness. We must reject the claim that, in the sense that matters, there is the same resemblance between *a* and *b* and between *a* and *c*. These are two different, but very similar, even exactly similar, resemblances. And the resemblances between the resemblances are likewise matching particulars, not universals. In Küng's regress, the items are particulars *all the way down.* If we insist on this, then Russell's objection can find no purchase.

Resemblance as a Derivative Relation

In one sense, the view advanced in this chapter accords to resemblance a derivative status – resemblings supervene upon their terms. But in another sense it is primitive: no eliminative definition of resemblance is available. Now this view can be challenged and indeed has been (see Armstrong, 1978, vol. 2, pp. 120ff).

To enable him to offer an account of the resemblances of *universals* to one another, Armstrong (1978) advanced the thesis that *resemblance is partial identity*. Two particulars *a* and *b* resemble in so far as they share a common constituent, which may be a property *a* and *b* have in common or a property of corresponding

proper parts of *a* and *b*. Two universals P and Q resemble in so far as they are complexes with some common universal constituent. This view requires us to acknowledge that there can be parts other than spatio-temporal parts.

If we require the concept of identity anyway, as seems extremely plausible, an economy of analysis is effected if *resemblance* is reducible to *identity of part*. But such a reduction is only available if the resemblance account of properties and relations is false. For the resemblance account specifically denies *any* identity of part between resembling particulars.

So, although Armstrong did not use the partial identity account of resemblance as an objection to the resemblance theory, it does provide the basis for such an objection. How serious an objection is it?

Whether or not resemblance calls for further analysis or is a primitive concept is very much a matter for philosophical intuition, with arguments to support one view rather than the other being hard to come by. For myself, I find the claim that resemblance needs or admits analysis uncompelling.

To guide our intuitions about resemblance among simple particulars, let us think a little about the complex case. Think of a rich and costly necklace. It is gold chain, interspersed with rubies every few centimetres, with a magnificent diamond forming the central pendant stone. Now think of another necklace, of roughly the same size and general configuration, but consisting of a silver chain interspersed with pearls. If we were to *transfer* the diamond from the first necklace to the second, there is a clear and unambiguous sense in which the second necklace now more closely resembles what the first was formerly like. This is because we are dealing with an uncontentious case of partial identity. The second necklace *now* is partially identical with the first necklace *then*, and in being partially identical, resembles that earlier state of the first necklace. Partial identity does indeed confer similarity.

But now suppose that our magnificent diamond has a twin, cut and polished to match it by the most highly skilled jewellers, so that even experts cannot reliably tell them apart. Let the *twin* diamond be attached to the necklace of silver and pearls. Now, there is no partial identity (of particulars) between our two

necklaces. Yet who will say they do not resemble one another? They may not resemble *quite* as much as in the case where one diamond is transferred. But resemble they do, in virtue of the very great *similarity*, not identity, between the original diamond and its twin. So far as intuitions about complex particulars can take us, partial identity of (ordinary) particulars is *not* essential for resemblances among things.

Now consider single, non-complex items: suppose for the sake of argument that our diamonds are truly single substances. Why should *they* not resemble *by having similar constituents*, rather than any literal partial identity? The two necklaces can resemble by containing similar, not identical, diamonds. I submit that the two diamonds can resemble by containing similar, matching tropes. A genuinely common universal property is not required.

2.5 THE ANALYSIS OF PREDICATION

The classic schedule of substance and universal property provides the wherewithal for a smooth account of predication. We have subject/predicate sentences in which the predicates have one or more places and in which, consequently, there are one or more definite singular terms in subject position. Thus:

The cat is furry.
The cat is on the mat.
The cat is nearer to the fire than to the dog, etc.

In such sentences, subject terms refer to substances (or quasi-substances), predicate terms refer to universal qualities or relations and the sentences affirm that the property referred to by the predicate inheres in the substances referred to by the subject(s).

We also have quantificational sentences with indefinite singular terms and pronouns in subject position, such as

Some fish swim.
Not all birds fly.
Pigs are smarter than buffalo.

Such predications are best treated canonically:

$(\exists x)(\text{Fish } x \ \& \ \text{Swims } x)$
$\sim(\forall x)(\text{Bird } x \supset \text{Flies } x)$
$(\forall x)(\forall y)((\text{Pig } x \ \& \ \text{Buffalo } y) \supset \text{Smarter } x,y)$

And the account of predication is again a smooth one: the variables range over substances or quasi-substances, and the predicates have extensions in the domain over which the variables range. The sentences assert that some, or all, of the substances ranged over by the variables fall within the appropriate extensions marked out by the predicates.

If we abandon the two-category ontology in favour of tropes, those basic semantic descriptions for predication are not available to us. For predications with definite singular terms in subject position we shall need to distinguish ordinary cases from those which are in truth more fundamental.

The ordinary cases involve our ordinary vocabulary of definite singular terms: proper names, definite and demonstrative descriptions, and pronouns cross-referring to definite singular terms. *Tom*, *Dick* and *Harry*, *the weaver*, *the organist* and *the baker*, for example, are ordinary definite singular terms. And they, of course, do not refer to individual tropes. They refer, according to the philosophy of abstract particulars, to *trope-complexes*, indefinitely multiple collections of compresent tropes, by no means all causally independent of one another.

So what an ordinary predication is doing is asserting (or denying) that a trope of the kind referred to by the predicate is compresent with (belongs to) the complex of tropes referred to by the subject term(s).

Ordinary quantificational predications will have variables ranging over trope complexes, with predicates having extensions which are themselves either complexes of tropes such as the natural kinds *rabbit* or *fish*, or sets of tropes corresponding to sortal adjectives, like *red* or *sharp*, or trope sequences where verbs such as *flies* and *swims* are involved.

The basic cases of predication will be rather unusual. Here the variables range over the tropes considered singly and the predicates have as their extensions such single tropes: *This is (a case of)*

red, and *There are some (cases of) electric charge* will be of this basic kind.

Tropes usually occur in complexes, so we need to be able to say both that a certain trope occurs (a basic kind of predication) and that a certain complex contains a trope of a certain kind (the more usual form).

Red tropes are cases of red. Electric-charge tropes are cases of electric charge. There is no Third Man problem, no issue over self-predication. With universals in an ontology, we have both the individual item, Socrates, who is a man, and the universal, humanity, inhering in Socrates, in virtue of which he is a man. Then there arises the classic problem of whether humanity and the man Socrates bear a resemblance (is humanity rather human?). For if they do, a second universal (the 'Third Man') will be needed, inhering in Socrates and humanity, to account for the resemblance. This approach threatens an infinite regress, as Plato fully realized.

On the other hand, if humanity bears no resemblance to the case of it which is Socrates, we are left baffled as to how this can be, since Socrates *is* a case of humanity because humanity inheres in him, and it is hard to see how something in which humanity inheres could fail entirely to resemble humanity itself.

The most promising reply to this is that the substance *substratum* of Socrates neither contains nor resembles humanity, while the complete substance Socrates does contain humanity (has humanity inhering in him) and in that way resembles humanity. It is a one-sided case of partial identity (a non-spatio-temporal part of Socrates is identical with humanity).

But if we allow, in this way, that two items can resemble *but not by virtue of possessing a common universal*, the whole rationale for a realist analysis of resemblance is gravely compromised.

These troubles in realism about universals are often put as the issue of whether a universal applies to itself (the self-predication issue). The trope philosophy has no such problem. The tropes are cases of kinds, the predicates apply *both* to the tropes taken singly and to any complexes in which the tropes are constituents, and no regress threatens.

2.6 WILLIAMS' PAINLESS REALISM

Around 1959, Donald Williams prepared and presented a paper, 'Universals and existents', on trope theory's treatment of the problem of universals. It was found among his papers by philosophers from Princeton, and eventually published in 1986.[8] 'Universals and existents' sets out his particularist and naturalistic vision of reality with characteristic clarity and brilliance and offers a new way of meeting the concerns which motivate realists about universals.

We need to accommodate our intuitions that concrete particulars incorporating matching tropes 'have something in common', and our consequent sense that predication is a process in which the *same* thing is being attributed to different subjects. Perhaps we can do better than baldly to deny any identity here. Taken strictly, abstract particularism insists that there is nothing in common, there are only matching tropes whose resemblance generates an illusion of identity. It insists further that predication attributes *different* members from a *matching* set of tropes to the different subjects both described by (matching occurrences of) a general term.

Again, we sometimes have occasion to refer to kinds as if they were single, numerable entities. Williams' example is the interior decorator's claim: 'I used just four colours in that room' – which is not the claim that the room contains just four colour tropes. It is, on the face of it, a claim referring to properties as universals.

To explain his approach to the problem, Williams needs to make the distinction between *inherent* and *adherent* properties. Inherent properties are the qualitative, monadic characteristics, such as *being blue*, or *at 10 °C* or *solid*, that a complex concrete item can have 'in its own right', that is, whether or not there is anything else in the world, and, if there is, what character that other reality may have. The *adherent* or 'external' characters, by contrast, are the relational properties of an object. These are still monadic; they belong to items taken one by one, but one object possesses an adherent character only in case the *rest* of the world has appropriate features. *Being the heaviest man in the room* would be a typical adherent characteristic.

Any item can plainly gain or lose an adherent feature without

undergoing any real (inherent) alteration, and no real alteration in the item's inherent characteristics can by itself guarantee that any adherent feature will be gained or lost.

We can now formulate a version of the principle of the Identity of Indiscernibles: items *a* and *b* are identical provided they share *all* their *inherent* characteristics. This is a very strong and implausible thesis if taken as completely general, and it is unlikely to have been widely affirmed. It is, however, the one Williams needs. For he can use it to provide a definitional specification of the distinction between particulars and universals, as traditionally conceived.

> A particular is any entity for which the identity of (inherent) indiscernibles can be false.

In other words, where particulars are concerned, matching of inherent character is not sufficient for identity. Tropes, with their one inherent character, count as particulars by this test.

With universals, however, the situation is quite otherwise. A universal *is* identical wherever it is to be found. Provided only that the (single) inherent character (blue, say) is present, that suffices for blueness to be present. And the blueness present on one occasion is the very same blueness present on every other (exactly matching) occasion.

So particulars can be alike in inherent character, yet not identical. They can be distinguished by differing *ad*herent features, such as their compresence relations, at least. And perhaps they can be distinguished even if they share all inherent *and* adherent characters. By contrast, universals' identity is guaranteed by inherent matching.

Now Williams makes his proposal for painless realism about universals: the difference between a case and a kind, a particular and a universal, is not a difference of *category* but a difference in *rule for counting*.[9]

Where there are, say, six occurrences of a green trope, each at its own distinct location, we can count in the orthodox way – where inherent character matches but adherent characters do not, count *one* for each such case, and you will treat the tropes as particulars. Where, no matter what the adherent characters may

be, you only count *more than one* where there is a difference in the inherent character which you wish to take notice of, you *identify* all occurrences of matching tropes. This one thing is not a new thing but our old familiar tropes now treated in a way that gives them some of the distinctive features of a universal.

That the same subject matter can be subject to different counting rules is not a new idea; that is the standard way of introducing Peirce's type/token distinction. The result, the 'painless universal', is not the same as the sum of all the tropes involved, since only part of that sum is present at each trope's place. The result is rather *indifferently any one of the tropes considered as fully equivalent to any or all of the others*. And this is an artefact arrived at by way of a second rule for counting the existing trope particulars. It yields an item common to all matching tropes, fully present in each one of them, not increased by increasing the number of matching tropes nor diminished by reducing that number. It is a substitute for *immanently* conceived universals: on this construction, only instantiated universals are possible.

Williams holds that in this way we can do justice to the intuitions that motivate realism without being committed to admitting a new, non-particular category into our ontology. Hence my title for the view: painless realism.

This view meets the realist arguments of J. P. Moreland and others concerning abstract reference – our capacity, apparently, to refer to a quality or relation as a single unitary entity, which has qualities or relations of its own. (See chapter 3, pp. 73–4.)

2.7 STRUCTURAL UNIVERSALS

David Lewis gave the trope ontology a great boost with his paper 'Against structural universals'.[10] The support provided is indirect: he argued that there are severe difficulties in any realist view of universals, arising from attempts to analyse structural universals as structures *of* universals, which seems to be the realist's only option. The difficulties that Lewis identified just do not arise on the trope view.

His argument in a nutshell is this: many properties, of indisputable importance, appear to be structural. They seem to be

properties that not only have parts (as conjunctive properties do), but in which the arrangement of these parts (how they are related to one another) is critical. His first example is *methane*. *Being a methane molecule* is a property that no object can have unless it is composed of one carbon and four hydrogen atoms bonded together. *Containing carbon* and *containing hydrogen* and *bonding* thus seem to be essential constituents in *being methane*. If the property *being methane* is a universal, however, problems arise. Being a multiply-instantiated universal, its parts or constituents must be universal also. Now there is only one universal *hydrogen*. There cannot be four *hydrogens* or four *being an atom of hydrogens* present in each instance of *being a methane molecule*. Yet something essential is missing if that four-fold aspect of the situation is not specified.

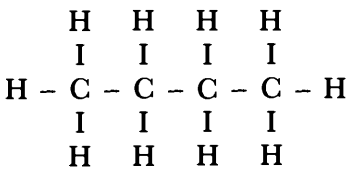
This becomes apparent as soon as we turn from methane (CH_4) to butane (C_4H_{10}), which will have as *its* universal something with the very same constituents (*carbon*, *hydrogen*, *bonded*).

The way to allow that a property can have four, or ten, different hydrogen constituents is to allow them particularity. The trope analysis is the most direct: the property *being methane* occurs as a particular with four particular hydrogen tropes as constituents.

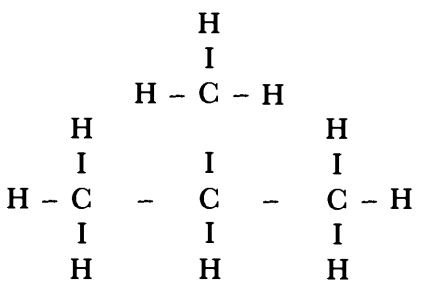
Lewis tries a middle course involving what he dubs *amphibians* which are supposed to have enough particularity to occur four, or ten, times over in a property universal, yet enough universality to be multiply instantiable wherever the methane, or butane, structure occurs. Although he is ingenious in supporting this hybrid conception, he decides it cannot be accepted.

Admitting plurality, allowing amphibians to occur more than once in a structural universal, will allow us to distinguish methane from butane. But plurality, it proves, is not enough.

To see this, Lewis reminds us that there are two different butane structures, butane:



and iso-butane:



To distinguish the properties of *being butane* and *being iso-butane*, we need not only to specify how many occurrences of *carbon*, *hydrogen*, *bonded*, *carbon–hydrogen bonded* and *carbon–carbon bonded* occur in each *butane* structure, but also which occurrences go with which. We need to single out, for iso-butane, an occurrence of *carbon* that is *carbon–carbon bonded* thrice. For this situation not just multiple occurrence but particular occurrence is required. Only that way can we specify that in one particular case the very *carbon atom* instance which has the first *carbon–carbon* bond has the other two as well.

To get two different composites, Lewis insists, you must build with different parts. *Butane* and *iso-butane* are two different composite properties. Their constituents must therefore differ. The difference can lie only in the presence or absence of *being a carbon–carbon bond involving a carbon atom which is also involved in two other carbon–carbon bonds.*

Lewis does not draw the moral explicitly, but that moral seems to me to be: to get the required difference, we must accept that the properties and their constituents are particular. With particulars, the *case of carbon* which has the treble carbon–carbon bonds (themselves particular) is distinct and distinguishable from all its matching tropes, can be identified and enables us to distinguish the structural property *being iso-butane* from its near relative, the structural property *butane*.

Three possible lines of response are explored in the issue of the journal in which Lewis's paper appeared:

1 Armstrong appeals to 'particularizing universals'. He

notes that only some universals have instances in a way that involves recognizing a particular. There is no such thing as a blunt or a soft, for example, by contrast to universals such as *cow* or *sheep*. *Cow* and *sheep* are particularizing universals, whose instances are particular items, a cow or a sheep.

Now where we have a particularizing universal F, we can recognize its instances as *an F* and *another F*, etc. But this is not enough. What Armstrong needs to deal with structural universals such as methane and butane is a series of universals:

an F
a second F
a third F
etc.

Armed with these, he could specify the components of the *methane* structure in a way that distinguishes methane from butane. The constituents of *being methane* are *being a carbon atom*, *being a hydrogen atom*, *being a second (third, fourth) hydrogen atom* and universals of bonding. *Being butane*, by contrast, will contain not only these universals but further ones: *being a second (third, fourth) carbon atom*, and *being a fifth, (sixth . . .) hydrogen atom.*

There are two decisive objections to this proposal: it is uneconomic and it is arbitrary.

It is uneconomic in that it multiplies universals without the usual constraints. Armstrong rightly advances a *sparse* theory of universals, admitting only those that earn their keep in the explanatory structures of total science. This imposes the discipline of finding, for each different universal, a different causal impact in the world. But all the causal powers of the fourth hydrogen atom in a methane molecule derive from its being hydrogen, and none from its being fourth. So here universals are being multiplied beyond causal necessity.

To see that this is so, we need to notice the other objection, that the 'numbered' universals are arbitrary. There is *nothing* in the nature of things that makes one of a methane molecule's hydrogen atoms *the first* rather than *the third*. That has to be an accident of where we happen to choose to start the count. So what is *the first* could just as well, without any change to any of its

actual natural intrinsic or relational properties, have been *the third*. So the difference between being the first and being the third is a difference without causal consequences.

Of all realists, Armstrong, the champion of every effort to banish anthropocentrism from the theory of universals, should resist the introduction of arbitrarily numbered universals. And if he does not, we should. The particularist alternative is superior.

2 Peter Forrest and John Bigelow explore different variants of a common theme: there can be modes of composition, unlike the part/whole mode, in which the very same constituents can be combined into two or more different structures.

These new modes of combination must be different from the only recognized alternative to part/whole composition, the combining of elements into sets. The property *being methane*, for example, is quite other than the set of properties {*being carbon*, *being hydrogen*, *bonded*}, for this set would exist if carbon and hydrogen existed, but two *other* elements were bonded. Being methane is also quite other than the set {*being carbon*, *being hydrogen* {*being hydrogen*}, {{*being hydrogen*}}, {{{*being hydrogen*}}}, *bonded*}, which at least looks as if it might distinguish methane from butane. For this set also could exist although no molecules of methane exist, since it also does not require that *bonded* should relate any of the other members of the set.

We have a good understanding of part/whole, but it yields only one composite from a given set or parts. We have some understanding of member/set, despite the obscurity of ε, which emerges when we try to explain the difference between an item and its unit class. But we have no grasp whatever of some third mode of association, different from both of these, which makes it possible for the same (universal) constituents to be combined into different structural universals. Bigelow hopes a dual of *being a natural part of* might do the trick. Forrest remarks that in metaphysics there is not even a *cheap* lunch, and this encourages him to hold that a new obscure primitive mode of composition is an acceptable price for maintaining the view that structural universals are composed of their simple universal constituents, and nothing else.

But this is a price that must be paid for sustaining the *universalist* doctrine of structural universals. There is no need to pay it all. The trope philosophy can accommodate different structural properties built from different numbers of differently related occurrences of component properties, without any need to appeal to new, unspecified, unexplained modes of composition. There is no need to pay this price, so it should not be paid. Lewis has located, in structural properties, a critical weak spot in the theory of kinds as real universals.

3 There is yet another possible response, which is the one now favoured by Armstrong. It revolves crucially about the notion of a state of affairs. The simplest, monadic states of affairs consist in a substance-having-a-property. There are, of course, relational states of affairs also. And complex, derivative, non-primitive ones. States of affairs are *non*-mereological associations of a substance and a universal.

The properties of being an atom of hydrogen and being an atom of carbon are, in fact, complex. But for present purposes we can set that aside and treat them as simple and basic, since none of *their* inner structure is relevant to dealing with the methane/butane/iso-butane problem.

Now consider the state of affairs this-carbon-atom-being-bonded-to-this-hydrogen-atom. It is distinct from this-carbon-atom-being-bonded-to-this-(other)-hydrogen-atom.

Any given example of a methane atom, butane atom and iso-butane atom has an analysis in terms of states of affairs that distinguishes it from every other. Armstrong's idea is that the methane atoms belong in a distinct *type* of array of states of affairs, the butane atoms in a second type, and the iso-butane atoms in yet a third. So we can, thanks to states of affairs, meet the challenge structural properties pose for realism about universals.

This approach does not succeed. States of affairs are themselves particulars, since the union of a particular (the substance) with a universal is itself particular (the 'Victory of Particularity', Armstrong, 1978, vol. I, pp. 115–16). To move from a particular (token) methane atom to a type, we must generalize *at least* from *being this hydrogen atom bonded to this carbon atom* to *being a*

hydrogen atom bonded to a carbon atom, with *being hydrogen* and *being carbon* universal properties. But now we have something, the type, which cannot be replicated four times. There is no distinction which can introduce plurality. If properties are universals, *being an F* is not different from *being an F and being an F.*

So the mode of association in states of affairs, while neither part/whole nor member/set, does not provide a way in which the same universal constituents can be combined into different structural universals. Lewis suggests it might, (in his 'Reply to Forrest and Armstrong') and objects to it only on the ground that it is neither part/whole nor member/set. In this, I think he is too concessive.

3

Some General Objections to Trope Theory

3.1 THE PROBLEM OVER SPATIO-TEMPORALITY

When tropes are introduced into an ontology, it must be made plain that they are particulars. It is in that way above all that they are to be distinguished from universal properties, redness for example. The tropes are, each of them, a different item from every other trope, no matter how closely two of them may resemble one another. And particularity is at least *introduced* by reference to place in space-time. Two cases of red, not being at the same spatio-temporal location, are indeed two, two different tropes. How can two exactly similar items *be* two and not one? By being at different places at the same time or by the one ceasing to be, at a time before the other comes to be.

Universals are promiscuous about space–time: they can be completely present at indefinitely many places at once. But particulars, and in our case this includes above all the tropes, all have a local habitation, a single, circumscribed place in space–time.

The problem then is this: if the basic entities are all tropes, and tropes are all particulars, and particulars are all located, what of non-spatio-temporal beings? Can it be a truth of analytic ontology, a truth about the ultimate structure of the world, that non-spatio-temporal beings are *impossible*? Is it right to rule them all out, in one fell swoop, *a priori*, without need to consider their individual merits? For apart from divinities, spirits and angels, this would banish Platonic Forms, Berkeleyian Ideas, Kantian Unities of Apperception and perhaps sets and numbers too. A case can be made that even if we do not adopt a Cartesian

Representative theory of perception, some perceptions are not located. Moreland suggests sounds and tastes, the notes in a piano chord, for example.[1]

A philosopher of a naturalistic bent is tempted to view this wholesale exclusion of other-worldly, beyond-nature items with complacency. It does, after all, have the advantages of theft over honest toil. But dialectically, it is an impossibly weak position. Defenders of the non-spatio-temporal will feel themselves entitled to repudiate any theory of particularity which produces such an unacceptable result. And they will be justified in so doing, for so long as no specific demerits of their favoured entities have been established.

Honest toil is not to be avoided. The role, or lack of role, in our general theory of reality played by particular specified beings, whether divinities, principalities or powers can be tackled piecemeal. Alternatively, one could pursue a research programme in the philosophy of possibility one of whose guiding principles would be the idea that spatio-temporality is *a posteriori* essential for every particular being. That all particulars are spatio-temporal would on this view be a Kripkean necessity, with the same status as the necessity that common salt contains chlorine.

Spatio-temporality in such a theory would characterize every possible particular, but this would derive not from the conceptual content of the notion of particularity, but from what has been found to be the best theory of possibility.

Whether or not metaphysical possibility is narrower than the conceptually possible in this way, we should allow, in principle at least, for particularity as a category not resting on spatio-temporal location. How could a trope philosophy accommodate non-locational particularity?

3.2 EXTENDED CONCEPTS OF DIMENSIONALITY

Our ordinary four-dimensional concrete particulars are distinguished from one another by their each occupying a different set of intervals, one on each of the four dimensions. Unlike these, tropes do not monopolize their places; but they are nevertheless

distinguished from all others *of the same kind* in the same way, with each trope of a given kind occupying a unique set of intervals on the dimensions.

Now, mathematically, there is no bar to considering manifolds of extended dimensionality. There are 'geometries' of 5, 6, . . .n – even infinitely many dimensions. That our imaginations fail us in trying to come to grips with such ideas is not regarded as a serious matter. This means that *place on a dimension* can be regarded as a rather formal concept involving order and structure, with space providing only our most comfortably familiar example. The idea of cardinal numbers, for example, conceived Platonistically, and thought of as arrayed in unique places along a single 'dimension', each being given a place according to the mathematical 'place' of its corresponding ordinal, is not too hard to frame.

The question is: how far can this extending of the concept of dimensionality carry us? In *Individuals*, Strawson explored the idea of the natural order among sounds as generating a quasi-dimension.[2] He concentrates on pitch, but volume could serve as a second dimension of order.

Sounds, in our world, being wave disturbances in the atmosphere (or other medium) are in point of fact solid candidates for spatio-temporal phenomena. (And also, prime candidates for items in our experience which *seem* to be qualitative yet without any substantial support. They support the idea that free-floating tropes are at least metaphysically possible.)

To be of help in improving our grasp on the idea of dimensionality without space, we should think of someone in a black room, experiencing sounds through both ears equally, via a set of headphones. Then phenomenologically, although temporal, the sounds can lack direction, dimension or location in space. Yet they can be ordered by pitch (or volume) and so be given a place on a new kind of dimension.

In this way it seems that they could acquire a quasi-locational particularity by way of their place in a pitch–volume–time dimensional scheme. And this could happen quite as much on a trope analysis as on any other assay of the situation.

How far this process of finding analogues for our familiar dimensions can be taken, I do not know. One can think of

orderings in which angels or other spiritual beings might be arrayed, but they have an artificial feel to them. It is one thing to order sounds by pitch, since pitch is so central to a sound's being, and hence acceptable as a basis for particularizing. But the orders angels might fall into, of the intensity of their powers, or the dates of the events they remembered, or the speed of their decision-taking, while formally they may do the job of providing for each a unique and particularizing 'location', seem somehow too extrinsic to carry conviction as what sets each angel apart from all others.

3.3 PURE OR BARE PARTICULARITY

I once had a conversation with Donald Williams about this issue of non-located particulars. He agreed that the supernatural or extra-spatio-temporal should not be ruled out by the requirements for particularly alone. So he was inclined to hold that *being a particular* was a basic and unanalysable fact about every particular. It did not *depend on* unique dimensional location, though this was its typical and familiar manifestation.

We could call this the theory of pure, or bare, particularity. But it does not involve the existence of any bare particulars in the usual sense. The purely particular items are (spatio-temporal or non-spatio-temporal) *tropes*, and as such they are not bare. They each have a nature, albeit a single or simple one in the basic cases. All tropes, hence all particulars, are 'clothed' – although this metaphor is foreign to trope theory since it suggests a duality of garment and wearer which it is the central aim of the theory to repudiate.

Although the idea here is that all particulars are particulars, and each of them has a nature, this does not involve conceding that a trope is after all complex (a union of particularity with a nature-providing property). The distinction is perhaps a 'formal' one, as Scotus used the term. It is a matter of the level of abstraction at which an item is being considered. To illustrate: let us grant that red, orange, yellow and brown are *warm* colours. Then a particular instance of orange will be a case of warm colour, as well as a case of orange. But this does not imply that it

is a union of two features, warmth and orangehood. To recognize the case of orange as warm is not to find a new feature in it, but to treat it more abstractly, less specifically, than in recognizing it as a case of orange.

In parallel fashion, to recognize that a particular case of orange is a particular nature, hence a case of particularity, does not include a duality of being, but two levels of abstraction in considering the case. The particularity of particulars is what I call a hyper-abstract, incapable of distinct and independent existence. (See below, pp. 89–90.)

If particulars can be particular *just by being particular*, and if this does not by itself carry any implications about location, then the possibility of extra-spatio-temporal reality is no longer a problem.

Is this fair dealing, or theft in place of honest toil? Well, in the first place every theory involves some unanalysable primitives, so it is not in itself a ground of complaint that particularity is chosen to be one of them. And in the second place, those that hold they have a clear conception of particularized divinities or powers, and that this conception is neither spatio-temporal nor otherwise dimensional are, it seems to me, almost bound to accept primitive particularity. For I can neither find, nor think of, any account of particularity in such cases that amounts to an enlightening analysis.

3.4 THE PARITY OF TROPES WITH SUBSTANCES

The thrust of the spatio-temporality objection to trope theory is that trope theory wrongly excludes the possibility of realities, particular realities, outside the space–time frame. For this objection to have any force, it must apply to trope theory but *not* also to trope theory's alternative, the theory of particularizing substances.

So let it be granted that particularizing substances can provide for the particularity of all sorts of beings, spatial and non-spatial, temporal and non-temporal, either by unique dimensional location, or by location on dimension-analogues, or by primitive particularity, or in some other way. Now the issue

is: if substances can do it, why cannot tropes? A substance is a specialist at particularity: it is introduced into theory as that which performs the particularizing role and no other. But this aspect of the situation, that a substance is a particularizing specialist, does not seem to have any relevance at all. Tropes are particular, but not bare particulars. Their role is dual: to be particular natures. However, nothing that has been shown tends to establish that only if the particularizer is a specialist can it perform its function outside the space–time frame. If substances can be non-spatio-temporal particulars, so can tropes.

3.5 HOCHBERG'S ARGUMENTS

In a recent paper, Herbert Hochberg developed a four-pronged case against the ontology of abstract particulars.[3] Let us take the articles of indictment one by one. First, the classical subject–predicate, substance–property scheme, with real universals, must allow a unique, pervasive, anomalous *non-relational tie*, for which *exemplification* is the best name, bonding any universal to its bearer(s). So realism recognizes three fundamental categories, particulars, universals and exemplification. The trope philosophy dispenses with this triad; its two fundamental categories are quality-instances (tropes) and a universal tie of *resemblance* between them. In this way moderate nominalism gains as apparent advantage on the ground of ontic economy.

Hochberg suggests the similarity-tie in the trope philosophy is a universal; but if ordinary universals such as solidity can give way to sets of cases of solidity, as is argued in this book, then there is no clear reason why the 'universal' *resemblance* should not give way in the same way to a group of cases of resemblance. So these may be only one category here, rather than realism's three. Furthermore, as chapter 5 argues, relations, especially internal relations such as resemblance, supervene on their foundations in the relata, and need not be accorded independent existence.

If abstract particularism does call for a fundamental tie, the most natural candidate is *compresence*, that in virtue of which many tropes can combine to yield ordinary concrete particulars. But although a very widespread relation, compresence is not

required by the very terms of the ontology to embrace all examples of the other category or categories, as is the case with substance/attribute theories which renounce both bare particulars and uninstantiated universals. In trope theory, individual, isolated tropes, compresent with nothing, are admitted as possibilities.

Be that as it may, the ontology of quality instances does indeed hold that they have fundamental status. In compresent groups, they constitute the 'substances' or particulars of classical realism. In resembling groups, they do duty for the classical real property universals. The predication F*a* does not assert that the substance *a* exemplifies the universal F. It asserts that among the compresent tropes constituting *a* is one resembling all other Fs. This assertion succeeds in communicating *a*'s character just to the extent that the hearer understands what it is to be some F or other, since the assertion assimilates *a* to any of these.

Hochberg's first charge is that the apparent ontic economy of the trope position is spurious, since it is achieved only by giving to one type of entity (the similarity connective) a two-fold function (p. 189). Exemplification connects particulars with universals to form states of affairs. That is all it does – combine elements into complexes that can be truth conditions for atomic states of affairs. But the similarity tie not only does that, yielding 'similarity facts' about two tropes, but also *provides the qualitative content for an object* (my emphasis).

This is a critical issue in the success of any resemblance particularism, including the one being presented here. I agree that it is fatal to such theories to urge that an object *a* is F (solid, say) *in virtue of* its resemblance to other items *b*, *c*, . . ., whether or not one of these others is selected as a paradigm solid. This fatal view was the one Price espoused, and which Armstrong laid to rest.[4] The object *a* can be solid even if there are no other solids in the world, at any time, for it to resemble. The object *a* can remain solid even when all other solids are vaporized, so that *a* no longer resembles them, nor they it. Resembling *b*, *c*, . . . will not make you solid unless at least some of *them* are already, intrinsically solid. So why can *a* not be solid 'in its own right'?

The resemblance relations among the Fs hold in virtue of the fact that those items are F, not the other way around. Tropes

(abstract particulars, quality-instances) must be particular natures. They are not 'bare particulars' which, without some similarity-tie, would have no nature at all. The particularist glosses '*o* is red' as 'a red trope is among those compresent at *o*'s place'. He does *not* have to add 'that trope's being red depends on its resembling other members of the *red* similarity circle'.

So the similarity-ties do not give to their terms the terms' nature, and consequently do not have the double function Hochberg alleges. The resemblance relation is indeed internal and resemblance facts among tropes are necessary facts, while exemplification facts are (at least for the most part) contingent. So resemblance and exemplification differ, as Hochberg rightly claims. But that they differ is not in itself a mark against either, and certainly not a mark against resemblance and in favour of exemplification. To the realist's contingent exemplification facts correspond the particularist's facts of compresence. And to the particularist's necessary resemblance facts correspond the realist's resemblance facts *which are just as necessary as the particularist's*.

But in any event, why should a tie's doing double duty count as a reason for rejecting the economy as spurious?[5]

Hochberg's second complaint is that no form of nominalism can deal adequately with relations. For the nominalist can recognize only particular instances of either qualities or relations, and such instances must one and all be localized in space–time. But it is nonsense to localize a relation, such as the *loves* of Othello's loving Desdemona (p. 192). This raises issues about relations generally and the nominalist treatment of them in particular, which are discussed below (chapter 5). If the programme advanced there succeeds, relations emerge as supervening on monadic quality instances and the difficulties do not arise.

Hochberg offers a critique of that programme (pp. 194–6), but he assumes the foundations for a relation must be the same in all cases, and that these foundations must guarantee that the relation holds. As I argue below, these requirements would indeed be fatal to the programme, but there is no need to adopt them. And when they are removed, Hochberg's argument loses its force.

His third charge is that a moderate nominalism will be committed to recognizing entities which function so like the realist's universals as to make the allegedly nominalist theory realist in all but name (pp. 197–203). For the nominalist is bound to specify truth conditions for F*a*. If this is done by reference to a paradigm F, then the nominalist is bound to specify truth conditions for the paradigm r's being F; and these are bound to be circular or trivial:

'*r* is an instance of red' is true ≡ *r* is exactly similar to *r*.

Abandoning this tack, the nominalist must then appeal to the sum or mass of instances of F, maintaining that the truth condition for '*a* is F' is that there is some (property instance or trope) *q* such that *a* contains *q* and *q* is part of, or contained in, the sum or mass of instances of F.

Now set aside the questions of what it is about this mass that makes it F-ish, and what qualifies an instance to be a part of it. The point Hochberg wishes to insist on is that this sum of Fs is so like a universal as to make the nominalist a crypto-realist. For consider: it is in virtue of its relation to the universal, or to the F-ish sum, that an item is F. Every instance of F bears the *same relation* to the universal (exemplifying) or the sum (being part of). The instantiated universal (the sum) is a spatial and temporal entity, but it is not located in the ordinary sense: the relations *left of*, *before*, *after*, do not apply to *it* in the way they do to its exemplars (parts). The universal (the whole sum over space–time) is unchanging and even unchangeable.

So why not admit real universals and be done with it? The first answer is that a judicious nominalism, which accords a particular nature to each instance of each kind, needs neither a paradigm, nor a sum, nor a universal, in its specification of the truth condition for '*a* is F'.

'*a* is F' is true ≡ *a* contains an F trope.

And an F trope is F just in case it is F:

'Trope *t* is F' is true ≡ *t* is F.

So although we recognize the legitimacy of the whole or mereological sum of the F tropes, this plays no role in our account of what it is to be F. And although each F trope is a part of that whole, there is no sense in which the sum is *wholly present in each F*. But it is precisely *that*, the complete presence of the universal in every one of its different exemplars, which is the critical, and fatal, distinguishing mark of the real universal. Nominalists need not be, and should not be, crypto-realists.

Fourthly and finally, Hochberg urges against moderate nominalists the problem of relational order (pp. 203–6). We must, he says, recognize ordering relations in the analysis of relational facts. And unless these are accepted as *universals*, the problem of order is insoluble.

In order to mark the difference, with asymmetrical relations, between aRb and bRa, the fact that aRb requires not only the components a, R and b, together with their combination into a relational fact, but further, the fact that a is the initial term and/or the fact that b is the second term, in this relational complex.

Let 'aI[. .]' express the ordering fact that a is the initial term in a complex aRb. For a realist, Hochberg argues, this generates no regress, since the difference in logical kind between the simple term a and the relational complex signified by '[. .]' implies that there is no need for an additional specifying fact determining that a, rather than [. .], stands in the initial position in aI[. .]. There is no other possibility.

So far so good. But this treats only the simplest case, where the terms of the relation can be treated as simple particulars. Take another example, where what is related is itself relational: one case of twin brothers occurring before another case. Call the first case r_1 and the second r_2. Let 'R' express the asymmetric relation *earlier than*. So we have r_1Rr_2, and we need to distinguish it from r_2Rr_1, which has the same constituents.

As before, we distinguish r_1Rr_2 by affirming that r_1 is the initial term in the relational complex embracing R, r_1, and r_2:

r_1I[R,r_1,r_2]

Although Hochberg does not spell this out explicitly, he

requires for his argument that a realistic view of properties as universals generates no regress here, that although r_1 is relational, and $[R,r_1,r_2]$ is a relational complex, a fundamental asymmetry between these two terms prevents the complex $[R,r_1,r_2]$ from filling the initial position in a relational fact whose main term is 'I'.

I think Hochberg can make such a claim: r_1 is an exemplification of a relation. The complex $[R,r_1,r_2]$ contains a term, R, which is a genuine universal, for the realist, and not an exemplification. Provided there are no higher-order relations (relations among relational universals), it is plausible to claim that the complex $[R,r_1,r_2]$ cannot be the initial term in a relational fact. This proviso may be more than Hochberg, or a judicious realist, is prepared to pay. But let it be granted, for the sake of argument, that in this or some other way a realistic treatment of relational complexes can distinguish asymmetric cases having the same constituents, without generating a vicious regress.

But for a nominalist, Hochberg claims, a regress does indeed threaten. Take our twin brother case again. The first instance of twin brotherhood, r_1, is one particular case of a relation. The second, r_2, is another case. And *their* relationship, of *occurring earlier than*, is in turn a third particular case of a relation.

For these three to constitute a genuine relational fact, *they* must, of course, be connected. It is no use for there to be two cases of twin brothers, and for some *other* cases to be linked by *earlier than*. So the complex relational fact involved here is:

$C(r_1$, *earlier than*, $r_2)$
(henceforth abbreviated to [. .])

Since this is crucially different from the relational fact $C(r_2$, *earlier than*, $r_1)$, we need to specify, for our original case, that r_1 is in the initial place, by specifying that $r_1I[. .]$. But if I is no true universal, then in this case the relational fact must involve some particular case of I, call it i_1.

The relational fact $r_1I[. .]$ thus involves the connecting in one fact of r_1, i_1, and [. .], to yield $C(r_1,i_1,[. .])$.

But now, although [. .] remains distinct as a relational fact complex, both r_1 and i_1 are *particular instances of relations*. They are

of the same category, and can therefore fill the same places in structures such as $C(r_1,i_1,[\,.\,.])$. It is therefore necessary to *specify* which slot each fills. We must add, to provide this specification,

$$r_1 I\{C(r_1,i_1,[\,.\,.])\}.$$

But here I is to be regarded as a relation instance i_2, and the regress is generated over again.

Hochberg concludes that as this regress is vicious, both moderate and immoderate Nominalism must be false.

This, the fourth of his lines of objection, is the most formidable. To meet it we must move from a consideration of the *logical category* of our relation instance terms to those particular terms themselves.

First, it must be acknowledged that it will indeed make syntactic sense to reverse the order of the relation instances r_1, and i_1, so that both '$C(r_1,i_1,[\,.\,.])$' and '$C(i_1,r_1,[\,.\,.])$' will be well-formed expressions for relational facts. So to cut off Hochberg's regress we must show that these are not two real possibilities, between which we can distinguish only be specifying, in a *new* relational fact, which of r_1 and i_1 occupies initial position.

To take the case most favourable to Hochberg, let r_1 and i_1 both be cases of *filling the initial place in a relational fact*, so that the prospects of their interchangeability are maximized. For example, let *aRb* signify that Edinburgh is north of Athens. Now take as r_1 the relational instance of Edinburgh filling first place in this fact. Then there is the further fact, that Edinburgh fills first place in the relational complex [North of, Edinburgh, Athens], or

[Fills first place, Edinburgh, [North of, Edinburgh, Athens]]
(henceforth abbreviated as [. . .])

that is:

$$r_1 I[\,.\,.].$$

Let i_1 be this case of I. We need all these elements to be combined with one another, or the asymmetric relational fact will not be fully specified:

$C(r_1,i_1,[\ldots])$

Now, to prevent further regress, we need to show that $C(r_1,i_1,[\ldots])$ and $C(i_1, r_1, [\ldots])$ are not both possible, and so do not require a new claim to be made, distinguishing the first as actual from the second as not actual. We can do this, with a little help from Russell's Theory of Types. We do not need the full theory which restricts every case of each quality and each relation to some one uniform level. We need only the idea that particular cases of relations have terms of some specific level. Thus our case of *north of* takes Edinburgh and Athens as its terms. Set these terms on level 0, then this case of *north of* will be on level 1. Our case r_1 of *filling first place* relates Edinburgh (level 0) to a relational complex involving Edinburgh and Athens (level 1), and is itself of level 2. The case i_1 take r_1 as its initial term, so must be of level 3.

Russell's intuition is now available to us: while a level 3 relation can have a term on level 2, the reverse is impossible. There is an essential asymmetry between $C(r_1,i_1,[\ldots])$ and $C(i_1,r_1,[\ldots])$. The first is possible, the second is not. It is a *necessary fact* that if r_1 is a term of i_1 then not the converse also. Put another way, it is the very character of the relational cases r_1 and i_1 which determine which is the term and which is the relation having that term. This is not a new fact, not some further contingency, which must be specified to fix the actual situation.

Thus just as Hochberg rightly argued that a fundamental asymmetry between universal and particular stops the regress for the realist, the fundamental asymmetry involving levels in the case of relational instances stops the regress for both moderate and immoderate nominalists.

3.6 THE MORELAND CRITIQUE

A good proportion of Moreland's book *Universals, Qualities, and Quality-Instances; A Defense of Realism*[6] is devoted to a critique of abstract particularism. The book canvasses many issues, and the reader is referred to it, for a properly full treatment of Moreland's case cannot be provided here. The essential kernel of that

case lies in the claim that a trope, of redness say, is not a simple entity as abstract particularism affirms, but a three-fold complex of a universal, an individuator and a tie of predication (p. 192).

Less central issues include the connection between particularity and spatio-temporal location, which Moreland raises (p. 66) and which is here discussed above, and an earlier thesis of mine that the shape and hue of a coloured trope are not truly distinct and can be distinguished by a distinction of reason only.[7] Moreland succeeds in making that proposition appear in an extremely unfavourable light. Indeed, I abandoned it on reading his criticisms. The shape of a coloured, or solid, or salty, or rusty, formed volume is an additional trope in its own right. Or, more exactly, it is a quasi-trope, a sub-region of space, whose boundaries are fixed by the presence of colour, solidity or whatever, but which mark no real distinction *in space itself.* Space is indeed a real, non-relational entity, as recognized below in chapters 5 and 6, but it is a whole which admits of indefinitely many equally valid ways of being subdivided. My earlier paper, by denying space its proper independence from its physical contents, reached the view that spatial form and content have only as much ditinctness as is admitted in a distinction of reason only. This is the view that Moreland correctly attacked.

The critical issues, however, lie rather in the question of whether tropes can be both categorically simple and also, on their own, provide an adequate basis for a satisfactory ontology.

Towards the end of chapter 1, Moreland (following Armstrong, 1978, vol. I, p. 86) advances what we might call *The Multiple Instance Objection.* Suppose some object, the Great Pyramid, is opaque. It has many other characteristics as well. On the trope view, there are many compresent tropes constituting the Great Pyramid. Now, if many tropes can be compresent, what is there to prevent *two* of these, say O_1 and O_2, from both being *opaque* tropes? On a realist view, the answer is straightforward: each variety of opacity is, or derives from, a universal. It is identically the one entity on every occasion of its presence, so wherever it occurs the same one item occurs. Hence for the Great Pyramid to be opaque (O_1) and opaque (O_2) involves no doubling up. It is the very same circumstance as the Great Pyramid's being opaque *simpliciter.*

But there are many distinct opaque *tropes*, none identical with any other, and we are supposing O_1 and O_2 to be two of these. So for the Great Pyramid to be opaque O_1 and opaque O_2 involves two different tropes, and so constitutes a different state of affairs from its being opaque just once over.

This is an objection which has maximum bite where qualities, rather than quantities, are concerned. In the case of a quantity, such as mass, the argument does not develop plausibly. Suppose the Great Pyramid's mass is K tonnes. One of its (complex) tropes is *having a K-tonne mass*. Now why is it that this is not doubled up? What is there to prevent a second *having a K-tonne mass* coinciding with the first? Answer: in that case the mass of the Great Pyramid would be 2K tonnes.

If the Multiple Instance Objection is impotent against quantities, perhaps it is impotent *tout court*, since it is a plausible hypothesis in the philosophy of the natural world that every quality is resolvable into (a complex of) quantities.

But there is no need to rely on that speculation to meet the Multiple Instance Objection. Two strategies are available.

1 Reality and causal power. Items supposedly belonging to the natural world with no causal powers make no difference. They are therefore, *ex hypothesi*, undetectable and there can be no evidence for their existence. But even worse, according to a tradition extant since at least Plato's time, power is the mark of being. That which has no power, has no being. So anyone urging the Multiple Instance Objection faces a dilemma: does the supposed second trope bring new powers with it or not? If it does, it will make a difference and we shall in principle be able to discover those cases where a kind of trope is doubly, or trebly, compresent with itself.

   If, on the other hand, the second case of a kind of trope has *no* causal efficacy, the onus is on the objector to show why, and how, it should be supposed to exist at all.

   But, how do we know that our single cases are not *every one of them* multiple, with the total causal punch we attribute to a single case of (say) opacity not in fact the joint product of two, or six, or twenty-six cases all acting, but all always acting together? Answer: that may be a possibility, but it is an *idle*

possibility to be ignored on Occamist grounds. Its status is like that of the idle possibility: how we do know that the whole universe does not flicker out of existence for an unmeasurably short period every second (or every two seconds . . .), and then is restored again just as it was?

2 The second strategy is to admit the possibility of occasional doubling up. This would allow for two or more *opaque* tropes to be compresent. But there must be grounds for supposing so if we are to think it happens. One possible ground would be if two tropes of the same kind followed detectably distinct trajectories through space–time, but coincided (perhaps with no doubling of causal power) for a section of those trajectories.

One case (which I owe to Armstrong) where we may have positive reason to admit multiple instances is with the charge of the electron: if quark theory is correct, charge comes in natural units of e/3, and an electron has three such (negative) units. Now if it is correct to treat the electron as point-like, three tropes of e/3 charge would coincide.

In the absence of any actual positive reason to hypothesize a doubling up, the Multiple Instance possibility remains an idle one.

3.7 SIMPLICITY AND INDIVIDUATION

As already mentioned, Moreland exposes the problems involved in holding that a trope, say of green, is both simple and individuated by its place. For if it is individuated by its place, that means it must *have a place*, and if it is simple, this place must not be something genuinely distinct from its colour. Thus a shape, a colour and any '*other*' compresent trope collapse into identity. So a colour can be a taste, two matching tastes can be one red and one blue, which must thus be taken to match, and other disasters threaten.

To meet these disasters, let us abandon the view that a colour trope is individuated by its place. Take *compresence* as a more abstract, more formal matter, recognize that a colour trope and a spatial quasi-trope are distinct entities and assay the presence

of green at a place as the compresence of a green trope with a place one.[8] And the presence of other characteristics, such as taste, temperature or solidity, will be further additions to this compresence totality. None will collapse into any of the others.

To preserve the simplicity of tropes, one must then affirm that *individuation is basic and unanalysable.* That is, to the question: what is it about one F trope that makes it the F trope it is and not some other F trope? there can be only the non-informative, but true, answer: (not any feature, aspect or constituent of that F trope but) just being that F trope rather than any other.

That this is not an illegitimate, easy way out can be seen by considering the alternatives: suppose we were to follow Moreland and agree that a trope is not simple, but has as a constituent an individuator (which Moreland holds must be a bare particular). Now ask: what is it about one of these individuators that makes it the individuator it is and not some other? There can only be the non-informative, but true, answer: (not any feature, aspect, or constituent of that individuator but) just being that individuator rather than any other.

Moreland's assay of the occurrence of a trope accords to that state of affairs an individuator (bare particular), a real universal and a predicative tie between them. On this view the bare particular or substratum both particularizes and individuates. It makes the state of affairs some particular one and also the one that it is.

There is yet a third possibility, which, following Armstrong, we can call the *Locke–Martin view.* This has a substratum or substance to unify, support and individuate the properties of a thing, but those properties are in their own right particulars. They are tropes in their particularity, but as they are not accorded the possibility of independent existence, they are not Humean substances and do not comprise (the whole of) the alphabet of being, as a full trope view insists.[9]

The Locke–Martin view is a version of particularism, in that it dispenses with real universals. But it is plainly less economical than a complete trope particularism. Further it is saddled, no less than realism, with the fundamental non-relational, inexplicable tie of exemplification across categories between substance and property. The one-category trope view links items of the

same category by cases of compresence, which are themselves of that category.

Moreland is aware of the possibility of taking a trope's individuality as unanalysable. He cites it in his discussion (p. 80), as made explicit by D. C. Long.[10] His objection to it is that unanalysable numerical difference is acceptable only for a true simple such as a bare particular as individuator. But tropes have *two* ultimate facts about them: their individual difference from all other tropes and (in most cases) their exact resemblance to some other tropes. He holds that this disqualifies a trope as simple, but there is no need to accept this. *Ad hominem*, as we have seen, Moreland's bare particulars are supposed to be truly simple, yet they both particularize and individuate.

A point is as simple as you can get. Yet points are both different from all other points and also, for example, 10 mm distant from some others. That x is involved in more than one sort of fact does not show that x is complex. Especially when we are dealing with formal facts of identity and difference.

The role of location, for tropes of solidity, temperature, and so on, now emerges as that of *identification* rather than *individuation*. Being compresent with its place is not what makes a given F trope the one that it is, but this compresence is *what we use* to distinguish F tropes from one another and single out particular specimens. Tropes do not need any special constituent in order either to be particular or to be individual. We keep track of them, however, through one of their relations, their compresence with one place rather than another.

On this view of the matter, compresence with a place does have a special status: although it is contingent which place any natural F trope is compresent with, it is *not* contingent that it be compresent with *some place or other*. Colours can occur without any sound, smell, temperature or solidity. But they cannot occur without any location.

This is a particular case of a more widespread phenomenon – necessary connections at the determinable level associated with contingency between determinates. Sounds, for example, have volume and pitch. These can vary independently, suggesting we are dealing with different tropes, yet every volume must be a volume at *some pitch or other*, and every pitch must have *some*

volume or other. Shape and size are a familiar pair of the same sort. The purity and hue of colours are another.

I have no account of the metaphysical, rather than logical, necessities which seem to be involved here. Nor, I suspect, does anyone else. But whatever the correct account may be, there is no reason to think it will tell against abstract particularism and in favour of realism about universals.

3.8 THE 'SWAPPED TROPES' OBJECTION

This is a convenient place to treat an objection which Moreland does not raise (although Armstrong, 1989 does): if properties are particulars, then one case of some property F is a different item from each other case, no matter how closely they resemble. Hence, where there are two different but exactly resembling cases, call them F_1 and F_2, there are two possible situations: F_1 is at place P_1 and F_2 is at place P_2, and the other way around, F_1 is at P_2 while F_2 is at P_1. We can, in short, envisage F_1 and F_2 being *swapped* for one another.

Such a swap is impossible for the thesis that properties are universals, since the F at P_1 is identically the very universal F at P_2, and so any 'swap' leaves everything exactly as it was.

The problem for trope theory, then, is this: it admits of a possibility, an alleged real alternative, which can make absolutely no difference to the world or what happens in it. Such alleged differences are spurious, and a theory which admits them is faulty.

One line of reply not open to us is to deny the possibility on the ground that F_1's identity depends on its place, so that the transposition of F_1 into P_2 would mean it would not be F_1 any more. For we have abandoned any idea of individuating tropes by their locations.

But another reply is available. The difference between F_1 and F_2 is a difference of individuation only; *ex hypothesi*, they resemble exactly and so their natures are alike. Consequently, if they are swapped then the only differences that can be anticipated are differences of individuation only, and not differences in the natures of the situation.

Once we recognize this we can see that it is not true to say that the swap produces *absolutely* no difference in the situation. The natures of the effects are exactly similar, it is true. But there is a difference in individuation: these effects are now the effects of F_2 rather than of F_1. The individuality of their aetiology has been changed. So the difference that the swap produces is not spurious and the objection falls.

3.9 EXACT SIMILARITY

In his chapter 4, Moreland raises objections to the appeal to resemblance among tropes as an alternative to the presence of universal properties in tropes (and concrete particulars). The first of these objections (p. 114) is that red tropes resemble one another in a different way from the way in which green tropes resemble one another, and the exact similarity account cannot provide for this.

The only reply this calls for is direct denial: the only difference (apart from irrelevances like place and time) between an exactly resembling pair of reds and an exactly resembling pair of greens lies in the fact that the first pair are reds and the second greens. The *resemblings* do not have any added distinguishing character.

His next arguments concern the trope nominalists' treatment of the Companionship and Imperfect Community difficulties discussed above (p. 33). Here his case rests either on the complexity of a trope (being, for example, both red and extended), or on the identity of a location with all the (allegedly) distinct tropes to be found there.

The complexity issue has already been addressed. And if tropes are indeed simple the companionship difficulty cannot arise. Perhaps there are, in fact, no simple tropes, but all are structures involving simpler ones. Then at the level at which, for the time being, we can detect no complexity, there cannot be, for us, any companionship difficulty. If we subsequently identify simpler constituents in the erstwhile basic tropes, then these *distinguished* elements will be distinct tropes, and even if *de facto* they always coincide their similarity circles will have quite distinct sets of members.

As we have abandoned the view that any trope and its place differ by a distinction of reason only, the quite correct criticisms resting on that hypothesis have no further power to embarrass. So the treatment of Imperfect Community can remain, with *distinct* tropes, at the same place, forming different similarity circles.

Moreland's chapter 4 finishes with a discussion of regress arguments against particularism about properties. The regress issue is addressed above, in chapter 2.

3.10 ABSTRACT REFERENCE

Moreland's chapter 3 is devoted to what he calls 'abstract reference'. This concerns constructions that, at least on the surface, refer to properties rather than particular objects. It is notoriously difficult to avoid forms of expression that appear to involve commitment to the existence of properties and universals. Some popular examples are:

Red is a colour. Orange is between red and yellow.	Pap's examples
There are just four fundamental forces. There are as yet undiscovered characteristics of physical reality.	Putnam's cases
It is a law of nature that inertial motion is constant and rectilinear. Heating causes expansion. Acquired characteristics are not inherited.	Armstrong's cases[11]

Attempts to paraphrase such expressions so that they quantify only over ordinary concrete particulars are a good deal less than convincing. Even Quine, among the most unyielding in his rejection of any category of a property sort, is forced to face the necessity of abandoning some established and very useful ways

of speaking. His loyalty to the best current science and his loyalty to a nominalistic particularism are at odds with one another.[12]

Some of the difficulties are eased if we have quantifiers that range over *tropes* rather than ordinary objects.

> Orange is a colour between red and yellow,

for example, seems to be handled adequately by:

> Every orange trope resembles every red trope and every yellow trope more or less equally and more closely than any red trope resembles any yellow trope.

However successful that paraphrase may be, our capacity to meet the challenge of abstract reference does not depend on it. For we have to hand Williams' painless realism. The quasi-universals that he recognizes – the cases of kinds, treated as obeying the Principle of the Identity of Indiscernibles – have all the features necessary to enable *them* to be taken as the referents of abstract nouns, and the values of the variables in sentences that quantify over properties in general.

Accordingly, even if it is accepted that such expressions are indispensable, and not to be replaced by paraphrases involving only concrete or abstract particulars, that carries no embarrassment for the trope ontology.

3.11 LAWS OF NATURE AND INDUCTION

A quite different line of objection to abstract particularism is advanced by D. M. Armstrong in *What is a Law of Nature?*.[13] His claim is that whether or not properties occur as particulars in cases of kinds, one must still recognize universals in order to provide a convincing account of laws of nature and provide a rationale for inductive reasoning. His theses are that laws of nature express *relations of necessitation* among universals and that induction can be vindicated only as depending on an inference to

the best explanation, which hypothesizes such a law of nature as the metaphysical base on which alone indictive generalizing can rationally be based.

His arguments against the view that laws of nature are universal generalizations involving the material conditional are convincing. It is neither necessary nor sufficient for a law of nature to satisfy one of the formulae:

$(x)(Fx \supset Gx)$
$(x)(\exists y)(Fx \supset Gy)$
$(x)(y)(Fx \supset Gy)$,

nor their quantitative, functional elaborations. Laws can have exceptions, and some true, exceptionless generalizations are not laws. It does not follow from that, however, that real universals must be involved. The matter is too complex for proper treatment here, but the essentials of a particularist position are these.

The differences between those associations among properties and sequences in the world's unfolding that arise out of laws of nature and those that are mere contingency or happenstance lie not in the presence of a special metaphysical bond between the related terms. The only special truth-maker for natural law, as against *de facto* association, consists in being, or arising from, the basic level of Nature. That *all gold conducts electricity* is a law of nature, since the very process of converting anything into gold – real gold, not just something that looks like gold – will change it into a conductor. By contrast, *all gold belongs to Midas* is not a law, since the very process of transferring assets away from Midas does not touch their inner, basic nature.

The world's workings, which include, as I urge in chapter 5, the inner powers of natural objects, settle which patterns of association and which lines of development are naturally possible and which are ruled out. Laws of nature state the constraints on what is (naturally) possible. They encompass what will be the case willy-nilly; what is immune from human manipulation. It is for that reason, rather than any special, and indeed mysterious, *necessitating* power in things, which leads us to say that some statements about natural connections, the laws of nature, ex-

press what must be, rather than merely happens to be, the case. For at a deeper level we hold, with Hume, that even statements of natural law express what happens to be the case.

Realists about causal necessitation concede that it is contingent. It could have been that that which necessitates its effects should not have done so. But in that case I cannot see how that which does necessitate should not cease to do so. And if that is possible, then arguing to a best explanation that attributes a necessitating link between universals in the cause and the effect will have no more force than an inductive inference resting on mere generalization concerning what has happened hitherto.

To meet this objection, it might be claimed that universals are necessarily changeless, so that if, contingently, they are linked by a necessitating relation, then this was, is and will be everywhere the case.

I hold that there is no security in this either. There can be dynamic universals, properties with a diachronic developmental character, such as *maturing*, *coming down with 'flu*, *spinning*, *increasing in entropy*. Anything having one of these properties will be different at later times from what it was at earlier times. It would be a bold philosopher who claims that fundamental properties cannot be of this type, for that involves asserting that process philosophies affirm the impossible. So it would be a bold philosopher who claims that *causally necessitating* could not possibly be a relation that fades out over time or abruptly disappears. In which case, necessitation cannot boost contingent generalizations into laws of nature with a special ontic status.

Laws of nature, as opposed to mere ganeralizations, are special in their epistemology and pragmatics, their place in explanation and their role in experimental situations. They rise out of, and in some cases point towards, Nature's heart. But they do not involve, or need to involve, a special ontology. If *de facto* generalizations can concern tropes rather than universals, so can laws of nature.

The special status of laws of nature does not depend on natural necessitation holding between universals; so this is not available to furnish the basis for a vindication of inductive reasoning. Fortunately, there is no need to appeal to any such

thing. To have shown this, in *The Ground of Induction*, is D. C. Williams' second great contribution to philosophy.[14] Williams saw that all induction, whether projecting into the future, or generalizing about past and present facts, or framing predictions about individual cases as yet unencountered, partakes of the nature of sampling. The rationale of induction is the same as the rationale of sample surveying and consists in performing a kind of inversion on a theorem of Bernoulli.

What Bernoulli had shown was this: if in any large population P the proportion of the members having some particular characteristic C is n per cent, then nearly all the substantial samples S from population P will contain very close to n per cent of their members with characteristic C. So, for example, if 20 per cent of the lions in Africa are males, then in nearly all substantial samples of the population (groups of 2000–3000), close to 20 per cent of the sample will be male. Not in all samples, of course. Some have all males; some have all females; some have half and half. But such samples are rare.

Again, only comparatively few samples contain *exactly* 20 per cent males. For a start, to contain exactly 20 per cent males, the sample must have a number of members exactly divisible by five. But the proportion of males *clusters closely around* 20 per cent. The proportion of samples with the proportion of males close to 20 per cent is well over nine in every ten.

These are mathematical facts; they depend on no knowledge of nature, on no contingencies and, most importantly, on no inductive reasoning whatever. They permit the making of inferences *from* the known composition of a total population *to* the probable composition of substantial samples taken from that population.

Such inferences are *not* inductive ones. But what Williams saw was that these same mathematical facts can also be used to vindicate inferences from the known composition of samples to the probable composition of the total population from which that sample is taken.

A very great majority of substantial samples from a population closely match that population in respect of the proportion of members having any given characteristic C. So our known, ob-

served sample S, with n per cent of members having C, is very probably one of that majority, for most samples are. We know that the sample has n per cent members with C. So, probably, the incidence of C in the total population P is close to n per cent.

Now this *is* inductive reasoning. It proceeds by generalizing from an observed sample to a whole, unlimited population many, indeed most, of whose members never have been and never will be observed.

The inference is not demonstrative: we may, of course, have an atypical sample S in which the incidence of C differs widely from the incidence in the whole population. It may be, that is, a biased sample. Such examples do exist, and there is no foolproof way of ensuring that we do not have one of them.

So inductive reasoning does involve risk. Its conclusions are matters of probability, not certainty, in the light of the evidence. But that is as it should be. Where conclusions claim more than premisses do, as in every inductive case, a vindication of the conclusion as that which is most probable is all that can be looked for.

This vindication of induction appeals only to the incidence, in populations and in samples, of characteristic C. This characteristic does not need to be a real universal. The presence of C in each member can be the presence of a different trope at each occurrence, and Williams' reasoning is unaffected.

The argument to this point places no restrictions on the kind of characteristic C can be, nor on the type of population P. So C could be *grue*, and P *emeralds up to the year 2000*, and Williams' reasoning vindicates the conclusion the emeralds are grue as much as it does the conclusion that they are green.

In fact, a complex array of higher-order inductions, about natural kinds, about discontinuities in nature, and about the kinds of population it is significant to investigate, are required if there is to be rational rejection of the thesis that emeralds are grue.

Those higher-order inductions are available. Informally, they make up the scientific community's intuitive consensus on what are, and what are not, promising lines of theorizing. They are not, of course, apodeictic reasonings, and they cannot guarantee

that emeralds are not grue. Again, that is as it should be. If hypothesizing over natural necessitation seems to provide some additional and firmer assurance on this matter, that is an illusion.

4

The Pattern of the Properties

4.1 NATURAL KINDS, GENUS AND SPECIES

The basic tropes of an abstract particularist ontology are both categorically and qualitatively simple. They are categorially simple in that they are not the union of a particularizer or individuator with a (maybe universal) nature. They are qualitatively simple in that just one property fully encompasses that intrinsic nature.

Basic tropes can be multiple in respect of their relations – of compresence, of mutual distance mediated through compresence with locations, and of resemblance. In respect of resemblance, tropes can be grouped together according to rules of various degrees of strictness: if we are in the dye business we shall discriminate into separate natural kinds groups of colour patches which for ordinary purposes are lumped together. Each shade of green is exactly what it is. In being that shade, it resembles very closely other patches which even the trained eye cannot distinguish even when next to each other. Such patches form one natural kind. Our original patch also resembles, though less closely, all other greens, which form another, larger, less tightly knit natural kind.

This process can be extended to embrace the blue-greens, turquoises, yellow-greens, . . . eventually all colours. Because resemblance is in this way a matter of degree, even simple tropes belong simultaneously to a plurality of natural kinds. Provided that the various degrees of resemblance all lie along a single dimension, they do not compromise the basic trope's qualitative simplicity.

But there is a further way in which many of our commonest descriptive terms correspond to a plurality of natural kinds. Our biological terms, such as 'rabbit', pick out not basic tropes but conjunctive compresent complexes. A rabbit is inherently qualitatively complex.

Not that the *term* 'rabbit' admits of a conjunctive definition in terms of severally necessary and jointly sufficient conditions – the phenomena of open texture and family resemblance in a working vocabulary, even a natural historian's moderately codified vocabulary, will see to that.

Nevertheless, each actual rabbit case is a multiple complex of features. The property of *being a rabbit* generates a natural kind by resemblance groupings along many different dimensions in quality-space.

Rabbits thus belong to one nested set of kinds according to the stringency of the resemblance required with respect to the colour of their fur, another with respect to its thickness, and yet others for its length, for body temperature, and blood composition, and so on. The rabbit kind is a significant conjunctive kind involving all these nested ones. Nature, in the case of rabbits, provides for a relatively sharp kind-boundary. Rabbits, as it happens, do not shade off into hamsters, hares and guinea pigs in the same way that greens shade off into blue-greens and yellow-greens.

The plurality of dimensions for the resemblance grouping of biological kinds – and many others: minerological and meteorological, for instance – together with greater or less degrees of resemblance being used, forms the basis of classification into genus and species.

Rabbits, snakes and whales have very different sorts of backbone. But by dint of ignoring the differences, by employing a relatively undemanding standard for resemblance, we treat them alike as vertebrates. Successive increases in stringency with respect to reproduction and metabolism distinguish rabbits from snakes, and in other respects we place rabbits in a separate class from whales, from other rodents, etc. Conjunctive trope complexes thus make it possible for us to recognize species and genera without introducing universals.

But it is not a necessary truth that reality admits of classification *per genus et differens*. For some part of the cosmos to be so categorizable, its constituents must fall into appropriate patterns

(of degrees of resemblance along dimensions of resemblance). Whether they do so is a contingent matter for scientific *a posteriori* investigation.

4.2 DETERMINATE AND DETERMINABLE

The relation of determinables to their determinates has long been regarded as a perplexing matter. The colours, the classic example, are all colours, but they are not species of the genus colour, for they cannot be distinguished from one another in virtue of distinct specific features for each of the colours, additional to their common generic feature. For, so the example always assumes, colours are *simple* properties. Two different colours do not agree on one property (*being coloured*) and differ on another (*being red* as opposed to *being blue*). By contrast, mammals and reptiles are both vertebrates so they agree in one respect, but what differentiates them are different features, in no way concerned with the backbone.

I think the general resolution of this difficulty lies in the simplicity of basic determinates. A determinable is a natural kind with a more relaxed resemblance standard than the determinates falling under it. It is important to realize that most natural kinds are neither inherently determinables nor inherently determinates. They can take on either role, depending on the context, and in particular, the stringency of the standard of resemblance in use. In this way the relation of determinate to determinable is a relative matter: relative to *colour*, *red* is a determinate. Relative to *scarlet*, *red* is a determinable.

This hierarchy in the colours, from *infimi species* (exactly resembling colour tropes) to colour itself, is matched in the case of sounds, once we distinguish simple aural tropes, of pitch, of volume and of timbre. From the narrow determinate kind of exactly resembling pitch tropes proceeds a more and more encompassing nest of natural kinds up to the (last) determinable, pitch *per se*.

Perhaps colour and pitch are not *quite* the last determinable: but the only one remaining, both more encompassing and on the same dimension, is *being a particular*.

Nothing can have a determinable character without possess-

ing *exactly one* fully determinate feature: this is a well-accepted principle. Or rather, it is two principles – that for anything to be of a determinable kind it must be of *at least one* appropriate kind, and that determinates of the same degree exclude one another, so each determinate item is of *at most one* determinate kind of the given degree.

The first principle, the principle of absolute *determinateness*, is a quite different thesis from that of *determinism*; it has not helped us to keep them distinct that both have been challenged by the same development – that of quantum electrodynamics.

Maybe, within the limits imposed by Planck's constant, an electron can have some momentum or other without having any particular fully specific momentum. This is widely regarded as paradoxical, which bears witness to the intuitive appeal of the principle of absolute determinateness. But it would be a bold philosopher these days who asserted that that aspect of quantum physics is conceptually out of order.

So the more cautious view to take is that even if there is a natural limit to how fine the net of close resemblance among tropes can be drawn, all items have any degree of resemblance only by virtue of having a nature which admits of comparison with others at that finest level, whatever that level should prove to be.

So there are, as we might put it, *no free-floating determinables*.

As for the second principle – the incompatibility of determinates. Nothing can be both red and blue (let us accept for the sake of illustration), but something can be both ultramarine and blue. Incompatibility arises at the same level of determination, not between levels. What is ultramarine cannot be sky blue. The incompatibility of same-level determinates has puzzled philosophers as an apparent case of synthetic necessity. I think it unwise to approach issues confident that, for example, no necessities will prove to be synthetic; that is too *a priori* a way to do philosophy.

Nevertheless, we do need an account of the situation and the idea of resemblance requirements of increasing stringency will provide one. Determinables are natural kinds all of whose members resemble one another to a certain degree. Determinates falling under a determinable constitute new kinds, distinguished

from one another according to a resemblance requirement with a higher degree of stringency.

The determinable resemblance requirement groups all Fs together, then, on tightening, separates G_1s and G_2s into exclusive groups. So every G_1 can be, and is, an F, but no G_1 is also a G_2.

That two *quite specific* colours are incompatible has a psychological aspect for us too. We cannot imagine what it would be like for this to occur, which is a less compelling consideration than it was before contemporary physics developed.

The incompatibilities among determinates, according to plausible conjecture, all rest on the special case of incompatibility which is the mutual exclusion of two different amounts of some common quantity.

4.3 QUANTITIES

Typical quantities, such as length and charge, are determinables with determinates falling under them which admit of numerical expression.

Not all quantities are basic: momentum, for example, and temperature are algebraic derivatives from simpler magnitudes. So unlike the determinables discussed above, these will not be qualitatively simple. They admit of variation along more than one dimension; thus although momenta are incompatible in the usual way, the masses of two bodies can differ even though they have the same momentum (or a change in mass can occur without a change in determinate momentum).

We do not know with any certainty that there *are* any truly simple quantities, still less which ones they are. But for our purposes this is a complication to be set on one side. We can suppose, relative to existing or recent theory, that, for example, length and charge are simple quantities. Let those examples be our examples for the sake of illustration.

Particular instances of quantities like length and charge, like all particular instances, are for us tropes, categorially and qualitatively simple. They form natural kinds, less and less determinate, more and more determinable, as the standard of resemblance is relaxed.

Now, paying attention to the most fully determinate level: although quantities are qualitatively simple, they are *quantitatively conjunctive*. Every case of an amount of a quantity above any minimum amount has smaller amounts as proper parts.[1] Thus it can be that a ten-metre length both resembles and differs from a nine-metre length in the same respect. Many overlapping parts of every ten-metre length are themselves nine-metre lengths, and so exactly match other cases of being nine metres long elsewhere in the world. And what remains, in the ten-metre length, is itself another case (or cases) of length.

With charge it is the same: a case of a charge of 200e is the same as the conjunctive compresence of two discrete 100e charges. Or five 40e charges, etc.

Areas provide the example intuitively the most straightforward. Because our thought about the part/whole relation is so thoroughly grounded in the *spatial* parts of all our paradigms and reinforcing examplars, it may seem more natural to say that the area of a twenty acre field has parts. Particularly if we propose to divide it with an electric fence, into fields or twelve and eight acres, let us say, the idea of *area* as a quantitative conjunction may seem better founded than the same idea about non-spatial quantities such as charge, or time.

That is an excessively narrow view. All quantities are partitive and additive, even the algebraically derivative ones. In what way does a velocity have parts? 30 mph is half of 60 mph in this sense: the distance covered, in equal times, at 30 mph is a part – half, in fact – of the distance covered at 60 mph.

In what sense is a temperature of 30°K part of a temperature of 180°K? The higher temperature contains a velocity of which the lower temperature's velocity is a (one-sixth) part. Here is an example of an apparently intensive magnitude whose basis, in the kinetic theory of heat, proves to be an extensive, numerical magnitude.

Theories of the physical basis of colour, such as Land's, according to which each colour (at whatever level of determinateness) can be correlated with a triple of reflectance values (at a corresponding level of determinateness) summed over three different wave-length intervals of light, similarly assimilate an apparently qualitative determinable/determinate relation to a

numerical quantitative one. The status of the truth that nothing red can be green is the same as that of the truth that whatever is 57 cannot be 83.

Using Kant's terminology, degrees of intensive magnitude depend on those of extensive magnitude.

4.4 UNITS

A notable difference between length and charge is this: charge comes in natural units, length does not. Or, to be more precise, provided our view of space as continuous is correct, length does not; and provided quark theory is correct, charge comes in natural units of e/3.

With a natural standard minimum quantity, the part/whole relationship between cases of smaller and larger amounts is very plain. The larger are always a summation of the smallest. Two non-minimal cases of a quantity with a natural unit, such as charge, are related as part and whole by way of their unit parts. A case of 200e contains 600 units of charge (assuming quark theory). A case of 100e contains 300 units, which each, one for one, exactly matches any 300 of the 600 units in our first case. So our 200e case is fully entitled to be regarded, also, as a 100e case, in virtue of any 100-fold selection from its unit parts.

Where the choice of unit is conventional rather than natural, ratios rather than absolute numbers are significant. No matter what units of length are chosen, a timber beam ten metres long will be twice the length of one five metres long. The length of the former will have as discrete proper parts two lengths both of which match exactly the total length of the latter.

With conventional rather than natural units, the part/whole relationship among different amounts of the same quantity remains intact. What is lost is any univocal and non-arbitrary answer to the question: *how many* parts are conjunctively present in this quantitative trope? What remain are univocal, non-arbitrary anwers to the question: how many parts, of a given size, are conjunctively present? In contrast to the case with quantities having natural units, the answer here can be a proper fraction. A quarter-unit amount of length, for example, is per-

fectly acceptable, and there can be objects (trope complexes) a quarter-unit long. Then ten-unit objects can be regarded as having as proper parts lengths matching our quarter-unit length. When we consider discrete proper parts, our ten-unit length will have a maximum of forty which exactly match our quarter-unit specimen.

Different determinates of a quantitative determinable are incompatible because a proper part, that is, *less than the whole* of one of them exactly matches *the whole* of the other. And it is impossible for less than some whole, and that whole itself, to be the totality of what is present on any occasion.

4.5 SETS, NUMBERS AND HYPER-ABSTRACTIONS

Quite apart from the role of number in ordering the amounts of the quantities, every ontology is bound to offer an account of mathematics. Let us appropriate brilliant work done over the last century and take it that, leaving geometry aside, mathematics can be modelled in number theory.

Number theory, as is well known, can be modelled in set theory, provided that theory transcends the virtual theory of sets, and admits irreducible quantification over sets.[2] What we need is an account of a numerical property, and an account, perhaps subsequent to this, of numbers themselves, both couched in set-theoretic terms. A collection of tropes, cases of *being an apple*, to take a favourite example, can be regarded in two ways – as a mereological sum of which the component apples are proper parts (though by no means the only ones), or as a set, or class, of which the individual apples are members. As David Lewis has emphasized, although the *sub-sets* of a set relate to that set as part to whole (a given collection of sub-sets can yield exactly one complete set), the *members* of a set do *not* relate to the set as part to whole (the same collection of members can be assembled into many different sets: for example, $\{a, \{b,c\}\} \neq \{\{a,b\}, c\}$).[3]

We need to recognize that the set-membership relation ε is a relation *sui generis*: it must be admitted at least as between a member a and its *singleton*, the unit class whose only member is a,

$\{a\}$. This singleton is then a *part* of every class of which a is a member.

By iteration, alternating as required forming a singleton and forming a set by combining sub-sets, all the sets generable in orthodox classical set theory from a given starting member a, can be constructed.

The set-membership relation ε depends on the nature of the member: it is apples, in virtue of their being apples, that belong to the set of apples, and a, in virtue of being identical to a, that belongs to a's singleton.

Our collection of apples, viewed as a set, has a mathematical property, its cardinality or *number of members*. Suppose, for purposes of illustration, that the set contains just three apples. What is it about this set that makes it a triplet? Is *being three* a new type of trope altogether, introducing new mathematical reality to the world and exposing an unsuspected complexity in tropes?

To see that this is *not* what is involved, let us concentrate on more simple members than apples. Let our apples all be Granny Smiths and so all a matching, uniform shade of green. Now consider the set of these green tropes. It also is a triplet. Being a triplet does not seem to depend at all on the fact that it is *greens* we are dealing with. That is what makes the idea of number as Platonic attractive.

But there is no need to take that view. Our green tropes are particular natures. We can, by an act of selective attention, ignore the nature – that they are green – and focus on the particularity – that they are this and this and this. The *three-foldness* of our triple is thus a *hyper-abstraction*, distinguishable in thought but not in fact from its *three-greenness*.

To be a case of Granny Smith green is not to be complex, except in so far as the hyper-abstraction of *being a case of something* is possible. Hyper-abstracts are so called because they are incapable of stand-alone existence. The world, so the trope philosophy claims, could contain nothing but a lone case of Granny Smith green. But it could not contain a lone case of being a case. Whatever is a case is not just a case of something or other but a case of some specific nature or other. There are, in nature, no bare particulars. In particular, there are no bare cases.

Hyper-abstraction can be viewed as a version of existential

generalization: in counting the members of a set we treat each member as a *case of something or other*, and this is a legitimate thing to do because every case, having a specific nature, has, in that very fact, some nature or other. But hyper-abstraction does not imply distinctness, still less separability, of particularity from nature.

Taking into consideration only the particularity of the particular natures, the tropes, which are the members of our sets of lowest type, we can introduce counting, hence cardinality of sets.

This yields the numerical *adjectives* – being a pair, or a triple, or. . . . To move to numbers, the numerical *nouns*, we have to hand familiar strategies. Russell's is the most attractive from our point of view: the number three is the class of all three-membered classes (triples) and more generally the number n is the class of all n-tuples. By allowing n-tuples to become, in turn, members of sets of higher type, we can generate sets corresponding to all integers and transfinite cardinals.

Russell's construction of the numbers, as generated from hyper-abstracts, is the most attractive as it does not rest on the *pure sets* (the null class and all classes whose only members are the null class, or its singleton, or *its* singleton, . . ., or which have the null class singleton as a sub-set, or a sub-set of a sub-set, or . . .). The pure sets enable the construction of arithmetic with, apparently, a very minimum of ontic assumptions, but they offend a philosopher with a robust sense of reality. That you can generate an infinity of sets out of just *one* apple or cow is embarrassing enough, but to generate such an infinity out of *not even one item of any kind* is beyond the pale.

Hyper-abstraction from something actual yields cardinality, and positive integers can be formed by taking sets of equicardinal sets. Then this system of numerical ideas can be *extended* by considerations of analogy (concerning the *less than* relation among numbers, or cardinalities) to embrace the null class, the other pure sets and zero. These, together with negative numbers and complex numbers, belong, in my opinion, to the invented sections of mathematics. They are most useful inventions and have application. But the use of mathematical sign to indicate vectorial direction should not lead us to suppose that the world contains any actual quantities of negative amount. Similar con-

siderations apply to the use of complex numbers in quantum theory.

4.6 GEOMETRY

Although it is possible, by way of Cartesian analytical geometry, to model geometries such as Euclid's in number theory, this does involve abandoning the idea that geometry is inherently or essentially a *spatial* science. And to give that up is neither necessary nor advantageous. The possibility of modelling provides us with a relative consistency proof – that geometry is self-consistent provided number theory is self-consistent – but it in no way diminishes our need for orderly knowledge of the structure and relationship of the spatial properties.

So we should continue with the plain opinion that geometry is an exploration of the character of space. Geometrical objects – points, lines, planes, volumes and shapes in two or three dimensions, are geometry's true subject matter. Some of these, the points and lines, may possibly be regarded as constructions (as in the Whitehead–Russell method of extensive abstraction). But as for the shapes, so far from them being merely ideal, the world is full of innumerable specimens of every possible variety. They overlap and intermingle because space has no intrinsic boundaries. Because boundaries in space need to be drawn rather than revealed, it is perhaps best to view individual specimens of each of the shapes as quasi-tropes rather than as genuine tropes.

But that refinement aside, geometric shapes are perhaps among the most intuitively appealing as examplars of tropes' simple, independent particularity. This view rests on a realism about space, and space–time, which is defended in later chapters.

If geometry has a real, spatial subject matter, we must interpret alternative axiomatic systems as being rival accounts of what is to be found. There will be, on this view, just one true geometry. Which one that is will not be able to be established *a priori*: we have relative consistency proofs that rule out the hope of convicting Euclidean, or Riemannian or Lobachevskian geometries of inconsistency.

In 'flat' geometries such as Euclid's there can be similar triangles that are not congruent – that come in different sizes, in other words. In a space with positive curvature that is not possible. Whether in the actual world, in space–time itself, there can be non-congruent similar triangles is a matter of *a posteriori* discovery: what does the best current total theory have to say on this issue? As you know, contemporary orthodoxy follows Einstein and opts for the non-Euclidean alternative. So, on that basis, Euclid's geometry is not a true account of a Platonic space, but a false description of this one.

Again, our world is a three-space one-time dimensioned reality.[4] Hence geometries that deal in more dimensions than these lack application. They can be treated, if we are in a severe frame of mind, as systems of falsehoods. But as they have not been developed or presented as descriptions of actual space, and as they may prove to have significant theoretical uses, it is to my mind better to treat them as belonging to the invented part of mathematics. Viewed as constructions of the imagination, we need assign them no subject matter and no truth value. We can retain our interest and respect for them without being committed to the existence of actual tropes, of novel kinds, for them to describe. Developing a new geometry has, in this way, no ontic implications on its own. It becomes ontically serious when literal applications are claimed for the new geometry. Until then, the only concept of truth we need to countenance for propositions in new geometries is that of internal consistency.

Meanwhile the tropes of actual space provide the real topic of the true geometry. As space is not static – according to contemporary cosmology it expands and changes curvature over time, as matter is redistributed – the *a priori* working through of the implications of a given, promising set of axioms is not on its own sufficient to settle geometric truth. What is required, in addition, is a match to the actual characters of the world's space tropes.

Geometrical theses, such as that the in-centre and circumcentre of an equilateral triangle coincide, are often expressed in ways that seem to refer to universals. But there is no real implication carrying us beyond particular cases. It is individual triangles that this claim applies to, although the extensive match of the features of one equilateral triangle with those of every

other means what is shown for one we know will hold for all the others.

Wherever there is an apparent reference to a universal, appeal to Williams' painless realism will defuse the issue.

4.7 POSSIBILITY

The spirit animating Williams' development of abstract particularism is naturalist, empiricist, Occamist. So it is no surprise to find him a staunch *actualist* (one who asserts that the only reality is actual reality, and that mere possibilities do not exist). Here is his actualist, particularist vision:

> The world whole, I take at least as a working hypothesis, absolutely all there is, is a four-dimensional plenum of qualia in relations, eternally actual through and through. Its fundamental pattern, which all other structure presupposes, is that of whole and part: the Big It is not merely infinitely divisible, or virtually infinitely, but infinitely *divided* in the sense that it is the sum of countless actual parts, countlessly including, overlapping, and excluding one another, each part and each whole as genuinely real and individual, in the cardinal logical and ontological respects, as any whole which includes it, right up to the World All, and as any part which is included in it, right down to the ultimate indivisibles which have no proper parts, if such there be.[5]

The down-to-earth appeal of actualism is felt by most people, yet serious talk about merely possible worlds flourishes. Providing truth conditions for modal and subjunctively conditional propositions and for probability claims is greatly facilitated by possible world semantics, and many philosophers hope to continue to enjoy the benefits of treating possibilities as if they were real for the purposes of semantics, while nevertheless escaping any ontological commitment to them. Many philosophers also harbour secret fears that David Lewis is right, there is no ontic free lunch even in semantics, and that if they want to continue letting their variables range over possible worlds they had better become honest and admit, as he does, that the real outstrips the actual.

An attractive compromise proposal is Combinatorialism. According to this approach there is a fixed basic stock of entities,

the actuals, which in combination constitute the actual world. But there can be other 'possible worlds', which are systematic rearrangements or recombinations of the same basic actual stock of entities. The image here is hands dealt from a pack of cards. Reshuffle the deck and deal again and the hands will be different, even though the cards which make them up are, overall, not different.

Our 'possible worlds', on such view, cannot vary from the actual world more than by recombination. All the constituents must be familiar; there are, in Lewis's term, no 'alien' possibilities. This restriction enables us to generate 'possible worlds', other than the actual one, which do not require any non-actual component.

For our abstract particularism, here is how it works: the actual world consists of compresent complexes of tropes at a place. These complexes are mereological sums of their components. But in addition to that whole *sum* (Compresent, $place_1$, *a*, *b*, *c*), there is the *set* whose members are that sum's parts: {Compresent, $place_1$, *a*, *b*, *c*}.

And, since set formation is so easy, we can ring the changes on the actual complexes, so that we have not only

{Compresent, $place_1$, *a*, *b*, *c*} and
{Compresent, $place_2$, *d*, *e*, *f*},

which correspond to actual complexes, but also

{Compresent, $place_1$, *d*, *e*, *f*}
{Compresent, $place_2$, *a*, *b*}

and so on.

Each of these actual sets, with actual members, can be treated as a non-actual possible world for semantic purposes. Each of them is a might-have-been. In Lewis's terms, this is an ersatz combinatorialism.

We need not insist that a place be a member of every such set, in this way allowing for disembodied consciousness, for example.

We need not insist that compresence always be a member, allowing for free-floating individual tropes as super-simple possible worlds.

We can allow for wide-ranging departures from natural law – unbalanced electric charges, violations of conservation principles, bodies travelling faster than light.

Combinatorial set formation is perhaps too easy. It seems to permit forming sets containing a colour trope but no place one, thus admitting unextended colour, or allowing for sounds with volume but no pitch. The restrictions needed to rule out such possibilities seem to me to be synthetic *a priori* principles for which we lack any deeper *rationale* than our intuitive grasp on what can be, and the conceptions of the nature of colour and sound to which those lead us.

The exclusion of alien possibilities is the deepest worry: we seem to be able to frame, and in some sense understand, the thought of a possibility beyond the range of recombination. The conceivable seems to outrun the recombinatorially possible. So meaning seems not to depend on possible truth-conditions. There are other uncomfortable consequences. For example, if there is indeed no God, it would seem that it is not possible for there to be one, since divinity seems to be, if not an actuality, an alien possibility.

These are both troublesome matters for the actualist programme, which require a fuller treatment than we can provide. Actualism is a compelling ideal; whether it can be sustained is an as yet unresolved issue.

5

Relations, Causation, Space–time and Compresence

5.1 RELATIONAL FACTS

The existence of relational facts is beyond dispute. That some items resemble others, that some are larger than others and that some are to the left of others are such commonplaces that they are more familiar and more certain than anything in metaphysics. As G.E. Moore so rightly insisted, any philosophy that is committed to the denial of facts of this kind is doomed.

However, the existence of relational facts does not automatically entail any real existence for relations. It does not of itself imply the separate existence of relations as irreducible dyadic properties; the claim that there are such dyadic properties should be seen as a philosophical theory advanced to account for at least some of the already admitted relational facts. The claim that some relational facts are grounded in the existence of dyadic properties is by no means a commonplace. It enjoys no Moorean privilege of immunity from philosophic challenge.

So let us explore the extent to which it is possible to account for relational facts without appeal to dyadic properties. Although we shall be considering both monadic and dyadic properties as tropes, that is, as particulars, very little of the discussion hinges on that point. Relations conceived as universals stand to monadic property universals in much the same ways.

5.2 WHY FROWN ON RELATIONS?

The attempt to dispense with relations is by no means new or unpopular. Aristotle called relations 'the least of the things that

are'. Averroes, William of Ockham, Hobbes, Spinoza and Leibniz all agreed with the Stoics that all real properties reside in objects taken singly. Relationality, involving both terms together, is a contribution of the apprehending and comparing mind, in its activity of making a relational judgement. Leibniz insisted that 'there is no denomination so extrinsic as not to have an intrinsic one for its foundation'. Bradley urged, using a celebrated regress argument, that any genuine relationality would be involved in self-contradiction and mere Appearance even more thoroughly than monadic predication. McTaggart had misgivings over the location of any relation between A and B. To place the *being-larger-than* which A bears to B in A, or in B, or partly in each, or suspended between them, all seem to be unsatisfactory.[1]

I think it would be fair to say that until Russell argued the irreducibility of relations in *The Principles of Mathematics*, the consensus view was that relations, if real at all, enjoyed but a second-class ontic status. What motivates such a view?

First, there are general Occamist impulses, alert to the possibility that to recognize both relations and monadic qualities is to deal in superfluities. The Occamist impulse is a determination to make one's inventory of the world's constituents comprehensive, yet not disfigured by double counting.

And there are particular grounds for suspicion in the case of relations. There is McTaggart's problem about the location of relations, already mentioned.

But more than anything else, relations have been viewed askance because of their dependence on their terms. No relations can exist (or be instantiated) except where all their terms do. No terms, no relations.[2] It is at least a plausible thesis that a world in which there are neither substances nor monadic qualities but there are nevertheless relations, is impossible.[3]

If the terms of any relation must involve items characterized by monadic properties, and the terms are prior to any relation they stand in, monadic qualities have an ontic priority over dyadic relations.

This asymmetry between the monadic and the dyadic (or triadic, . . .) is especially pressing within a trope philosophy. For the only items available to be the terms of any relation are

themselves tropes. In a classical substance–property dualism, both monadic qualities and polyadic relations can be seen to have the same kind of bearer, viz. substances, and to differ only in the number of bearers involved. But on our no-substance view, some tropes, the monadic ones, can stand on their own as Humean independent subsistents, while the others, the polyadic ones, are in an unavoidably dependent position.

Monadic tropes require no bearer, polyadic ones call for at least two, which will have to be themselves tropes, and in the most elementary cases these terms will be monadic tropes. For this reason the trope philosophy cannot treat qualities and relations as differing only in the number of their bearers, a difference which carries no serious implication as to ontic priority.

Using the image of God's creative activity, to create relations presupposes the bringing into being of their terms, so relations cannot be on the world's bottom line. Continuing the image, since God must deal with the terms one by one, to give them individuality and their monadic properties, might He not be able to complete the job, relations and all, dealing with the terms singly rather than in pairs?

Although the considerations advanced in this section are matters of motivation, rather than argument, they reinforce the view that here in the case of relations, as everywhere in ontology, those who affirm the necessity for a distinct category bear the onus of proof.

5.3 RELATIONAL TRUTHS ARE NOT ELIMINABLE

There is no prospect, however, of any easy demonstration that relations are superfluous on the ground that relational descriptions are dispensable. The classic requirements for reducibility do not obtain. Propositions of the form aRb are not typically replaceable by propositions of the forms Fa and Gb. For example, the fact that John is taller than Tom may rest on the fact that John is 2 metres tall and Tom is 1.82 metres tall. But these facts about John and Tom, while sufficient for John's being taller than Tom, are not necessary. For John could be, not 2

metres tall, but 1.9 metres, etc. Comparative propositions, like one claiming John is taller than Tom, characteristically speak indifferently of indefinitely many distinct concrete positive facts, in this case many sizes of John and Tom. *A is lighter in colour than B* shares this feature: the actual colours of A and B constitute sufficient, but not necessary, conditions for A's being lighter than B. The case is similar where one thing is to the left of, or the north of, or above, another. For more abstract relations, such as *Resembles*, or *Differs From*, one would not know where to turn for adequate monadic replacements.

So there is no way of dispensing with the relational vocabulary and relational descriptions altogether. This need not be too discouraging, since a comparable situation exists in other areas. For example, the psychological vocabulary and psychological descriptions are widely conceded, even among materialists, to be indispensable. What materialists claim is that in any given case, it will turn out that the psychological description rests on and is exhausted by, facts which are either straightforwardly physical or supervening upon, and so not properly distinct from, the physical.

In the same way, the would-be eliminator of relations as genuine dyadic properties claims that in every particular case, a relational fact rests on and is exhausted by, monadic facts and anything that may supervene upon monadic facts. That is reduction enough, even though it involves retaining the relational vocabulary.

So unless we admit relational properties as distinct additions to an ontology of monadic tropes, the claim must be that relations are not reducible in the strict sense but, rather, supervenient upon the monadic characteristics of the terms involved. ('Supervenience' covers those cases where an unavoidable expansion in our descriptive resources does not rest on any expansion in our commitment to the realities described.) The key is *determination*: realm A supervenes on realm B if and only if how things are in the realm B settles how they are in A. There can be no change in realm A except in so far as there is a change in realm B. Two states in realm A can not differ unless there are corresponding differences in realm B. Where two states in B match, the corresponding states in A must match also.[4]

5.4 FOUNDATIONISM

In at least some cases the existence of a relation definitely is closely connected with and dependent upon the monadic properties in its terms. Consider the relation of *being the same colour as* holding between two guardsmen's scarlet jackets. These jackets are the same colour because and in so far as both are the colour they are, to wit, a particular shade of scarlet. The monadic colour features of the jackets are thus the *foundations* of the same-colour relation between those jackets. Our question thus becomes: can relations be replaced by their foundations without ontic loss?

Call the thesis that accounts for relations by reference to foundations alone Foundationism. According to foundationism, for *all* relational facts there are corresponding foundational facts, and in every case the relational facts call for no ontology beyond that involved in the foundational facts themselves. Leibniz is perhaps the most celebrated foundationist, but as we have noted, he made the mistake of introducing a *mental act of comparison* over and beyond the foundations. Relations have in general no more mental a nature than monadic properties. Had Leibniz said just that relations supervene on foundations, he would have espoused the view being explored here.[5]

Bertrand Russell, with Reinhardt Grossmann following him, and G. E. Moore, have advanced arguments aimed at refuting foundationism which have met with widespread approval. I propose first to show that these fail in so far as they fail to distinguish supervenience from reduction, and then, more positively, to consider causal and spatio-temporal relations, the two most plausible cases of relations with no foundations in their terms. A final section discusses whether *compresence of tropes* has foundations.

5.5 RUSSELL'S ARGUMENTS IN SUPPORT OF RELATIONS

The Principles of Mathematics, §212ff set out Russell's arguments against foundationism. He identifies two varieties of the doc-

trine, monadism and monism. Monadists propose to replace the relational *a*R*b* with two monadic propositions, F*a* and G*b*, which attribute qualities to *a* and *b* individually. Monists propose rather to replace the relation *a*R*b* with a single proposition H(*ab*), which attributes one quality to the whole compounded from *a* and *b*. Leibniz is a monadist, Bradley a monist.

Criticizing monadism, Russell takes asymmetrical relations as his theme, and *greater than* as his example. His first target is the idea that relations can be avoided by taking

L is greater than M,

and substituting for it

L is (greater than M),

which, formally speaking, is a monadic proposition. This procedure results, as he points out, in a merely pseudo-foundationism, since the bracketed term cannot be interpreted except as involving a relation to M.

The appeal of this manoeuvre perhaps derives from the recurring idea that a relation is 'in' *one* substance as far as existence is concerned, but 'to another' so far as its nature goes.[6] Despite its genealogy, this notion fails to treat relations in any genuinely eliminating way, since 'to another' is inherently relational. I take Russell's strictures on the manoeuvre to be soundly based.

Russell's second argument takes up the suggestion that

A is greater than B

can be analysed as two propositions, each of which would specify the *magnitudes* of A and B respectively.[7] Let us take for example

A is 20 hectares,

and

B is 15 hectares.

These two propositions provide a foundation for this A's being greater than this B in the sense that they imply that A is greater than B. But they do this only because 20 is more than 15. The greater-than relation, banished from between A and B, reappears as holding between the numbers 20 and 15. So no significant elimination of the greater-than relation has been accomplished.

Now a foundationist, if a realist about numbers, would of course now offer to repeat for the numbers 20 and 15 the exercise just completed for A and B. This involves attributing the larger size of 20, when compared with 15, to monadic characters of these numbers (to their being, in short, the numbers they are).

A foundationist who is not a mathematical realist can still undertake to find adequate foundations for whatever relations, between whatever entities, remain after the analysis of number has been completed.

Either way, the relation of greater-than will be resolved into a relation between the numbers which will be subject in turn to foundationist resolution.

Using the intuitive picture of divine creation: if God makes an island A with so much rock, soil, etc. as to amount to 20 hectares, and, subsequently, an island B of 15 hectares extent, there is *nothing more* needing to be done to make A larger than B.

Russell rejects this approach because a regress is set up. Whatever characters are attributed to the numbers as the appropriate foundations, they will only guarantee that 20 is more than 15 if these foundational characters stand in some asymmetric *relation* to one another. To resolve *that* relation introduces another, etc.

Russell finds this regress vicious because he takes foundationism to be proposing an eliminative *analysis* of relational *propositions*. Accordingly, he takes the regress to imply that no relational proposition has a finitely specifiable meaning, and this he regards as a fatal *reductio*. But foundationism should not propose eliminative analysis; rather, it should claim only that relations supervene upon foundations. In which case, although relations arise from, and cannot fail to arise from, the properties of their terms, relational propositions neither entail, nor need be entailed by, specific propositions attributing only monadic prop-

erties. But where relations are supervenient, Russell's regress is not vicious. At each step in the regress, the asymmetric relation between the foundations will become more abstract, and will soon be repeated at each successive step. For example, in the *greater than* regress, *the first term has something matching the second term as a proper part* will soon be the asymmetric relation cropping up at every 'new' step in the regress. Regresses of successively more abstract items, even if non-terminating, are harmless.

Since only relations as polyadic properties are here being denied, while relational facts are being accepted, a nested succession of relational *facts*, which Russell points to, is no embarrassment.

To consider a parallel, no one is bothered by the multiplicity involved in a colour patch's belonging to indefinitely many different nested segments of the colour continuum, each specified less concretely than its predecessor.[8]

5.6 RELATIONS AS UNILATERAL OR BILATERAL

There is another way in which Russell's argument fails. He considers that the 'adjectives' in the terms, that is, the proposed foundations, must either themselves be related, or must *each severally* be sufficient to provide a foundation for the relation in question. Thus the monadic foundational property first suggested for L was *greater than M*, which belongs to L alone, yet suffices for L's being greater than M.

A better view insists that in general foundations in *both* terms must be considered in seeking the basis for a relation. Thus if A is canary yellow while B is ultramarine, the foundation for

A is lighter coloured than B

does not lie in A alone, nor in B alone. Being canary yellow does not of itself make you lighter coloured than anything. The required foundation is to be found only in the colours of both A and B.

In the normal case, a relation might be said to be *bilateral*. But there are exceptions, *unilateral* relations, in which a foundation in *one* term only does suffice to found the relation. Aristotle cites

knowledge in this connection. Thus whether or not Tom has become familiar with some knowable item, such as Piccadilly, depends only on the character of Tom and not at all on any peculiarity in Piccadilly's qualities. And in the medieval period the relation of *creature to Creator* was held to be unilateral on the side of the creature, since any foundation for this relation in God might imply some contingency or changeability in Him, which would have been theologically unacceptable. In bilateral relations, of course, a sufficient foundation for that relation exists in *neither* term taken alone.

Changes in relationships can also be unilateral or bilateral.

Think of two different sorts of ways in which you can become the fastest runner in town – by training, coaching and effort, or by tampering with the opposition. It can come about that *a*R*b* either by change in *a*, or by change in *b*, or by change in both. In all cases, *a* acquires a new *relational property*; where this arises from change in *b* alone, *a* is said to undergo a 'merely Cambridge change'. The *change* is unilateral (and not in *a*). But the relation itself is bilateral in most cases, as the character of *b* will not, in general, suffice to determine on its own that *a*R*b*. It will not suffice, for *a* to be a faster runner than *b*, that *b* be tampered with – *a* must have legs.

As will emerge later, a successful foundationism will need to appeal to unilateral relations in its account of spatio-temporality, so the notion is an important one.

With relations of whole and part and in particular with *A has a part B*, we get a degenerate sort of unilateral situation (Figure 1). If A has a part B, then just because B is a part of A, there is in A (which includes B), the sufficient ground for the relation.

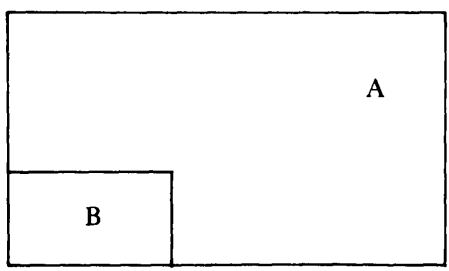


Figure 5.1

More interesting cases of unilaterality arise where term A has a sufficient foundation for a relation to B even though B is properly distinct from A. The set-membership relation ε seems to be such a case. If A is a rabbit and B is the set of rabbits then A ε B, and this depends entirely on the fact that A is a rabbit. This fact alone suffices for A to belong to B. Since a member of a set is not a part of that set, it seems fair to claim that it is properly distinct from it.

God created Adam is the classic example of a relation unilaterally founded in God; secular cases of production, while not *ex nihilo*, might nevertheless qualify.

Since in general relations are bilateral, it will be no refutation of foundationism to point out that there is nothing in *one* term *a* of a relation *a*R*b* adequate to guarantee that it stand in that relation to *b*. Of course not. In general, the character of the other term *b* will have to be taken into consideration.

Russell's further arguments are directed against the monistic theory that a relation is a single property of its terms taken together. His criticism of monism rests on its inability to distinguish the two directions possible with asymmetric relations, that is, the difference between *a*R*b* and *b*R*a*. Even here, the reasoning is inadequate. A monistic foundationist will hold that two *different* monadic bases, H_1(a, b) and H_2(a, b), underly the two different asymmetric situations.

At another place (*Principles of Mathematics*, §425), Russell argues against the monistic theory but points out, what affects monadism equally, that if a relation holds between *two* terms, A and B, then A and B must already be related by *diversity*, before the attribution of foundations to A and B, as *two* terms, can begin. This wrings no withers; diversity, it seems to me, is almost *obviously* supervenient. God can safely proceed with the creation of monadic properties only, since if he does, diversity will look after itself.

5.7 REINHARDT GROSSMANN'S ARGUMENTS AGAINST FOUNDATIONISM

In *The Categorical Structure of the World* Grossmann takes up and amplifies Russell's position.[9] He advances three arguments: first,

the foundations must themselves be ordered. (This recapitulates Russell's claim that the foundations for an asymmetric relation must themselves be asymmetrically related.)

Suppose we have four philosophers of different heights, in this descending order:

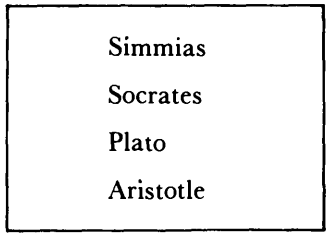


Figure 5.2

So Simmias is taller than Socrates, who is in turn taller than Plato, with Aristotle shortest of all.

Now try to eliminate *taller than* as a relation between Simmias and Socrates. Grossmann considers the idea that the foundation in Simmias is a *tallness* T, while Socrates has *shortness* S.[10] Grossmann has little trouble disposing of this proposal, since if carried through it will land us in the situation that

(a) Socrates has T and Plato has S

and also that

(b) Socrates has S (on account of Simmias) and Plato has T (*vis-à-vis* Aristotle).

In that case, if (a) analyses

Socrates is taller than Plato,

(b) must affirm, *contra hyp.*, that

Plato is taller than Socrates.

All of which is most absurd.

If we distinguish Simmias' tallness *vis-à-vis* Socrates as T_1,

vis-à-vis Plato as T_2, *vis-à-vis* Aristotle as T_3, the tallnesses which Socrates and Plato bear to Plato and Aristotle as T_4, T_5 and T_6, and introduce corresponding *shortnesses* $S_1 \ldots S_6$ in Socrates, Plato and Aristotle, this particular absurdity does not arise.

Furthermore, from the information about T_1–T_6 and S_1–S_6 we can now place our four philosophers in order of height, as any proper account of *taller than* should enable us to do.

However, Grossmann insists it is not possible to place the philosophers in height order without continuing appeal to relations, since Simmias is tallest only because he has 3 tallnesses (T_1, T_2 and T_3), whereas Socrates has only 2(T_4 and T_5) and 2 is *fewer than* 3. Relations, banished from between philosophers, have reappeared among the numbers.

Russell, you will recall, arrived at relations between numbers even more directly since he did not consider tallness and shortness tagged with subscripts, but went straight to numerical measures of size. Russell's route is to be preferred, since it does not assume that wherever different instances of the same relation are found, instances of the same foundations must always be present.

This is a point of great importance. Foundationism must not allow itself to be restricted in its search for foundations by any idea that sameness of relations requires sameness of foundation. The possibility must always be kept open that there are many different bases upon which various pairs of terms can enter into similar relations. This parallels the need to insist, in other cases of supervenience, that a given function, in machines or organisms, can be discharged by many different structures, or a given virtue can be possessed thanks to many different dispositions and actions and a given play presented in many different productions.

By following Plato and allowing it to be thought it must always be some tallness which provides a foundation for taller than, Grossmann makes his criticism of foundationism seem more forceful than it really is.

If we take any person's particular height, rather than a tallness, as the foundation in that person for the taller-than relations in which he or she stands, different tallness relations will all be tallness relations but they will not all rest on the same property in the terms. Different individual heights will serve as

foundations for like relations. This will eliminate the nonsense that since Plato has tallness because of Aristotle, this tallness will equally serve to make Plato taller than Socrates. Concrete heights rule that out and provide what common sense demands, that for a given reference frame and standard units the same feature of Plato (his height) should serve as foundation both for his being taller than Aristotle and for his being shorter than Socrates.

If numbers are essential to specifying heights, we have already seen from the discussion of Russell that relations among numbers may allow of foundationist treatment. But it seems to me that numerical specification while it may be available, is not essential. The heights of the taller philosophers have proper parts which exactly match the heights of other philosophers. This qualitative, abstract, asymmetric relation will generate a unique ordering with respect to *taller than*. And the part/whole relation is a promising one for foundationist treatment.

Grossmann's second argument, that for the elimination of tallness to work T_1 must be *related to* (in fact, coordinated with) S_1 and not S_2, rests equally on the mistake that some kind of shortness and tallness, rather than a size, is the foundation for *taller than*. With sizes, the coordination problem solves itself.

His third argument claims that relations do not reduce to foundations because

(c) $(x)\ (\exists y)\ xRy$

is not equivalent to

(d) $(x)\ (\exists y)\ Fx.Gy$.

The reason for this is that (c) and (d) have different implications, since (d) entails

(e) $(\exists y)\ (x)\ Fx.Gy$,

while (c) does not entail

(f) $(\exists y)\ (x)\ xRy$

Since (c) and (d) are not equivalent, the proposition (d) involving Fx and Gy, which is supposed to specify the foundations for R, cannot replace the relational proposition (c) involving xRy.

The reply to this is that it once again assumes, incorrectly, that all cases of similar relations must have the same foundations. To demand (logical) equivalence is to demand too much. In this case, it is assumed that every instance of the relation R must resolve into the foundation pair F and G. The sensible foundationist is not proposing any such uniform resolution, but allows there may be cases of xRy where x is not F and/or y is not G.

Another of Grossmann's arguments claims that the foundationist must at least hold that the relational fact is to be replaced by a *conjunctive* fact, embracing a fact about each of the terms. And indeed this applies to monadists at any rate, if not to monists also, for every bilateral relation. Now conjunction is a relation. So relations have not been excluded after all.

I am content to concede this. Foundationism is still quite sufficiently interesting and powerful a thesis, even if it does not cover the kind of relationality to be found in conjunction. For any two monadic property instances of any kind give rise to the (speciously) novel fact, their conjunction. We see that the conjunctive fact is speciously novel by noting a *two-way* supervenience: given Fact A and Fact B, there must be a fact (Fact A and Fact B), and given fact (Fact A and Fact B) there must be both conjuncts, Fact A and Fact B. And it is an unpromising idea that there are not at least two monadic property instances, quite apart from those cases put forward as the foundations for a relational fact. So even if there were no genuinely additional material dyadic relational properties, there would still be logical relations such as conjunction and disjunction. Wittgenstein said of the logical constants that they do not signify.[11] He meant they do not refer to additional ontic items.

5.8 EXTERNAL AND INTERNAL RELATIONS

In a celebrated paper Moore meticulously, even laboriously, elaborated the meaning he proposed to give to the slogan 'All

relations are internal', then proceeded to show that to common sense the doctrine was false, that the most plausible reason he could think of for adopting the slogan was mistaken, and that the doctrine implied both the Identity of Indiscernibles and that there are no contingent truths, two egregious falsehoods.[12]

Since foundationism is a relative of the denial of external relations, Moore's treatment merits examination. The examination reveals that as Moore uses the term 'internal relation' not only does the existence of an internal relation *a*R*b* imply that its terms possess suitable foundations in virtue of which the relation holds, but further, it implies that those foundations are critical to the identity of the terms to which they belong. Were the relation to change, should *a*R*b* cease to obtain, the terms would cease to exist, i.e. cease to be the terms they are. *Being intermediate in colour*, for example, as a relation among colour patches, is internal in this sense. If a patch of colour begins by being intermediate in colour between two others, and then ceases to be so, this requires that at least one of the patches must have lost its identity, that is, must have ceased to be the colour patch it was.

But it must be allowed that some entities, especially familiar things from the manifest world, can change some of their qualities without ceasing to be the things they are, without loss of their identity. Once that is admitted, foundationism is no longer committed to the denial of external relations. A growing girl can become, and then cease to be, intermediate in size between her parents, without ceasing to be the child she is. What foundationism insists on, merely, is that the relation subsists in virtue of characteristics in the terms, and can neither come into being, nor pass away, without appropriate changes in those characteristics in some or all of the terms. These changes can be the sort that leave the terms' identity intact.

Thus in place of the usual two-fold division into internal and external relations, a three-fold division is required (Table 5.1).

The possibility of relations which exist in virtue of foundations and yet which are in Moore's terminology *external*, is critical to any successful foundationism. It makes the necessary room for relations less rigorously anchored in their terms than are internal relations, and conversely, terms which can survive an alteration in relations.

Table 5.1

Relations		
Internal	External	
	Founded	Unfounded
Relation has foundations in the terms, which are essential to the identity of those terms. Example: *is a darker colour than*	Relation has foundations in the terms, but these are not essential to the identity of the terms. Example: *is a cleaner shoe than*	Relation's holding or not has no consequences for the existence, or monadic characteristics of, the terms. Example (putative): *is to the left of*

Internal relations are generated by their terms in all possible worlds. It is logically necessary that if A is canary yellow and B is ultramarine, then A is a lighter colour than B.

But *external, founded* relations supervene upon, yet are not entailed by, their terms. Shoe C is not equally dirty in all possible worlds in which it exists, nor is shoe D. None the less, C's being a cleaner shoe than D depends only on how dirty C and D are. Furthermore, this *is* a necessary truth: If X_1 and X_2 are equally dirty, and Y_1 and Y_2 are equally dirty, then if X_1 is cleaner than Y_1 then X_2 is cleaner than Y_2.

Given a world with shoes of different degrees of cleanliness in it, a further, dyadic property of *cleaner than* is an unnecessary addition.

The link between foundations and external relations allow for the common-sense truth that it is often a contingent matter whether or not a relation holds between two items. In fact, it allows it in two ways: it is often contingent whether or not a given term has the monadic quality which serves as foundation (it is contingent how clean a shoe is). And it is often contingent, though less obviously so, whether a pair of terms which do have the appropriate foundations do indeed stand in the given relation. Examples of this are: *being a sweeter wine than* and *being a more*

dangerous venom than. Each of these is a two-termed relation, between wines in the one case and venoms in the other. And each has foundations in its terms. But these foundations provide a basis for these relations, rather than some other, only on the contingency that there are not only wines and poisons but also living, sentient beings, partial to sweetness and vulnerable to venom.

Thus a judicious foundationism can agree that not every feature of every thing is essential to that thing, and that contingent attributions, both monadic and dyadic, are possible. Foundationism can avoid Moore's strictures on the doctrine of Internal Relations. A judicious foundationism also avoids commitment to the Identity of Indiscernibles.

Foundationism *is* committed to the slogan 'No relational differences without qualitative differences' or 'There are no merely relational differences'.

5.9 CAUSATION

Causal Relations and Particular Cases

Many of the causal claims that we find most interesting are generalizations – that the bite of the adder is deleterious, for example, or that droughts cause crop failures, or that like charges repel. But the actual transactions which make up most, if not all, of the world's history are as peculiar and individual as anything else. The terms of every real causal sequence are one and all of them particulars. When you drop it, it is the weight of this particular brick, not bricks or weights in general, which breaks the bone in your particular left big toe. In so far as the world is a network of causal relations, it is a network of relations among particulars.

A rather too hasty opinion among philosphers holds that the causal relation's terms are always *events*; cause and effect are indeed often events, as in

The short-circuit caused the fire.
The plunging of the detonator caused the explosion.
The burglar's sneeze led to his discovery.

But standing conditions, rather than the change implied in events, can also participate in causal sequences:

Condition/event:	The acid's concentration caused the container to erode.
Event/condition:	The embezzlement produced the insolvency.
	The power failure resulted in the black-out.
Condition/condition:	The skin's pigmentation prevented any melanoma.

Perhaps standing conditions are always only apparent. Perhaps they always involve, at the quantum field level, a ceaseless restless sequence of events. Even if this were so, it would be a contingent matter of fact that at the deepest level there are no standing conditions. And a comprehensive first philosophy should be able to allow their possibility. Standing conditions should not be excluded *a priori* as terms of causal relations.

They can easily be accommodated in a trope philosophy. In the unfortunate case of the dropped brick not the brick in its entirety, but rather the mass and solidity which in part constitute the brick, are the proper terms of this causal relation. They are the causes, properly so called, in the disaster. On the effect side not toes as such, but their boney and nervy characters, suffer unwelcome alteration.

Even on a trope view, however, there can be different accounts of what the terms of any causal relations are. Russell put forward a scheme in the 1920s according to which concrete particulars, together with their characteristics, can all be resolved into component events. From that metaphysical standpoint, since everything consists in events, the terms of all relations, and *a fortiori* causal relations, are always and only events. The 'events' at the base of such an ontology are very small regions of space–time, characterized perhaps by a single physical quantity. They are but tiny fragments of the macro-entities called events in ordinary causal contexts. The switching of a light switch, let alone the lighting up of a room, comprises enormous numbers of Russell-type events, and what we have called conditions will

prove to be equally multitudinous. Unless one is using 'event' in this special ontological sense, events do not monopolize causal transactions. They do, of course, monopolize the transactions that consist in something or other's coming-to-be or passing-away, but these are not the only kind.

5.10 PARTICULAR CASES AND GENERALIZATIONS

Even if it be granted that the terms of every causal relation are particulars, there is still the question whether every causal claim entails a generalization. Hume and all the regularity theorists he has inspired insist that there is an entailment, that it is logically impossible for any A to be the complete cause of a B unless all As have Bs as effects. Every properly formulated singular causal claim brings a generalization along with it.

Now whether the regularity theorists are right about this is a semantic issue. It concerns the conditions required for the truth of a causal claim, but does not of itself introduce any special causal ontology. What I mean is this: take two sequences, A followed by B, and C followed by D. Let AB be a causal sequence, and CD be a sequence that is not causal but accidental. Now let us ask, what is there, in A or B, or the sequence AB, that gives it its causal character? For regularity theorists the answer must be: nothing. The distinction between causal AB and non-causal CD lies not in those sequences but elsewhere. AB is causal because, and in so far as, all items relevantly similar to A have items relevantly similar to B as successors, while CD is non-causal just in being unaccompanied by this cosmic mimicry.

Ontologically, AB and CD are on a par. They are both sequences, no more, no less. AB does not have any extra binding or forcing element, its causality.

I take this to be Hume's meaning in denying *nexus*, *necessary connection* and *power* as elements to be found in causal chains. The causal relation has no ontology to distinguish it from other sequential relations. It is this view of the matter that has as consequence the view that the causal relation is always *external*. A and B could retain their identity, and all their inherent characteristics, whether or not A was B's cause.

The denial of any intrinsic ontology, any real *push* in causation, is the implausibility at the core of Humean theories. The intuitive conception of the world with which we operate when not doing philosophy accepts the notion that a causal sequence is distinguished by the presence, in the cause, of something or other which produces the effect. If this natural conception can be defended, it will lend support to the view that causal relations do rest on foundations in their terms after all.

5.11 HUMEAN GROUNDLESSNESS IN CAUSATION

So far as its ontology is concerned a causal sequence is, for Humeans, just a sequence. The causal relation is on this view a *spatio-temporal* relation distinguished by lack of originality, and if the causal relation has any foundation in its terms, that will derive from whatever foundation, if any, there is for spatio-temporal relations.

That this was Hume's position is underlined by his celebrated claim that *a priori*, anything can be the cause of anything, so that even if one were familiar with *all* the monadic characters of an 'object' (i.e. an event, state or particular), these would on their own provide no guide to that object's causal links. The causal links can be discovered only by a study of sequences which reveals uniformity of succession.

If anything can be the cause of anything, causation must be a strictly external relation, having no foundation in its terms.

Paradoxically, this is an objectionable view because it involves an occult, even mystical, conception of the world's unfolding, which is clearly contrary to the progressive, scientific and enlightened spirit in which Hume himself recommended it.

The view that the essence of causality is regularity of sequence makes the causal relation quixotic and mysterious. It makes whether or not each specific earthly A causes B depend on what follows A-type items on Sirius or in the depths of the Magellanic clouds. It holds that there could be two possible worlds, in one of which A causes B and in the other of which A′, which is exactly like A in every intrinsic respect and in every non-causal relational respect, is not cause of any B′. It means, to use an

image, that God, by frustrating the activity of an A-type item in the year 2050, could retrospectively bring it about that this year's particular case of A didn't cause this year's B after all.

In this connection, again paradoxically, it seems that the champion of a loose or unbound conception of causality has ruled out, *a priori*, the possibility of probabilistic causal connections. For if strict regularity (100 per cent) is relaxed to admit of probable relations, and if sequence (with contiguity) is the be all and end all of causality, no causal tie can be established. For *every* observed frequency in B's succeeding A, is compatible with any specified probability for that succession, except the extreme values 100 per cent and 0 per cent.

Further, the regularity view implies that no A-type item could possibly be the cause of any B-type item if the world either begins with a B or ends with an A. That is an astonishingly rationalist result from a determinedly empiricist analysis.

Since foundationless causes depend in no way on the inherent character of the items involved, why anything should be cause of anything is and must remain inherently mysterious. So foundationless causes are a desperation option, to be embraced only when all else fails.

To deny what Humeans allege, that the distribution of cause and effect is still arbitrary even when all the intrinsic features of things have been allocated, is to claim that there are to be found, in A or in B, or in both, the necessary and sufficient conditions for A's being B's cause. That is the idea that causal relations depend only on the natures of their terms, that the causal relation is indeed grounded after all. Relations can be grounded, although external. To claim causal connections have foundations is not to deny they are contingent.

5.12 CAUSAL POWERS AND THE *VIRTUS DORMITIVA*

In the doctrine of *Causal Powers* we already have an apparatus for expressing the grounding of causal relations. A power, *ex vi termini*, is just whatever a cause has and non-causes lack, no matter how similar they may be in all other respects. This sounds as if it runs into the occult powers objection. You

remember Molière's example of an occult power, opium's *virtus dormitiva*. The objection that this power is occult is the complaint that the description of opium as possessing a *virtus dormitiva* is a spurious piece of intellectual work. Opium is a soporific; the effect to be explained is the drowsiness it induces. The postulated cause, the *virtus dormitiva* in the opium, is an explanation without content. It merely re-echoes, while quite failing to explain, the effect. Since, it is alleged, there is no possible way in which this inner power could be detected and explored except indirectly, through its effect, it is dubbed occult and damned as intrinsically unknowable.

This objection to powers is as old as Plato, who complains in the *Phaedo* about what he calls the 'safe and stupid' idea that what makes a body hot is the inherence of heat.

The objection is good if it is supposed that the postulation of an intrinsic virtue or power is all that need be done to account for a pattern of effects. But the objection fails against the view that the postulation of a power is merely the *first step* in the process of tracking down the inner causes of outer happenings.

That first step must be followed up by a concrete investigation which will, if successful, identify the actual inner characteristic which is at work when opium induces drowsiness. The pharmacologists have probably already done this, finding which molecules, acting in which ways, are responsible for opium's effects. People without Humean predilections find it perfectly natural to call such substances the *active ingredients* of the drug.

Acids provide a less complex example. Muriatic acid has the *virtus acidia*: among other things, it attacks marble. It does this *in virtue of* the presence of free hydrogen ions. In its free hydrogen ions lies its *virtus acidia*. By appeal to the behaviour of the ions the acid's effects can be accounted for in a genuine and by no means spurious explanation.

Successful investigation reveals which intrinsic characters constitute which powers. Then powers, so far from being occult, become natural, known and understood. In short, occult powers are only occult until they are found and brought into the light.

In the mere act of supposing that a given pattern of effects arises from an inner active characteristic, we do not thereby discover which characteristic that is. Nevertheless postulating

inherent powers is the first step towards a genuine understanding of cosmic processes. It is a scientific step, clean contrary to the image conjured up by the tag 'occult'. *Without* powers, causation must remain mysterious, magical and, indeed, occult.

5.13 POWERS AND CAUSAL CONTINGENCY

To avoid triviality in causal claims, a power must not be a *bare* power, a power with no characteristics beyond its production of its distinctive effect. Otherwise, statements claiming that the power is in operation reduce to unimpressive trivialities.

> In opium, a *virtus dormitiva* results in drowsiness

transforms, by meaning substitution, into

> In opium, a factor which induces drowsiness results in drowsiness

Beyond claiming that drowsiness is indeed an effect, and not some merely random event, such claims are valueless.

So powers are not to be thought of as bare, but rather, as having an indefinite inner complexity. As the complexity is unravelled, contingency without triviality, and thereby genuine explanatory power, is achieved. In our opium example, identifying the power with the action of specific substances takes us one step beyond a bare power. Then finding the mode of action of the substances, in their molecular interactions, and subsequently the way the forces exerted by the molecules involved affect the human nervous system – all this is a progressive unveiling of a causal power. Complex powers resolve into simpler ones; the simplest are the fundamental forces acting in Nature.

There are at least two dimensions of contingency in causal power claims, provided that the powers are complex and not bare. First, where the terms of the causal tie are taken to be familiar, complex macro-items, such as doses of opium, earthquakes and meteors, it will be a contingent and not a necessary

or essential fact about them which powers, i.e. just which intrinsic characteristics they have. Although opium induces sleep, earthquakes causes fires and meteors produce craters, non-soporific opium, non-fire-starting earthquakes, and even non-solid meteors are not contradictions in terms. This being the case, it will always be contingent that they produce sleep, or fires, or craters respectively.

Second, the powers that furnish the foundations for the causal tie can only operate in the right circumstances. Powers are defeasible. Whether a power is actually active typically depends on indefinitely many extraneous conditions. Powers can be inhibited or diverted from their normal working. Hence the claim that a power operates is contingent. Most obviously, the causal relationship is generally *bilateral.* It has a foundation in both cause and effect. The active power in the cause stands in need of a passive power on the effect side, or it will not operate. Opium acts soporifically, only on appropriately receptive, neural structures. Hydrogen ions in acid need carbonates in marble or no corrosion would occur. (The causal nexus is generally bilateral, but creation may be an atypical exception and events as effects are brought into being by the causal process, which cannot therefore rest on any foundation in them.)

The existence of the passive power in the item acted upon will be a contingent matter if we take the item affected to be a normal complex macro-item. Inert marble is not logically impossible, and no more is a nervous system immune to opium's blandishments.

5.14 POWERS, BASES AND SUPERVENIENCE

In a world without creatures which wake and sleep, would opium be a soporific? I do not think so. That is an active power which calls for its passive complement in order to be realized. But (*pace* all Idealists) in a world without consciousness opium would have all its chemical characteristics, including all those essential to its soporific capacity.

So we must in some way distinguish opium's soporific power from the chemical features which confer that power. Call these

chemical characteristics the power's *basis*. It seems that basis and power are distinct, not to be identified with one another, since in a world without consciousness the basis is realized yet the power is not.

On the other hand, in this world, with nervous systems of the requisite susceptibility (i.e. the right passive power), could opium fail to be a soporific? Could a substance with opium's chemistry and in particular with the chemical characteristics which form the power's basis, not also have the power? Again, I do not think so.

The connection of basis and power is closer than any merely contingent tie. The relation is one of supervenience. The power is a functional feature, resting on the basis as constitution. It arises inevitably in the right circumstances and is incapable of varying unless the basis varies.

So a power is not, strictly speaking, the intrinsic foundation for a causal relation. Rather, the power's basis is. For the power is not an intrinsic character in its own right, additional to the constitutive features of its basis. In making opium, God did not need to give it its inherent molecular characteristics *and also* endow it with its soporific power. Given there are animals with appropriate nervous systems, there is nothing further to do.

The foundation for a causal relation lies in the intrinsic characters of the basis which gives rise to the function which we describe using the language of powers.

Sometimes, when our knowledge is insufficiently comprehensive, this situation emerges quite plainly. We speak of 'factors' in a black-box sort of way. There is a provisional, functional chemistry of the blood, for example, which describes blood's constituents as coagulants, antibodies, oxygen transporters, etc. At this stage we have recognized and distinguished the powers, but are not yet able to specify their basis. By thinking in terms of such factors in this way, we claim the existence of the foundations for the causal transactions, without being able to spell out what they are.

Philosophers are often uneasy with causal powers because they have an ontically inflationary and un-Occamist ring to them. But where one item supervenes upon others there is no real additional ontology. And the powers do not take us to really

new items beyond the intrinsic characters we must recognize anyway. To treat the causal relation by reference to powers in the terms avoids ontic commitment to dyadic characteristics, provided the powers are functional supervenients on a monadic qualitative base.

5.15 ABSTRACT PARTICULARS AS CAUSAL TERMS

We often speak as if familiar concrete particulars were the protagonists in causation, but according to the trope philosophy this is a mere *façon de parler*. Strictly speaking, it is not the earth and the compass needle as entire complex wholes which are cause and effect in the compass' pointing north. Rather, it is the *magnetic characters* of these complexes which do the work. Their other features have nothing to do with it.

Events are changes of abstract particulars, in the typical case where, for example, sunlight fades the drapery. Where conditions, rather than events, are involved in causal situations, they too will be tropes, usually tropes belonging to a compresent complex or concrete particular.

Now if it is not the earth in its entirety which constitutes it a controller of compass needles, but rather the presence of the earth's magnetic field, there can seem to be a problem over the contingency of causal statements.

> The earth is now directing the compass needle

is contingent since, *inter alia*, it is contingent that the earth is magnetic and likewise the compass needle.

But it is not contingent that a magnetic field is magnetic. Does this make

> The earth's magnetic field is now directing the magnetized needle

non-contingent? No. Why not? Because causes can misfire. That is, what is, ordinarily, for the most part, a reliable and recurrent

causal factor can, on occasion, fail. A can produce B even though As do not always, still less necessarily, issue in Bs. A can produce B even though *this* A, given repeated opportunities to produce Bs, does not do so invariably, still less necessarily.

The whole notion of probable causes is precisely the notion of causes which have the results they do as a matter of probability only. Which is as much as to say, certainly *not necessarily*, and almost certainly *not invariably*.

It is too late in the day to be protesting that somehow the very concept of a cause rules out probable causation. If the probabilistic relationships in quantum theory may not be *called* causes, they will do very nicely in the meantime, whatever we may call them.

Since a cause can, on occasion, fail of its normal effect, it follows that any claim that a cause is in fact operative will be contingent.

Laws of Nature are contingent in another way. They generalize about causal powers, and deal in syndromes, packages of causes and effects. At least the ones we cite in explanations do. Thus,

> Occurrences of the characteristics which result in the display of the *magnetic* syndrome (magnetic fields) direct magnetized compass needles

is contingent because the *magnetic* syndrome is a package of many effect patterns. The presence or absence of particular members of the package is a contingent matter. So far as logic goes, lining up iron filings and generating current in loops of wire need not have been packaged together with making pivoted compass needles swing.

The intertwining of contingency and supervenient necessity in causal relations seems to me to be as follows.

It is, in general, contingent that objects contain the bases they do, and contingent that other things in the world have the passive powers without which bases would be unable to be effective on them.

It is, in general, contingent whether or not a causal base 'fires' on any given suitable occasion (whether the causal power is exercised).

But being a cause, or being capable of receiving an effect, supervenes on having the appropriate power and that power supervenes on its intrinsic base.

So that given the active and passive powers, the existence of causal relations is a supervening necessity, but whether given objects have the appropriate powers is contingent and whether those powers are exercised is contingent. Hence true causal claims, in those ordinary cases where the cause and effect are identified in ways independent of this particular causal link, will be contingent.

An approach to causation through causal powers can, therefore, be naturalistic, Occamist and preserve the contingency of causal claims. The causal relation is founded but external where the terms are taken to be complex particulars or situations. Where the particular tropes identified as involved in a causal transaction are the intrinsic characters that form the *basis* for the active and passive powers in the cause–effect situation, the causal relation is also founded but external. Here the foundation is the very term itself, not some component of it.

There is an internal relation between an *exercised* power and its outcome. This is no embarrassment, since powers are conceptually, and not just actually, causal in character.

Causation does not provide a counter-example to the thesis that there are no dyadic properties.

5.16 THE MONISM ISSUE

Thinking in terms of cause and effect is an essentially pluralistic way of conceptualizing the cosmos. Cause and effect must be *distinct existences* for the notions to have any application at all. So discrete items (local events, specific instances of properties or particular objects), are the terms with which causation deals. Analysis, so often called for in refining a causal explanation, identifies simpler and simpler structures as the protagonists in causal transactions, and so gives this inherent pluralism an atomistic tendency.

Any plan to display causation as supervening upon monadic

foundations follows in the same path, pluralistic and tending to atomism.

Much modern cosmology, however, is not pluralistic in this way. The geometrodynamics of the General Relativity theorists, in so far as it deals with local particulars at all, treats them as regions of space–time, with unity and boundaries artificially imposed for convenience's sake, corresponding to no real inner unity and boundary discontinuity in nature.

Less comprehensively, a physics in which field theories take precedence over particle theories likewise regards local regions in a field as not distinct, independent items.

So there is a sense in which a monistic cosmology has no use for cause and effect; it has variegation and patterning across a single field-like entity spread through space–time. The elements of the pattern, regions in the field, are quasi-entities, and between these quasi-entities relations may be said to obtain. These relations are typically of greater or less, representing the intensity of the field in their region. Since greater and less are, if anything, more nearly internal than cause and effect, the prospects for finding suitable foundations upon which they supervene are bright, indeed almost guaranteed.

In a world of fields, without a unified field theory, there can be interaction between fields. Interactions among fields come closest to the familiar cause and effect between distinct existences. They too have their foundations in the nature and value, at each region, of the intrinsic characteristic present in and making up each field.

So although it may well prove that cause and effect as a familiar relation, arising in the manifest world image, among apparently independent objects, of much less than cosmic scale, does not survive in a thoroughgoing scientific account of nature, that by itself is no reason for thinking that foundationism about relations is in any similar jeopardy.

Even if foundationism can be maintained in the causal context, there still remains the issue of spatio-temporal relations. Space and time are the traditional bastions of pure, ungrounded relations, the most plausible ground for counter-examples to foundationism.

5.17 POSITION AND THE NATURE OF SPACE–TIME

If space, or space–time, is nothing more than an integrated set of relations of distance and direction among bodies, then position will be simply a relational matter, differences in position will be relational differences only and foundationism will fail. It was because he was both a relationist about space and time, and a foundationist about relations, that Leibniz was led to the monadology which denied that space and time are real.

Fortunately, we are not in such desperate straits, since relationism about space–time is false. Space–time cannot be constructed out of spatio-temporal relations among bodies. An excellent paper to this effect is Mortensen and Nerlich, 'Space–time and handedness',[13] which shows how the existence of incongruent counterparts, such as left- and right-handed gloves, sabotages any attempt at reducing space–time to a system of relations among bodies.

So far so good. But those authors also distinguish what they call *realism* about space (and hence space–time) from *absolutism*. Realism is the doctrine that space–time must be acknowledged as an entity in its own right, over and above all material entities. Absolutism calls in addition for frame-invariant properties of the space–time and relations among bodies in it. Their argument from handedness takes them to realism about space–time and about spaces (as composed of space–*time* points), but establishes no absolutist results.

That need not be serious for present purposes. If distance and direction are unavoidably relative to a frame of reference, difference of position will have to be understood as similarly frame-dependent. The question will then be whether or not frame-dependent differences in position are purely relational or not.

Since space is real and not a construction out of relations among bodies, position is not essentially a matter of relations among bodies. A single body has position, and would continue to have position even were it the only body in existence. Nevertheless, position seems to be relational still, since it seems to be a relation between the body in question and the space itself. Mortensen and Nerlich speak of *shape* as a relation between a body and space. I take shape to be a construct whose com-

ponents are the positions of the body's parts, but on this view also position is a relation between (parts of) a body and the space they occupy.

Now the critical question is, of course, is this relation between a body (or its parts) and space grounded or not? Is there any foundation for *it*? It does not seem that there could be any foundation in the body itself, since it seems that motion (i.e. change of position) can occur without any other changes in a body.[14]

Then could the space provide a foundation? A real space–time providing absolute position would, I believe, do the trick. There may be many spaces derived by taking different slices from space–time, but in every one of them, the positions are always space–time points, and each of these space–time points is unique. If each is unique, something must distinguish them. If we do not opt for pure individuality, whatever it is that distinguishes them from one another will serve as a foundation for position.

We do not need, fortunately, any very precise idea of what such a distinguishing characteristic might be. For our purposes, we can fancy each point carries a unique label (its name in the mind of God, or its coordinate numbers in some arbitrarily selected coordinate scheme). We can be even more circumspect and say only that each point is distinguished from every other point by the distinguishing characteristic C required by absolutism about space–time.

Now we have an answer to the question: In virtue of what feature of the situation is Body B at Place P? That answer is: in virtue of C, the characteristic in virtue of which P is the place it is. And thus we have a monadic foundation for location, the dyadic relation of *being at*.

The relative position of bodies can be treated in the same way: B_1, is so far, in such direction, from B_2 in virtue of the characteristics C_1 and C_2 of the places B_1 and B_2 occupy.

This would then be another important set of cases of unilateral groundedness. A body could be in several different places, at different times, without any change in the body's intrinsic characteristics. It would be the inherent features of the *location* which would furnish the ground for *being at*. Once *being at* is

accounted for, *being far from* or *being to the left of* will involve only some very natural constructions.

But the world may well be more complex than that. The existence of absolute space–time is scarcely an uncontroversial matter, so it is not satisfactory to rest a case on that possibility alone.

Let us suppose that there is no absolute position, motion or acceleration. Would that imply that there is no foundation for position as a relation between a body and the space it is in? Not necessarily. In the first place, there is space's curvature. The presence of matter at a place consists in an increase in the density of mass/energy at that place, and this is best represented by the tensor that expresses the degree and direction of space's curvature in that region. Now the values in this tensor can be seen as Mach saw the gravitational field; they can be understood as arising out of the total distribution of mass/energy across all of space. In this way each region becomes a sort of monad, 'mirroring' the total situation from its own particular locality. It is at least possible that the upshot is a space which is *everywhere variegated*. Each region may be unique because the net tensor resultant at any one place is different from that at any other. In such a circumstance, the values on the tensor would provide a *de facto* unique description for every place, which could serve as a foundation for position as a relation between a body and its space.

Unhappily, I can see no reason of principle why two different regions should not have tensor values in common, which would wreck the proposal. The foundation for position must at least distinguish different places from one another.

There may, however, be another solution to the difficulty, derived from the physicalization of space. This physicalization involves not just grounding the geometric feature, curvature, in the physical characteristic, density of mass/energy. It goes further and proposes to identify these two, and on such a view the distinction between a body and the place it occupies would indeed become blurred.

The possibility of motion, as we ordinarily conceive it, involves objects that retain identity through change of place. This makes a body and the region it happens to occupy at any given

time distinct entities. Even if the body is at rest, it could move, in which case place and occupant would part company. But were that to happen, each would retain its own identity. Where body and place are distinct in this way, *being at* is a genuine relation between two items, a body and a chunk of space. And as a genuine relation, it raises the Foundationism issue.

The physicalization of space changes all that. Matter is no longer some additional being superimposed upon the otherwise empty spatial or spatio-temporal field. The presence of matter does not add something alien to the original spatial field, it is that very field itself, in a condition of rather higher curvature than so-called 'empty' space. As a consequence, there are no longer two distinct beings, matter and the space it occupies. Full and empty space are now more like a pumped up and a deflated tyre. 'Pumped-up-edness' is scarcely a promising candidate for an additional, superimposed reality.

On this view of the situation, contrary to our common-sense intuitions honed on the world's manifest image, matter and space, or body and its place, would prove to be distinctions of reason only, and not also of reality. But entities distinguished by reason alone are not so distinct as to stand in any genuine relation to one another. A radio wave and its frequency are distinguishable only to reason. So they stand in no real relation to each other.

The programme for physicalizing space – or *geometrodynamics* as it was called, has fallen on rather hard times of late.[15] It seems that we must retain the intuitive distinction between matter and space–time, and treat space–time's curvature as an effect of the presence of a new substance, matter, after all.

Even if the identification of matter with the curvature of space–time is not successful, there is still a more holistic approach worth exploring. Let it be granted that the presence of mass/energy is not identical with, but rather, produces spatio-temporal curvature. Now let us take a *field-theoretical* view of matter, according to which physical reality consists not in distinct and separate bodies moving or at rest in space, but in superimposed fields of force, one for each of the independent fundamental forces current physics recognizes.

This conception is explored more fully in the next chapter.

Here, what is important is that a body's *place* is no longer a merely contingent feature of it. For a body is now a particular sub-region of the superimposed fields. And these sub-regions are not contingently where they are. It is of their essence that they have the location they have and stand in the relations they stand in to all other sub-regions.

What, in the manifest world, is the motion of an identity-retaining body through space becomes an orderly succession of fluctuations in the values of the fields in neighbouring sub-regions.

On this picture of the world, the spatial and temporal relations of neither the fundamental realities (the fields) nor the derivative realities (the sub-regions) are external. It is internal to them how they stand to one another.

When, in the scheme of the manifest image, we insist that this cup, which is on the saucer, could without intrinsic alteration be on some other saucer, or on none, the corresponding field-theoretical description would be trying to say that the sub-region with that set of superimposed force fields which we identify as a cup could be somewhat else. (Or that the saucer-zone could be somewhere else.) But that, of course, is impossible, since parts of space can neither move nor change places.

Adopting such a field interpretation of the cosmos implies that while the familiar objects of the manifest image do indeed stand in purely external and ungrounded relations of distance and direction in space and time, their replacements in the scientific image do not. Purely external relations belong to Appearance only, and not also to Reality. The vindication of Bradley is the last consequence one would have anticipated for the trope philosophy.

5.18 COMPRESENCE

What of compresence, which if not *essentially* ubiquitous, nevertheless relates almost all the tropes we recognize? Since we have separated out and distinguished tropes of place and shape (and hence size), everything spatio-temporal occurs in a compresence tie with its place.

So apart from any possible tropes of the divine, or Cartesian consciousness, probably only hyper-abstractions will lack compresence with anything. And hyper-abstractions are nòt after all admitted as genuine tropes.

Now do cases of compresence have foundations? So long as we confine our attention to familiar examples from the manifest world, it seems not.

If the compresence of a trope T with its place P were to have a foundation in trope T, then T could not move without a change of character. Since trope T has only the 'two' aspects of nature and individuality, one or other of these would have to alter whenever T moved. But since things lose neither their nature nor their individuality by changing position, there is no foundation in T for its position, that is, for being compresent with its place.

The possibility that P might furnish a foundation has already been canvassed above. Its reliance on an everywhere variegated absolute space is a heavy count against it.

Now let us consider the compresence of a nature-furnishing trope T_1 with another nature-furnishing trope T_2 in a compresent complex bundle (an ordinary object of common life such as a fork, for example). In some cases, a foundation for compresence will indeed be available; in those cases where tropes are nomically linked. The presence of hardness and solidity are both linked to the presence of iron. Such compresence links supervene on the tropes of the inner nature of steel.

But this does not extend to independent aspects of forks. The *determinates* of many features seem to be independent of one another: *shiny* and *at 12°C*, for example. Or *soluble in acid* and *weighing 35 grams*. That one member of such pairs can be varied independently of the other, without the fork or its other characters losing their particular identity, suggests that here again we have foundationless external relations.

If we accept the reality of temporal parts, then our basic tropes will be characteristics *at a time*, rather than (perhaps variable) characteristics *over time*, and if anything that increases the scope for the kind of independent variability which counts against a foundationist interpretation of the compresence ties. Our ordinary tropes lack the complexity and depth in which foundations might be found. The apparent independent vari-

ability is also unfavourable to the desperate notion that compresence is an *internal* relation. The desperate idea here is that T_1 just would not be the particular case of hardness it is, were it not compresent, at this place, and time, with all the other present tropes, of solidity, etc., with which it currently coexists.

While we use compresence to *identify*, *keep track of* and *communicate about* particular cases of hardness such as T_1, it is worse than counter-intuitive to propose that T_1's individual identity rests on its compresence relations. For in that case T_1 has all those very same compresence relations in every possible world in which it exists. And this places altogether too harsh restrictions on what is possible. It implies that there are no possible worlds in which our fork is ever given a higher polish, or brought to a higher temperature, at a corresponding stage in its career.

From these considerations it is a short step to the conclusion that no possible world differs from this one. But for a world of tropes similar in character to our manifest tropes of *solid*, *shiny*, *warm* and *fork-shaped*, such a Spinozistic outcome is a *reductio ad absurdam*.

Therefore, if the world is a world of such tropes, restricted to a specific locality, occurring in nomic clusters which are largely independent of one another, capable of independent variation, then the compresence ties between these tropes are unfounded external relations, and the foundationist programme, whatever its merits in other areas, fails for compresence.

This is not, however, the end of the story. In the next chapter I spell out reasons (from first philosophy, largely independent of the reasons from the direction which physical theory is taking), for taking the monism option seriously. In a world of fields the apparent mutual independence of many familiar tropes gives way, on deeper analysis, to patterns of mutual interconnection.

Now suppose, to take the most extreme possibility, the world is a world of fields, and some unified field theory is correct. Then the world contains just two tropes: Space–Time, and The Field, variegated across Space–Time but containing no real, detachable parts.

Now it is contingent, I assume, that there is a world at all. That is, The Field is not a necessary being. But granted that The Field did not have to exist and so did not have to be compresent

with anything, provided it does exist, *it is not contingent that it be compresent with the whole of space–time.*

And correspondingly, if there are several independent fields, it would be contingent that any one of them exists at all, but not contingent that all existing fields are compresent with all of space–time, and consequently compresent with one another.

How can this be? Fields are essentially extended. (Colours are essentially extended, too, providing the classic conundrum of an apparently synthetic necessity.) There is *something* about the electrodynamic or electro-weak field, for example, in virtue of which it spreads across space–time. So that field's compresence relation to space–time does have a foundation in the field term. It is a unilaterally founded relation, whether external or internal I cannot tell (For I do not know whether 'our' electro-weak field could fill some other space–time than 'ours', yet still be 'ours'.)

What provides this foundation? *Either* the electrodynamic (or electro-weak) force itself or some further aspect of that field. I cannot see how to choose between these two alternatives considered in isolation. But since the former both preserves the simplicity of tropes and rescues foundationism, it merits support until shown to be untenable. We meet here a very widespread and crucial example of a primitive synthetic necessity in Nature: fields fill space–time.

6

Fields: Dealing with the Boundary Problem

6.1 IDENTITY IN ONTOLOGY

The philosophy of abstract particulars, or tropes, is in the first place an ontology. Like all its rivals, it proposes a schematic schedule of those items it takes to be fundamental and mutually irreducible. The trope philosophy's schedule is very ambitiously short: it undertakes to furnish a single-category ontology with cases of the basic kinds as the only irreducible items.

All ontologies are bound to spell out just how they conceive their recognized items and, in particular, how they conceive their basic items. What they must propose is an ontological assay of (at least) all normally encountered conditions of the cosmos. This must provide us with a grasp of what assay is being proposed that is elaborate and clear enough for the assay to be assessed.

Providing an ontological assay involves, as a necessary prerequisite, providing identity criteria for items of the kinds that the ontology recognizes. This requirement is particularly pressing for the trope philosophy, since tropes are avowedly particulars, which call for criteria in terms of which they can be counted. And the requirement is even more particularly pressing where, as here, we rely on spatio-temporal location for identifying particular specimens of a given kind of trope. For spatio-temporal tropes it is essential that we be able to specify *where* and *when* one trope ends and another begins. And in this context, 'where' and 'when' bear the most literal of interpretations. Unless rules for counting tropes can be developed, we lack a properly developed theory. And the trouble is that tropes in the

manifest realm seem to generate a whole series of intractable problems about unity, identity and counting.

6.2 MANIFEST TROPES AND THE PART/WHOLE PROBLEM

When we are thinking about the trope philosophy the examples that come most naturally to mind are cases of the sensible qualities, such as colour, warmth, solidity, roughness. Colour patches are dubious specimens of genuinely physical tropes, but cases of primary qualities ought to be no problem and from the viewpoint of the manifest image colours are qualities in good standing. Patches of all these kinds have both location and extent and duration; they are paradigms of the spatio-temporal.

Now in almost all normal cases we are presented with more than the bare minimum of colour, warmth or whatever. A typical colour patch is a uniform expanse larger than the minimum area required for an object to be coloured. Likewise with warm, hard and tough tropes.

In such ordinary cases, are we in the presence of one trope of the given colour or the given degree of warmth, or of many? Either answer has its difficulties, and if we answer 'Both', we abandon any definite notion of a trope. If we take an unbroken uniform expanse of, for example, green, of normal size, and claim that it is just *one* trope, then its left half is not a trope, but merely a part of one. Yet were that left half to exist on its own, it would be a perfectly good trope in its own right.

So by the mere Cambridge operation of painting the *right*-hand half of the original trope light blue, I can change the *left*-hand side from a non-trope to a trope. But the whole idea of *an item becoming a trope* strikes at the heart of the idea that tropes are ontically basic. *Being a trope* cannot have any genuine fundamental status if it can be gained or lost by items that retain their identity throughout the transformation. There would have to be some more basic sort of thing, which can become a trope, or leave off being one as circumstances alter. The truly fundamental is that whose identity remains fixed through all variations of circumstance.

On the other hand, if we take more than minimal tropes to be combinations or unions of many distinct tropes, then we must be able to specify how many. We can begin on that issue by determining the minimum size for tropes of the kind in question – in our green case, discovering how small a green surface there can be. At least *in principle* we can make a start at this point. Progress would be a minor matter involving merely the science of colour, the science of vision, the philosophy of perception, the philosophy of microscopes and the true philosophy of colour, none of which need detain us.

Having established a minimum extent for colour tropes, we can then divide the area of our given original expanse by that minimum. This will determine the number of distinct tropes present. Likewise for other examples; minima for warmth, solidity and roughness will give us the numbers of tropes of those kinds present on any given occasion.

That is as far as we get and it is not far enough. For even if we know how many tropes we are dealing with, we shall still not be in a position to identify *any* single individual trope. For there are, unfortunately, indefinitely many different ways to partition our original green patch, or our warm, solid or rough patches, into minimal areas. This is particularly obvious for situations, like the present one, in which there are no *shape* constraints on how it must be done. Here are four of indefinitely many different alternatives:

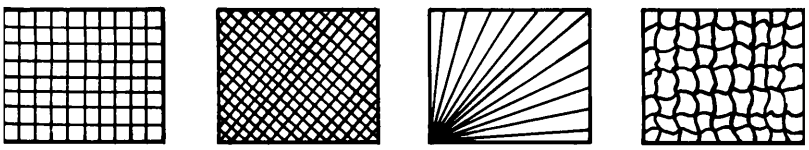


Figure 6.1

The crucial point is that the lines of division between our proposed individual basic tropes can be imposed by our decision. This shows that they are conventional, rather than real and natural. In this respect Nature has altogether too many joints. There is no one way of dividing the original expanse with any experiential or theoretical salience. So there is no basis for taking any division as *the* correct way to partition the whole.

This is not a problem for colour alone: temperature, texture, compressibility, magnetic power are all in the same boat.

We can make the same point in a dynamic context. To vary the example, think of an iron bar expanding on heating. (An ink blot spreading from the nib of an old-fashioned fountain pen would have served to make the same point.) Unless we resolve tropes into *instantaneous* temporal parts, we face a dilemma: is one warm trope getting larger? In that case the original expanse of warmth, which is, of course, still there and still warm, used to be a trope but is no longer. Now, while still just as it was, just where it was, it is now merely part of a trope. So here again the supposedly fundamental items, the tropes, take on a derivative status.

Suppose we take the other alternative, holding that new warm tropes are being added to our originals. How many new tropes are being added depends on their shape. What shape are the new? Are all warm tropes the same shape? If so, what determines that that should be so?

Counting tropes in this context is either impossibly hard or disgracefully easy. It is impossibly hard if we treat is as the task of discovering purported real boundaries between tropes, where there are no such realities to discover. It is disgracefully easy if we insist that any pattern of division we choose is an acceptable one.

6.3 SPECTRA AND THE BOUNDARY PROBLEM

If we take manifest tropes seriously as candidates for fundamental status, as Donald Williams did, a second problem becomes urgent.[1]

Again colours provide examples that are easy on the imagination and not misleadingly atypical. Colours occur as a spectrum with each hue *shading into* the next. Temperatures occur as a continuum, at least so far as the limits of measurement will take us. Size and shape admit of continuous variation; sounds, and tastes, likewise.

With tropes of some of these kinds, this gives rise to boundary problems in the literal, spatial sense. Just where, in that rainbow

over there, does indigo give way to violet? As that ice-block melts in that glass of whisky, where exactly does solid give way to liquid?

All attempts at insisting on sharp boundaries within spectra seem doomed to failure. If we allow no variegation across the extent of any one given trope, we are committed to an atomist path, one which comes to rest only in *point* atoms. We must resolve the continuous variations in our world into an infinity of distinct items with indistinguishable neighbours. And because the transitions are smooth, there is no natural break between one of these items and its neighbours. Even on a quantum-theoretical view, continuous variation in wave-length is recognized and generates the same difficulty.

On the other hand, if we do allow some variation across a trope, the inevitable decisions about how much variation to allow will be under-motivated by the objective situation. There will not be any real feature of the situation indicating that one particular place is the right place to draw the line. As a result, the decisions about where to draw that line involve an altogether excessive anthropocentrism. The identification of the world's fundamental realities should not depend in this way on human choice or fiat.

Corresponding to the spatial spectra are temporal continuities. In abrupt changes, the trope philosophy describes the situation as one in which first one trope (of one kind) is present and then another (of a different kind). But what about the situation of an iron bar slowly heating up? Here is change sure enough; but is it trope replacement? If so, at what rate – one new trope per degree centigrade? Or more, or less? Or, if we regard the temporal parts as the real tropes, are they being replaced at the rate of one per second, or more, or less?

Here again, there seem to be no natural lines along which Nature admits of partition. But if tropes are really basic, the line between one trope and another, even another of the same general kind, is as deep and as natural as anything can possibly be. The elements of being should not come with indeterminate boundaries, either spatial or temporal.

6.4 TEMPORAL PARTS

Continuous, gradual change gives anyone trying to count tropes a headache, but what is perhaps worse, plain stolid uniform unchangingness yields problems too.

There may be well a minimum duration for any trope whatever. This would imply that there could not be any literally instantaneous colour, temperature, mass, magnetic field or whatever. In my opinion, that is a contingent issue and can be left to the experts. Current expert opinion suggests that there is a finite minimum time for any occurrence. Whether *being green* is an occurrence, I am not sure.

It does not matter for our purposes here, since even if there are such minima, it is plain that many manifest tropes endure for far longer than the minimum. Now consider such a long-lasting trope. Think of the first half of its life. Should whether or not this first half is a trope in its own right depend on a sheer contingency, the contingency of whether or not an abrupt change occurs at the end of that first half?

Supppose our trope is the high temperature of a cook-top gas burner. For the first half of its being, this trope was boiling a kettle of water. For the second half, it was steaming a dish of asparagus. Here we have two different causal transactions, and in a trope philosophy, all causes are, of course, tropes of one kind or another, since nothing else is available. Where we have two different causes we should expect at least two different tropes. The cause of the kettle's coming to the boil was, one would suppose, a different trope from that which steamed the asparagus. The kettle-boiling trope was present *and complete* before the asparagus got near the stove.

Or think of the solidity of a squash court's walls. Only a tiny temporal fragment of solidity is causally operative in the ball's rebounding on one particular occasion. The components of the solidity before and after the impact are causally irrelevant.

So, it would seem, we have good grounds for recognizing as distinct tropes the temporal parts of familiar manifest tropes no less than their spatial parts. Then problems over counting and indistinct boundaries arise again to vex us. Especially for those tropes, if any, for which there is no minimum duration.

Even where there is a minimum duration – as I suppose there is where solidity works to bounce squash balls back into play – the time is very short and can perhaps be reduced indefinitely by increasing the velocity at which balls hit the surface. The time-spans we are dealing with here are so small that we cannot settle the number of temporally distinct solidity tropes in an ordinary macro-object like a squash court wall by working out the minimal duration for solidity, then counting forward from the creation of that wall. For the processes that brought the wall's solidity into being are not sudden, especially for concrete walls, and there is an indeterminancy over just when they were first completed, of the same order of magnitude as the time involved in rebounding a ball. So it will be indeterminate where to begin. Consequently, it will be indeterminate where each succeeding minimal solidity trope ends and the next begins. The attempt to furnish identity criteria for tropes will have failed here too.

6.5 CHANGE

The trope philosophy's theory of change is, at bottom, Aristotelian. Every real change involves trope replacement – if trope A gives way to trope B, where $A \neq B$, a change has occurred. If A and B are of different kinds, we have qualitative change of the classic type. What was green is now red (as apples ripen). What was solid is now liquid (as ice melts). What was shiny is now dull (as iron rusts).

Trope replacement is a particularist analogue of the displacement of one form by another in the Aristotelian scheme. So, unhappily, trope replacement shares in that scheme's inadequacy. An Aristotelian account of change involving tropes admits of two different conceptualizations. As *trope replacement*, one trope disappears and its place is taken by a brand new creation, a trope that has not hitherto existed. The trouble with such a theory is that the whole process remains absolutely obscure and magical. Where does the original trope go? Where does the replacement come from? How does the new trope nudge the old one out of the way? There is no machinery to manage the transition. It is this lack of appropriate machinery which gives

Aristotle's Form Replacement account of change its wildly implausible air.

For a philosophy in which abstract particulars are fundamental, there is no hope for rescue here. Machinery is not to be had. If tropes are basic, as the theory requires, they cannot be conjured up or extinguished by any systematic and intelligible process. Any such process would involve underlying entities and would thus convert tropes to ontologically derivative denizens of the cosmos.

Alternatively, we might propose not that one trope is replaced by another, but that it is *transformed into* the other. But here again an almost irresistible tendency of the mind will be to conclude that the Before and After tropes are variant forms of some common, deeper, item or stuff. It is no accident that classical atomism was for so long so widely popular. Its basic items are neither created nor destroyed in any natural interaction, and they undergo no intrinsic alterations at all. Rearrangement is the extent of the changes asked of them: there is at the basic level neither replacement nor transformation to contend with.

6.6 RUSSELLIAN EVENTS; A TROPE ATOMISM

The considerations touched on so far lead us to conclude that a problem-free trope ontology would do well to find basic tropes which are partless, changeless and with unambiguous boundaries. And, in fact, there is just such an ontology extant. It is the event ontology of Russell's *Analysis of Matter* (1927). The basic particulars are *atomic tropes*; they are the occurrence, at a place in space–time, of a quality. Each of these occurrences is a case of a kind, that is, an abstract particular or trope. Each occurrence is of minimal extent; perhaps even strictly a point. The actual extent of an atomic trope depends on the details of the theory of each different kind of trope: is the electromagnetic field, for example, continuous or quantized? The occurrence of an electromagnetic field strength trope in an appropriate space–time region will count as an event.

Events of similar kinds can, and commonly do, occur next to or near each other in both space and time, and events of different

basic kinds can be superimposed on one another. By these means the familiar complex concrete objects of the manifest world can be constructed.

Being of minimal extent in both space and time, Russellian events of kind K have neither spatial nor temporal parts which are themselves events of that kind. Such tropes are wholly and strongly non-dissective; in this way the problems about unity and counting which arise for tropes with parts disappear.[2] Only compound, derivative tropes are dissective.

As temporal atoms our Russellian tropes are, of course, changeless: we have either a string of extremely similar tropes parallel to the time axis (this is what, in the manifest world, counts as stability and rest), or we have a string of more or less systematically and more or less dramatically different atomic tropes. Sequences of the latter type constitute change or motion in the macro-world: rotating, or rusting or burning up, for example. In neither case does any Russellian event trope move, change, grow, shrink or fade. So no change problems arise. On a four-dimension view of the cosmos, past, present and future are equally real, and the 'changes' of Coming-to-be and Passing-away need not be provided with any underlying mechanism to produce them.[3]

6.7 RESISTING THE RUSSELLIAN TEMPTATION

So far so good. There are, however, two reasons for not pursuing the trope philosophy to a Russellian resolution. They concern cohesion and space or space–time itself. The cohesion problem is this: in the manifest world, there is a clear and important difference between granular and genuinely coherent solids. Compare sculptures made from sand with those carved out of ice. Unitary solids cohere across both time and space. An ice sculpture is significantly different from a loaf of sliced bread in both spatial and temporal dimensions. These differences must, of course, be accounted for.

But the Russellian event ontology seems to be inherently and unavoidably granular. Why do some contiguous families of events form much more coherent bodies than others? They must

have an internal binding force. But it seems that this internal binding force, relational as it is, should *suffuse* the coherent body. Otherwise, it is hard to see how a *granulated* set of event tropes, supposed to be the ground for the coherence of a body, can actually do any binding.

If the binding agency is suffused, it has considerable extent-cum-duration, certainly more than the indivisible minima. In which case the problems over parts, over boundaries and over change at once emerge again, this time with respect to the Bindingness tropes.

I do not claim there is no strictly atomistic escape from the cohesion problem, only that any pure atomism will, it seems, need to appeal to inexplicable binding effects of granular tropes.

The first problem over space or space–time is the Kant–Nerlich–Mortensen problem. Enantiomorphism, of which non-congruence of left- and right-handed gloves is the most familiar manifestation, is a fact about the cosmos we inhabit.[4] It is a fact that decisively refutes all Leibnizian relational explications of space–time. Space–time has a reality and character of its own, independent of any matter or energy it may hospitably receive.

Space–time cannot be constructed from punctual events, nor from space–time points, nor from minimal space–time quanta. For such constructions fail to capture the enantiomorphism.

Although somewhat thin and transparent, pure space–time is a unitary, distinct reality. I accept this conclusion of the argument from enantiomorphism. But the very thinness of space–time as a particular makes it extremely natural to accord to it a tropist rather than a classically substantial character. So here is at least one trope that is very far indeed from minimal extent-cum-duration. Tropes do not, in fact, come any bigger. Thus a pure trope atomism of the Russellian event sort breaks down.

There is a second difficulty that space presents for a Russellian granular world: space is expanding as time goes on. So each of the events at time t_1 will have a successor in the same place at time t_2 which will be swollen relative to its predecessor. Or, if events at t_2 are no larger than events at t_1, there will be more events at t_2 than at t_1. Neither process, swelling nor giving birth to twins can have any explanation if literally nothing perdures from t_1 to t_2. This aspect of reality would consist of myriads of sheer brute facts.

Perhaps it is necessary to admit some brute facts. But such things should not be multiplied beyond necessity.

6.8 THE FIELD APPROACH TO THESE PROBLEMS

What we need, therefore, is a set of items, different from the atoms, which are nevertheless like them partless, changeless and without boundary problems. This is a tall order, but space–time itself provides an example and a clue. For all we know, even if it proves to be finite, space-time is unbounded. Getting to the edge of space has been recognized as at best a paradoxical possibility since the time of the Greeks.

And space–time has no true parts. For simplicity's sake, let us consider space alone. The subdivisions of space are not parts from which it is built. They cannot exist independently of the whole and then be assembled into more and more inclusive structures. They cannot, of course, be moved about to join in forming wholes, nor can they be selectively abolished. If there cannot be a hole in space, there cannot be a true part filling the place where the hole cannot be.[5] Space has merely quasi-parts. They belong to space as vortices and eddies belong to a flowing river; the quasi-parts of space, unlike real parts, depend on the whole for their existence, and not vice versa.

As for change, how does space fare in that respect? Space is said to be growing: in a four-dimensional view of things, later spatial cross-sections are larger than earlier ones. Space has a certain changelessness, nevertheless. Even if later temporal slices are larger than earlier ones, this is not a process of trope addition. New tropes are not being added to old, since the additions are not true parts and so are not additional tropes. Nor is the process one of trope transformation, since no new kind of trope is appearing in place of the old.

A better picture is of all space's pseudo-parts swelling simultaneously. This involves rejecting the division of tropes into ultimate temporal parts. Then the swelling of space becomes a harmless kind of change, generating none of the problems we encountered in considering change of tropes themselves. No creation or annihilation is involved, since we allow the very same trope to become larger, and for the same reason no replacement

mechanisms are required. In this way the swelling of space corresponds to re-arrangement as the harmless kind of change recognized in classical atomism.

Taking our clue from space–time itself, we now propose that all the basic tropes are partless and edgeless in the ways that space is, and that they change only in space–time's innocent way. All basic tropes are space-filling fields, each one of them distributes some quantity, in perhaps varying intensities, across all of space–time.

What are the plausible candidates for such cosmos-filling basic tropes? The ones that spring to mind first are those we already think of as having field characteristics, the fundamental forces recognized in contemporary physics. So we postulate superimposed fields for gravitation, electromagnetism, the weak and the strong nuclear forces.[6]

Those forces are ordinarily thought of as exerted by bodies, which are not themselves fields, having appropriate features – mass, charge, etc. – in virtue of which the bodies generate the fields. To sustain a field version of particularism we shall need to interpret the existence and the properties of such bodies in field terms. This will take us beyond the more familiar fields they are regarded as generating.

A *matter* field is called for whose determining property is inertial mass. And that is now by no means such a bizarre notion as it once was. Contrary to rough experience, and contrary to classical atomic theory, matter does not occur in discrete chunks with completely empty space between. The Planck indeterminateness over location and momentum requires us to think of matter as spread out, as present in varying strengths across a region and as lacking any sharp boundaries to its location. Further, in accordance with special relativity there are alterations in the quantity of mass as velocities approach the speed of light. Still further, there is what is in effect a photon mass wherever there is electromagnetic radiation. And that, of course, is everywhere.

Interstellar space is full of energy-bearing particles (or waves) of many other kinds too, and most of these can be seen as centres of non-zero intensity of local inertial mass. Matter is not either fully present or completely absent; it is present with more or less intensity across all space–time.

Taking Einstein's views of gravitation seriously, gravity is not a force exerted by each body on every other, but an effect of matter on the curvature of space–time. This is a case, on our matter field view, of the coupling of one field to another; for space–time can be conceived as the most ethereal field of them all. The inertial mass field, suffusing space–time, is linked to it at every point. It imposes a curvature, and the curvature varies from place to place in accordance with the variations in the intensity of the inertial mass field. The curvature alters the geodesics (the lines along which inertial motion will occur) to produce an imitation of acceleration without the impress of a real force.

There was a time when it seemed that the presence of inertial mass could be identified with the curvature of space–time, which has just been described as an effect of the mass. Identification was the programme of geometrodynamics; this programme has run into severe difficulties and is not now regarded as likely to be successful. This is a pity, since the elegant economy of the idea is so appealing.

6.9 PARTICLES

The electromagnetic field introduces a second coupling problem. We must, of course, consider how one field's state is a function of another's as, for example, charge accelerates a proton, or, as this would be described in terms of a field theory, how values in an electric field induce systematic variations in the intensity of local inertial mass, along a line in the mass field. But we must also rethink the issue of how a field relates to the bodies, the particles, which are ordinarily thought to generate it. The electromagnetic field is generated by charged particles and electromagnetic waves are produced by accelerating such charged particles. Now what about these particles? I think that it is possible to begin by ignoring the particle and concentrating on the charge on the particle. It is that charge which generates a field and produces radiation, and that local 'particle' charge can be interpreted as a small zone of high intensity of the field property itself: electromagnetism. Then when we turn to the particle, the proton or electron will, of course, represent a zone of high intensity in

other fields as well, of inertia, or hadronic force, for example. Particle physics has been so successful because these zones of concentration tend to coincide. The various fields typically link up and march in step with one another. A zone in which several fields all sharply increase their intensity is conceptualized as a single entity, the particle.

The particles, from the field point of view, are thus derivative individuals. They are complexes, superimposed zones of intersection of the flickering and transforming values of the basic underlying fields. The patterns of the dance in which particles combine, divide and decay are created, according to field theory, by the restless shuffles and re-shuffles of the eddies and vortices of these interpenetrating, space-and-time-filling, thin particulars, the field tropes.

The hadronic, or strong, nuclear force both binds quarks to one another and holds together the resulting heavy particles, such as protons and neutrons, in the atomic nucleus. Quarks are smudged points of intersection of inertial, electro weak and hadronic fields.

The entire sub-atomic bestiary, of pions and muons, neutrinos, W bosons and Ψ hyperons, etc. can, so far as I can tell, all be subjected to this interpretation as zones of commonality and linkage between various local levels of intensity of the quantities present in some or all of the basic fields.

On the field cosmology, there are just two fundamental kinds of process, one quasi-causal and the other genuinely so. First, there is the quasi-causality involved in the transmission of the field quantity across that field itself: the wave radiation of electromagnetic energy is of this type. So is the causal persistence of matter from one time to its near successors, which is the transmission of a mass-density along the time axis. This persistence, which gives the world its familiar stability was once thought to be absolute, but it is now known to be subject to the famous variations expressed by $e = mc^2$, and mass itself can, in some circumstances, disappear. These processes are quasi-causal because their terms are sub-regions of a field. Sub-regions of a field are not really separable parts and so count only as quasi-tropes. The orderly transformations in which they are involved are hence quasi-causal.

Second, there are real causal links between one field and another. Matter annihilation with the production of gamma rays, is an example of such a link. Chemical explosion, which transfers energy from the electromagnetic field to rates of change in the matter field, is another. When a flame heats water the energy of combustion in the electromagnetic field links to the matter field, producing the agitations described in the kinetic theory of heat. Then there are back linkages if the heated water drives an alternator.

These changes are changes in the distribution of the field quantity across the spatio-temporal extent of a field, and they are produced by comparable changes in another field that is superimposed on the first and totally interpenetrates it, each touching the other at every point.[7]

The processes of causal interaction here are direct; they are not carried by any mechanism. We are at a level too basic to admit any underlying mechanism. In each field there is a fundamental power to affect other fields. We sum up the patterns of these interactions in basic laws of nature, which are generalizations, probabilistic perhaps, about the fundamental 'ways of working' of the cosmos. Other more superficial generalizations may derive from these basic ways of working. Or they may be mere coincidences.

This way of looking at the world, though it be Humean in admitting no connecting intermediary between cause and effect, can nevertheless distinguish, in terms of the world's ways of working, between a law of nature and an accidental invariable sequence.

6.10 A JUDICIOUS INSTRUMENTALISM

What about the famous odd features of the particles – spin, isotopic spin, baryon or lepton number, strangeness, bottom or charm? These terms are not the names of forces. They do not pick out causal characteristics, properly speaking. They do not specify basic powers to bring anything about. Rather, they are quantities or qualities postulated to specify restrictions on the otherwise chaotic range of possible interactions, and so to bring

order into our theories of the micro-world. These odd and unpictureable features enter into conservation or transmission laws which rule out certain lines of development. They serve to place limitations on the effects which proper forces can produce when brought to bear.

This invites us to invoke Plato's dictum that power is the mark of reality: where a theoretical item has no distinctive effects, it should not be accorded real ontic status. We are all, for example, excluding *trends* from our inventory of the world's denizens, on precisely this ground. To talk of trends is to talk of patterns in events produced by *other*, effective entities. We are instrumentalists about trends.

And we should, in the same way and for the same reason, be instrumentalists about those features recognized in physical theory which do not themselves involve a distinctive pattern of produced effects. Baryon number, strangeness, and quark charm are all examples of just such qualities. No field should be invoked whose defining quantity is any of these.

Given an instrumentalist interpretation, as specifying the directions in which there are restrictions on the coupling of one real field with another, our notorious inability to model these features ceases to be a problem.

The same line of thought will lead us to make a clear distinction between ontologically genuine waves, such as those in the electromagnetic or gravity fields, and the 'probability waves' in the quantum description of, for example, electron orbits. These probability waves are not causes, not fluctuations which can themselves link to other fields. They are expressions of the failure of our real fields to be definite in their distribution of other real values, for example, intensity of electric charge.

Particles are real in so far as they are derivative intersections of field fluctuations. They are not real separable objects nor real parts of the fields in which their characteristics occur. For fields, like space–time itself, have no real parts.

A scheme which limits the real features to the properly causal ones excels in economy. How many physical tropes are there in the world? If we include space–time, and the weak nuclear force is independent, five; otherwise, four. A satisfyingly small number, satisfyingly definite.

The philosophy of mind may well lead us to conclude that a purely physical schedule of tropes is insufficient. That is the issue of the adequacy of materialism; the two great stumbling-blocks to a materialist account of mentality are, of course, the intentionality of thought and the *qualia* in sensation. If, for the sake of argument, we suppose that both these aspects of consciousness resist reduction, we shall be required to add one or more kinds of *consciousness* tropes to our basic schedule.

But even here, a space–time-filling field kind of trope is an attractive conjecture. For the facts of continuity, among living forms, and in the embryonic development of each individual, invite interpretation on a basis that accords mentality in degrees rather than in any yes–no fashion. And these lower and higher degress of mentality can be spread through the regions occupied by less-and-more convoluted combinations of the physical fields. The continuity problem, for irreducible mentality, invites a panpsychist solution.

This will add field-like mental tropes to the interpenetrating physical fields. And in keeping with our Platonic insistence on real causal power for all fields, additional non-physical fields will bring with them an at least one-way, and probably two-way, Interactionist view of the mind–body problem.

This would still be a notably sparse ontology, and such economy is universally regarded as a philosophical merit.

Moreover, on this scheme each of the basic tropes occurs exactly once. There is, at this basic level, no recurrence. So one of the most powerful of the drives towards recognizing universals, that they alone can explain recurrence of qualities, just does not arise for the really fundamental cases.

That each of the basic tropes occurs just once is no accident. On a holistic field approach, it is implicit in the idea that there is just one cosmos.

6.11 QUASI-TROPES: RECOVERING THE MANIFEST WORLD

The manifest world is a world of things rather than of fields. It is dominated by concrete, medium-sized specimens of dry goods,

limited to small parts of space and time, distinct from one another, highly complex. It is these familiar objects, such as toothbrushes and loaves of bread, which make life liveable. Their salience is responsible for substance ontologies, and for the natural impulse to take as the paradigms of tropes characteristics which seems to be confined to a specific local existence.

The world of fields dethrones such tropes, of course. But it cannot simply dismiss them. They must be given their due; they are not illusions, and they are not fabrications; they are *well-founded appearances* (at least), and must be treated as such. So, if they are not to be accorded straightforward reality, we must be able to explain, on the basis of what truly is, why the manifest world seems to be as it is.

It is not, in my view, too difficult to provide the required account. The density of mass/energy (which is a composite measure of the local values of our five field tropes) can vary very sharply across very short distances: this is what gives us, in manifest experience, objects with what seem to be sharply definite surfaces, existing in a quite distinct medium, such as the atmosphere. It is sudden transitions in the local values of the fields that lead us to think in terms of definite, located characteristics, such as the temperature, acidity or magnetism of the body we are investigating. We can in thought separate out from the field small, bounded subsections of that field (and the other fields that exist in that place) and treat these complex subsections, abstracted in this way, as though they were separate entities. We can treat what are eddies in a stream as if they were bricks in a wall.

Let us call a spatially restricted subsection of a field, which we have already noted is merely a pseudo-part, a *quasi-trope*. Quasi-tropes are not figments, as already mentioned. They are not human inventions. But there is an element of human relativity in which quasi-trope boundaries strike us as significant; and once a quasi-trope has been singled out as significant, an element of choice in quite where its boundaries lie. It is to some degree up to us where we draw the line between the different colours, the different smells or the significantly different impenetrabilities, textures or temperatures that make up our familiar manifest world. As our iron bar heats up, do we have one, changing

temperature trope or many (how many?) successive replacements? The issue is one for decision and convenience. That very fact shows that where the heat of an iron bar is concerned, not real tropes but merely quasi-tropes are involved.

Quasi-tropes have all the indecisiveness over identity and counting that we would expect where what is involved are quantum-fine gradations. Gradations so small are, for humans, effectively undetectable. So far as our experience of them is concerned they could well be genuinely continuous. Yet despite this apparent continuity, they are having borderlines laid down for them. There is no hope of counting quasi-tropes, except by using conventional or arbitrary rules. But just because quasi-tropes *are* quasi-tropes, this does not matter in the slightest.

A quasi-trope is a chunk of field trope, treated as if it were a distinct and independent item. Although we can conceive of such chunks as enjoying an independent existence, what is conceivable outruns what is possible at this point. Our familiar world of objects, of wattles and gums, tables and chairs, mountains and lakes, consists in non-frivolously selected co-located chunks of this kind.

The co-location of a complex concrete object's properties is a supervenient fact. It arises from the location, i.e. the specific coincidence with a region of space–time, of a region of relatively high value of several field quantities.

That there are such complex objects, which encourage a substance philosophy of many independent bodies, I take to be entirely contingent. Indeed, Big-Bang speculation takes us back to a time when space–time and all its fields yielded just an almost smooth, hot putty. That, nowadays, there seem to be no charged objects without mass (i.e. no zones of high charge intensity but low matter intensity) is a contingent matter of how the fields are causally coupled. It is patterns of causal linkage like that which give rise to bodies with the complex, localized, physics and chemistry which make up the familiar material and living realms.

The ontological reality underlying substance thinking is the compresence of tropes one with another. A substance, traditionally concerned, was a complete, even if finite and local, and self-subsistent or independent entity. What the field view en-

dorses is the completeness; it repudiates the self-subsistent independence. For tables or apples consist in dependent quasi-parts of real tropes. A genuine substance is a total set of coincident tropes, and on the field view, each of these tropes is a field. Since they are all coextensive with space–time, they all coincide with one another always and everywhere.

Thus if we wish to continue with the concept of substance in our metaphysics, we would reach Spinoza's conclusion, that there is just one genuine substance, the cosmos itself, with the fields as its modes.

Our ordinary causal judgements, judgements about particular changes brought about, or particular states maintained, in the familiar world, are expressed in terms of quasi-tropes. For example, the gas flame boiled the kettle. Such judgements are true or false depending on whether the underlying causal relations within and among fields would in fact give rise to just such a quasi-trope sequence. They differ from mere sequence judgements, such as: first the gas lit, then the television programme came to an end, which have no deep order of connections to sustain them.

The stuffs the world is made of – gold, copper and tin, for example – are local, derivative, peculiar combinations in the strengths of the underlying fields. To put it more familiarly, different kinds of stuff occur where there are different patterns of electrons and nucleons. Our interest in such chemical substances is in the ways the constituent quasi-tropes resemble and differ from others in other places. We are not intent on singling out bounded individuals, and any occurrence of the appropriate quasi-trope complex is as important as any other. Nevertheless, very much as bodies do, the chemical elements exist in bounded samples. They are spread through the world like a shifting archipelago. They are natural kinds, even if not ultimate natural kinds. And specimens of them, local chunks of the archipelago, are one sort of familiar object in the manifest world.

It is a wise philosophy that can arrange to avoid answering such questions as: at what point, exactly, in converting a metal into a plasma, has the metal ceased to exist? Or: are two isotopes of an element two different stuffs really, or not? Although categorizations like metal/plasma or element/isotope are not arbi-

trary, there is an element of human purpose and of salience for humans in these and many other of our everyday, technological and even scientific distinctions. On the field version of the trope theory, what such categorizations yield is not the deep fully objective real tropes, but a world of appearances. Where categorization is well done, the appearances are well-founded and the quasi-tropes deserve their place in our cosmology. They constitute the manifest world.

7

The Human and Social Worlds

7.1 THE PHILOSOPHY OF MIND

The philosophy of matter, discussed in the previous chapter, encourages an holistic view of space, time and matter. It tends to the conclusion that the best way to conceive of the cosmos is as a collection of some few field tropes, each filling all space-time, each thoroughly interpenetrating and coextensive with all others, each acting on the others to generate the transformations over time that make up the world's history.

This vision allows that we can accept and treat of derivative, local tropes, such as the mass or shape of manifest objects, as measured in a specified reference frame. These local derivatives arise out of locally restricted sub-regions of our basic fields. So nothing in the field philosophy of matter prevents us from developing our understanding of particular, local, physical complications, such as the manifold complexities of a human brain. All these complexities of material structure and biochemical process will be, ultimately, matters of very local, very various and systematically varying strengths in the fields. But it will be perfectly possible to ignore that fact, and proceed directly to the study of the chemical and electrical phenomena. And it seems well established now that this is the level at which processes and patterns significant for mental life are located.

As ever, it is important to remember that the derivative is not the unreal. Although none of the basic items in the world is a Texas longhorn, it does not follow that there are no Texas longhorns. All that follows is that in so far as there are Texas longhorns, these must prove on investigation to be compounds

of, or in some other way derivative from, whatever are the basic items. In a philosophy of field tropes, Texas longhorns will be local subregions of our superimposed fields, distinguished from other subregions by the detail of their interior variegation (and, to some extent, the detail of their exterior contour).

Likewise, brains and their electro-chemical workings, while not themselves fields, are complex subregions of the fields, and in that way, and for that reason, perfectly real.

On such a view, if we start with the fields of physics only, brains will be physical, and will, in particular, be physical, local-and-manifest trope complexes. The existing debate about the adequacy of physicalism as a philosophy of mind will continue, couched now in terms of tropes and their relationships rather than of substances, universal properties, or processes, but making essentially the same points on either side.

7.2 MATERIALISM WITH TROPES

Certainly a trope philosophy can be materialist. It has available to it all the strategies for avoiding a genuine metaphysical dualism that are open to a substance philosophy. Local, apparently mental tropes can be subjected to strict reduction, as in a behavioural dispositional analysis of *being a cook*. Or they can get functional treatment, as with *believes it will rain*. Here it is, strictly speaking, not the (universal) type *belief-in-imminent-rain*, but the tokens of this type which are given a functional role account. The trope philosophy is ready-made to endorse and absorb the development of token–token rather than type–type identifications of mental with physical/functional states, such as we have witnessed in recent years.

Those reductive accounts that identify a mental state as a gestalt phenomenon, such as *wearing a happy smile* or *having a daring and aggressive style at chess*, can similarly be taken over and used in the trope context. Attempts to cope with sensations such as *seeing red* as gestalten whose constituents are neural events and/or processes similarly need only be interpreted as concerning themselves always and only with tokens to be directly assimilable within the trope view.

All such treatments, if not strictly reductive, involve claims that the mental supervenes on the physical. In our ontology, such reductive treatments will make the claim that local mental tropes, whether manifest or unmanifest, supervene on local complexes of subregions of the field tropes. They will thus be in a sense doubly supervenient. There is nothing wrong with that: the derivative is not the unreal. As we shall see, social phenomena may well be trebly, or even more indirectly, supervenient.

7.3 TROPE DUALISM

Now although the field-trope view admits of materialism as a metaphysic, it does not require it. This is a merit of the position. The philosophy of abstract particulars is an ontology, a first philosophy. It should leave open, as far as possible, such plainly *a posteriori* issues as whether the world contains non-physical realities. The debate between physicalism and dualism belongs to what D. C. Williams distinguishes as 'speculative cosmology', and although he himself took the physicalist side, he thought this matter could only be settled by considerations additional to those which recommend abstract particularism.

This is plainly correct. Abstract particularism can perfectly well admit tropes of two (or more) mutually distinct basic kinds. In the absence of the idea of sorts of stuff (matter, spirit) or sorts of substance (bodies, minds) as distinct basic categories or entities, quite what makes a mental trope *mental and not physical*, rather than *physical but idiosyncratic*, is a delicate matter. My own view is that the attempts at physicalist interpretation of mentality have scored some permanent successes, especially using the functional strategy. Which amounts to conceding that at least some mental tropes turn out to be (derivative) physical tropes. Having set those on one side, the issue becomes whether there are other mental tropes that turn out not to be derivative physical ones. Here the traditional view maintains its appeal: the distinguishing mark of the non-physical mental tropes is involvement with one kind or another of *consciousness*. Sensations (*qualia*), intentionality (understanding) and emotion (a combination of these two) are exactly those mental phenomena that

so stoutly resist physical glosses and that incorporate consciousness.

Abstract particularism can be physicalist, or it can have a dualist stamp. There are two ways – the traditional two ways – in which it can be dualist. The first, the panpsychsist way, has already been mentioned. A new basic space-and-time-filling, variegated field-type consciousness trope can be added to the physical ones already recognized. And then the programme would be to exhibit the non-physical mental phenomena of the cosmos as arising out of, or deriving from, the local special variegation of the conscious trope, and its commerce with the local physical fields. A vision and programme reminiscent of Spinoza and subject to the same credibility problem: it flies in the face of the apparently extremely localized and scarce nature of manifest conscious mentality.

The second way is to accept that conscious tropes are not just special in their non-physicality, but that they are a new type of basic trope which, it turns out, is restricted to some few particular sub-regions in space–time, which prove to coincide with specially complex physical field convolutions. This, the *local and rare emergence* view of non-physical mentality, has, of course, its own credibility problems.

But it must be emphasized that these are less severe on the trope philosophy. For according to that philosophy, token characteristics can exist just as themselves, unaided and unsupported. Even if they are non-physical, they do not require a complete new substance to be their bearer. They do not call for a special kind of stuff, with indefinitely many unknown and unsuspected further features, to make non-physical mentality possible. In this way the trope view is more receptive to dualism than most of the ontologies in implicit use in the materialism debate.[1] Abstract particularism is certainly compatible with physicalism, but it does relieve some of the pressure towards reductionism, whether of the strict or of the more plausible supervenient kind, which a science-oriented substance/property ontology generates.

Another vexed issue on which the trope ontology need take no sides is that between wide and narrow psychology. The question is whether the semantic value of a psychological state is fixed by

the internal economy of the mind alone, or if a wider physical and/or social environment needs to be taken into account. 'Narrow' partisans affirm that meanings are in the head, their 'wide' opponents deny it. But either position is capable of expression in terms of tropes and able to be absorbed into a trope system. For as we have seen, derivative tropes with all kinds of boundaries, and any kind of internal variegation, can be carved from the full space–time fields. Which ones it is worth our while to single out is not a matter of choice, convention or decision, but rather a matter of which boundary lines leave us with classes of (derivative) resembling tropes whose regularities of co-occurrence and sequence lend themselves to the building up of scientific understanding.

The philosophy of abstract particulars, *per se*, need take no view on how large is the trope of *Albert's thinking of Vienna*, nor on what, precisely, it contains.

It is no easy matter to specify the circumstances under which one has satisfied the conditions sufficient for establishing that Bs supervene on As. But general considerations of economy – Occamite principles – establish a presumption in favour of supervenience where Bs cannot be shown to provide any distinctively new, non-dependent, aspect of any situation.

This gives us at least one touchstone for the *failure* of supervenience claims. Bs do not merely supervene on As if, whether or not it is As that bring them into being, Bs have causal powers of their own. It is independent causal power which is the most unambigous sign of first-class, additional reality in any emerging entity.

So if we take the view that consciousness has not been present from the foundation of the world, but rather has emerged relatively recently, this still leaves open the question of whether or not consciousness is supervenient, or in some other way reducible. Children derive from and emerge from their parents, but do not merely supervene on them. And the best test of that is that the offspring are capable of bringing about their own effects in the causal network.

This most unequivocal mark of dualism, the independent causal power of the non-physical, is however just what is hardest to find. And many find the incompleteness of the physical causal

net so implausible an idea, that this provides a major motivation towards physical reductionism. In the case of the *qualia*, the felt or experienced character of sensations, for example, the idea that each sensation is carried by (occurs only in the presence of) a distinct neural state, is so common as to be orthodox. And on that view, an independent causal role for the *quale*, in distinction from its neural base, would be extremely difficult to establish. This is so, notwithstanding our intuitive conviction that the felt pain caused our wince, or the seen character of the green paint caused our appreciation of the painter. For intuitions about causes are far from infallible, even in cases of our own mental causation.

It is for this reason that defenders of the irreducibility of the *qualia* tend not to seek to establish any independent causal role for them, but to rely on variations of the spectrum-reversal, missing *qualia* and atypical *qualia* arguments.

Even if successful, such reliance would take one only as far as an epiphenomenalism, rather than a full dualism, and epiphenomenalism tends to be an unstable hybrid, forever tending to fall either into a supervenient reductionism (which involves no ontological addition to physics) or into a more robust dualism which claims independent causal efficacy for conscious states.

While abstract particularism is comfortably compatible with either view, it is somewhat less hostile to dualism than substance and stuff philosophies. According to abstract particularism, the world is made of tropes, separate, independent and clustering merely *de facto* into stable concrete particulars (table, planks or molecules) and recurrent kinds of stuff (marble, calcium or matter). This view is not hospitable to the image of a closed world of matter-stuff, parts of which can affect or be affected by other parts of itself only. For matter is but a set of sub-regions of space–time each containing groups of tropes all or most of whom are matched by resembling tropes in all or most of the other sub-regions. There is no metaphysical imperative requiring that no chunk of matter have any character not shared by all. There is no bite to the prohibition on causal links to tropes outside the 'material' circle.

The trope philosophy can thus be less inhibited in its empiri-

cism; with Hume it holds that, antecendent to all experience, few restrictions can be placed on what sorts of causal process there can be. In particular, the physical is not confined to producing effects only in the physical. The trope theory has no place for the idea that emergent tropes cannot, in the nature of the case, have any impact on the course of the cosmos.

From this perspective a dualism that accepts causal power in the non-physical is a somewhat less daunting position to defend. It is plainly a possibility. Our grip on the actual progress of cause/effect processes in conscious beings is far from comprehensive enough for us to insist that the possibility is not actualized.

The emotional life presents a field in which the idea of non-physical causal power seems to enjoy intuitive plausibility. Anger has a distinct 'feeling tone' to it, a characteristic *quale*, and that seems to play a central role in how we act out our anger, how we 'relieve our feelings'. If that is right, the *quale* has causal power. And if *qualia* resist reduction, the implication will be that not all causes are physical. But in the context of abstract particularism, this will involve only an expansion in the number and range of tropes to be admitted. It will not bring in spiritual substances or stuffs.

7.4 THE SELF

In terms of the traditional alternative views of the mind–body relation, Trope Dualism is closest to Attribute Dualism. It is, indeed the purest version of attribute dualism, as it recognizes the attributes, both physical and non-physical, without postulating any further, single, underlying substance.

That may indeed be seen as a source of difficulty. For abstract particularism resolves the familiar unities of the human-scale world – natural objects, artefacts and people themselves – into collocations of tropes. And it is under powerful atomistic pressure to continue that resolution into the time dimension. This yields a view ordinary familiar objects, including people, as sequences of clusters of occurrences of characteristics. It accords to individuals no really deeper unity than is accorded, in ordinary thought, to a committee or any other grouped collection.

Such an atomistic conception of the self is an extreme version of Hume's notorious 'Bundle' view. It seems to be at odds with our self-consciousness, whose deliverances seem to include knowledge of a significant continuing identity of ourselves from one day to the next. Hume asserted that this identity is not manifest to introspection, and in this I think he was right. Even the unity of the self *at a time*, never mind *across time*, is more fragile and more incomplete than self-consciousness takes for granted; and this is brought out by the collocation-of-tropes view.

Nevertheless there is some sense in which it is correct that, barring traumas, we are one person and remain the same person over extended periods.

Studies in cognitive psychology suggest that the 'committee' image of the self is much nearer the mark than casual introspection suspects: we harbour in ourselves large numbers of relatively independent and often disharmonious cognitive and affective subsystems. A successfully integrated person is indeed rather like a committee operating under a firm and effective presiding officer. The notion of an integrated personality is rather an ideal to be striven for than a naturally established fact.[2]

An on-going, effective unity of self is not only an aspect of reality to be recognized in a sound metaphysical system, it is also, as is widely appreciated, an essential aspect of ethical thought. The moral life, both in its aspirations to develop virtue and to pursue the good, and in its recognition of responsibility for actions performed in the past or planned for the future, is intelligible only on the basis of our individual, continuing identity.

The need to find a place for the on-going self in psychology and ethics provides, in my opinion, further reason for avoiding an atomistic Russellian event ontology, in favour of the holism of space–time-filling fields. If such fields are basic, since they are identical across all space–time, sub-regions of them, of human scale in both space and time, can also be accepted as single, continuant tropes. Stable coincident complexes of these tropes, bound to one another by their own network of internal causal links, will constitute stable, single, on-going complex entities. There is room for change, for development, for gaining and losing characteristics. Provided that change is gradual and

orderly, the on-going complex remains non-arbitrarily recognizable, and so keeps its identity across time. Such complexity, such stability and such measured change are exactly what is required for the continuing, unitary self of psychology and ethics. A single, simple strictly self-identical continuant (a substance as classically conceived) is neither required nor well evidenced.

Although a person, like a mountain or a motor car, partakes of the character of a closely associated committee in constant session, in a person the continuing and copious causal processes involving so many members of the committee mark off that self as a distinctive continuing recognizable identity, both to others and to him- or herself. A self is a densely interacting committee. And that is enough.

7.5 THE SOCIAL WORLD

People, being clusters of tropes, are in that sense dependent and derivative entities. When we turn our attention to human society, we encounter a further level of dependency: most social entities are rather loose clusters of the sorts of trope which arise out of complex relationships among people.

Institutions are perhaps the clearest cases: a family, for example, is a group associated by patterns of shared origin and activity, which in established societies is also a cluster of people standing in patterns of mutual obligation, of special expectations governed by convention, and of distinct sets of legal relationships to one another and other social structures.

With more formal, more thoroughly artefactual institutions, such as a business corporation or a church, there are not only complex patterns of characteristics distinguishing the members from outsiders, but there is also a structure of roles, such as director of marketing or rural dean, which can be filled by different people in turn, to give the institution a sort of independent reality, and account for its potential indestructability.

There are individual people, there are particular, middle-range groups, more or less organized into an institutional form, to which some people in a society belong, and there are society-wide, all-embracing social structures, such as the economy or the

state. Within such social structures, characteristic activities are carried on by people in virtue of the roles which the institutions allot to them. Trade union secretaries, clerks of the court or overseers behave in their capacities as trade union secretary or whatever, in ways determined by the social arrangements, and the significance of their actions is a function of the recognized social place of these institutions and of the role-filler's place in the institution in question.

The distinctively social complexion of human life does not end with roles in institutional structures. There are, in addition, many forms of behaviour, and of feeling, and of consciousness, which arise only in social contexts – all those aspects of life, for example, which depend on social standing, emulation and prestige, such as insults, fashions, ambitions, credit ratings and the value of gem stones.

Furthermore, there are many social artefacts that are neither organized groups of people nor complexes of behaviour at all, such as bank accounts, interest rates, constitutions, minutes of committee meetings and ceremonial robes.

All three sorts of social phenomena; groups or institutions, socially determined behaviour patterns, and artefacts, whether abstract or concrete, whose significance is a function of their place in social life, must admit of a gloss in trope terms if the philosophy of abstract particulars is to be adequate to social reality.

7.6 AGAINST SOCIAL SUBSTANCES

And indeed in some ways abstract particularism seems tailor-made to fit the social world. For one of its leading features is the repudiation of the classical substance philosophy. This involves the denial that characteristics, as particular occurrences, can occur only with the support of an underlying, unitary substratum. For the absence of social substances seems to be one of the most evident facts about the social realm.

It is possible for a cluster to tropes to be exactly that, a cluster, bound together by no metaphysical bond, related perhaps no more intimately than as compresent together, yet to have suf-

ficient unity and identity to be singled out, explored, described and recognized as a relatively stable complex in the world's patterns of recurrence with diversity. The trope philosophy holds that not only the manifest clusters, such as galaxies, but also familiar natural particulars, such as cats, dogs, forests and people, have just that cluster kind of unity and identity.

Social entities must be clusters in the same way. And this is intuitively appealing. Business enterprises for example, are a variegated lot. They differ in size, in organizaiton, in product, in internal and external relations. They can change over time, in all these ways. They have no identifiable essence, no core of indispensable contituents on which their existence and identity rests. And they have no substratum.

The social world, then, is a world without substances. Even if people are more substantial than clusters of tropes, social realities are not. The vocabulary in which we describe the social world should be understood in this light. It is inevitable that the terms of social description exhibit the open texture, flexibility and looseness of fit which is characteristic of family resemblance predicates. General terms apply to members of classes of social phenomena in virtue of overlapping and criss-crossing similarities. This provides one of many reasons why the vocabulary of social terms in indispensable, and cannot be replaced by terms applying to individual people.

It may well be the case, moreover, that attempts at a more rigorous terminology, through the use of strict definitions, always fail to do justice to the subtle variability of social forms. In that case, one would conclude that the social world is not, or is largely not, a world of natural kinds (classes of complexes with significant numbers of strongly resembling tropes in every member). And if the social world is not one of natural kinds we would have an explanation for our apparent inability to discern any strong and convincing set of natural laws for social phenomena.

7.7 SOCIAL FACTS AND ASPECTS OF LIFE

Another feature of social facts which lends itself readily to a trope interpretation is this: a social role represents but one

aspect of a person's life. People who are justices of the peace are a great deal else besides. Yet it is only *in their capacity as* a justice of the peace, or *in virtue of being* a justice of the peace, or *qua* justice of the peace, that they can witness statutory declarations. We need to isolate that aspect of them and accord it an independent part in social life.

In just the same way, the administration of justice requires that we focus on the separate particular characteristics of particular persons. In a case concerning the offence of unlicensed driving, equality before the law requires that the *only* relevant issue is whether or not the defendent is a currently licensed driver. This must be considered in abstraction from all the other characteristics, of race, sex, class, prior record, influential family, and so forth, which also contribute to the person's whole nature.

So here, as with causal relationships among complex entities, legal and social matters call for the recognition of the constituent items in a trope complex as entities in their own right. They are, on their own, responsible for the social and legal authority, responsibility and validity of people's actions and status.

That social realities are clusters of characteristics is a plausible view of them which sits very naturally in a trope ontology.

That social phenomena are in some important sense dependent on the existence of people with appropriate characteristics and relations is scarcely controversial.

We can see that they are dependent entities by the *Abolition* test. Established institutions do not depend, for their continuation, on any particular identifiable people – the founder can pass on while the corporation remains, the chief executive can resign or be fired yet the enterprise retain its identity, the whole staff can be replaced, certainly over time, and in some cases all at once, yet the business continue with its existence unscathed. In that sense social institutions have a life of their own and are not reducible to the existence or activity of any specifiable persons. But, of course, if there were no people there would be no institutions. Less drastically, if there were to be a general amnesia, and everyone woke one morning not just not remembering the Ford motor corporation, but neither knowing what a corporation is, nor remembering how to interpret any documents or

enter complex economic activity, the corporation would not survive. Abolish social understanding and socially conditioned activity among people, and you abolish social institutions, together with the roles which they create and sustain, and the entities to which they give rise.

This too presents no sort of embarrassment to the trope view.

7.8 SOCIETY AND EMERGENCE

It is a more controversial question whether social phenomena represent new emergent realities, neither reducible to nor supervening upon facts concerning individual people. A bank teller's acts are what they are, in virtue of the construction put on them by the generality of people in the society that includes the bank. And this significance is neither the product of identifiable individuals, nor is it alterable by people except in so far as they are acting within a social structure, for example, by passing a law invalidating the currency.

Similarly, what the obligations of a dutiful son are, whether I have discharged them, and if so, how well, seem to be matters of social convention and practice which lie outside any individual hands. Yet they impact, sometimes quite dramatically, both on how I see myself and on how others treat me, as Oedipus could confirm. We are, to a considerable extent, made into the individuals we are by the society we live in and the place we fill in that society. So it can seem that the social is prior to the individual, despite the stubborn individuality of our biological aetiology.

There is a sense in which this issue of the precise extent and manner of the dependence of the social on the individual can be here left unsettled. For it is a question concerning which tropes are the fundamental, underived ones, rather than whether the social realm resists a trope analysis of any sort. If there are any genuinely *emergent* social characteristics, they will nevertheless be particular occurrences of (probably complex) characteristics, involving people but not supervening on the biology or individual psychology of those people. Emergent social tropes will very probably be highly relational in character, since the interac-

tion of many people, organized and structured in many ways, is the essence of the social realm. If, as argued in an earlier chapter, relations rest on monadic foundations in their terms, any emerging social characteristics will call either for emergent 'social' monadic foundational tropes in the poeple involved taken severally, or in a new, holistic kind of intrinsic character belonging to social groups taken collectively.

The latter alternative, to my mind, makes rather more vivid how strong and strange a claim the assertion of genuine emergence is for any complex realm, including of course the social.

So it is worthwhile taking stock of the resources available to a philosopher seeking to establish that the social supervenes upon the individual, and that there is no call for any ontological addition to the clusters of tropes which make up the members of society.

In the first place, straightforward reductions, which permit of the definitional elimination of social terms and social descriptions in favour of individual ones, are not to be looked for. Just as psychological terms cannot be defined in behavioural or functional/active terms because the psychological deals in indeterminately general and variable patterns in behaviour, function and action, so sociological terms apply in virtue of indeterminately general and variable patterns in the psychology – in the understanding, judgement, memory, expectation, intention, acquiescence, insistence, and so on – of society's members. But in being thus of a gestalt character, focusing on the overall pattern rather than particular elements in it, the social is not ontically new. This gestalt emergence is a species of supervenience.

There are other ways in which the irreducible can nevertheless be merely supervenient. Being an holistic property might be one way. Cresswell's example of the fountain pen is a case in point.[3] *Being a fountain pen* is not reducible to any specifiable set of intrinsic physical properties of an object. Even if there were a single fixed form in which fountain pens come, the physics leaves out that an object is a *pen* only in so far as other things (in this case people) have appropriate characteristics of their own (in this case communicative purposes and the understanding of the pen as a suitable tool for their accomplishment). But being a

fountain pen is neither a relation between the object and (specified or unspecified) people, nor is it a characteristic of the object plus the people considered together. It is a characteristic of the object which it would not have if the people did not have the characteristics they have. Yet since the combination of the object's physical features with the people's psychological features guarantees that the object is a fountain pen, we are at ease with the thought that here is a supervening characteristic, and that *being a fountain pen* is no genuine new creation.

This pattern applies, it seems to me, to many social predicates – *being a set of traffic lights* or *being a driver's license* from the secular world, and *being a chasuble* or an *altar* from the sacred.

We have already met a second kind of supervenience: social institutions are families of social facts. A sailing club has a complex set of features. It includes members (in almost all cases extant active members) who sail (in many cases, but not necessarily, in concert and even in races together – but you could have a club of lone sailors). And it has office-bearers, a constitution, rules, nominations and elections, policies, property, a programme. *Being a sailing club* is a feature supervening on an appropriate selection from this wide and fluid range of constitutive features. Then the idea would be to display each of these constitutive features, in so far as it has a social content, as supervening on characteristics of the people and objects involved in the club's activities. One such constituent component is the existence of delineated social roles – club treasurer, for example. There are a rather more narrowly circumscribed family of activities, authorizations and expectations that make up being a treasurer. These fall into a hierarchy with respect to how 'deeply social' they are. A treasurer is required to keep proper accounts. In many cases, this requirement has the force of law (if the club claims non-taxable status, for example). Now for something to have the force of law is very deeply social. There is all the long complex pattern of decisions, habits, practices, expectations and intentions that are involved in a community's generating and maintaining a legal system. There are all the processes by means of which, within a legal system, a law is enacted – in this case, to require the treasurers of non-taxable bodies to keep proper accounts. The law itself, incorporating the concepts of tax and

accounting, and hence of finance and its place in an economy, is mind-bogglingly complex in the way it relates to the thoughts and intentions of only vaguely specifiable people over an only vaguely specifiable period of years. All these thoughts and intentions are but an appropriate selection from the range of relevant possible thoughts and intentions, for here too we are dealing with family resemblance concepts.

Although no one will ever be able to trace either the developing or the sustaining of most social phenomena to the actions, thoughts and intentions of designated individuals, whose actions, thoughts and intentions are themselves socially conditioned, it is nevertheless both a plausible and an attractively Occamist thesis that the social supervenes on the individual human realm.

7.9 THE CAUSAL ISSUE

Since at least the time of Plato, power has been recognized as the mark of being. And the issue of whether social characteristics emerge or supervene turns on the issue of an independent causal role for the social.

On the surface, this independent role is freely accorded. The writing of history and sociology, in its discussion of change and development, concerns itself with groups – movements, such as the Chartists, or the Quakers or the Wobblies, and their involvement in political change, classes and churches, as in Civil War analysis, and also with impersonal 'social forces', economic and technological developments like rising interest rates or the introduction of computers, occurring in ways that are not consciously planned, foreseen or even desired by any individual or group. Such forces are described as bringing about, in an autonomous, law-governed way, the evolution of the whole society.

Again, the effectiveness of groups is seen to depend on group characteristics for which there is no ready resolution into features of the participating members – the group's morale, *esprit de corps*, cohesion, traditional solidarity or capacity to evoke loyalty and energy, for example.

That neither of these features of the situation is conclusive can

be seen from a consideration of the stock and currency exchanges. What the markets do, how they change, is a patently reducible matter. The prices represent agreed sales, the indices offer weighted summations of those sales, and every fact about the markets derives directly and completely from the opinions, decisions and actions of individual people (even where those people are acting in their capacity as corporate treasurer or investment trust manager).

So everyone agrees that the markets have no independent causal power: the market, or the prices, have no way to make anyone sell, or buy or do anything. Yet it was commonplace to read serious discussions of whether the stock market crash of October 1987 would or would not cause a recession, or an oil shock, or tighter controls on insider trading. This was harmless enough – in most cases it was shorthand for discussions of what reactions people might have to their knowledge of the new lower level of stock prices.

The same goes for money markets: one is often told, in Australia, that the Australian dollar is 'struggling to break through the 80 cent barrier' or 'has gained a now unstoppable momentum towards gains over 2 cents'. No one should be deceived by such manners of speaking: they provide dramatic summaries of patterns of individual, causally efficacious action.

That these should be models for the whole social realm is at least a plausible thesis. Apart from releasing us from the mysteries of emergence, it gains appeal from the consideration that if social processes supervene on multitudinously complex families of individual psychological and biological facts, then social generalizations, even social laws, will not be watertight, exceptionless cause–effect transactions. They will give expression to tendencies, to what happens not always but for the most part and other things being equal, to what can be expected with probability rather than certitude. Now the generalizations of economics, anthropology and sociology are just like that.

The situation is parallel to that in meteorology. Where and when a cyclone will form, how intense it will become, how fast in which direction it will travel and quite what effects it will have, are, so far as our knowledge goes, matters of probability and tendency. And we have no way of relating the holistic impact of

the cyclone to the behaviour of the individual air and water molecules involved. Yet only superstitious animists attribute to cyclones powers that are not just functions of the powers of those constituent molecules.

A trope philosophy can afford to take a relaxed and truly empiricist attitude to the emergence question. As no substratum is required for emergent characters, there is no objection, in ontological principle, to emergent holistic characters, whether in the social realm or anywhere else. The acid test is always one of case-by-case capacity: are there any phenomena, in the social realm, which just could not be produced as supervening gestalten by the interplay of individual beliefs, hopes, purposes, desires, preferences, habits, vices, etc? In my view, the interim answer to that question is – probably not.

Even if this is correct, the implications for the social sciences are not as radical as might be expected. The derivative is not the unreal and, even if all social forces are derivative, they are not unreal. The discerning and tracing through of the dynamic influences in societies and lesser social groups remains of very great interest. And the techniques by which the social sciences proceed need not be altered in light of the supervenience thesis either. For that thesis maintains only that whatever patterns are uncovered will turn out to be patterns deriving from patterns of interplay of individual psychological and biological facts. It makes no comment on the appropriate ways to discover and validate the laws of social reality.

Finally, the social world is an immense cloud of intertwining, supervening holistic tropes. These tropes depend, typically, on the beliefs, understandings and values of the people involved. And social investigators are often, to some degree, themselves people involved. But none of that provides any ground for holding that objective, realist social science is impossible. Social facts are what they are and their development will proceed no matter how social phenomena are envisaged or conceptualized by social investigators. Investigators of society no more create the social world in their own image than physical investigators create theirs. The discipline that reality imposes on our wishes and prejudices is no less available, and even more essential, in social than in other scientific explorations.

Notes

CHAPTER 1 A ONE-CATEGORY ONTOLOGY

1 Colour must be recognized at least *prima facie*, even if an eliminativist account is ultimately to be offered.

2 Williams (1966, p. 78). It was Williams, as much as any one, who kept classic metaphysics in general, and this ontic option in particular, alive through desert periods of positivism and linguistic miniaturism in English-speaking philosophy. Philosophy, and Western culture generally, are deeply indebted to him.

3 Again, this is an intuitive exposition, which assumes, for purposes of illustration with convenient examples, that colour is an objective material quality. But nothing here hangs on this; choose another example if cases of colour won't do.

4 Williams (1966, pp. 84–5).

5 This may need refinement. What about that portion of the earth's magnetic field that is where the pea is? Indeed, I think it is an open and almost empirical question whether or not two concrete particulars, perhaps two odd fundamental particles, with different total histories, might not coincide for some short part of their careers. But to a first approximation, concrete particulars monopolize their places.

6 Williams (1966, p. 83ff).

7 He picked on it, he said, because no other philosopher's use of it had any decent meaning at all. Since linguists and botanists have perfectly good meanings for this term, it is a source of confusion and even misunderstanding. But I think it is too late to change it, even if a better term were to be coined.

8 Aristotle (1928, Book Z).

9 Quine (1960, Motto).

10 Austin (1962, p. 8).

11 As indicated earlier, I do not believe rival ontologies can be convicted of strict incoherence. I regard these troubles not as refutations so much as considerations which ought to influence the intellect.
12 Armstrong (1978). This is the most comprehensive and most convincing realist treatise of recent years.
13 Diogenes Laertius (1925, volume 2, p. 55).
14 Locke (1979, p. 409).
15 Armstrong (1978), part 6; (1983), ch. 7.
16 Hume (1978, p. 18).
17 Carnap (1967), Price (1969) and Quine (1969).
18 This view is championed in Russell (1961, ch. 6); and Russell (1948, part II, ch. 3).
19 See Black (1952, p. 161); Ayer (1954, p. 34); Campbell (1976, p. 215); and Armstrong (1978, vol. I, p. 91).
20 Aristotle (1928, 1017^{b}, 1020^{b}).
21 Quine (1960, p. 171). Quine proposes to identify events with chunks of space-time, including all their contents.
22 Davidson (1966, 1967); and Taylor (1985).
23 Lewis (1983).

CHAPTER 2 THE PROBLEM OF UNIVERSALS

1 Quine (1960); Goodman (1966).
2 Compare, in this connection, Devitt (1980).
3 Price (1969).
4 Quine (1969, p. 119).
5 Küng (1967).
6 Armstrong and I both came to see this, independently so far as we can tell.
7 Russell (1912).
8 Williams (1986).
9 Körner (1959) made a rather similar suggestion in connection with the relation of propositions to statements.
10 Lewis (1986).

CHAPTER 3 SOME GENERAL OBJECTIONS TO TROPE THEORY

1 Moreland (1985, pp. 65–7).
2 Strawson (1959, pp. 59–86).

3 Hochberg (1988). 'Moderate nominalism' is Hochberg's term for what is here called 'abstract particularism', with the concession that *resemblance* is an exception, and is accepted as the only universal. The view advanced in this present work, which treats resemblance, like all other properties, as consisting only in particular instances, Hochberg dubs 'immoderate' nominalism. But this difference makes no difference to how an abstract particularist can meet Hochberg's contentions.
4 Price (1969, chapter 7); Armstrong (1978, pp. 46ff).
5 For a discussion which defends the view that exemplification has no advantage in economy over resemblance, although the classic view is to be preferred on other grounds, see Armstrong (1989).
6 Moreland (1985).
7 Campbell (1981).
8 This solution was pointed out to me by Mr Michael Shepanski, a post-graduate student at the University of Sydney.
9 Locke is committed to this view, as we see by combining his celebrated insistence on the substratum necessary to support the properties which exist only in so far as they inhere in it, and his equally celebrated dictum that all things are always only particulars (including properties). C. B. Martin advances his view in Martin (1980), but is careful to avoid commitment to substance as *unknowable* substratum.
10 'Particulars and their qualities', in Loux (ed.) (1976).
11 Pap (1959); Putnam (1969); Armstrong (1980). See also Jackson (1977).
12 Quine (1960).
13 Armstrong (1983). See also Tooley (1988).
14 Williams (1947). The argument is presented with more rigour and refinement in Stove (1986).

CHAPTER 4 THE PATTERN OF PROPERTIES

1 I take this view from David Armstrong (1978, ch. 22), making the modifications required to avoid commitment to his universalist theory. See also Armstrong (1988).
2 Quine (1963) parted company from Goodman, the stoutest refusenik, on this issue.
3 'Against structural universals' (1986), and in more detail, in later, as yet unpublished work.
4 Unless those speculations about the quantum world which speak of

ten or more dimensions are true and do actually refer to literally spatial dimensions – issues on which I am not competent to pronounce.

5 Williams (1986, p. 2).

CHAPTER 5 RELATIONS, CAUSATION, SPACE–TIME AND COMPRESENCE

1 *Leibniz–Clarke Correspondence* (1956), ed. H. G. Alexander, 5th Paper, §48. That relations are creatures of the mind, but not extra-cognitively real, was the doctrine of the Stoics, Averroes, William of Ockham and Spinoza. Hobbes held a view very close to Leibniz: relations are, so far as their objective reality goes, the same as their monadic foundations, while the relation 'itself' is a comparison which we make. Hobbes (1839–45, vol. 1, p. 135). As for Bradley's regress argument: nothing new under the sun. A close relative of Bradley's argument was advanced by Fakhr-al-Din al-Razi, one of the Moslem theologians, the Mutakallimun, in the twelfth century. Even then it was not new. See Weinberg (1965, p. 90).

2 In Grossmann (1983, pp. 197ff), there is an exposition of the contrary view, that this does not hold for intentional relations. I regard this as a proof that 'intentional relations' are not properly relations at all.

3 Williams (1966, pp. 260–2) advocates, tentatively, as a possibility that every quality is structural and can be resolved into relations among other 'deeper' terms. But at every step in such a descent there would be tropes, the terms of the relations, which on that level would be monadic.

4 For a lucid discussion of supervenience, and defence of a supervening realm involving no ontic expansion, see Post (1987).

5 Perhaps Henry of Ghent was a foundationist without any mentalistic trappings. See Weinberg (1965, p. 105). An excellent modern paper, exploring the logical ramifications of foundationism, is Fisk (1972). Fisk avoids the error of supposing every pair of resembling relational cases must rest on exactly matching pairs of foundations.

6 This notion can be traced from Aristotle through Avicenna and Albertus Magnus to Aquinas. (*Sententiarum*, ii, d.40, q.la.4, *ad primum.*)

7 The switch from L and M to A and B occurs without explanation, in Russell's text. L and M descend, one surmises, from the Leibniz–Clarke Correspondence, but they are abandoned without ceremony.

8 In *The Philosophy of Logical Atomism*, Russell (1972), pp. 62–3, Russell attempts a more peremptory despatch of the denial of relational properties. Consider asymmetrical relations: the foundation cannot consist in the terms' having the *same* property, for this would be symmetric. Nor can it consist in their having *different* properties, for this too is symmetric. Since these are the only two possibilities, foundationism fails, Q. E. D.

This argument is worthless. The foundationist claims that the foundation for *a*R*b*, where R is asymmetrical, will be not the mere existence of difference between the qualities of *a* and *b*, but the existence of some pair of different specific properties P and Q, such that *a* has P, and *b* has Q. *That* situation is not symmetric.

9 Grossmann (1983).

10 Philosophical examples show extraordinary longevity. As Grossmann points out, this one is from the *Phaedo*, proper names, chosen relation, proposed foundation, and all (102 b7–c4).

11 Wittgenstein (1974, 4.0312).

12 Moore (1919–20).

13 Mortensen and Nerlich (1983).

14 The so-called 'Fitzgerald contraction', which is of course frame-relative, only alters which place is occupied by which part, according to observations in a frame different from the body's. It could not be a change of the kind required to indicate that in the body there is a foundation for the body/place relation.

15 Stachel (1974).

CHAPTER 6 FIELDS: DEALING WITH THE BOUNDARY PROBLEM

1 Williams (1966).

2 The idea of a dissective quality is discussed in Goodman (1966).

3 According to Hide Ishiguro (1969) the *objects* of Wittgenstein's *Tractatus* are what we call tropes: both Russell and Wittgenstein, in taking the atomistic simplicity road thus reach similar conclusions, which yield support for the abstract particularist approach. Although similar, the two views need not be identical. For example, Wittgenstein's objects would be different from Russell's if they could move.

4 See Nerlich (1976); Mortensen and Nerlich (1983).

5 In correspondence, David Lewis has urged that there can indeed be edges for space, and so, on suitable topologies, holes (closed edges).

If this is correct, it would provide support for an atomistic approach that views space as a compound construction, and Lewis thinks this is a viable and perhaps the best option. But you cannot get a hole by abolishing a volume, and it is this that shows the parts of space are not true parts.

6 Should one of Hawking's Grand Unified Theories succeed, or even some Einsteinian unified theory, this schedule of four basic superimposed field tropes will be altered and shortened. A single electroweak force is now gaining acceptance; this may be followed by further unification. But this will not alter the essential character of a field version of abstract particularism. On any properly empirical approach, just which specimens of the basic category should be recognized is a contingent matter calling for *a posteriori* investigation, subject to change as theory advances.

7 Perhaps that needs to be qualified for black holes.

CHAPTER 7 THE HUMAN AND SOCIAL WORLDS

1 See Campbell (1983).

2 See Campbell (1985).

3 Cresswell (1980).

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