Powers

A Study in Metaphysics

GEORGE MOLNAR

edited by
STEPHEN MUMFORD

Powers: A Study in Metaphysics

George Molnar came to see that the solution to a number of the problems of contemporary philosophy lay in the development of an alternative to Hume's metaphysics. This alternative would have real causal powers at its centre. Molnar set about developing a thorough account of powers that might persuade those who remained, perhaps unknowingly, in the grip of Humean assumptions. He succeeded in producing something both highly focused and at the same time wide-ranging. He showed both that the notion of a power was central and that it could serve to dispel a number of long-standing philosophical problems.

Molnar's account of powers is as realist as any that has so far appeared. He shows that dispositions are as real as any other properties. Specifically, they do not depend for their existence on their manifestations. Nevertheless, they are directed towards such manifestations. Molnar thus appropriates the notion of intentionality, from Brentano, and argues that it is the essential characteristic of powers. He offers a persuasive case for there being some basic and ungrounded powers, thus ruling out the reducibility of the dispositional to the non-dispositional. However, he does allow that there are non-power properties as well as power properties. In this respect, his final position is dualistic.

This is contemporary metaphysics of the highest quality. It is a work that was almost complete when its author died. It has been edited for publication by another specialist in the subject, Stephen Mumford, who has also provided an introduction that will allow non-specialists to become acquainted with the issues. David Armstrong, one of the greatest living metaphysicians and personal friend of George Molnar, has provided a Foreword.

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and a Foreword by
D. M. Armstrong

OXFORD
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Great Clarendon Street, Oxford ox2 6dp
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It furthers the University's objective of excellence in research, scholarship,
and education by publishing worldwide in
Oxford New York
Auckland Cape Town Dar es Salaam Hong Kong Karachi
Kuala Lumpur Madrid Melbourne Mexico City Nairobi
New Delhi Shanghai Taipei Toronto
With offices in
Argentina Austria Brazil Chile Czech Republic France Greece
Guatemala Hungary Italy Japan Poland Portugal Singapore
South Korea Switzerland Thailand Turkey Ukraine Vietnam
Oxford is a registered trade mark of Oxford University Press
in the UK and in certain other countries
Published in the United States
by Oxford University Press Inc., New York

First published 2003
First published in Paperback, 2006

British Library Cataloguing in Publication Data
Data available
Library of Congress Cataloging in Publication Data
Data available
Typeset by SNP Best-set Typesetter Ltd., Hong Kong
Printed in Great Britain
on acid-free paper by
Biddles Ltd., King's Lynn
ISBN 0–19–925978–x 978–0–19–925978–6
ISBN 0–19–920417–9 (Pbk.) 978–0–19–920417–5 (Pbk.)
1 3 5 7 9 10 8 6 4 2

Nature loves to hide.
(Herakleitos)

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Foreword

D. M. Armstrong

George Molnar died suddenly before he completed his task. But the book was well in progress and already stands as an important contribution to a central topic in contemporary metaphysics: the theory of dispositions or, as he put it, powers. We can be very grateful to Stephen Mumford for making a volume from the much that we have. His excellent Introduction serves in place of the introductory chapter that was left unwritten. The chapters that were written put George's theory in front of us. Some further development there may have been, but nothing essential.

The Introduction also contains some biographical information. The strange thing about George's academic career is that it fell into two parts, parts separated by a twenty-year interval. He began his studies at Sydney University in 1953 in economics, but shifted to philosophy where John Anderson and after him John Mackie were the leading figures. George was eventually appointed to a lectureship, primarily to teach political philosophy. But the decisive moment in his philosophical development came with the arrival at Sydney in 1966 of C. B. (Charlie) Martin, an American who had previously taught at Adelaide University in the department headed by Jack Smart. George turned towards metaphysics, a metaphysics that, following Martin, made causation and power central to an account of being. He had found a central theme for his thought, one that he never let go of.

But then politics struck. In the late 1960s the universities of the West, with Australia and Sydney no exception, were subject to what the late David Stove called 'red shift'. George shifted rather violently to the Left. I understand that his political oratory was something to hear. After the Sydney Philosophy department had been split into two, George became a member of the new department of General Philosophy, which was Marxist, feminist, and revolutionary. But that was not the end of it. George eventually decided that it was morally wrong to be taking public money to be teaching in such an institution as Sydney

University. A man of conscience, he made the mistake of acting in accordance with it, and resigned his position.

One might have thought that that would be the end of George's interest in the abstractions of metaphysics. Most fortunately, it was not. For the next twenty years he continued to read and think about metaphysics. He reread the classics and kept up his reading in contemporary philosophy. He also stayed in philosophical touch with Charlie Martin, who went on to Canada, as far I know the only such contact that he had. After a period in England, I understand at a commune in Leeds, he returned to Sydney. By that time it seems that the first flush of revolutionary enthusiasm had died down, and George became a civil servant, eventually reaching a position of some importance in the Department of Veterans' Affairs. Then, late in his life, in 1996 or thereabouts, he resumed contact with the life of philosophy in Australia.

He started once again to attend meetings and conferences, and to associate with the Sydney philosophers. He seemed effortlessly to resume his place in Australian philosophy. I particularly admired his apparently complete absence of self-pity for the long years of self-imposed exile. We lived in the same suburb, not far from Sydney University, and he took to dropping in to talk and argue about metaphysical matters, with powers and dispositions the central topic. Very much the Hungarian mind, it seemed, with wit, clarity, forthrightness, and an ability to write English better than most native speakers.

He had left the public service and returned to Sydney University as Anderson Research Fellow. His book was rapidly taking shape. Then: untimely death.

Acknowledgements

In compiling the list of references, I was helped in places by my colleague Eros Corazza. I am grateful to the editors of the *Philosophical Quarterly* for permission to include material that originally appeared in volume 49 (1999), 1–17. I am grateful also to Tony Skillen and to D. M. Armstrong, who have taken an ongoing interest in the completion of the manuscript. In particular, I would like to thank and pay tribute to Carlotta McIntosh, without whom this book might never have seen the light of day. She has shown a remarkable persistence and determination to see George Molnar's most important work in print. She was aided in the early stages by Marnie Hanlon and Ross Poole.

I have no doubt that George Molnar would have included his own list of people who helped and stimulated him to write this book. Rather than attempt to construct such a list, which would no doubt have been incomplete, I had best mention no one at all. Those who knew and helped George with the main philosophical project of his life will know who they are. His list of citations and references also gives a good indication of his main inspirations.

S. M.

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Contents

Introduction: George Molnar and *Powers*

Stephen Mumford

This is a book of analytic metaphysics by the late George Molnar. It concerns subjects that a number of contemporary metaphysicians regard as the most central and important. Its author had a theory that was virtually complete when he died. He planned to continue working on the book and apply the theory to a number of other problems in philosophy. Unfortunately, that work remained unfinished. The theory itself, however, was complete enough, and worked out enough, that it can stand alone. We can only speculate on how much better the book would have been had Molnar seen through his project to completion.

This introduction has a number of purposes. First, a context is set for the debate to which Molnar was contributing and some of the problems are established that he was trying to solve. Second, the background to Molnar's own work is detailed. This will include some biography but will lead to an account of his other contributions to philosophy, during two spells in the profession. I will then consider the argument of *Powers* itself, during which I will try to identify what is important and controversial in the work. I will justify a claim that Molnar's theory is a substantial contribution to the existing debate. There will be further detail on two of the most controversial claims of the book: that there is physical intentionality and that there are ungrounded powers. Finally, I will explain the history of the unfinished manuscript and indicate the editorial principles that saw it through to its current form.

The Debate

An area of metaphysics that has increasingly concentrated minds is the issue of dispositional properties. What are they? How do they

differ from other properties? Are they bona fide? How do they relate to other categories such as events, causes, and laws? Philosophers have wanted to answer these questions because the notion of a disposition has been useful in both the philosophy of mind, most notably in Ryle (1949), and the philosophy of matter. Physical dispositions are long recognized; indeed, Ryle explained mental dispositions as analogues to well-known and accepted physical dispositions such as solubility and fragility. More recently, however, physicists have invoked properties of fundamental particles that have an appearance of dispositionality. Further, some philosophers are arguing now that the laws of nature may be explained in terms of the dispositional properties characteristic of natural kinds.

Philosophers have said widely varying things on the question of what dispositions are. Some follow the empiricist line, of Humean origin, that states they are nothing at all. This view finds expression in a conditional analysis where the ascription of any disposition can be rephrased as affirming the truth of a conditional that has no dispositional elements. An ascription of solubility to *x*, for instance, means nothing more than 'if *x* is placed in liquid, *x* will dissolve'. The opposite view is that dispositions are real and ineliminable properties, which can be distinguished, for instance, as being the causal *powers* of objects, and it is this realist line that Molnar defends. The realist line has come under constant attack from empiricist adversaries. Empiricists argue that there is just no need to invoke a separate category of powers in addition to categories such as events and their categorical (non-power) properties. If there is nothing more to the ascription of a power property than asserting the truth of a conditional, and that conditional mentions only events with their categorical properties, then power ascriptions can be reduced away into non-powers. Carnap (1936–7) had argued this line, though the precise form of his 'reduction sentences' needed some refinement. Ryle fell into the same category and was a defender, if anyone was a defender, of the 'naive' conditional analysis. In contemporary metaphysics, David Lewis (1998) has been the chief advocate of the Humean view and he has tried to show that, although the naive conditional analysis has problems, a reformed version is tenable that preserves its Humean spirit. Molnar argues against this view, primarily in Chapter 4.

The opposition to powers has not taken this form only, however. In addition to the conditional analysis, there has been a line of argument

based on a principle of microphysical reduction. David Armstrong (1968, 1973) was a chief proponent of this line. The central idea of the account is that to each disposition of a particular there corresponds a categorical property of that particular such that the disposition is reducible to that property. When a glass is fragile, for instance, its fragility may be entirely explained by the substructure of the glass, such as the bonding between molecules. The persistence of such a substructure may explain what it is for a disposition to be possessed by an object between manifestations. Such properties would explain the truth of counterfactual conditionals, therefore, which disposition ascriptions seem to entail. Molnar has arguments against this position, mostly presented in Chapter 8.

Realism about powers is a view that has gathered momentum in the contemporary debate. There have been a number of landmark contributions, such as Mellor (1974) and Martin (1984, 1993*c*, 1994). My own *Dispositions* (1998) was intended to uphold the view. Since then, Brian Ellis (2001, 2002) has done a fine job in defence of realism about dispositions. Molnar worked on the present book before Ellis's were published. Ellis uses a realism about dispositions in an attack on the whole Humean metaphysic. Only in Molnar's *Powers*, however, do we get a detailed defence of the ontological status of power properties. Within realism and the anti-Humean movement, this book ought, therefore, to be considered one of the key texts.

George Molnar: The Man and his Work

George Molnar was a multifaceted man. He was born on 14 May 1934 into a Jewish Budapest family. George, together with his whole family, faced Nazi persecution but were saved from the concentration camps by a Swedish diplomat, Raoul Wallenberg, who used bogus documents and Sweden's neutrality to keep thousands of Hungarian Jews from the gas chambers. After the War, George arrived in Australia, where his father had already fled.

In 1953 he started at Sydney University, reading Economics, but switched to Philosophy and was taught by the influential John Anderson until 1956. However, he dropped out of formal education in the hope of making a living as a professional gambler. This was not a success but he got by until returning to complete his degree and

graduating in 1964. His ability was rewarded with a tenured position at Sydney and he was highly regarded for his lecturing, which was mainly in political philosophy. During this time he produced noteworthy work such as 'Defeasible Propositions' (1967) and the respected and anthologized 'Kneales' Argument Revisited' (1969).

Molnar then became gripped by the spirit of the times. He became a leading light in the bohemian and anarchist movement known as the Sydney Push. He was part of the Libertarians, the intellectual wing of the Push, who recommended anti-authoritarianism and sexual freedom. His political principles led him to believe that the position of an academic philosopher was morally untenable in current society and in 1976 he resigned his position. He decamped to England, settling in Leeds, and took up the causes that had become his passion. These included nuclear disarmament, far-Left revolution, women's rights, children's rights, gay rights. At the time, he worked at a crèche he had set up and took part in many protest movements. He moved in with his long-term partner Carlotta McIntosh and both returned to Australia in 1982. He took up what appeared to be a respectable position at the Department of Veterans' Affairs but this was still in the interest of one of his causes, namely the plight of the Vietnam veterans. During this time of public service he worked on a number of publications, some for the DVA and some philatelic.

He rose to a senior position as assistant director of the Disability Assessment Unit, but in 1996 he was able to return to academic philosophy. He produced a number of papers and worked on the current book, *Powers*. In addition to the papers associated with the *Powers* project, George had a paper accepted by the *Australasian Journal of Philosophy* on 'Truthmakers for Negative Truth' (2000). In 1998 he was appointed the Senior Research Fellow at Sydney University to edit John Anderson's papers. According to Carlotta McIntosh, this was the happiest time of his life. He was pursuing his work with a renewed vigour, was working at the cutting edge of contemporary metaphysics, and was fulfilling the promise in philosophy he had shown earlier in his career. Then, in August 1999, he had a heart attack on the steps of the University's Fisher Library and died in hospital the following week.

Just four published papers in metaphysics may not seem a lot for a lifetime and might not qualify their author as one of the great metaphysicians of our time. An examination of them reveals a

notable philosophical intellect, however: meticulous, incisive, and elegant.

In 'Defeasible Propositions' Molnar considers this troublesome class of proposition and shows how no simple and reductive treatment of them is easily found. Defeasible propositions have the unusual feature of being both general but also permissive of counter-examples. Power terms fall into this category. Hence, it is true that water freezes below 32 °F even though there are circumstances in which some particular sample of water does not freeze below 32 °F. Defeasible propositions may remain true despite exceptions. We cannot reduce such a proposition to a universal statement with an 'all else being equal' clause because such clauses cannot be explicated in a non-trivially true way. But Molnar does have a positive proposal:

> The moral to be drawn from these considerations is that the analysis of a defeasible proposition must include some reference to a principle of relevance which functions as a principle of exclusion ranging over all simple property predicates, known or unknown. *To say that the standard F is G is to say that any F is G if it has those properties which, according to the appropriate principle of relevance, suffice to distinguish it from all exceptional cases*. (1967: 189–90)

Two years later 'Kneale's Argument Revisited' appeared. This paper concerned William Kneale's argument concerning laws of nature (1950, 1961), which Molnar thought had not been given due consideration or a satisfactory response. The argument was that, on a certain broadly Humean account of laws, we cannot say that propositions express unrealized empirical possibilities, though that is what we would ordinarily take them to express. The problem arises when laws of nature are taken to be adequately expressed in propositions that are universally quantified, omnitemporally and omnispatially true, contingent, and containing no local predicates (such as 'in Smith's garden'). In this Humean account, if nothing is F, anywhere or anywhen, then it is a law of nature (or statement of a law of nature) that 'Nothing is F'. But this entails that 'Something is F' is inconsistent with a law of nature and thus not a possibility. Hence, if there is never, anywhere, a river of lemonade, the statement 'there exists a river of lemonade' is deemed not to express a possibility. Kneale's argument forces us to decree such statements as either true or impossible, as 'there exists a river of lemonade' will be possible only if it is at some time true. This conclusion is counter-intuitive, as we would ordinarily take such

statements to be false but possible. The argument sets up a puzzle, therefore. It shows that there are problems for this account of laws when coupled with certain accounts of truth and possibility.

Molnar went on to discuss four possible ways of resisting Kneale's conclusion, for example, placing extra empirical requirements on laws such that, if 'something is F' is false, it follows that 'nothing is F' is true but not necessarily that it is a law. Molnar favoured a different way of resisting the conclusion, however, which Kneale also seemed to prefer. This was the strengthening modality strategy that rejects the contingency of laws of nature. Molnar was suggesting, though admittedly not proving, a necessitarian view of laws of nature. He saw it as the best answer to Kneale's argument. It deems that from the falsity of 'something is F' one cannot infer that 'nothing is F' states a law of nature. More importantly, the strategy, once endorsed, resists Kneale's argument without any undesirable consequences. Molnar says very little about the necessitarian view of laws, however, other than that such a view is able to answer Kneale's argument. The paper shows him to be one of the first modern proponents of a view that currently has a growing popularity (see Bird 2001, Ellis 2001, and Lombardo 2002).

David Armstrong acknowledged the clarity and importance of this paper when he quotes it as an example of the problem of the regularity theory and refers back to it throughout his study of laws in *What is a Law of Nature?* (1983). This is all the more impressive when one considers that Armstrong cites relatively few sources and that 'Kneale's Argument Revisited' is still held as an exemplar fourteen years after publication. In the passing of those years, others had attempted more illuminating discussions of the issues but failed to improve upon the work of Molnar, who had then retired from professional philosophy.

From a philosophical perspective, 1976–96 appeared to be Molnar's wilderness years, but Carlotta McIntosh, who was with him throughout, is able to tell us that he retained his interest in metaphysics. This is further evinced by the discovery of an earlier version of *Powers* found among his papers that probably dates from around 1983. The interest in powers pre-dates the existing book by some years, therefore.

Molnar returned to professional philosophy in the late 1990s and this was marked with his return to print with 'Are Dispositions Reducible?' (1999). As this was an integral part of the *Powers* project, I will not pass comment on its arguments until later. The period also produced a free-standing piece of philosophy, however, with

'Truthmakers for Negative Truth' (2000). Molnar argues in this paper, which he saw accepted but did not see in print, for the wholly negative conclusion that there are, as yet, no discovered positive truthmakers for negative truths. The finding brought him no joy, however, as we need such truthmakers for the negative truths which clearly are true. He finished the paper by candidly admitting his own lack of success:

> I confess, with much gnashing of the teeth, that the Holy Grail of positive truthmakers for negative truths remains undiscovered. We need positive truthmakers for negative truths but we have no good theory of what these might be. That is the sad conclusion from the arguments of this paper. I have criticised proposals by other philosophers for solving the problem of negative truths, but that criticism must be tempered by the acknowledgement that where they have failed, so have I. It is an impasse and at present I cannot see the way out. (2000: 85)

Molnar impresses the urgency of the problem on us by setting it up in the following way. He offers a realist metaphysics that holds:

(i) The world is everything that exists,
(ii) Everything that exists is positive,
(iii) Some negative claims about the world are true,
(iv) Every true claim about the world is made true by something that exists.

Claims (i)–(iv) jointly imply that negative truths have positive truthmakers. But Molnar proceeds to show how all accounts so far offered, which attempt to provide positive truthmakers for negative truth, fail. Thus, ruled out is the *exclusion* of the negative truth by a positive truthmaker, as already dismissed by Bertrand Russell (1918). *Absences* of truthmakers will not work, as they would have to postulate negative facts. Molnar shows that there are good reasons to think that there are no negative facts: they would be mysterious, they would fail the Eleatic Stranger's reality test (Plato's *Sophist* 247e) by being acausal, and they cannot be directly perceived, contrary to the claim of Richard Taylor (1952: 444–5). *Totality facts* which, together with positive facts, could serve as truthmakers for negative truths, are rejected; not least because they are not positive facts. They are 'no more' facts, which look negative.

Need one really find these truthmakers for negative truths? The obligation can only be avoided if one rejects one of (i) to (iv), above.

But for any realist, the denial of any of (i) to (iv) is difficult. A fifth escape is to deny that the truthmaker has to be something that exists, but Molnar sees this as a desperate move also. The obligation remains and that is why Molnar accepts the failure to find such truthmakers as his own failure as much as those who have preceded him.

The Argument of *Powers*

There are four distinct sections to *Powers*, which would have corresponded to separate parts had the book been completed. The first section (Chapters 1 and 2) sets out a general metaphysical background against which the theory of powers is to be developed. This is not as detailed, or as introductory, as intended. There was to be a different first chapter that, like many first chapters, the author was to write last. It would have eased the reader into metaphysics and the issue of powers, but almost nothing of it has survived. We do, however, have discussion of the substantial and important commitments necessary for an understanding of Molnar's theory. Molnar argues that properties are tropes: non-repeatable particulars as opposed to universals. Both realism and nominalism are in part right and in part wrong, necessitating a move to tropes, which retain the best features of realism and nominalism. Next, Molnar argues for selective realism about properties. Properties and predicates are not isomorphic, in agreement with Armstrong's rejection of the 'argument from meaning' (1978: ch. 13). This leaves us with a 'sparse' theory of properties, where best science, not philosophy, tells us which properties there are. A number of distinctions are then stated and clarified with a view to their deployment later in the book.

Chapters 3 to 7 offer the main theory of powers. This is presented in the form of a fivefold characterization of powers with each chapter describing and defending one of the features. These are directedness, independence, actuality, intrinsicality, and objectivity. By directedness, Molnar is claiming that there is such a thing as physical intentionality on a par with the mental intentionality discussed by Brentano and others who have followed him. This claim will be one of the most controversial of the book. By independence, Molnar means that the existence of a power is independent of the existence of its manifestation. Hence, a fragility trope can exist without its manifesta-

tion (in breaking) ever existing. Powers exist whether manifested or not. It is here that Molnar dismisses the famous (or infamous) conditional analysis of power ascriptions. In Chapter 5, Molnar only briefly defends the actuality of powers. He thinks it absurd to defend in depth something so obvious. Chapter 6 defends the intrinsicality of powers. Powers are intrinsic properties of their bearers, so having a power is independent of the existence of any other object and this is contrary to, so requires a rejection of, Popper's account of propensities as properties of the entire experimental set-up. The final characterizing feature of powers is objectivity. Physical powers do not depend on how we cognize them. This is a rejection of the Humean view that all necessary connections are in some sense mind-dependent.

Having characterized powers so, Molnar enters a third section in which he answers some of the further questions that must be addressed before we have a completed theory of powers. Chapters 8 is on the relationship between powers and their grounds in a so-called causal base. Molnar rejects the claim that all powers must be grounded. Although many powers do appear to have such a causal base, the powers of the subatomic particles appear to have no substructure so cannot be causally based. The groundedness claim is not borne out empirically, therefore, providing philosophers with the problem of the missing reduction base. Molnar categorizes and dismisses each of the resisting responses that have been offered to the problem, from the claim that the missing base is there but unknown to the claim that such powers are 'ultra-grounded' (see 8.4.2) in relatively macroscopic properties. The best response, therefore, is acceptance: there are ungrounded powers. But this leaves further work to be done. We will have to explain the difference between a grounded and ungrounded power. We will have to give up causal analyses of powers in general because we have accepted that, for some, there is no causal base. Chapter 9 develops further the ontology of powers. The groundedness of those powers that are grounded is explained in terms of derivability—one of the concepts explained in Chapter 1 (1.4.1). A taxonomy of theories of the ontology of powers is introduced. The taxonomy differs from that in *Dispositions* (Mumford 1998: 1.5) in some key respects. We agree that the division between dualists and monists is the most important division but Molnar divides the monists into pan-dispositionalists, categoricalists, and neutral monists, whereas I had used the less transparent terms dispositional monists and categorical

monists for the first two of those subdivisions. An initial evaluation is given of these positions but it is only in Chapter 10, after considering whether there are any non-powers, that Molnar states his own preferred position. Because he thinks there are non-powers, he opts for a property dualism: there are both powers and non-powers. What are the non-powers? In brief, they are the S-properties, which include spatial location, temporal location, spatial orientation, and so on. These, basically positional, properties fail the test for powers. They are not directed, independent or intrinsic properties, as described in Chapters 3, 4, and 6. Nevertheless, the S-properties have causal relevance, so pass the Eleatic Stranger's reality test. Where objects are located makes a difference to what effects they have on each other (10.3). How can something be a non-power yet have causal relevance? The locations of objects affect the outcomes of the workings of the powers (10.4). Alternative theories of what count as non-dispositional properties are then shown not to match this account (10.5).

Chapter 11 is a consideration of some objections to the general theory of powers that Molnar has offered. He defends his theory against two main charges that pull in opposite directions. He summarizes the two objections thus: 'According to one, ontological seriousness about irreducible powers empties the world of something that it contains. According to the other, it imports into the world something that does not exist' (11.1). Against the first objection, Molnar shows that his theory is not subject to a vicious regress. Against the second objection, he defends the necessary connections denied by the thesis of Humean distinctness. This completes the theory of powers.

There was to have been a lengthier final part, 'Powers at Work', in which the completed theory of powers was applied to various other areas of metaphysics in an attempt to show the connections with, and centrality of, powers. The book's subtitle, 'A Study in Metaphysics', indicates that Molnar did not see powers as some peripheral and specialist sub-area of metaphysics. Rather, it is one of the most important parts and could be the key with which we might unlock many other philosophical problems. His task was to show how powers, understood in the way he has described, relate to various problems in an enlightening way. Unfortunately, just two problems were addressed in a substantial form: those of causation and modality. There is every indication that Molnar was hoping to offer similar treatments to a host of other issues.

Molnar's Theory of Physical Intentionality

Something more should be said on the key, controversial claims of the theory.

In recent times, some philosophers have argued that there is such a thing as physical intentionality and that this is the mark of the dispositional rather than the mark of the mental. These philosophers are Ullin Place, who died in January 2000, Charlie Martin, and John Heil. In *Powers*, Molnar offers the most developed defence of the view that intentionality is the mark of the dispositional. Additionally, he argues that physical intentionality demonstrates the irreducibility of the dispositional but also that there are non-powers. This leaves him with a dualism of properties: there are two distinct kinds. These appear to be controversial claims. How can they be defended? Is Molnar's defence of physical intentionality any advance on the previous versions, which have been attacked, for instance, by Crane (1998) and myself (1999)?

The notion of intentionality comes from Brentano (1874). Famously, he suggested it as the mark of the mental. The key notion in intentionality appears to be directedness, though there are others associated with it. A thought (belief, desire, emotion, perception, etc.) always seems to be directed at, or be about, something. To believe is to believe something, that is, to believe *that p*. To fear is to fear something. To see is to see something. One thing that seemed to mark off such mental intentionality from any directedness in the physical world, such as the directedness of an arrow towards a target, was the possibility of intentional inexistence. I can fear an intruder who is not really there but exists only in my imagination. Despite the lack of any intruder, my fear is real and it is indeed directed towards an object that, outside my mind, does not exist. The view that intentionality is the mark of the mental still persists. But not all follow the line. Some see consciousness as the best way to distinguish the mental from the physical.

Martin and Pfeifer (1986) argued that the typifying features of intentionality are applicable to physical causal dispositions as much as to mental phenomena. A disposition is characterized, for instance, in terms of that to which it is directed. Dissolving, for example, can be understood as that towards which solubility is directed. As such an event need be possible only, because something soluble need never dissolve, there appears to be the possibility of intentional inexistence. Martin and Pfeifer's argument does not automatically support the con-

clusion that there is physical intentionality, however. The notion may be bolstered to avoid the comparison. But Martin and Pfeifer ended the argument there.

It was Ullin Place (*1996a*, *1996b*) who carried the argument forward. He argued that Martin and Pfeifer's argument could be used to support the claim that intentionality was the mark of the dispositional—physical and mental dispositions—rather than uniquely the mark of the mental. There was, therefore, physical intentionality. But Place's argument did not appear absolutely conclusive. He argued that certain features of dispositions were best accounted for by them being intentional states. But what if these same features could be explained another way? Such an explanation was my goal at one time (Mumford 1998).

Powers advances the debate in a numbers of ways. Molnar shows in detail that the directedness of physical causal powers meets all the traditional marks of intentionality that have developed in the post-Brentano literature. This includes the serious, non-linguistic, criteria of intentionality; hence Molnar's account is not clearly vulnerable to Crane's attack on non-mental intentionality (Crane 1998: 248). Molnar accepts the following characteristics of intentionality:

(i) An intentional state is directed to something beyond itself, the intentional object.
(ii) The intentional object can be existent or non-existent.
(iii) There is indeterminacy of the intentional object, which depends on 'partial consideration'.
(iv) There is referential opacity and non-truth-functionality.

Characteristics (i) and (ii) cannot be dismissed as merely linguistic. They are seriously ontological. Nevertheless, Molnar argues that there is physical intentionality because:

(i) Physical powers, such as solubility, are directed at something beyond themselves, their manifestations.
(ii) These manifestations need not exist/be actual.
(iii) There is indeterminacy with respect to dispositions, for example, a manifestation can be indeterminate as to timing.
(iv) Statements of a capacity to F are not truth-functions of F. And the intentional object cannot always be replaced with a co-referring expression in an account of that power.

After first considering some other objections, Molnar concentrates on providing a naturalistic account of physical intentionality. The problem arises from traditional accounts that suggest that the directedness of an intentional state requires some *representation* of its intentional object. Molnar answers such a concern by arguing that there are states or properties that are (a) mental, (b) not semantic or representational, but (c) intentional. Showing that there are such states provides a model of non-semantic directedness, creating the conceptual space for physical intentionality. The example brought forth is pain, which is undeniably mental, but is it non-semantically directed? Molnar thinks so. Pains meet the marks of intentionality as they are felt *somewhere*, in a location that may be non-existent or with a fuzzy boundary. Further, pain exhibits what Grice called natural meaning. Pains may naturally mean their locations but they do not non-naturally mean them so do not require representations of them. We have, thus, a model of non-representational directedness available to us into which fits physical directedness.

The argument means that we now have two candidate ways of characterizing the dispositional: the conditional entailment criterion and the physical intentionality criterion. A compromise is suggested by Place (1999): that the difference between the two might be purely verbal. The compromise could be developed into the view that intentionality provides an ontological distinction between powers and non-powers, while conditional entailment is the same distinction, at the level of concepts, between power and non-power ascriptions. However, Molnar's position stands also against any such compromise. He argues that no conditional entailment criterion can work. Some disposition ascriptions entail no conditional, for instance, such as those that are manifested at random or continuously. It remains to be seen whether any argument will be produced against this crucial point.

Ungrounded Powers

A second key claim of the book is that the simple particulars of our world are, or may be, entities with nothing but ungrounded dispositional properties. Molnar states that 'According to all indications, some subatomic particles are absolutely simple.' He interprets current

subatomic theory as holding that such particles have only dispositional properties and the usual reductive explanation of those properties, in terms of microstructural components, is not available because a simple entity is defined as one without components.

This is one of the key battlegrounds in the debate between Humeans and anti-Humeans. Blackburn (1990) suggests that we ought to consider the acceptance of something like ungrounded dispositions but he concedes that no satisfactory ontology has been developed for simple particulars that have only dispositional properties. Molnar, more boldly, thinks we should openly accept the existence of ungrounded dispositions.

The Humean is likely to object to Molnar's account that there is no credible account of the *Being*, *existence* or *actuality* of such simple particulars when their dispositions are not manifested. Simple particulars cannot consist only of ungrounded dispositional properties because there would be nothing manifest—or actual—about them. Simple particulars must manifest their properties constantly, it seems. If not, they cease to exist. Further, a property that must be manifested constantly is not dispositional at all but, rather, occurrent (some would say categorical). This suggests that a category of ungrounded dispositions cannot be inferred from simple particulars. Such properties would require a bearer between their manifestations and one is noticeably absent in this case.

Molnar's claim that simple particulars have ungrounded dispositional properties is strongly realist about dispositions in that it does not have available the standard, microphysically reductive, explanation for their presence. Most frequently, this standard explanation invokes some basis for each disposition. The basis is usually understood to be categorical but not always. Some dispositions might ground other dispositions (Mellor 1974). Given that this basis is standardly taken to be at a microlevel, relative to the disposition it grounds, by definition there will be no microbasis for the dispositions of simple particulars. That is why they are putatively dispositions that are ungrounded.

Let us consider, again, the two candidate characterizations of dispositions. The conditional option is that a disposition ascription has a special relation to a conditional statement. The question might naturally arise of what makes any such conditional true. What, in the world, is the truthmaker, where a truthmaker is whatever in the world

makes a truth true? (Armstrong 1997: 2). Ordinarily, an answer is readily available. There is a microstructural base, certain other properties of the disposition bearer, which cause such-and-such manifestations upon such-and-such stimulation. In the case of ungrounded dispositions, there is no such ground and so no such truthmaker for any such conditional. As there is no reason to assert any such conditional there is, therefore, no ground to assert the existence or presence of an ungrounded disposition.

The second characterization of dispositions is the intentionality option. The same question of Being arises. To be a disposition is just to be directed towards some possible manifestation. To be an ungrounded disposition is to be so directed and nothing else. In particular, it is for there to be no microstructural basis to this directedness (what Molnar calls, and accepts, the missing reduction base). But if such a property is unbased, *what in the world is it* that is directed towards some possible manifestation? Such a property looks like no property at all. It is nothing more than the possibility of some future property, when there is a manifestation. An ungrounded disposition has no Being between its manifestations and such manifestations need never be actualized.

This charge is serious. Given, as we have seen, that such ungrounded dispositions are the only properties our simple particulars are said to have, their lack of Being would suggest a lack of Being on the part of their bearers. If such dispositions were unmanifested, it would appear that the particular would have no manifest properties—nothing displayed—and any particular with no manifest properties seems like nothing at all.

Molnar's argument is that we should accept ungrounded dispositions—powers—at the basis of everything. The lowest level of existence should be taken as one of ungrounded powers for which there is no further explanation. Given what I have said above, this might seem a high ontological price to pay. But, sometimes, it is worth paying a high start-up price if the eventual benefits are considerable. The application of the ontology to other problems of metaphysics would have shown those benefits. Molnar wasn't able to demonstrate these benefits but Brian Ellis has done a worthy job (2001). One might further respond to the Humean, that while the realist ontology requires inexplicable powers, the Humean ontology requires inexplicable events, the occurrences of which must be taken as basic facts. If both

ontologies can begin only by assuming their own foundations, they are in equally strong, or weak, positions in that respect and we must look for some other basis to choose between them.

The Manuscript and its Completion

George Molnar contacted me by e-mail in the summer of 1999 and told me about the book he was working on. He told me that it was near completion and asked if I would be prepared to read it and give some comments. I agreed and said I would look forward to reading the manuscript.

We would have met that December as we were both to speak at a conference on Australian metaphysics to be held in Grenoble. We were greatly looking forward to this but the meeting never occurred owing to George's death. I did meet others in Grenoble, and heard quite a bit about George Molnar, the person. I also heard of the manuscript of *Powers*, which was reported to be in a good state, with a wealth of worthy material but, as yet, not quite a finished book.

That seemed to be the end of the matter until, the following spring, I got an e-mail from Tony Skillen, lecturer in philosophy at University of Kent and old friend of George's. He had access to the manuscript, via Carlotta McIntosh, and asked me what I thought. My view was that if publication was to be considered, it would be best to try to preserve the manuscript as much as possible in the form George left it but that some changes might be necessary to make it a readable book. As my idea appealed to Carlotta and to Tony, they asked if I was prepared to go ahead and do it. First I needed to see the manuscript, however. As soon as I started reading it, I realized that it was work of the highest calibre and, by the end, that it could be a significant contribution to the debate. This work deserved to be read by those working in the field. I had little hesitation in offering to help, however I could, to get the work available to a reading public.

Then followed the, at times, difficult editorial work. From what can be gathered from George's papers, he had an unusual but admirable approach to his work. The argument was planned out in his head and then written up in complete and detailed draft. This had a good side and a bad side for any budding editor. The draft chapters, early on in the book, were almost complete, polished and tightly argued. The later

chapters, in complete contrast, were non-existent and almost impossible to construct as only a few fragments appear in the remaining papers. He left a table of contents that shows how the final part of his book, 'Powers at Work', would have developed, but little survives that matches these proposed contents. I was reminded of what David Armstrong said to me, as we travelled down from Paris to Grenoble, when I said that George had told me the book was near finished: 'it was near finished, in his mind'. This suggests that the book would indeed have been fully written if George had lived just another month or so.

The main theory of powers is, however, complete and it has not been necessary for me to alter much to make these main chapters finished and presentable. The reader can be confident here that the work is George's and that he said what he wanted to say. My main quandary was how to deal with the later chapters of which barely anything existed. Carlotta sent me everything that remained on his computer at the time of his death. My solution was to make a final chapter out of the relevant fragments found there. This could only be a condensed version of George's thought that drops hints of how his theory would be applied to a range of problems. We can be quite sure that George would not have been happy to present this as his finished work, and that he would have worked out his position in meticulous detail. But only if I wrote a substantial new work and tried to pass it off as George's ideas could we have anything approaching that. I had to keep my obligation to Carlotta in mind and change as little as possible. That, after all, was why she wanted me to complete the book rather than anyone else. On this last chapter, however, the reader can be assured that the ideas were all George's, even if they were not as developed as he would have wanted. This is the best we can have that accurately represents what George would have done. There was also nothing by way of introduction to *Powers*. The book rather plunges in at the deep end. Part of the aim of this introduction has been to make up for that.

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POWERS

George Molnar

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I

The Elements (I): Properties

All things that exist are only particulars.

(John Locke)

This chapter is intended to give a broad-brush description of the nature of properties. The description is, inevitably, too brief and too dogmatic given the complexity of the issues arising. I do not pretend that the account of properties I'm inclined to accept is adequately defended here, or that all the competing positions are fully stated and fairly assessed. Nevertheless, these general statements about properties do describe parts of a metaphysical environment for the theory of causal powers to be developed. Without the context provided by such an overview, it would be more difficult to state an account of powers.

1.1 Foundations

First, to begin with assumptions so basic, and of such significance, that we cannot hope to justify them in a study of this nature. The assumptions are: first, that 'existence' is univocal, in that although there are different types of thing which exist, there is only one type of existence; second, that there is at most one world, contrary to some claims by notable philosophers; third, that truth is correspondence, broadly speaking. Were there more time, these three claims would admit almost limitless discussion but, having stated them, we must focus the investigation more narrowly, if progress is to be made at all.

The metaphysics to be presented here is intended to be naturalistic. Its theme can be summed up in the motto 'less conceptual analysis, more metaphysics'. We distinguish between conceptual analysis and substantive metaphysics. This is equivalent to the distinction between saying what 'F' means and saying what being F is. What is the

difference between these? (Twentieth-century analytic philosophy—but not only it—has notoriously blurred the distinction.) Meaning depends on rules governing use. To say what an expression means is to say what criteria govern its application across all the contexts in which it can be applied. The criteria specify certain properties that have to be present (and other properties that have to be absent) for the application of 'F', to a subject, to be justified. These properties may not be the ones that determine the nature of F-things. They may not be properties that are essential to something's being F, but merely properties that enable one to identify and re-identify, for the most part and as a matter of fact, something as an F. To say what being F is, on the other hand, is to say what constitutes the nature of F-ness, and this may well be done in terms of properties that are not the ones commonly used for identifying something as F. All this was discovered not by Kripke (not even by Putnam or Donellan), but by good old, much maligned, John Locke.[1]

1.2 Properties Are Tropes

There are objects and they are of various kinds. Are there also kinds? Traditionally opposed answers to this question, given by realists and nominalists, have a common root in an ontological thesis about properties:[2]

(α) If there are real properties, then they are universals.

Universals are higher-order 'characterizing entities'. Their relation(s) to the first-order individuals are appealed to as explaining what it is for an object to bear a property, or what it is for many objects to bear the same property. Each first-order bearer of properties is an individual, and has singular occurrence. Universals can occur multiply. Universals can be fully present in many objects at once, and so can occur in different places either at different times or at the same time. *Repeatability* is the salient difference between universals and the first-order property bearing individuals that we encounter in life and science.

Although (α) is agreed common ground between realists and nominalists, they put it to different uses. Realists affirm the antecedent to

[1] See nominal versus real essence (Locke 1690: Bk II, 24–5); also Leibniz (*c.*1704).

[2] For a contemporary treatment of the problem of universals, see the brief but excellent Armstrong (1989*a*).

infer the consequent of (α) (ponens), nominalists deny the consequent to negate the antecedent (tollens). Realism versus nominalism is basically an *ontological* conflict: realists say that entities belonging to a certain category exist, nominalists say that the category is empty. The account of causal powers in this book is based on a general theory of properties as *tropes*. Tropes are genuine, mind-independent properties, but they are non-repeatably particular. They are 'unit properties', as Mertz (1996) calls them. This distinguishes trope theory from both classical realism and classical nominalism.[3] These familiar theories of the nature of properties have (α) as a core doctrine, whereas the trope alternative starts with a rejection of (α). But the traditional theories are not altogether wrong. I am convinced that there is something fundamentally correct in all versions of realism, and there is something (else) that is fundamentally correct in all versions of nominalism. It is desirable that trope theory should recover and preserve the insights of both realism and nominalism. In the next few paragraphs I will indicate briefly the elements of the traditional accounts that trope theory selects for preservation and the elements it discards.

What is wrong in nominalism? We can truly predicate 'freezes when cooled to 0 °C' of water. There are facts of predication. It seems perfectly reasonable to ask for a robust, ontologically grounded, explanation of the fact that a predicate applies to an object. Such explanations are often available, and they typically present as explanans the existence of some properties borne by some objects. According to explanations of this type, it is the having of those properties that determines what predicates an object satisfies. Nominalism, being globally antirealist about properties, cannot offer any such explanations. Instead it restates the semantic criterion for the correct application of the predicate: it is correct to say that *a* is F if *a* belongs to the extension of 'F', or if *a* satisfies 'F', or if *a* is among the Fs, and so on. This gives a formally adequate answer to the request for a truthmaker for the claim '*a* is F'. But it is not metaphysically adequate. It is not the robust explanation that one can reasonably expect. The nominalist's formalist substitute for a robust explanation faces an obvious Euthyphro question: Do some things freeze when cooled to 0 °C because they satisfy the predicate 'freezes when cooled to 0 °C', or do these things satisfy the predicate 'freezes when cooled to 0 °C' because they in fact freeze when

[3] Ibid. 113–33. On trope theory see also Bacon (1995); Campbell (1990); Mertz (1996); Stout (1930), and Williams (1966).

cooled to 0°C? Once formulated the question looks easy to answer. Surely *a* belongs to the extension of 'F' because of some property or properties it has, and not conversely. For the nominalist, however, belonging to the extension of a predicate is just an inexplicable ultimate fact. The trope-theoretic verdict on *What is wrong in nominalism?* is that nominalists' well-founded distrust of universals misleads them into denying the reality of properties as such.

What is right in nominalism? The great insight is particularism: everything is particular. Even the properties had by individuals are particular, namely, tokens of characteristics. In terms of both common sense and science it seems like a needlessly reificatory move to postulate non-particulars over and above the particulars. The fact that the particular property instances fall into natural groups (types) is to be explained by the *exact resemblance* of the tropes to one another. Universals are kosher if, but only if, we think of them, in a deflationary way, as just being equivalence classes of exactly resembling tropes.[4] Of course this relation of trope-resemblance has to be accepted as primitive, not further definable within our theory of properties. This seems admissible since the concept of trope-resemblance is intuitively much clearer than the primitives of the alternative theories.[5] The trope-theoretic answer to *What is right in nominalism?* is that nominalism enables one to replace difficult ideas like object-resemblance, or type-instantiation, by the clearer idea of trope-resemblance.

What is wrong in realism? Classical realism identifies properties with universals, which are strange posits indeed. On the account of them descended from Plato, universals are inconsistent with naturalism, since they exist outside of space-time, in a 'higher realm' from whence they communicate with the mundane particulars in inexplicable ways. On the account of them descended from Aristotle, they are immanent to the world, being repeatable individuals that manage to be wholly present in all their many instances at once. I agree with the many philosophers who have thought that such entities cannot explain or cast light on anything. Whenever universals are invoked in an account of something of philosophical interest, be it the facts of predication, the nature of lawfulness, the necessity of causation, the

[4] Williams (1953: 9–10).

[5] Cf. 'If you will not countenance primitive similarity in any form, then trope theory is not for you. But if you will, then duplication of tropes is an especially satisfactory form for primitive similarity to take' (Lewis 1986*c*: 66).

character of numbers and other abstract entities, and so on, we understand less *after* the explanation is given than we understood before it was given. The world seems more intelligible without universals.

What is right in realism? Where nominalism is ontologically frivolous, realism in contrast is ontologically serious on an issue that calls for ontological seriousness. By including properties among the irreducible contents of this world, realism allows us to construct the robust explanations, of the facts of predication, of causation, of nomological connection, etc., that are blocked by nominalism. According to trope theory, realism gets the relation between metaphysics and semantics right and so delivers the correct answer to our Euthyphro question.

1.3 Selective Realism about Properties

1.3.1 *Predicates and properties are not isomorphic*

A predicate is a language-dependent thing, whereas a property (i.e. on the present account, a trope) is a feature of reality that is, in typical cases, independent of language or of thought. There are philosophers who claim, or presuppose, that properties and predicates, although belonging to different categories, are correlated one-to-one.[6] If this were the case, realism about properties would have to be indiscriminate. A property realist would have to affirm that whenever a predicate truly applied to an object there exists a corresponding trope of that object. One does not have to be a desert landscape lover to find such ontological profligacy deeply unattractive. Fortunately we are spared this embarrassment, because predicates and properties are not isomorphic, and there exist convincing arguments to show that they are not. Here is a reminder of some of them.

First, although it does not flatter human vanity to admit it, there are omnitemporally unknown properties to which no predicates correspond.[7]

Second, there are predicates, such as 'is a game', that apply to many objects by virtue of a family resemblance among the objects and not by

[6] For a discussion of 'minimalist realism' versus 'maximalist realism' about properties, see Swoyer (1996: 243–64).

[7] Armstrong (1978: 12–14).

virtue of each of them having one member of a set of exactly resembling tropes.

Third, the converse of Wittgenstein's famous point also holds and counts against isomorphism. There are co-denoting non-synonymous predicates, such as 'has the shape of a ball-bearing' and 'is spherical', both of which can apply to the same object by virtue of a single trope of that object.[8]

Fourth, this last point when generalized serves to bring out what many of us regard as a very objectionable feature of isomorphism. Predicates can be generated out of other predicates and out of sentences, in accordance with accepted formation rules, up to many orders of infinity (at least one infinite set corresponding to each generative operation, such as disjunction, double negation, sentence abstraction, etc.). The expressions so obtained are mostly non-synonymous, but they do not seem to correspond to an equal number of tropes. The ontological costs of producing this plethora of predicates can only be avoided by adopting what Ellis and Lierse have called the Principle of Non-Proliferation: 'satisfaction of a predicate is not a sufficient condition for the existence of a real property distinguished by that predicate.'[9]

For a fifth point against isomorphism, we can adapt a powerful argument due to M. C. Bradley. The argument requires only one reasonable premiss, namely, that 'we take seriously the use of the real number system in physics'.[10] Given that much, there will be an uncountable infinity of properties, for example, a particle passing through each of the points of a real line segment will have non-denumerably many properties. For unambiguously denoting each of these properties with a predicate, we would need an uncountable infinity of expressions and such a number of predicates is not available in principle in any language capable of being used by humans. We have the recipe for generating infinities of predicates but not the time to actually make an infinity of predicates. All efforts to match predicates to properties are bound to finish short of isomorphism.

Last, there are the paradoxical predicates. 'Is a property to which no predicate corresponds' corresponds to a property only if it does not. So it does not correspond to any property.

The arguments that I rely on to reject property/predicate isomor-

[8] Cf. Campbell (1990: 25).

[9] Ellis and Lierse (1994*a*: 9).

[10] Bradley (1979: 12–13).

phism also provide, between them, sufficient grounds for rejecting two weaker theses: first, the thesis that there is one property for every predicate; second, the thesis that there is one predicate for every property. The correlation between predicates and properties is altogether looser than is required either by the claim of isomorphism or by its weaker relatives. In view of this one should adopt what David Lewis aptly calls a *sparse theory* of properties: what properties there are is not determined by what predicates apply to objects, but on a posteriori grounds, most likely by current best science.

1.3.2 *Dispositional predicates and power properties are not isomorphic*

Someone persuaded by the above arguments could admit that there is no predicate/property isomorphism, in general, yet still maintain that there is an isomorphism between the dispositional predicates and the power properties. It would be a mistake to do so, since many of the arguments against general predicate/property isomorphism apply also to any claim that dispositional predicates are one-to-one correlated with power tropes. For example, there are omnitemporally unknown power properties. More importantly, ordinary language affords the facility for the generation of multiply infinite sets of dispositional predicates, just as it does for predicates in general. Quine has inveighed against what he calls 'the general dispositional idiom', by which he means 'the general technique of applying the suffix "-ile" or "-ble" to verb stems and of using the word "disposition" and, for that matter, the corresponding intensional conditional'.[11] The three elements of the general technique can be used, singly or in combination, to generate any number of fresh dispositional predicates. For instance, to create a new dispositional predicate, using the second technique in Quine's list, just substitute any verb for the dash in 'is disposed to——'. Inflation can be further increased by exploiting the fact that, since verbs designate actions determinably, it is usually possible to make our descriptions more determinate. In addition, the generative procedures applicable to predicates in general are, of course, available for the special case of dispositional predicates. So we can have:

is disposed to dissolve,
is disposed to dissolve when placed in water,

[11] Quine (1973: 11).

is disposed to dissolve when placed in water on Sundays or Mondays, is disposed to dissolve when placed in water and is such that snow is white, etc.

Word-making is not world-making. Quine is right to denigrate the ontological significance of such verbal fertility, even if the final philosophical import of his remarks is somewhat ambiguous. Both eliminativists about powers and selective realists about powers can draw some comfort from Quine *anno* 1973. I urge acceptance of what is common to these positions, viz. that there is not a power *in the object* corresponding to each of the predicates mentioned above.

1.4 Distinctions

In this section I want to introduce and discuss certain conceptual distinctions that will be used in the rest of the book.

1.4.1 *Derivative–basic*

In the chapters to follow use will be made of a distinction between two sorts of properties that I call '*derivative* properties' and '*basic* properties', respectively. Intuitively, there seems to be a difference between those properties the having of which by an object is ontologically independent of other properties, and those properties the having of which by an object is not ontologically independent of other properties. This is a very crude statement of the apparent difference that we are trying to capture in the definitions of 'derivative' and 'basic'. The intuition needs some refining before it can be transformed into a definition.

What is meant, here, by 'other properties'? Objects can have parts. If they do they are complex. If they don't they are simple (more on this in 1.4.3, below). The properties of objects are not parts of the objects, but a property of a whole object can bear important relations to properties of the parts, as well as to other properties of the whole. A property of a complex object may be ontologically dependent on some properties of the object's parts, or it may be ontologically dependent on some properties of the object as a whole that are not properties of its parts. If it is so dependent, it is a derivative property in our sense and, if it is not so dependent, then it is a basic property in our sense. On the other hand a property of a simple object cannot be dependent on properties of parts and can be ontologically dependent only on some

properties of the object itself. The expressions 'derivative' and 'basic', when applied to properties of simple objects, denote the presence or absence of this dependence. If we wish to define 'derivative property' and 'basic property' without mentioning the difference between simple objects and complex ones, then our definitions will have to be disjunctive.

What is ontological dependence? If, but *not* iff, *A* ontologically depends on *B*, then it is impossible for *A* to exist without *B* existing. Why not iff? Amplifying the conditional into a bi-conditional (i.e. into a definition) would have unwelcome consequences. (i) Suppose that B is a necessary existent. Then *A* would ontologically depend on *B*, whatever *A* is. (ii) If the impossibility of *A*'s existing without *B* existing is sufficient for *A*'s ontological dependence on *B*, then everything will ontologically depend on itself. (There are devices for filtering out this result but it is not clear that their use would be other than ad hoc.) To define ontological dependence as simply the logical impossibility of one thing existing without another, risks trivializing the relation. Instead we should say that *A* ontologically depends on *B* iff it is impossible for *A* to exist without *B* existing, *and* the impossibility is due to the nature (essence) of *A*. Discussion of essentialist modal connections is deferred to Section 1.4.4 below. Here are definitions that sum up what has been said so far:

Df_1 F is a derivative property of *a* iff *a* has the property F and *a*'s having F ontologically depends on some properties of some parts of *a*, *or* *a*'s having F ontologically depends on some other properties of *a*.

Df_2 F is a basic property of *a* iff *a* has the property F and *a*'s having F does not ontologically depend on any properties of any parts of *a*, *and* *a*'s having F does not ontologically depend on any other properties of *a*.

There is nothing in Df_1 that would rule out a derivative property ontologically depending on other derivative properties. Df_1 does not even rule out the possibility that all properties are derivative. This possibility clearly obtains in a world that satisfies the premiss of the Bradley-argument (as discussed in 1.3.1): a world in which an object can have continuum-many properties. The possibility may still obtain in a non-Bradley world in which objects have only finitely many properties, provided there is such a thing as the *mutual* ontological dependence of two properties, or two sets of properties, on each other. The claim that

such mutual dependence is possible is controversial.[12] One can think of putative examples: the two properties of certain closed two-dimensional figures, *being three-sided* and *having three internal angles*, seem to be mutually dependent. But the example could be disputed. I do not wish to decide whether the dependence of properties on properties is asymmetrical or non-symmetrical. One can just note that if it is the latter, that is enough to permit the possibility of a non-Bradley world containing nothing but derivative properties. In some places I use the expression 'ultimate property' (or 'ultimate power') to mean a basic property (power) of a simple object, for example, a fundamental subatomic particle. If a posteriori atomism is a true theory of the world, then all properties are derivative from ultimate properties in this sense of 'ultimate'.

1.4.2 *First-order–higher-order*

Hierarchies of properties have often been described in the terminology of 'first-order properties' versus 'higher-order properties'. However, these terms have not always been used to mark one and the same distinction. I want to identify two clear senses in which one can, and should, distinguish hierarchies of properties for purposes of theory construction.

First, we can distinguish properties of objects from properties of properties. That is one sense in which we can talk of 'first-order' and 'second-order' properties. There are examples of attributes that both objects and properties seem to have. For instance, both objects and properties can be said to be *physical*, or *spatio-temporal*. By contrast, only properties but not objects can be *relational*, or *dispositional*, or *accidental*. This suggests that the categories of properties-borne-by-objects and properties-borne-by-properties are not exclusive, and that we really need a tripartite classification into (i) properties-borne-only-by-objects, (ii) properties-borne-only-by-properties, and (iii) properties-borne-by-both-objects-and-properties. I do not see a good reason for adopting such a taxonomy. It seems to me that the apparent lack of exclusivity between orders of properties is an artefact of the predicate–property distinction. There are some *predicates*, such as 'is physical', that can be correctly applied to both objects and properties. But it does not follow from this that in each of its (correct) uses the

[12] 'Our (primary) intuitive notion of ontological dependency is of a distinctly *asymmetrical* relation' (Lowe 1994: 39).

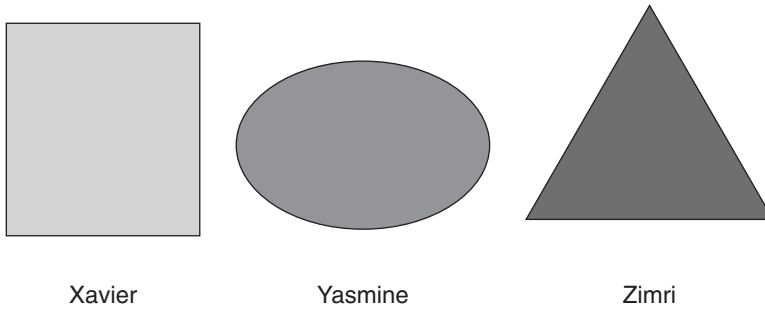

Fig. 1

predicate picks out a genuine property. Think of how we establish the application of such predicates. Descartes argues that a certain substance is physical because it has an essential property that is antecedently given as a physical property. Even if one does not agree that *being extended* does the job Descartes wants it to do, it is clear that any alternative to his definition of a substance as physical would have to be in terms of the substance having properties that are accepted as physical properties. This suggests that a property like *being physical* is just a second-order property. When we truly say of a first-order property that it is a physical property, the truthmaker for our statement is the first-order property's having a certain second-order property, that of being physical. When we truly say of an object that it is a physical object, the truthmaker for our statement is the object's bearing a first-order property that itself bears the second-order property of being physical. *Being physical* is not required as a first-order property. The inflation of ontological categories suggested in the tripartite classification is not necessary.

Do objects have determinable properties *in addition* to having fully determinate ones? Some of us, looking at Figure 1, would say that 'Xavier is rectangular', 'Xavier has a regular shape', and 'Xavier has shape' are three different truths that have the same truthmaker, namely, Xavier's fully determinate (rectangular) shape. Others among us would say that Xavier has a property corresponding to each of the three determinable predicates. I follow Russell and adopt what seems like a good compromise: treat determinables as higher-order.[13] The

[13] 'I should regard "red is a colour" as a genuine subject-predicate proposition, assigning to the "substance" *red* the quality *colour*' (Russell 1959: 127).

concession to the minimalists is that all first-order properties (properties of objects) are fully determinate, while we agree with maximalists that there are genuine determinable properties, only they are all higher-order ones. Yasmine has fully determinate shape as a first-order property. That shape in turn has the property of *being oval*. Being oval itself has the property of *being a regular shape*, etc. There is a reason for treating determinables as genuine, if higher-order, properties. Yasmine's having some shape necessitates Yasmine's having some (positive) size. This necessary connection only holds at the level of determinables, not at the level of fully determinate properties. It is a 'higher-order connection'. There are many such necessary higher-order connections among determinables, and I would argue that their necessity is neither a conceptual necessity, nor a formal (logical) necessity, but a material, *de re* necessity. If so, the most natural explanation of that necessity seems to be that it is grounded in the nature of two real, *n*-th order properties of properties had by Yasmine. The higher-order properties earn their keep here as necessity-makers.

There is a second reason for including second-order determinable properties in our sparse set of properties. It is not uncommon for an object to contingently have a determinate of a determinable property, although it is essential to the object that it should have some determinate or other of that determinable. We want to be able to say, for example, that it is in the nature of some objects that they are in space-time, but that their actual spatio-temporal location is contingent. These essentialist claims also call for determinable (second-order) properties to be given full status in the ontology.

The distinction drawn earlier (1.4.1) between derivative and basic properties applies only to first-order properties (properties of objects). Properties of properties cannot be divided into, on the one hand, those the having of which depends on other properties of the object, or of parts of the object, and, on the other, those the having of which does not depend on other properties. There are neither derivative nor basic higher-order properties.

Now to a second sense in which we need a hierarchical taxonomy of properties. There is a distinction to be drawn among dispositional properties that is of particular interest to our inquiry. We can talk of a behavioural disposition of an object, for example *being magnetized*, as a first-order power. We can also talk of an object's capacity to acquire a first-order power, for example *being magnetizable*, as a second-order

power. We can also call an object's aptness to lose a first-order power, for example metal's *tendency to fatigue*, a second-order power. A power that is second-order in this sense, is not, of course, a second-order property in the sense identified in the previous paragraph. *All* dispositions are first-order properties in that sense.

For the sake of clarity, from now on I will refer to properties of objects as 'first-order properties', properties of properties as 'second-order properties', and to powers to acquire (or to lose) a power as 'iterated powers'. I cannot find any other use for 'orders' or 'levels' of properties.

1.4.3 *Simple–complex*

Is a division of properties into simple and complex required for a theory of properties? *Can* properties be divided into simple and complex ones? The question is not straightforward since there are many senses in which things can be said to be simple or complex. Some of these clearly do apply to properties: for instance there is a perfectly good sense in which a property can be said to be *phenomenally* simple (or, more broadly, epistemologically simple): when we cannot discern any structure in the property. A predicate or description can be *logically* (syntactically) simple or complex in a clear sense: when the description does not contain other descriptions as components. And of course objects and events are complex or simple depending just on whether they have or lack parts (components). Our question needs more precise formulation.

It may be best to begin by examining how the distinction between complex and simple works in the domain where it unquestionably has application. What is it for a physical object to be complex? An object is complex iff it has (spatially extended) parts. An object is simple iff it has no (spatially extended) parts. 'Part', as applied to objects, has been used to mean different things, so yielding different senses in which an object can be said to be 'simple' and, correlatively, 'complex'. First, a part can be conceived of as *the result of a partition* of a whole object. Call this a part in the narrow sense ('part_n'). Such a part is detachable from its whole. It may be defined as:

Df$_3$ *a* is a part_n of *b* iff there is a physically possible process by which *b* can be partitioned into *n* objects ($n \geq 2$), and *a* is identical with one of the *n* objects that would result if *b* were actually partitioned.

Second, a part may be conceived of in a much wider sense as anything distinct in or about an object that is not a property of it ('part_w'). A part_w does not *have* to be detachable although it *may* be detachable. Being a part_w depends merely on spatial extendedness. Any object that has non-zero extension in one of three dimensions has parts in the sense of 'part_w'.

Df$_4$ *a* is a part_w of *b* iff *a* is something in or about *b* that can be selectively attended to, and *a* bears some properties not borne by *b*, and *a* is not a property of *b*.

It is a consequence of *Df*$_3$ and *Df*$_4$ that an object may be simple in the sense of not having any parts_n, and yet not be simple because it has some parts_w. For an object to be absolutely simple it would have to be spatially unextended, that is, occupy no more than a point in space. I am happy to accept this consequence of the definitions, although there are philosophers who would not accept it because they are sure that it is possible for an object to be simple *and* extended.[14]

To sum up: detachable (proper) parts of complex objects are themselves objects. Undetachable (proper) parts are only notionally objects: they are differentiated from the whole object of which they are part simply as a consequence of the spatio-temporal extendedness of the object. The question is, can properties be thought of as simple or complex in the way in which objects (and events) are simple or complex?

One version of the case for complex properties is the claim made by some philosophers that there are conjunctive properties. Thus Armstrong:

> If *a* has the property, P, and also the distinct property, Q, then, I maintain, it has the conjunctive property P&Q.[15]

I take the proposal that there are conjunctive properties to be that *properties* are combined to form complex properties, under principles that are strictly analogous to the semantic formation rules that allow conjunctive *descriptions* to be generated from the conjunct descriptions.[16]

The truth-functional definition of the &-connective permits *two*

[14] Heil (1998: 188). [15] Armstrong (1978: 30).

[16] Some writers clearly acknowledge this point, e.g. 'The most fundamental modes of property composition to consider are trope theoretic analogues of the Boolean operations of complementation, union, and intersection; namely, negation, disjunction, and conjunction' (Bacon 1995: 38).

(syntactically distinct) conjunctions to be formed out of each pair of predicates. If the combination of properties is to mimic the conjoining of predicates, then every pair of properties, F and G, will yield two conjunctive properties, *being F&G*, and *being G&F*. By elementary arithmetic, n distinct properties generate $(n \times (n-1))$ conjunctive properties, for example, for five distinct properties that an object has there are twenty conjunctive ones it has. This *looks* like violation of the Principle of Non-Proliferation: the application of an a priori combinatorial rule results in the overproduction of properties. (If it were said that only one of *being F&G* and *being G&F* results from combining F and G, we would also need to say *which* one. Even if there is only one conjunctive property for each pair of distinct properties an object has, for five distinct properties we would get ten conjunctive ones.) It may be said in response that overproduction in this type of case is ontologically innocuous, because the conjunctive properties are 'nothing over and above' the properties that make them up, the conjuncts.[17] But then why postulate conjunctive properties at all? Why not just say that whatever satisfies 'F&G' also satisfies 'F' and 'G' (taken collectively), and vice versa, or that sentences of the form '*a* is F&G' and '*a* is F and *a* is G' have the same truthmaker? These formulations are truly ontologically innocent since they do not imply that conjunctive properties exist. In a sparse theory of properties, ontologically innocuous predicates merit equal treatment: 'F&G' is to *being F* and to *being G*, as 'is not unsound' is to *being sound*. If doubly negated predicates do not denote mereologically complex properties, then neither do conjunctive predicates. There is at least one good reason for not postulating conjunctive properties. If conjunctive properties are not additional to the conjuncts, then they are not causally and dispositionally additional to the conjuncts. Let *a* be an object that has charge *e* and also has spin $^1/_2$. Whatever difference *a*'s charge and spin number make, or could make, to anything in the world, is accounted for by *a*'s having charge *e* and *a*'s having spin $^1/_2$. Thus *a*'s having charge *e* and spin $^1/_2$ is causally, dispositionally, and explanatorily redundant. Ditto for *a*'s having spin $^1/_2$ and charge *e*. Such radically impotent properties should not be recognized in any broadly naturalistic metaphysics.[18]

[17] Armstrong (1978: 30).

[18] One could add, *ad hominem* against Armstrong, that he uses arguments from causal impotence to reject disjunctive and negative properties. If I am right, he should have used them also against conjunctive properties.

Another, different, conception of complexity in properties is the complexity attributed to so-called 'structural properties'. A structural property has been defined as:

> A property, S, is structural if and only if proper parts of particulars having S have some property or properties, T, . . . not identical with S, and this state of affairs is, in part at least, constitutive of S. It will be seen that a structural property must be complex.[19]

This idea of structural property embodies two salient elements: the dependence of a property of a whole on some properties of the parts of that whole, and the idea that such properties of wholes are complex, in some sense of 'complex'. The first of these ideas can be fully accommodated (I claim) by using the distinction between derivative and basic properties (1.4.1). Structural properties are clear examples of derivative properties. However, according to the definition above, they would be derivative properties that have the *additional feature* of being mereologically complex. Why should one accept this claimed complexity of structural properties? It is after all possible to conceive of structural properties as not having any parts, as David Lewis points out.[20] However, the conception of structural properties as mereologically atomic may have problems. If these problems could only be resolved, or could most naturally be resolved, by making the structural properties complex, we would have an independent argument for the existence of property complexity from the undisputed fact that there are derivative properties.

Here's a rough outline of this argument against mereologically atomic structural properties. A molecule's *being water* is necessarily connected with, or 'involves' as Lewis puts it, the properties *being hydrogen* and *being oxygen* had by the three constituent atoms of the molecule. This involvement must be explained somehow. If the molecule's structural property does not involve the properties of the constituting atoms *as parts*, then the connection between them cannot be explained in mereological terms. It cannot be explained as description-dependent, and it cannot be explained in any other terms (claims Lewis). The connection is 'magical'.[21] So, if we want to avoid

[19] Armstrong (1978: 69). Also: 'If a property is complex, then it has parts. These parts are properties and/or relations. We will call them *constituents* of the complex property' (ibid. 67, original italics).

[20] Lewis (1986*b*: 41–2). [21] Ibid. 41.

commitment to magical connections but want to retain structural properties, our best chance of doing so is to accept that these properties *are* mereologically complex.

Section 1.4.1 outlines an essentialist explanation of the nexus between a derivative property and the properties on which it depends. It is somewhat similar to a theory proposed by Bigelow and Pargetter: the structural property 'stands in a pattern of internal relations of proportion to other properties—the so-called "constitutive" properties . . .'.[22] Bigelow and Pargetter use 'internal relation' to describe a relation which is essential to its relata. Ontological dependence is one of these essential relations, and, as those authors say, they are not 'magical'. Of course, essential relations are inconsistent with Hume's notorious denial of necessary connections between distinct existents. I discuss Hume's Distinctness Thesis in Chapter 11 and argue that it is unsupported and insupportable. The 'no magic please'-argument against mereologically atomic structural properties takes no account of the possibility of an essentialist (non-mereological) explanation of how properties of wholes involve properties of parts.

Let us note that as objects can be complex so can events. The parts of events are themselves events. The principles of mereological calculus appear to have the same application to event-wholes and their parts as they do to object-wholes. Events, however, are no different from states of affairs, that is, they are not as ontologically fundamental as objects, properties, and relations because they are made out of, or at least depend upon, such things.

There are no metaphysical facts about properties that cannot be fitted into a theory that recognizes the distinction between derivative and basic properties (1.4.1), and first-order and higher-order properties (1.4.2). We can explain structural properties as derivative properties, we do not have to say that they are also, additionally, complex. The contrast between simple and complex properties is not needed. However, I am not arguing for the view that 'all properties are simple'. I am rather claiming that the distinction between simple (= lacks parts) and complex (= has parts) does not apply at all to properties.

1.4.4 *Essential–necessary–accidental*

'Essential' and 'necessary' are often used interchangeably. But pretheoretically it does not seem to be the case that what is essential to a

[22] Bigelow and Pargetter (1989: 6).

thing includes *everything* that is necessarily true of that thing. Thus, if we assumed for present purposes that class-membership is a real relation, one could say of any thing that it necessarily belongs to its singleton. Yet surely *being a member of the Socratic singleton* does not belong to the essence of Socrates![23] One should distinguish between essence and necessity, in such a way as to respect the following theorems:

(i) If *a* is essentially F then *a* is necessarily F.
(ii) It is not the case that if *a* is necessarily F then *a* is essentially F.

According to (i) and (ii), the essential is a species of the necessary. What is the specific difference? Above (1.4.1) we said that ontological dependence is better understood in terms of an essential connection, rather than simply a necessary connection, between existents. 'Ontological dependence' is meant to pick out that relation whereby one thing, *a*, depends for its existence on another, *b*, specifically because of the nature *a*, of what *a* is. Generalizing, one can say that an essential property is one that an object has because its identity depends on its having that property. One way of distinguishing essential properties from the necessary-but-not-essential ones is by the test of 'generalizing away'.[24] By this test, a property, F, cannot be part of the essence of a particular if everything has F. (The ontological dependence of a particular, *a*, on another particular, *b*, cannot be any relation, R, that is such that everything has R to *b*; nor can it be any relation, R*, that is such that *a* has R* to everything.)

The concept of essence that I adopt here is very nearly the one described by Locke: 'the very being of anything, whereby it is what it is'.[25] As Locke argues, the essence, or nature, of a thing is what we are defining when we are giving the *real definition* of the thing. A real definition expresses the sum of the properties that constitute the identity of the thing defined; in the case of a complex thing the properties definitive of identity will be those of inner structure. This idea, of grounding the nature or essence of a particular in its identity, is familiar enough for me to adopt here without further analysis. The grounding of essence in identity explains the difference between essential properties and necessary properties: the inessential properties of an

[23] Example due to Fine (1994).
[24] Fine (1995: 277).
[25] *Essay*, Bk III, ch. 3, sect. 15.

object are not merely its accidental ones, but include all those it has necessarily yet not by virtue of what it is. Founding essence in identity also justifies the use of the generalizing away test: a property had by everything cannot be an ineliminable part of what determines the identity of anything. For example, if there are necessary beings then everything has the necessary relational property of co-inhabiting its world with those beings—but this relational property will not be an essential property. So we define our use of 'essential' and 'necessary' as:

Df_5 F is a necessary property of *a* iff *a* has F in all possible worlds that include *a*.

Df_6 F is an essential property of *a* iff being F is constitutive of the identity of *a*.

Note that, in consequence of Df_5 and Df_6, 'necessary' and 'non-accidental' are equivalent, but 'essential' and 'non-accidental' are not.

1.4.5 *Extrinsic–intrinsic*

Some properties are intrinsic to their bearers and some are not. It is quite obvious that the distinction matters a great deal in many areas of metaphysics. See, for example, the individualism versus holism disputes in the philosophy of mind. Given the importance of these concepts, it is useful, and perhaps necessary, to construct explicit definitions of them.

'Intrinsic' can be understood in a number of different ways. By 'the intrinsic shape' of an object one can mean its quasi-natural shape, the shape it tends to return to after a distorting force ceases to apply to it (example due to Brian Ellis). Or one could think of intrinsic properties as the fully portable ones: those properties that an object retains through all changes of location. However, the deepest intuition concerning 'intrinsic' is that the intrinsic properties are those the having of which by an object in no way depends on what other objects exist. That makes 'intrinsic' a *modal* concept, a fact that should be reflected in an adequate definition. I propose the following definition, which descends from Kim (1982) via Langton and Lewis (1998), as embodying this modal intuition:[26]

Df_7 F is an intrinsic property of *a* iff *a*'s having the property F is ontologically independent of the existence, and of the non-existence,

[26] Langton and Lewis (1998) improves on Kim (1982), and on Lewis (1983*a*).

of any contingent *b* such that *a* is wholly distinct from *b; and a*'s not having the property F is ontologically independent of the existence, and of the non-existence, of any contingent *b* such that *a* is wholly distinct from *b*.

Df_8 F is an extrinsic property of *a* iff F is a property of *a* and F is not an intrinsic property of *a*.

Langton and Lewis's definition ('Df_{LL}') is simpler in one respect than Df_7 but not simpler in others.

Df_{LL} F is an intrinsic property iff no two duplicates differ with respect to F.

Subsidiary definitions:

Duplicates. Two things (actual or possible) are duplicates iff they have exactly the same basic intrinsic properties.

Basic intrinsic. F is basic intrinsic iff (1) F and not-F are non-conjunctive and contingent, and (2) F is independent of accompaniment.

Independent of accompaniment. F is independent of accompaniment iff something accompanied may have F or lack F, and something unaccompanied may have F or lack F.

Accompaniment. An object is accompanied iff the object exists in the same world as some contingent object wholly distinct from it.[27]

Df_{LL} is simpler than Df_7 because it contains a concept of independence from accompaniment that is defined in terms of *necessary* coexistence (and negation), whereas in Df_7 'independence' is defined in terms of *essential* coexistence (and negation) (1.4.4). Df_{LL} uses a plainer, more topic neutral, modal concept. But in several other ways Df_{LL} is more complicated than Df_7.

First, Df_{LL} is put forward as excluding impure or haecceistic properties, such as *being Socrates* or *having Socrates' nose as a proper part*.[28] The motivation for this restriction is that we normally think of an object's duplicate as one that shares all its intrinsic properties, but the impure intrinsic properties of an object are *not* had by its duplicate. I propose to let Df_7 range over both pure and impure properties, and meet the difficulty by amending the definition of 'duplicate': two things, actual or

[27] Langton and Lewis (1998: 333). [28] Ibid. 334–5.

possible, are duplicates iff they have exactly the same *pure* intrinsic properties. This move is open to anyone who does not want to use the concept of a duplicate in the definition of 'intrinsic'.

Second, Df_{LL} contains significant additional complications designed to accommodate disjunctive properties. Now, if you have an ontology of sparse tropes and if that ontology *excludes* disjunctive properties (while being able to supply truthmakers for disjunctive predications), your definition of 'intrinsic' will not need to cover disjunctive properties. This is one of the little pay-offs from having a metaphysics as parsimonious as the one recommended in this book.

Third, Langton and Lewis suggest that there is a difficulty for strong laws in a definition of 'intrinsic' along the lines of Df_{LL}. Intuitively *being ellipsoidal* is an intrinsic property, but if we imagine a case in which it is nomically impossible for a star to be ellipsoidal without another star existing, and we hold the laws to be modally strong, being ellipsoidal comes out as not intrinsic, contra the initial intuition.[29] The quick answer to this is that a friend of strong laws need not admit the imaginary case for any world that contains all and only the properties instantiated in the actual world. But in a world containing alien properties, for which the case is admissible, I do not see that there is any powerful intuition in favour of taking a fully determinate shape to be intrinsic.

Fourth, a difficulty for Kim-like definitions similar to the one posed by strong laws is supposed to arise from the existence of necessary beings.[30] Df_7 meets the problem by restricting the requirement of independence to independence from other contingent beings.

Fifth, if Df_{LL} is combined with a certain functionalist account of what dispositions are, then whether dispositions come out as intrinsic will depend on whether *being subject to a law of nature* is itself an intrinsic or an extrinsic property. This point will not matter to those of us who do not share Langton and Lewis's view that the dispositions of an object depend on what laws there are. I would argue that this gets the relation that holds between laws and dispositions wrong: what powers there are does not depend on what laws there are, but vice versa, what laws obtain in a world is a function of what powers are to be found in that world. On the latter view of the relation between laws and powers, both Df_{LL} and Df_7 make dispositions intrinsic. The complementary pair intrinsic/extrinsic is similar to, without being the same

[29] Ibid. 337. [30] Ibid. 338.

as, the relation/non-relation couplet. What is the exact contrast between them?

Df_9 R is a relation iff R is an *n*-adic property and $n \geq 2$.

Df_{10} F_R is a relational property of *a* iff F_R is a property of *a* and it is essetial to *a*'s having F_R that there exists some *x* and some *y* and some relation ϕ such that ϕ (*x*,*y*).

Note that '-adicity' can be understood either as a *syntactic* value or as an *ontological* one. In the syntactic sense, which is how it is conventionally used in logic, the adicity of R depends on how many variable places have to be added to 'R' to make a sentential function. 'R(*x*,*y*)', 'R(*x*,*y*,*z*)', etc. are examples of (syntactically) polyadic sentential functions. (In Df_9 '*n*-adic' is used in the syntactic sense.) In the ontological sense of 'adicity', the adicity of R depends on how many numerically distinct relata have to exist for R to hold. Reflexive relations are, and non-reflexive relations may be, monadic in the ontological sense although they are syntactically polyadic. The possible connections between 'intrinsic', 'extrinsic', 'relational', and 'non-relational' can be illustrated in a diagram of four overlapping triangles (Figure 2). In this figure, the triangle ABC is the domain of the intrinsic, the triangle ADC the domain

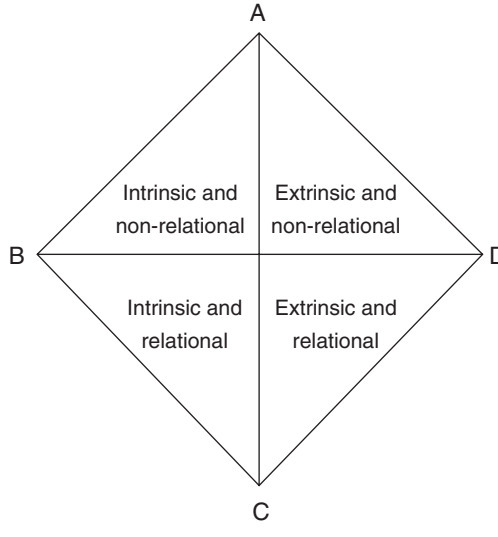

Fig. 2

of the extrinsic, the triangle CBD the domain of the relational, and the triangle ABD the domain of the non-relational. All combinations are represented in the four quarters. For *predicates*, it seems that examples can be given of all four kinds. The two possibly controversial ones are intrinsic-and-relational predicates, and extrinsic-and-non-relational ones. 'Is self-identical' or 'has a left hand that is stronger than the right' exemplify the former, while 'is such that the Duke of Wellington is mortal' is an extrinsic-and-non-relational predicate when applied to anyone but the Old Duke. When it comes to *properties*, however, the situation is less clear-cut. Perhaps *suicide* is an instance of a genuine, syntactically dyadic but ontologically monadic, relation. That would place it in the category of intrinsic-and-relational tropes. On the other hand, I think that all the extrinsic properties of an object are relational. The only putative counter-examples that come to mind are of the sort that Sydney Shoemaker has called 'mere Cambridge properties', that is, not properties rightly speaking at all.

1.4.6 *Transferable–non-transferable*

Suppose that one particular, *a*, has a property, F_1, and that another particular, *b*, has an exactly resembling property, F_2. Could F_1 have been, or be, or become, a property of *b* instead of *a*, and could F_2 have been, or be, or become a property of *a* instead of *b*? Are tropes *transferable*?

Although properties and relations are particulars, they differ in an important respect from particulars that are objects. Objects are 'Aristotelian primary substances'. They have independent existence, while properties and relations have dependent existence. Properties have to be borne; relations have to have relata. I will refer to the principle that properties and relations are ontologically dependent on bearers as 'OWNERSHIP'. Not all trope theorists accept OWNERSHIP. I do not offer any apodictic argument in its favour, only a reflection. 'No OWNERSHIP' is a trope-theoretic version of Platonism. It allows the existence of properties without bearers just as Platonism allows universals not instantiated in any object. Thereby the bad features of Realism, the 'mysticism', are reintroduced into trope ontology. By contrast, OWNERSHIP is the sober, naturalistic view. Conjoin OWNERSHIP with the stipulation that all bearers of properties are themselves existent and you have a trope-theoretic analogue to the immanentist thesis, according to which universals exist only in their instances.

Other things, besides properties, are also subject to OWNERSHIP. For

example, *modes*, and *ways*. Some people would shrink from any kind of realism about ways. For my part, I think it proper to regard the way some thing is as perfectly real, but not, of course, as capable of existing independently of the thing itself. And ditto for modes, for example the mode in which an event occurs or an action is performed. Ways and modes also cannot be divided into the mereologically molecular and the mereologically atomic. They are neither-simple-nor-complex, in the strongest sense. They have no proper parts and they do not even have themselves as parts. Perhaps what puts properties, ways, and modes altogether outside the scope of mereology is just the fact that they are dependent entities.

To return to the question of whether tropes are transferable or non-transferable, this is not to ask whether it is a necessary truth about a thing that it is F, but rather, is it a necessary truth about this F that it is borne by the very thing that in fact bears it? If the answer to the latter question is affirmative, then we are saying that tropes are non-transferable. The precise meaning of that is captured in the following:

Df$_{11}$ F_1 is a non-transferable property of a iff if a has F_1, then if any thing, x, has the very trope F_1 that a has, then $x = a$.

It is easy to find bad arguments for and against non-transferability. One bad argument *for* non-transferability is verificationist. It is true that a trope-swap, were it to happen, could not be detected (strong unverifiability), but that does not show its metaphysical impossibility. A bad argument *against* non-transferability relies on the premiss that we can conceive of the transfer of tropes. Even if that premiss were granted, the inference from conceivability to possibility has no probative force.[31] But I am not inclined to concede the premiss. What could we conceive trope transfer to be? It certainly cannot be any natural (non-instantaneous) process, for a *process* of trope swapping would either entail interrupted existence or would violate Ownership. One can deceive oneself here by thinking that since tropes are particulars they must in all respects behave like those paradigms of particulars, the objects. Of course, 'object-swapping' is possible, since the Identity of Indiscernibles is false or, at any rate, not a necessary truth. But object-swapping is not a model for trope-swapping. The thought that all

[31] The classic refutation of the argument from conceivability to possibility is in *Essays On the Intellectual Powers of Man*, Essay IV, ch. III (Reid 1785: 375–9).

exactly resembling particulars are interchangeable does not give rise to any difficulties when the interchangeable particulars are substances. We can *explain* the principle of object-swapping, for example, as a naturally possible process, or, at least, as an eventuality consistent with the laws of nature. With entities that are subject to OWNERSHIP, no such explanation would work.

The strong arguments for non-transferability, in my estimate, are quasi-abductive: the assumption of non-transferability is justified by its theoretical/explanatory simplicity, economy, and fruitfulness. I cite two such arguments. The first is from identity. Tropes have their type identity, which is their exact resemblance to all tropes that are their identical twins. They also have their particularity, or numerical identity. What is it about tropes that determines their numerical identity? Can it be that about them which grounds their type identity, or is it something different? If the latter, then presumably it is something that all tropes have in common, and *that* looks like a universal. There are philosophers who think, 'in trope theory, individual, isolated tropes, compresent with nothing, are admitted as possibilities'.[32] Such theories have the greatest difficulty in giving an account of the numerical identity of (transferable) tropes. The best they can do is to treat that identity as an undefinable primitive. We can do better, with tropes that are non-transferable in the sense of Df_{11}. Such tropes get their particular identity from the object that bears them. Their identity is parasitic but well defined, provided we reject the possibility that two exactly resembling tropes could be had by the same bearer at the same time. That possibility is intuitively unappealing anyway.

The second strong argument for non-transferability is Ockhamist. Several philosophical positions seem to require the inclusion of ultimate, irreducible states of affairs, or facts or situations, among the non-empty ontological categories. Standard realism, according to which there exist particulars (= objects) and universals, is one philosophical theory with an enlarged ontology that includes irreducible states of affairs. Correspondence theories of truth tend to presuppose similar ontologies. It can be seen that the argument for *sui generis* states of affairs, which is compelling in the context of an ontology of particulars/universals, or of transferable tropes, loses its force when tropes are assumed to be non-transferable. With tropes non-transferable, one can

[32] Campbell (1990: 59).

omit states of affairs from the list of the ultimate categories, and make do with, at most, objects, properties, and relations: a significant saving in ontological cost! Since it is doubtful in any case whether we can make good sense out of the idea of transferability of tropes, non-transferability comes out as a highly attractive alternative.[33]

This concludes the preparatory study of properties. Understanding them better, we can now proceed to a study of *what there is* which, in turn, will inform our theory of powers.

[33] I have learned about non-transferability from C. B. Martin.

2

The Elements (II): On What There Is

The ontological question *What is there?* does not ask what things there are, nor does it (initially) ask what sorts of things there are. The question takes us one step higher up the ladder of abstraction: it asks what *categories* are non-empty. In the course of sketching a metaphysical context in which to investigate causal powers, I have suggested that the ontologically fundamental categories are three in number: Objects, Properties, and Relations. They are fundamental in the sense that entities of a given world falling into these three categories are (collectively) necessary and sufficient as truthmakers for all truths about that world.

Why have exactly three fundamental categories? This seems to be a legitimate question. Do we really need objects, or could we give a reductive explanation of them as bundles of properties? The issue is taken up in 2.1, below. Do we grant first-class citizenship in the realm of Being to relations? Maybe relations are grounded in intrinsic characteristics of objects and so are ontologically reducible (2.2). Finally, what if objects, properties, and relations are not enough, and we need a further irreducible category, that of states of affairs (2.3)?

2.1 Objects as Bundles of Properties

According to many contemporary trope theorists, an object is nothing but a bundle. Unit properties of the object, the tropes, are items appropriately held together by a bundling relation, sometimes called 'compresence', to form the object. An object, then, is a bundle of compresent tropes. This theory contrasts with a 'substance/attribute' view of objects. On the latter, objects are property-bearers that are

themselves not borne by any bearer ('non-predicables'), and the tropes are united to each other by each of them having a binary nexus or 'tie' to the object: that of being borne by it.

Bundle analyses of what it is to be an object have an obvious initial advantage over substance/attribute views. The former make do with one category where the latter appeal to two. Therefore, there is a presumption in favour of bundle-of-tropes theories as more economical. Despite this presumption, I believe that the account of objects as bundles of their properties is not acceptable in the end.

The usual form of bundle theory posits a single type of bundling relation to tie all the tropes together. I call this relation 'compresence', but the criticisms I make of it are general and apply to any relation that is proposed as the realizer of this bundling function. There appear to be three possibilities for the adicity of compresence. (i) Compresence is a dyadic relation that holds, pairwise, between every trope belonging to the bundle and every other. (ii) Compresence is a triadic relation, holding as before but with a space-time location as the third relatum. The form of this relation would be 'F_1 is compresent with G_1 at P'. (iii) Compresence is an n-adic relation, where n is the number of tropes in the bundle. Only one such n-adic compresence trope is required to bundle an object.[1]

Compresence as dyadic. There are two 'rules for bundling' that constrain the compresence relation for tropes: (a) the compresence relation must relate every trope in the bundle to every other; and (b) every compresence trope is itself a trope within the bundle. Rule (b) is justified by the intuition that any genuine relation between unit properties of an object is itself a (further) unit property of that object. The result of applying these two rules to a dyadic compresence relation is a vicious regress. For dyadic compresence, (a) implies that there must be a compresence trope for each trope pair in the bundle. If an object, a, has four distinct non-relational properties, then six compresence tropes are required to bundle these. But by (b) the six compresence tropes are themselves part of the bundle, and so a has ten tropes. These generate forty-five further tropes, and the regress is on its way.[2] How can the regress be prevented? Not by dropping rule (a): that would

[1] The structure of this criticism of bundling relations is influenced by Simons (1994).

[2] The relevant formula is $\frac{n \times (n-1)}{2}$, where n is the number of tropes before the application of the formula.

prevent compresence from doing the job of bundling all the tropes of an object. Not by dropping rule (b), for similar reasons. Could it be claimed that compresence supervenes, or is founded, on the nature of the bundled tropes, and that therefore the regress is ontologically benign? This way out might work for tropes that are ontologically dependent on one another, if there are such, and it might still work for couples of tropes where one is unilaterally dependent on the other. But it does not work for tropes that are merely contingently related to one another (see 2.2 below).[3] There seems to be no obvious way of neutralizing the threat of the regress.

Compresence as triadic. A bundling relation of the form 'F_1 is compresent with G_1 at *P*' has the consequence of including the spatiotemporal location of the object among its essential properties. Universal quantification over a location-variable would meet this point: the relation then would have the form '$(\forall P)$(F_1 is compresent with G_1 at *P*)'. This has the consequence that an object cannot lose a property in moving from one location to another, without detriment to its identity. Another objection to compresence as a triadic relation between a pair of tropes and their (joint) location is that this conception of the bundling relation rules out a priori a possibility that science suggests is quite real, namely, the possibility that two objectively wholly indiscernible objects should be in the same place at the same time. Third objection: triadic compresence also generates the regress mentioned above.

Compresence as n*-adic*. On this account of compresence, no regress arises. But it does have other difficulties. First, this form of bundling turns all the properties of an object into essential properties, that is, essential members of the bundle. This need not worry philosophers, such as Leibniz, who believe anyway that objects cannot have accidental intrinsic properties. It will worry the rest of us. Second, the postulation of *n*-adic compresence relations gives rise to an apparent absurdity. Consider the *n*-adic compresence trope that bundles O_1 and the *m*-adic compresence trope that bundles O_2. What makes them both *compresence* tropes? Their exact resemblance. That answer is good, unless $n \neq m$. If O_1 and O_2 have an unequal number of properties, which is surely possible, then the first compresence trope will have a different adicity from the second, and therefore the two will not

[3] Simons (1994: 558–9).

exactly resemble. So, the two relation tropes must exactly resemble each other in order to be both compresence tropes, but it is also possible that these compresence tropes do not exactly resemble each other. Again, foundationism about compresence as a way out is barred (2.2).

A sophisticated bundle-of-tropes theory of objects has been proposed by Simons (1994). It takes a two-stage approach to the analysis of objects: in the first stage, a *nucleus* is identified. This nucleus, which forms the individual essence or nature of the object, consists of tropes that 'are all directly or indirectly mutually founding'. An individual *A* is founded on another individual, *B*, in the relevant sense, iff *A* is necessarily such that it cannot exist unless *B* exists, and *B* is not a part of *A*.[4] The periphery around this nucleus consists of determinate tropes that depend on the nucleus without the nucleus depending on them, although there is a higher-order dependence at the determinable level. It is contingent which determinate of a determinable peripheral trope is tied to the nucleus, though it is not contingent that some determinate or other of that determinable is.

This nuclear theory has a number of strong points. First, it avoids any regress by circumventing both rules for bundling. It circumvents rule (a) by not having a single bundling relation for all tropes of the object, and it circumvents rule (b) by having the tropes of the nucleus tied together by relations that are essential to the related tropes and so have a foundation in their nature (see 2.2). Founded relations preserve the advantage of economy that bundles have over substrata. The tropes of the periphery are not bundled by lateral, trope-to-trope relations at all. Their unity is just that each of them is borne, contingently, by the nucleus. This particular relation appears to be analogous to the trope to trope-bearer relation on which substratum theories rely. Second, the nuclear theory successfully evades a stock objection to theories that analyse objects as a single bundle of all their tropes, namely, that such analyses cannot distinguish between essential and accidental properties. Third, the nuclear theory is flexible enough to cater for the possibility, mooted by physics, that the fundamental particles have only essential intrinsic properties (a nucleus without a periphery).[5]

Let us consider the muon, one of the unstable leptons. Its bundle theoretic nucleus presumably consists of its essential properties, including its mass (106.2 MeV), its unit negative charge, and spin

[4] Simons (1994: 559). [5] Ibid. 568.

number $^1/_2$. Simons's proposal requires that these properties should be united by relations that each has to every other, relations that are founded on their respective natures. Unfortunately for the proposed analysis, this is not the case. There is nothing in the nature of unit negative charge to guarantee that an object which has it also has mass of 106.2 MeV. The electron is 200 times less massive, the tauon is 17 times more massive, than the muon, although both carry unit negative charge. If there is any connection between being charged and being massive, it is on the higher-order, determinable, level and that would make mass a peripheral property instead of a nuclear one. There is nothing in the nature of spin number $^1/_2$ to guarantee that an object which has it also has electric charge, first- *or* second-order. And so on. The properties that constitute the essence of the muon are not mutually entailing. Their essential connection is not with one another, but is indirect. It consists in the fact that each is borne by the same bearer, the muon itself. The attempt to reductively analyse the bearer as a nucleus, in the sense explained, succumbs to fairly obvious counter-examples. The analysis may apply to some objects, but it is not sufficiently general. Diagnosis: the bearing-a-property relation is really cross-categorial, one that holds between an object and a trope. Objects belong to one category, tropes to another, and the categories appear to be irreducibly different. Both categories are wanted in metaphysics.

2.2 Foundationism about Relations

There are some relations that are founded on non-relational properties of their relata. These relations cannot come to hold or cease to hold without appropriate changes in the founding properties. Comparatives are obvious examples: *being taller than*, *resembling*, etc. Such founded relations do not represent a net addition to the ontological inventory, over and above the founding non-relational properties. They are an ontological bonus. This is sometimes expressed in the metaphor of divine creation: after creating Mount Everest and K2, complete with all their intrinsic properties, God did not have to create, as an additional item, the relation between their heights. *Foundationism* is the doctrine that all relations are founded, and that therefore we do not have to include Relation among the irreducibly different categories to which all existents belong.

Campbell (1990) offers a detailed and ingenious defence of foundationism. His strategy is two-pronged. First, to answer the classic twentieth-century objections to foundationism, due to Russell *et al.*, that have gained wide respect. Second, to explain away the crucial cases of external relations that are seemingly foundationless, such as purely spatio-temporal relations.[6] I think that an assessment of the success of Campbell's project should give a good pointer to the proper ontological status of relations.

One of the strongest of the classic arguments against foundationism is an argument from mixed multiple quantification, due to C. I. Lewis and C. H. Langford (1932/1959). The objection is to any monadic reduction of statements like (a) $(\forall x)(\exists y)\ \mathrm{R}(x,y)$ to (a*) $(\forall x)(\exists y)\ \mathrm{F}x \wedge \mathrm{G}y$; and of statements like (b) $(\exists y)(\forall x)\ \mathrm{R}(x,y)$ to (b*) $(\exists y)(\forall x)\ \mathrm{F}x \wedge \mathrm{G}y$. Lewis and Langford point out that while (a) and (b) are not equivalent, (a*) and (b*) are. Hence, 'dyadic relations cannot be analysed as conjunctions of predicates.'[7] Campbell's response is that the argument 'assumes, incorrectly, that all cases of similar relations must have the same foundations'.[8] The inadequacy of this reply has been shown by Mertz (1996). Let us replace (a*) by (a**) $(\forall x)(\exists y)\ [(\exists \mathrm{F}^{\mathrm{n}})\mathrm{F}^{\mathrm{n}}x \wedge (\exists \mathrm{G}^{\mathrm{m}})\mathrm{G}^{\mathrm{m}}y]$ and replace (b*) by (b**) $(\exists y)(\forall x)\ [(\exists \mathrm{F}^{\mathrm{n}})\mathrm{F}^{\mathrm{n}}x \wedge (\exists \mathrm{G}^{\mathrm{m}})\mathrm{G}^{\mathrm{m}}y]$, where '$\mathrm{F}^{\mathrm{n}}$' and '$\mathrm{G}^{\mathrm{m}}$' 'range over the foundations or, in general, any property reducta for R in x and y, respectively'.[9] Now (a**) and (b**) conform to Campbell's constraints, yet they are still logically equivalent, whereas (a) and (b) are not. Lewis and Langford have obviously proved that sentences about relations cannot be *translated* into sentences not about relations.[10] In my opinion, the foundationist could concede this point, and still argue that the ontological grounding of relations in non-relational properties does not require translations. Since most of the other classic arguments also presuppose that the reduction of relations to the non-relational requires translatability, it is possible that foundationism can survive these criticisms. The real test for foundationism lies in its treatment of spatial relations.

[6] Campbell (1990: 125).
[7] Lewis and Langford (1959: 387).
[8] Campbell (1990: 10).
[9] Mertz (1996: 168).
[10] Fisk (1973: 163–4), proposes to meet Lewis and Langford's argument by abandoning classical logic in favour of relevant logic. This strategy involves solving substantive metaphysical problems by changing the most topic neutral part of one's theory, namely its logic. This is not a move likely to be favoured by those who are not already committed to relevant logic.

Intuitively, the location of an object is a contingent fact about it. Objects can change their location without changing in any intrinsic respect. This contingency of location is a very important fact for our whole inquiry. In Chapter 10, I will argue that it holds the clue to identifying the properties that are *not* powers. Here we are concerned with the challenge that contingency of location presents to foundationism. If relations between objects and space-time can change without the real intrinsic properties of either undergoing any change, then spatio-temporal relations appear to lack foundations in the relata. Campbell has a two-stage strategy for meeting the challenge. In the first stage we are asked to

> 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 forces current physics recognizes.[11]

On this view, the capacity of the familiar objects of the manifest image to have external, unfounded relations with space-time, is merely apparent, as is the very existence of such a plurality of objects. In reality, (i) fields are the only occupants of space-time, (ii) each field occupies the whole of space-time; and (iii) each field does so essentially. The spatial location of a field is therefore not a matter of an external relation between the field and space-time, but supervenes on the nature of the field. In the second stage of the argument, Campbell claims that bodies are particular sub-regions of the superimposed fields, and the sub-regions have their location non-contingently: 'a body's *place* is no longer a merely contingent feature of it.'[12] To say that a body could move without undergoing intrinsic change would be to say that a spatially identified zone of the field could move, which is impossible since 'parts of space can neither move nor change places'.

What do we know about fields? First, we know that all energy fields are discontinuous below the distance measured by Planck's constant, *h*. The physical world ultimately consists of discrete objects. Second, we know that field strength, as measured at a point, varies over the entire extent of the field. Third, and most important for us, the strength of a point in the field at a time, is *not* an essential, but a contingent, feature of the field. Conservation laws guarantee, to a high probability, that the *average* density of the whole field is constant, but

[11] Campbell (1990: 129). [12] Ibid. 130 (original italics).

no law implies that density-at-a-point is constant. Fields have contingently variable density. What corresponds to a body in the manifest image, is not a spatially defined zone of the field but a portion of the fieldscape differentiated from its neighbourhood by its density. The variegated density of matter in space that is presented in experience is not an illusion according to physics, it is real. Matter moves in the field as the bulge moves in the carpet, or the bubble moves in the spirit level. The contingent movement of matter, so conceived, is fully consistent with the fact that a field is essentially a whole-of-space-filler. This shows, I believe, that Campbell's tenacious defence of foundationism fails at the last hurdle. According to (my reading of) physics, spatial relations are what they had seemed to many philosophers to be: unfounded external relations. If that is so, then the category of relations is not dispensable.

2.3 The Status of States of Affairs

There are two contrasting metaphysical depictions of the categorial nature of the world. According to one, the world consists of quasi-propositional entities such as facts, or situations, or states of affairs. Objects, properties, and relations are perfectly real, but they are not collectively sufficient as truthmakers for all truths. One needs the fundamental category of states of affairs, which encompasses objects, properties, and relations. The latter exist only as ingredients in states of affairs. This ontology is summed up in Wittgenstein's dictum, '*Die Welt ist die Gesamtheit der Tatsachen, nicht der Dinge*.'[13] On the rival view, the basic constituents of the world are nothing but objects, that is, first-order, particular property-bearers, together with their properties and relations. This does not destroy the legitimacy of our talk of facts, and situations, and circumstances. The idiom of facts is immensely convenient and pragmatically ineliminable. However, what we refer to when we talk of facts or states of affairs are not fundamental existents, but logical constructs out of objects, properties, and relations. To summarize this position one could invert *Tractatus* 1.1: the world is the totality of things, not of facts.

The competition between that-like and thing-like conceptions of

[13] Wittgenstein (1921: §1.1).

fundamental ontology raises some of the most basic and difficult problems of metaphysics. To simplify somewhat, first, we concentrate on those versions of the two positions that are ontologically serious about properties and relations, as distinct from those nominalists who reductively analyse properties and relations, say, in terms of class resemblance. Second, we ignore the distinction within thing-like ontologies, between object-ontologies (e.g. Democritus, Locke) and stuff-ontologies (e.g. Thales, Descartes). We can note that there is a prima facie difference between that-like and thing-like types of positions. They agree on the existence of objects, properties, and relations. But a metaphysics according to which the world is basically propositional, needs to postulate an *additional* category of fundamental constituents, the category of facts or states of affairs. Thing-like metaphysics has the advantage of being more economical. In my opinion, this shifts the onus of proof. Unless there is a good argument showing that we *have* to have irreducible states of affairs, we should accept a metaphysics in which states of affairs are idiomatically convenient but ontologically eliminable.

There exists a Master Argument for the unavoidability of states of affairs. It has several versions, depending on the matter to which it is applied. In a semantic version, it is an argument to the effect that the minimal truth-bearer is a judgement that has a proposition or an indicative sentence as content. *Lists* of names of objects, properties, and relations cannot be true or false, because they do not make the appropriate linkage between the bearers of the listed items, namely, that the objects *have* the properties and/or *stand* in the relations. Plato showed all this.[14] We are interested in an ontological version of the Master Argument. Armstrong has an excellent formulation, from the perspective of realism about universals:

> If *a* is F, then it is entailed that *a* exists and that the universal F exists. However, *a* could exist, and F could exist, and yet it fail to be the case that *a* is F (F is instantiated, but instantiated elsewhere only). *a*'s being F involves something more than *a* and F. It is no good simply adding the fundamental tie or nexus of instantiation to the sum of *a* and F. The existence of *a*, of instantiation, and of F does not amount to *a*'s being F. The something more must be *a*'s being F—and this is a state of affairs.[15]

I think that this argument is compelling for anybody who is a realist

[14] *Sophist*: 261–2. [15] Armstrong (1989*a*: 88).

about repeatables. Does it also apply to tropes? The answer depends on the kind of trope theory one has. If tropes are transferable, then the Master Argument applies: the state of affairs of the object's having the trope is not derivable from the mere existence of the object and the (transferable) trope. The theory needs to postulate states of affairs in addition to objects and tropes.

With tropes taken as non-transferable (1.4.6), the Master Argument loses its force. If the unit property F_1, that is had by *a*, cannot be had by anything else then, although the existence of *a* alone does not guarantee the existence of F_1, the existence of both *a* and F_1 does guarantee that *a has* F_1. We do not need states of affairs as an irreducible category.

Armstrong complains of 'the huge amount of necessity *in re* that this version of trope theory has to postulate'.[16] What exactly is the problem? It is that, 'Given all the particulars and all the trope properties and relations, the arrangement of the world is fixed.'[17]

There are (at least) two senses of 'fixed' in which one may say that the arrangement of the world is fixed. Any metaphysical theory that aims to enumerate exhaustively the categories of being, is committed to holding that, given every existent belonging to these categories, the arrangement of the world is indeed fixed. For example, in the theory of the *Tractatus*, the arrangement of the world is fixed by all the *Tatsachen*. This sense of 'fixed' is entirely aseptic. The second sense of 'fixed' implies a deep determinism. The fixing of the arrangements of the world, in this sense, entails the absence of any unrealized possibilities, which is not an acceptable consequence for a theory to have. But it is evident that an ontology of objects plus non-transferable tropes does not commit one to denying *any* unrealized possibilities that are recognized in an ontology of particulars and universals constituting states of affairs. If tropes are non-transferable, then it is impossible for a unit property that is had by *a* to be had by any object that is not *a*. On the realist view, there is an exactly analogous impossibility: it is impossible for *a*'s instantiation of U to have been, or be, or become, *b*'s instantiation of U. The essential particularity of the two instantiations mirrors the non-transferability of the tropes. The two theories are indiscernible in respect of these necessities that they find in the world.

Facts, situations, and states of affairs have an ineliminable place in thought and discourse, but not in ontology. All truths that express

[16] Armstrong (1997: 117). [17] Ibid.

facts, or represent states of affairs as obtaining, have only objects, unit properties, and unit relations, as truthmakers. That is the position that will be adopted in the following chapters.

2.4 Introduction to the Theory of Powers

The chapters to follow develop the theory of powers within the context of the general metaphysics outlined in Chapters 1 and 2. It will be of help to provide an overview of the argument in the remainder of the book.

There are a number of interrelated concepts, indicated by such words 'power', 'disposition', 'capacity', 'ability', 'skill', 'aptitude', 'propensity', 'tendency', 'potential', 'amplitude', etc. Some of these, ('disposition', or 'potential' in Aristotle's use) are philosophers' artefacts.[18] Some of the others are part of the technical vocabulary of science ('amplitude'). The rest are entrenched in ordinary language and resonate with common sense. I do not want to explore the differences among these concepts, however interesting that might be for certain inquiries. Instead I want to find the most important features that they have in common: the deep characteristics, or marks, of the family of dispositional properties. These have a double use. They provide much of the conceptual data to be organized by a metaphysical theory of powers. They also serve to constrain theorizing about powers. Any good theory in this domain must at least be consistent with powers having all of these initially identified marks of dispositionality.

In Chapters 3 to 7, I discuss five features, each of which seems to have good credentials to be counted as a mark of powers. According to me, the five basic features of powers are these:

I. *Directedness*. A power has directionality, in the sense that it must be a power for, or to, some outcome. It is this directedness that provides the prima facie distinction between powers (dispositions) and non-powers. My account of directedness is given in Chapter 3.

II. *Independence*. Powers are ontologically independent of their manifestations. They can exist even when they are not being exercised and have not been exercised and will not be exercised. This peculiar feature of powers is a fertile source of philosophical puzzlement,

[18] Prior (1985: 1).

leading to scepticism and anti-realism about such properties. Independence is the subject of Chapter 4.

III. *Actuality*. A particular strand of anti-realism holds that a power is really nothing over and above the possibility of manifestation. In Chapter 5, the claim that powers are fully actual properties of their bearers is defended by two arguments.

IV. *Intrinsicality*. Powers are intrinsic properties of their bearers, in a sense of 'intrinsic' already described (1.4.5). However, some accounts exist that make powers into extrinsic properties of their apparent bearers. I examine two examples, and argue that neither provides any grounds for an analysis that treats all powers as extrinsic properties of their bearers (Chapter 6).

V. *Objectivity*. Hume's notorious projectivist theory holds that dispositions have no objective existence in nature, but their appearance is generated by the psychological structure of human observers. I defend the objectivity of powers in Chapter 7 by criticizing the Master Argument on which the rejection of such objectivity depends.

In Chapter 8, I move on to consider the thesis that all powers must be grounded in, what is often called, a *causal base*. I argue that the thesis of groundedness is not true by analytic necessity. Is it true empirically? I argue not: groundedness is empirically underdetermined. This looks bad for the thesis and I evaluate possible responses. I conclude that the favoured response should be acceptance. We should accept the existence of ungrounded powers, which are as real as any other powers. This is a thesis we can call *groundlessness*.

Chapter 9 offers a taxonomy of ontologies for powers. This, first, traces out the various stances one could take on the position of powers in one's general metaphysics and, second, offers an initial evaluation.

As an important step in deciding which of the possible positions to adopt, I consider in Chapter 10 the question of whether there are non-powers. I take it as established that there are powers but our final ontology will only be decided when we have looked at, and assessed, the claim that there are also distinct 'categorical' properties. While rejecting the term 'categorical', I will endorse the view that there are properties that are non-powers. I will argue, however, that non-powers do have a causal role and I will explain away this seeming paradox.

This leaves me with a position that can be called a posteriori dualism, which develops more clearly when I consider objections in Chapter 11. Pan-dispositionalism is to be rejected but not for a priori reasons. Some have ventured a priori arguments against it but, as I show, these do not constitute a *reductio*. Rather, on empirical grounds, we can say that both powers and non-powers are indispensable.

In the last chapter, I apply the theory of powers to two central problems of contemporary metaphysics: causality and modality. I do so because I believe that it will, ultimately, be the work that powers do that will provide the chief ground for accepting the theory I offer.

3

Directedness

> According to Brentano . . . intentionality is peculiar to psychological phenomena and thus provides a criterion by means of which the mental may be distinguished from the nonmental. The problem for proponents of this . . . thesis is not so much that of showing that mental phenomena are intentional as it is that of showing that physical phenomena are not intentional.
>
> (R. M. Chisholm)

3.1 Directedness

Powers, or dispositions, are properties *for* some behaviour, usually of their bearers. These properties have an object towards which they are oriented or directed. The objects of powers are usually called 'manifestations', a name that carries an epistemological loading. This should not be taken very seriously since it is clear, *pace* verificationism, that unobservable objects have unobservable powers with manifestations that are not at all 'manifest'. We cognize these hidden manifestations only indirectly, through their remote effects. I will continue to use the word 'manifestation', despite its potential to mislead, as the general name for the dispositional object.

Directedness is an essential feature of power properties, in the sense of 'essential' described in 1.4.4. Having a direction to a particular manifestation is constitutive of the power property. A power's type-identity is given by its definitive manifestation. So the identity of dispositional tropes is as determinate, but no more so, than the identity of the manifestation events towards which the dispositions are directed. There is an obvious objection to this. Event identity is itself defined in terms of property identity[1] so, it appears, we have a circle.

[1] Cf. Kim (1993: 35).

But this circle is acceptable, like the modality circle where possibility and necessity are interdefined. Likewise, property identity is defined in terms of event identity and event identity is defined in terms of property identity. These cases are not vicious; rather, they are indicative of families of interrelated fundamental concepts.

Now the manifestation to which a trope is directed is not sufficient for determining the (numerical) identity of the trope. Numerical identity of power tropes depends, additionally, on which individual object bears them. We have a logical, a priori, basis for counting unit properties, including powers, only if we have a basis for counting objects.

The connection between power and manifestation is necessary, in the sense of absolute or strict necessity. To explain the exact nature of this necessary connection is one of the most difficult tasks facing a theory of powers. To this compulsory task we now turn.

3.2 The Brentano Thesis

There is a theory, due to Franz Brentano (and scholastic predecessors) according to which intentionality is both necessary and sufficient for the psychological, and, conversely, non-intentionality is necessary and sufficient for the non-psychological. Intentionality provides the *demarcation* between the psychic and the physical. The theory, known as 'the Brentano Thesis', has become widely accepted in contemporary philosophy of mind.

Mental states and the physical powers that determine the behaviour of their bearers share a number of traits that suggest intentionality. It is arguable that their similarity is sufficiently strong, in respect of the central criteria of intentionality, to create a case for *physical intentionality* (PI) as a concept that is in fundamental respects analogous to *mental intentionality* (MI). I think that the Brentano Thesis is basically mistaken. Thinkers who wished to deny the intentionality of certain types of mental states have said this before, of course, but my intention is to subvert the Brentano Thesis from the other direction, as it were. I accept the intentionality of the mental, and go on to argue that something *very much like* intentionality is a pervasive and ineliminable feature of the physical world.

3.3 What Is Intentionality?

There is an approximate consensus in the post-Brentano literature on four criteria in terms of which one can identify MI. One can use these criteria as an initial test of the reality of PI.

(i) The fundamental feature of an intentional state or property is that it is *directed to* something beyond itself, to the so-called intentional object. This was Brentano's basic thesis. All mental states and processes have an internal reference to an object. The identity of the intentional state is defined in terms of this intentional object. While there are many ways of characterizing a particular mental state or process, only a characterization in terms of the intentional object conveys the nature of the mental state or process. Since intentionality constitutes the identity of mental phenomena, it follows that the nexus between the mental state or process in question and its M-intentional object is non-contingent.

(ii) The intentional object can be existent or non-existent. We can be looking for, seek or want something that may or may not exist. We can have beliefs about non-existent objects, attribute fictitious properties to things that exist as well as to things that do not. This implies, as Brentano emphasized, that the nexus between the intentional state and the object to which it refers is *not that of a genuine relation*. In the case of a genuine relation, for example a causal relation, all relata must exist. Not so with intentionality.[2]

(iii) *Fuzzy objects*. Anscombe gives as an example of indeterminacy of intentional objects: 'I can think of a man without thinking of a man of any particular height.'[3] But if she is thinking of an existing man, she is thinking of a man *with* a particular height although not thinking of him in terms of his height.[4] This kind of indeterminacy depends on what Locke called 'partial consideration'. There are, however, M-intentional objects whose indeterminacy does not arise out of partially considering a determinate object. If I say, 'I am expecting a phone call soon', the state of mind that I am avowing is not the expectation of a call at a definite time without consideration of that time. The time at which I expect the call is quite appropriately described by that fuzzy

[2] 'Mental Reference As Distinguished from Relation in the Strict Sense', in Brentano (1874: 271 ff.).

[3] Anscombe (1968: 161).

[4] Martin and Pfeifer (1986: 533–4).

indexical expression 'soon', the use of which gestures towards a vague time-span. There *is* no definite time such that I expect the call at that time. Here the M-intentional object is seriously indeterminate.

(iv) *Non-truth-functionality and referential opacity*. These are semantic criteria for the intentional. There is a distinction between intentional objects that are truth-bearers and those that are not.[5] The propositional attitudes are examples of intentional attributes with truth-bearing objects. For these types of case, the criterion says that having the attribute does not guarantee the truth or falsity of the object. The intentional object, the propositional content, can be either true or false. In all other cases, in which the intentional attributes are directed to objects that are not truth-bearers, the criterion says that the having of the intentional attribute is sensitive to the description or name given to the object. Under a different description of, or name for, the same object, the attribute may not be had. There is here a failure of substitutivity of co-referring expressions.

3.4 Parallels between Psychological Intentionality and Physical Intentionality

(i) Psychological states and properties are directed to something beyond themselves. Contrary to the Brentano Thesis, physical powers, such as solubility or electromagnetic charge, also have that direction toward something outside themselves that is typical of psychological attributes (3.1). The intentional object of a physical power is its proper manifestation. Of the many ways of characterizing a power, the only one that reveals the nature (identity) of the power is the characterization in terms of its manifestation. Consequently the nexus between the power and its manifestation is non-contingent. A physical power is essentially an *executable* property.

(ii) An intentional property can exist whether its intentional object exists or not. A purely physical object can be soluble without ever dissolving, or fragile without ever breaking. If the behavioural manifestation that is the intentional object of the physical power can exist or not exist without detriment to the existence of the physical power, then, in a further parallel with the psychological case, the physical causal

[5] Lycan (1969: 305), where a cognate distinction is drawn in terms of 'proposition-verbs' and 'object-verbs'.

power does not stand in a genuine relation to its manifestation (3.1). 'The dam is high enough to prevent any future floods'—if this statement is true it is not made true by any relation between the dam's flood preventing capacity and a flood.[6]

(iii) There are two types of indeterminacy of the intentional object. The first kind of indeterminacy arises when we incompletely describe something determinate, the second occurs when redescribing the object cannot eliminate the fuzziness. Martin and Pfeifer, in an important article, have shown how the description-dependent indeterminacy of psychological intentional objects has its analogue in the case of physical dispositions.[7] Just as men have heights although one can think of them not in terms of their heights, so bearers of powers have their locations, although their having the powers is not dependent on them having the locations they have. Physical powers can also have fuzzy objects in the second, description-independent, sense. An exact physical analogue to this kind of indeterminacy can be found in the propensity of unstable elements to decay. A given radium atom has a disposition for radioactive disintegration within 1 year with probability of 0.04 per cent. That means that there is no definite moment within the ensuing 2,130 years at which the atom's disposition to disintegrate must manifest. The manifestation-outcome is *de re* indeterminate as to timing.

(iv) Statements ascribing propositional attitudes to embedded contents are themselves not truth-functions of those contents. Clearly, 'The weatherman predicts that the drought will break' does not entail anything about the truth-value of 'The drought will break'. Neither is 'The cloud seeding apparatus has the capacity to bring it about that the drought will break' a truth-function of 'The drought will break'.[8] This is another parallel between MI and PI.

The parallel extends to referential opacity. The statement (A) 'Andrew believes that George Eliot wrote *Middlemarch*', does not entail (B) 'Andrew believes that Mary Ann Evans wrote *Middlemarch*' and the statement (A_1) 'Acid has the power to turn this piece of litmus paper red' does not entail (B_1) 'Acid has the power to turn this piece of litmus paper the colour of Post Office pillar boxes'.[9] Extensionality fails equally in M-intentional and in P-intentional contexts. Could this be denied on the ground that in the case of A_1 and B_1, at least, the

[6] Chisholm's example (1967: 203). [7] Martin and Pfeifer (1986).
[8] Example adapted from Martin and Pfeifer (1986: 532). [9] Molnar (1967: 191).

substitution *is* truth-preserving? Such a denial would not be plausible. If, in some possible circumstance, pillar boxes are a colour other than red, then A_1 does not entail B_1. The power to turn something the colour of pillar boxes belongs to the paint chosen by the Post Office, not to acid. The capacities of acid have a purely contingent connection with the colour preferences of the Post Office. While 'power to turn litmus paper red' denotes a genuine intrinsic power of acid, 'power to turn litmus paper the colour of pillar boxes' is a predicate to which no single power property corresponds. The predicate applies to acid, if and when it does, by virtue of (a) the genuine powers of acid, and (b) the contingent circumstances of the Post Office's colour preferences for its pillar boxes. Put in semantic terms, the expression 'the colour of Post Office pillar boxes' designates red non-rigidly, unlike 'red' which is a rigid designator for red. Analogously, in some possible circumstances, namely when Andrew does not know that George Eliot is Mary Ann Evans, A could be true while B is false. Andrew's beliefs about the identity of the author of *Middlemarch* depend on purely contingent facts about what he knows concerning the bearer of two names.

One could insist on reconstruing B_1 so as to preserve the transparency of A_1, perhaps as follows. (B_2) 'Acid has the power to turn this piece of litmus paper the colour which happens to be, at time *t*, and place *p*, the colour of Post Office pillar boxes.' Since it is assumed by the example that, at given *t* and *p*, Post Office pillar boxes are red, the expressions 'red' and 'the colour which happens to be, at *t* and *p*, the colour of Post Office pillar boxes' are necessarily co-referring. Therefore A_1 entails B_2. The reconstrual of B_1 as B_2 seems unjustified since they are clearly non-synonymous, but even if we allowed it, for the sake of argument, that would not *distinguish* PI from MI. A similar move is open in the case of the propositional attitudes. One could reinterpret B as (B_3) 'Andrew believes concerning the person who as it happens bore the name *Mary Ann Evans*, that that person wrote *Middlemarch*' while reading A as (A_2) 'Andrew believes concerning the person who as it happens bore the name *George Eliot* that that person wrote *Middlemarch*'. Such reconstrual also makes A transparent since the expressions 'the person who as it happens bore the name *George Eliot*' and 'the person who as it happens bore the name *Mary Ann Evans*' are necessarily co-referring. Any reasons for taking B_2 to express what is said by B_1 are also reasons for taking A_2 and B_3 to express what is said by A and B, respectively. This restores the parallel between MI and PI.

We should note that even *hyper-intentionality* can be exemplified by a purely physical system. Consider a machine whose only function is to take variously shaped straight-sided two-dimensional objects as input and to return measurements of the lengths of their sides. There is a sense in which this machine can select equilateral triangles from any other shaped objects but cannot select equiangular triangles from objects with internal angles of different magnitudes. Such examples have been discussed before in the literature and have received conflicting interpretations. I side with writers like Sober (1982) who treat these as cases of physically instantiated hyper-intentionality.[10]

3.5 Objections to Physical Intentionality

I will consider three lines along which the Brentano Thesis may be defended. The theme of the first is refining the Criterion Set. If the four criteria of intentionality do not (jointly) demarcate the mental from the non-mental, as I claim, then perhaps one can find an amplified set of criteria that would give us a definition of intentionality that will apply only to the psychological. The second group of objections to PI revolve around dire consequences. Predicting dire consequences, should your opponent's doctrine be accepted, is a familiar tactic in (and out of) philosophy. The third line of defence of the Brentano Thesis has as its *Leitmotiv* a claimed dependence of intentionality on intelligible content.

3.5.1 *Impossible intentional objects*

Whereas psychological states apparently can have contradictory or otherwise impossible intentional objects, no physical attribute could have direction towards impossible objects. In particular, there could not be such a property as the power to bring about the impossible. If so, then here we have a fifth criterion that demarcates the mental from the non-mental in terms of intentionality alone.

In an original and profound paper (which regrettably remains unpublished) John Burnheim has suggested an objection to this way of demarcating the intentionalities, that seems to work, at least in the case of certain cognitive attributes.[11] Suppose that a person, A, believes

[10] For criticism of Sober's position see Reinhardt (1989).

[11] Burnheim (1969) states that the proposal to use impossible intentional objects as a criterion of demarcation is due to Armstrong.

that *p* and A also believes that *q*, and *p* and *q* are inconsistent. It is fairly easy to resist the inference to the conclusion that A believes that *p* and *q*. The grounds for blocking the inference are that 'we are at a loss to give content to the notion of a belief for which there are no conceivable truth conditions.'[12] This is a situation to which one can find P-intentional analogues. Let an object, A, have the power to attract another object, B, that has a mass of exactly 2 GeV, and let A also have the power to attract B that has a mass of exactly 4 GeV. It is easy to resist the inference to the conclusion that A has the power to attract B that has a mass of exactly 2 GeV and exactly 4 GeV. The grounds for resisting this conclusion are that 'we cannot make sense of the idea of a disposition that could not be actualized in any possible world.'[13] Conclusion: there is a sense in which one cannot believe a contradiction that is not so different from the sense in which a physical power cannot have an impossible object. The problem with this ingenious argument is that it cannot be readily extended to some other important psychological states (as Burnheim himself points out). It seems that one can have contradictory wishes, intentions, aspirations, hopes, and, more significantly, one can imagine or conceive of contradictory and otherwise impossible states of affairs.[14] *These* impossible M-intentional objects cannot be analysed as we have analysed contradictory beliefs, and there are no plausible P-intentional analogues to them.

I think that the pertinent point to make here is that not every type of psychological state or mental act can be directed towards impossible intentional objects. Wishes and desires, together with some other propositional attitudes, can have impossible intentional objects, but there are other psychological states that cannot, even leaving aside the contentious case of belief. It seems that some perceptual modes take only possible objects.[15] Can one hear a note whose pitch is both above and below a certain value? Proprioception is another category in which there can hardly be impossible intentional objects. The same is true, I think, of bodily sensations like pain. Can one feel a pain of an *exact* degree of intensity in a certain bodily location and, at the same time, feel a pain of exactly the same quality but of a very different intensity in that location? Such examples tend to show that

[12] Burnheim (1969: 13) [13] Ibid.

[14] I have argued for this conclusion in Molnar (1994).

[15] A similar point is made, briefly, in Johansson (1992: 188).

directedness to an impossible intentional object does not divide properties in the way required by the Brentano Thesis, that is, some properties that cannot have impossible objects are not physical properties.

The argument from impossible objects fails as a fully-fledged defence of the Brentano Thesis. Nevertheless it is instructive. Psychological states with impossible objects cannot be fully assimilated to dispositional directedness, so the class of such states remains as a kind of surd in relation to the overall picture that I am trying to present. Care is required not to overestimate the analogy between M-intentionality and P-intentionality. They are not exactly similar.

3.5.2 *Unique intentional objects*

Some psychological states are such that they can be directed toward a particular individual object, and *not to anything that is just like it*. Martin and Pfeifer, who agree that the boundary between the mental and the non-mental is not defined just by the four criteria, have proposed to use the possibility of a uniquely individual intentional object as an additional criterion for demarcating the mental as intentional from the non-mental as non-intentional. It is true that the powers of relatively simple physical substances and objects are powers for *kinds*. If water is a solvent for salt, it has the capacity to dissolve any lump of salt, not just some particular lump. And so on. It is vital to Martin and Pfeifer's case that they give an account of a process which (a) enables humans (or whatever else it is that has a mind) to form unique intentional objects, but which (b) is in principle not open to mindless physical systems. This is how, according to them, a representation can be incorporated in an intentional state so as to be directed to a particular entity:

> The representation incorporated in such an intentional state is directed to something (a particular something and not just anything like it) as being or as having been seen, heard, felt, tasted by the agent or something causally related to what was seen, heard etc., or as having a unique spatio-temporal relation to the agent itself. . . . The basic method, then, is perceptual in its initial representation and projective by the traces of perceptual memory acting as representations of what was seen, heard, etc., rather than as of anything exactly like it. It is this that forms the representation of a particular individual, and the satisfaction conditions can be satisfied only by that individual.[16]

[16] Martin and Pfeifer (1986: 552).

In this story of how the agent forms a representation of the unique intentional object, two aspects of experience play a part. One aspect of the representation-forming experience is that it initiates the flow of information by a direct and perhaps short causal route from the object to the agent, laying down the causal traces that enable the agent to form a representation of that object rather than anything like it. The other aspect is that experience is *conscious*, with all the felt qualities of consciousness. The human agent's representation-forming experience is the *conscious* acquisition of information, caused directly by that very entity whose representation comes to be incorporated into an intentional state directed to a singular object. A problem for Martin and Pfeifer arises from the fact that the two aspects of the representation-forming process, as described by them, are *grossly unequal*. The load bearers in their story are the strictly causal elements (memory traces, recall, reidentification), and *not* the consciousness of experience. Let us imagine a sophisticated palm print recognition device that has programmed itself to recognize only the owner of a particular palm print rather than anybody whose palm print is exactly like it. (The requirement that the device be self-programming is inserted so as to sidestep any questions arising out of the distinction between original and derived intentionality. That distinction is irrelevant here, since nothing in the case to be developed hinges on whether the device itself, or its behaviour, is due to design or simply the consequence of an accidental collocation of atoms.) The device's first act is to explore and record a large array of detailed information (visual, physiological, etc.) *both* about a particular palm that is presented, *and* about the act of presentation. Then the traces of this exploratory contact are placed into the memory of the device to be used as representations of what was transmitted in that contact, 'rather than as of anything like it'. The non-consciously 'experiential' acquisition of information by the device matches (mimics) the conscious experiential acquisition of information by the agent, both in the process of acquisition and in what is acquired. In each case a representation is formed by way of traces of a causal contact that is, in both the human and the device, some 'internal environment', ó, which is similar in the two instances except for the lack of consciousness in the case of the device. ó is required for the causal process to work as described. Now if the representation, so formed, can be uniquely individuating in the one case, why not in the other? Of course, words like 'see', 'hear', 'taste' cannot

be applied in a literal sense to a purely physical non-conscious device, but this fact of ordinary language should carry little metaphysical weight. Of the device we can say that it experientially 'explores' and 'records' (words I used above) the originating encounter. This captures what is *causally important* in fixing the information gleaned from the palm itself (a very particular palm), and the presentation of the palm (a very particular presentation) so as to make it represent the individual and not the kind. The challenge to the Martin–Pfeifer view is this. What a person does when forming what is apparently a fully particularized intentional object, and what a sophisticated piece of machinery does when forming what is apparently a fully particularized intentional object, may differ only in that the person does it consciously, and the machine (of course!) does it without consciousness. Now if we want to say that, in the case of the person, the apparently fully particularized intentional object *is* essentially unique, but that in the case of the machine the intentional object, appearances notwithstanding, is any-instance-of-a-kind and not something essentially particular, then we have to explain how *this difference* depends on the human agent's representation-formation being a conscious process, where the machine's is not. We are still owed such an explanation and until we get it, it will remain implausible to claim that the causal history of the formation of the intentional object is sufficient for demarcating the P-intentional states, of which sophisticated machinery is capable, from the M-intentional states of people.

These two objections (3.5.1 and 3.5.2) are typical, but not exhaustive, of efforts at refining the criterion set. I am sure that with ingenuity others can, and probably will, be devised.[17] For now I pass to two examples of the second type of defence of the Brentano Thesis.

3.5.3 *The threat of panpsychism*

Someone might say that my argument for PI, instead of undermining the Brentano Thesis, just shows that many more things are mental than is usually supposed.[18] To extend the domain of intentionality from the admittedly mental sphere to what are normally taken as purely physical states and properties, is to prove, according to the objector, that Thales may have been literally correct in attributing a soul to the magnet. *Reductio*.

[17] Johansson (1992) contains a different proposal for refining the criterion set.

[18] Something *like* this has in fact been said in Mumford (1999).

Of course this riposte gains its force from assuming the correctness of the Brentano Thesis, and so begs the question against the position I am putting. Nevertheless, the charge of panpsychism does have a serious point in my opinion. It shows that one who is not eliminativist about the mind but rejects the Brentano Thesis is under an obligation to replace it with *another criterion of demarcation*. In the history of philosophy there have only been two serious proposals for distinguishing mind from matter. One appeals to intentionality, as per Brentano and his medieval precursors. The other, harking back to Descartes, Locke, and the British empiricists, uses the capacity for consciousness. By disjunctive syllogism I favour the latter, while acknowledging that this position has its own distinctive difficulties.[19]

3.5.4 *A deluge of necessities*

'Positing purely physical intentional attributes recklessly proliferates the world's necessities,' claim Humean defenders of the Brentano Thesis, who are radical critics of *de re* necessities. They flatly deny the existence of *any* necessary connections between wholly distinct existences, including the connection between a power and its manifestation. The motivation for the denial comes from Hume's famous Distinctness Thesis. Now I do not believe that Hume's views about modality in general, or his Distinctness Thesis in particular, pose a serious threat to PI. I offer my reasons for this conclusion in Chapter 11.

3.5.5 *Intentionality and meaning*

The central aspect of intentionality, that an attribute points to, or is directed to, something beyond itself, is a very difficult notion, since this pointing to cannot be understood as an ordinary relation between what does the pointing and what is pointed to. Intentional directedness must have an explanation and preferably a naturalistic one. Now we have one, and perhaps it will be said only one, successful model for such explanation. An item can point to something beyond itself only by somehow including or containing a *representation* of the thing beyond itself. The view that the nature of such representation is pictorial, which is at the centre of the *Tractatus*, currently lacks popularity. Contemporary accounts of directedness as representational

[19] Strawson (1994: 153), defines 'mental' not in terms of intentionality but in terms of consciousness: 'B is a mental being if and only if B is . . . a being whose current state or structure makes it now capable of experience.' This is a useful starting point.

identify the representative items as ones that, either atomistically or as part of a symbolic system, refer to, or describe, something beyond themselves. According to this defence of the Brentano Thesis, intentionality can only be explained, in the way it should be, from within a theory of meaning. If intentionality in general is held to be intelligible only as *aboutness*, we have here the foundations of a very powerful objection to any proposal to ascribe intentionality to purely physical properties. Clearly a theory of meaning cannot be stretched to cover physical powers because it is impossible to see physical powers as semantic properties. Solubility has no *intelligible content* that represents dissolving. An electric charge is not *about* its manifestation. Since one cannot explain the directedness of physical powers in semantic terms, these powers cannot be intentional.

To circumvent this objection to the possibility of PI, we must find a way of loosening the alleged tight conceptual link, if not alleged identity, between aboutness and the intentional. In what follows I propose to continue the criticism of the Brentano Thesis by arguing for the existence of certain sorts of states or properties that are (a) mental, (b) not semantic, that is, not representational in the relevant sense, but (c) intentional. The strategy is to show that some genuinely psychological states are both intentional and meaningless (non-representative), and that, consequently, meaning does not divide the properties in a way favourable to the Brentano Thesis. That should create the required conceptual space in which to position PI.

I begin by noting that, even in the case of perception, the 'fit' between intentionality of the act and intentionality of content is far from perfect. The intentionality of an act of perception does not seem capable of being reduced to, or being fully explained by, its representational content. Philosophers who subscribe to fairly standard cognitivist views about perception would deny this. Armstrong holds that perception is the acquisition of belief and the intentionality of perception is the intentionality of belief.[20] According to Dennett 'seeing is rather like reading a novel at breakneck speed.'[21] If these cognitivist views were correct, one could not appeal to perceptions as counterexamples to the claim that having representational content is all there is to intentionality. But I don't think that they are correct. The acquisition of belief, or the grasping of a meaning, is not *necessary* for

[20] Armstrong (1993: 211). [21] Dennett (1969: 139).

perception. Armstrong admits that there are perceptions that are neither cases of the acquisition of belief nor cases of the acquisition of the tendency to believe.[22] So perception can occur in the absence of such acquisitions. And being blind is not at all like being illiterate, *pace* Dennett.

Nor is cognitivism any more successful at giving *sufficient* conditions for perception. It seems entirely possible to acquire exactly the *same* informational content from *different* sensory modalities. The Cambridge psychologist Morgan concludes, on the basis of a careful review of empirical studies of perception, that

> [T]he 'sensationalist' strand of empiricism has obstinately maintained that the way in which we perceive is entirely dependent on the way in which the message enters our brain: so much so, in fact, that there is no way in which to recognize that two messages coming over different pathways signify the same object, short of associating them by trial and error. This particular aspect of empiricism was wrong, and Locke's answer to Molyneux's question was mistaken.[23]

If Morgan is right, then one cannot infer that the intentionality of perception is nothing over and above the intentionality of information acquisition or belief formation. That there must be something *more* than descriptive content to the intentionality of perception is shown by the fact that two different acts of perception, say, one of seeing and one of touching, can deliver *identical* information about the perceived object. Whatever that extra something is, cognitivism misses it. Descriptive content is neither sufficient nor necessary to account for the intentionality of acts of perception.

Nevertheless, it must be admitted that the argument does not rest here. Although the intentionality of perception cannot be *wholly* accounted for by the semantic properties of its content, perception is still *overwhelmingly* representational. This is shown, *inter alia*, by the fact that perceptual experiences are subject to semantical or quasi-semantical evaluation, as either veridical or hallucinatory. There still exists a definite, if loose, connection between the intentionality of perception and the intentionality of content. The very general considerations of the previous two paragraphs have inserted a wedge between mental intentionality and representation, but we have yet to achieve a decisive separation. For that we can switch to another

[22] Armstrong (1993: 216–26; 1973: 22). [23] Morgan (1977: 207).

example. Bodily sensations are among the mental attributes that exemplify intentionality without representation more thoroughly than does perception. Pain is a convenient example to discuss.

What are the credentials of pain to be an example supporting the possibility of PI?

Is pain a mental state? There really should be no need to ask this question. The answer is embarrassingly obvious, or it would be but for the current dominance of cognitivism in the field of philosophical psychology. According to cognitivism, states like believing and activities like thinking are to be analysed in terms of their informational (representative) content. The full cognitivist programme extends from its central application (to the rational mind) to include also connation and sentience. It is not the case that the contemporary orthodoxy explicitly denies that emotions and sensations are mental. It would be more correct to say that cognitivism can acknowledge the mentality of feeling and sensory experiences only in so far as these are assimilated to the propositional attitudes. The mind as a whole is an information-processing system. *X* is mental if and only if *X* can be systematically related to some intra-human information-processing system as a functioning element of it. For example, if you can show that an itch is a vehicle for carrying content, that it represents something as being somehow to someone, then you have shown that itches are mental. Otherwise having an itch is scarcely more mental than having a pulse.

Speaking strictly, cognitivism does not prevent us from regarding sensations as mental, but the combination of cognitivism with certain extraneous but plausible propositions, does tend to call into question the entitlement of pain episodes to be considered genuine psychological events. In this philosophical climate of neo-rationalism, it is worth reaffirming that 'Being in pain is a mental state' is a bedrock truth. It is better credentialled by far than any piece of philosophical analysis inconsistent with it. If one had to choose between having to reject some propositions in the theory of mind or having to reject 'Pain is mental', the rational choice would be to reject the theory.

Are pain states intentional? To be in pain is to feel pain *somewhere*. The intentional object of a pain is the (felt) location of the sensation. There is the usual quartet of reasons for taking pains to be intentional.

(i) Pains have directedness to their location in the following sense. First, pains must be experienced as being at a location. Whether pains must be felt at a bodily location or whether it is logically possible that

one should feel pain as located in a part of an external object, is a question I leave open.[24] Second, pains are individuated by their location. This implies, and experience confirms, that one cannot have, in the *one place*, multiple pains that are qualitatively exactly similar. An analogue to the Pauli exclusion principle operates for sensations. Unlike Anscombe, I think that intentional directedness is a *de re* characteristic of token episodes of feeling pain, not merely a grammatical feature of the descriptions we give to the pains.[25]

(ii) Pains may be experienced at non-existent locations. These are the notorious phantom limb cases. They speak decisively in favour of the account of pains as intentional.

(iii) The locations of pains may be fuzzily bounded. This type of indeterminacy is not description-dependent. We sometimes find it impossible to specify the location of pains with any greater precision than is conveyed by 'The pain is near the elbow', or 'The pain is below the knee', etc. The reason why sometimes pains cannot be located more precisely has nothing to do with limitations of our descriptive resources. Statements of this type may be strictly and literally true, that is, they may correctly capture the fact that the pain, as sensed, does not have a sharp boundary. They are true because of the inherent and irremediable vagueness of the locations of the sensations.

(iv) Ascriptions of pain-at-a-location create opaque contexts. Compare two arguments:

A	**B**
There is a disk in the computer.	There is a pain in my finger.
The computer is in the study.	My finger is in my mouth.
(So) There is a disk in the study.	(So) There is a pain in my mouth.

Clearly, A is a good argument and B is not. What is the explanation of the difference? Ned Block has suggested *ambiguity*: the 'in' used in B has a different sense from the 'in' used in A. Tye has argued, against Block, that the better explanation is *intentionality*.[26] I side with Tye: there is little independent evidence for multiple senses of 'in', so the appeal to ambiguity looks ad hoc. The required explanation comes not from differences in the meaning of the word 'in' but from differences in the two contexts of use of the word—the one transparent and the other opaque.

[24] Cf. Armstrong (1962: 64–6). [25] Anscombe (1968). [26] Tye (1995: 111–12).

Are pains capable of semantic evaluation? If pain states are meaningful, are they so in the sense of having some meaningful content, or are they meaningful in some other sense of 'meaning'? In thinking about this question, it is helpful to recall Grice's classic distinction between two types of meaning.[27] There is natural meaning ('meaning$_N$') and non-natural meaning ('meaning$_{NN}$'). Natural meaning is described in terms of four characteristics.

(1) *No misrepresentation*. According to Grice, *x means$_N$ p* entails *p*. If those spots mean$_N$ measles, then he *has* got measles. In ontological terms, natural meaning is an ordinary relation, and ordinary relations ontologically depend on, and hence entail the existence of, their relata.
(2) *Non-expressiveness*. This criterion has two parts: first, we cannot conclude from *x means$_N$ p* anything about what is meant by *x*. For instance, 'Those spots mean measles' does not imply 'What is meant by those spots is that he had measles'. Second, we cannot conclude from *x means$_N$ p* that somebody meant *p* by *x*. Natural meaning does not express either a communicative or any other sort of semantic intention.
(3) *No semantic ascent*. A sentence or phrase in quotation marks cannot express what is naturally meant by something. 'Those spots mean measles' cannot be paraphrased as 'Those spots mean "measles" ', or as 'Those spots mean "he has measles" '.
(4) *Factivity*. There is always available an acceptable paraphrase of *x means$_N$ p* into a sentence beginning with 'The fact that . . .', e.g. 'The fact that he has those spots means that he has measles'. Natural meaning is a relation between actually obtaining states of affairs, and the paraphrases serve to make this explicit.

The criteria for non-natural meaning are converses of those above:

(5) *Capacity for misrepresentation*. *x means$_{NN}$ p* is consistent with not-*p*. Non-natural meaning is not an ordinary relation, and so does not ontologically depend on, or entail the existence of, its 'relata'.
(6) *Expressiveness*. We can argue from *x means$_{NN}$ p* to some conclusion about what is meant by *x*. We can infer from *x means$_{NN}$ p* that somebody meant *p* by *x*. Non-natural meaning is expressive of the intentions of speakers and thinkers.

[27] Grice (1989: 214).

(7) *Possible semantic ascent*. A sentence or phrase in quotation marks can express what is non-naturally meant by something. For example, 'That white flag means surrender' can be paraphrased as 'That white flag means "We surrender" '.[28]

(8) *Non-factivity*. Non-natural meaning is not a relation between states of affairs, and so permissible paraphrases of statements of the form *x means*$_{NN}$ *p* into statements beginning with 'The fact that . . .' are not available.

We return to the question, are pains meaningful? The first point to be established is that pains do not mean their location, in any sense of 'mean'. If the intentional directedness of pains to their location is to be explained as a representational (semantic) characteristic, everything that has such directedness has to have *something* in or about it that does the representing, some representational *content*. Where is the representational content in pain? There is no aspect or element distinguishable within the sensation of pain that refers to, or describes, the location in which the pain is felt, in the way in which an auditory image is involved in the hearing of a sound that may be taken as representing the sound as it was emitted.[29]

One could say that pain is informative. But it would be a mistake to assimilate the informativeness of pain to the informativeness of perception, at any rate if we think that what we perceive when we are in pain is the *location* of the pain. The only information concerning the location of pain that I get from being in pain is due to the transparent character of the experience: a headache does not *represent* my head as hurting, it *is* my head hurting. (If representation were taken to be reflexive that would allow a trivial sense in which my headache represents my head as hurting. The Brentano Thesis cannot draw support from the fact that even pain is representational in the sense in which *everything* represents itself.) A perception of the cat as being on the mat can be right or mistaken, but a pain's location just *is* where the pain is felt to be. If being in pain was a case of perception it would be *logically incorrigible* perception, but I do not think that any perception can be logically incorrigible. We should conclude, instead, that pain is

[28] According to Grice 'in "nonnatural" meaning, consequences are conceptions or complexes which involve conceptions' (ibid. 350).

[29] I intend this remark to be *neutral* between various theories of the nature of imagistic element in perception, e.g. between sense-data theories of sensing and, say, adverbial theories.

directed towards its intentional object without representing (symbolizing) its object. Pain does not non-naturally mean its location and is, in this respect, exactly like a physical power that does not non-naturally mean its intentional object (the typifying manifestation).

Nor does pain mean its location, in the sense of natural meaning. The phantom limb cases are enough to show this. Natural meaning is an ordinary relation according to my reading of the Gricean scheme, and there can be no such relation between pain and a non-existent location.

Although pain does not have its location as content capable of semantic evaluation, pain is still informative in some sense. We typically learn something from being in pain. Pain is diagnostic. According to some cognitivist philosophers this is because pain has a more inclusive intentional object than its location:

> Just as a visual experience of a tree is an awareness of a nonconscious object (the tree) pain is an awareness of a nonconscious bodily condition (an injured, strained, or diseased part). . . . What we are conscious of when we feel pain (hunger, thirst, etc.) are not the internal representations of bodily states (the pains), but the bodily states that these representations (pains) represent.[30]

> [I]n optimal conditions, sensory experiences of the pain sort track certain sorts of disturbances in the body, paradigmatically, bodily damage. So pains represent such disturbances.[31]

> Consider the experience of having a pain in your right leg. . . . The content of your experience is that there is a disturbance of a certain specific sort in your right leg. The intentional object of the experience is an event located in your right leg.[32]

Pain experiences make us aware of pathological bodily occurrences, and, according to these philosophers, they do so by somehow representing to us that parts of our bodies are in an abnormal condition. I suggest that we are not really forced to conclude, from the facts disclosed in these cases, that the intentional object of pain episodes is, or includes, some damaged bodily state. How then do pains inform us of bodily damage? Not *pictorially*, nor by *resemblance*. Another possibility is *co-location*: pains represent disturbances by being felt at the very location of the disturbed body part. However, this is ruled out by the

[30] Dretske (1997: 102–3). [31] Tye (1995: 112–14). [32] Harman (1990: 39–40).

(common) phenomenon of referred pain. The right answer, I believe, is that pains are *non-accidental accompaniments* of bodily disturbances. This relation of non-accidental accompaniment is grounded in causation. The sense of 'represents' in which pain represents disturbance or injury is the one in which we can say that effects represent their causes,[33] joint effects of the one cause represent each other as well as their cause, etc. Obviously this is not the sense of 'represent' in which, say, the sound of the bell represents the end of a round, or flying a white flag represents surrender. It is rather a sense that is very closely related to, if not identical with, Grice's natural meaning.

The hypothesis that pains mean_{N} bodily damage can be tested against the criteria for natural meaning. To take just the first two. If the doctor at first diagnoses my headache as meaning congested sinuses but it turns out that my sinuses are not congested, the diagnosis will have to be retracted: the headache did not, after all, mean congested sinuses! Diagnosis is by symptoms, and symptoms are effects, and nothing is an effect of a non-existent cause. Criterion 1, no misrepresentation, appears to be satisfied. So is criterion 2: natural meaning is not an expressive relation. 'The headache means compression of the cervical spine' does not allow inferences to 'What is meant by the headache is that the cervical spine is compressed' or 'What *N* meant by the headache is that the cervical spine is compressed'. Symptoms are neither actual nor possible expressions of an intention to communicate some mental content.

Cognitivists appear to be saying that pains are contentful experiences that non-naturally represent bodily damage. This claim can be tested against criteria (5) and (6). Things that have natural meaning cannot misrepresent, but things that have non-natural meaning *can*. If on a particular occasion the bell sounds two minutes after the start of the round, the sounding of the bell still means the end of the round although it is (in fact) not the end of the round. If pains had non-natural meaning, they should also be able to misrepresent. If a pain (non-naturally) means congested sinuses, then it has that meaning independently of whether the sinuses are congested or not. As we have seen, this is not so. If the sinuses are not congested, then pain does not mean congested sinuses. Criterion (5) for $\text{meaning}_{\text{NN}}$ is not satisfied.

[33] But not that causes represent their effects!

Nor is criterion (6): expressiveness. If pain non-naturally means damage, one should be able to look for whoever or whatever meant by pain that the sinuses are congested. But, of course, when the question, *Whose meaning*? is asked about pain, the answer will be negative. Pains are not expressions of intended content.

If one analyses the relation between pain and pathological somatic states as natural meaning, taking the latter to be a causally grounded nexus, one can explain some salient facts about pains. One can explain why pains are diagnostic, and why sensitivity to pain raises the individual's survival chances while giving an evolutionary advantage to the species. The theory that pains are intentionally directed towards some bodily damage is not likely to be required for any serious explanatory purpose.

This discussion of the intentionality of sensations has been somewhat difficult, but the result can be summarized simply. I have argued for the following six theses:

Are pains intentionally directed to their location?	*Yes*
Are pains intentionally directed to some bodily damage?	No
Do pains naturally mean their location?	No
Do pains non-naturally mean their location?	No
Do pains naturally mean some bodily damage?	*Yes*
Do pains non-naturally mean some bodily damage?	No

The implications of these six propositions can also be summed up succinctly. There are two kinds of MI, roughly corresponding to the traditional division of the mind into the rational and the sentient. The intentionality of the rational mind is analysable in terms of semantic content. Sentient MI is not so analysable. The M-intentional properties/states that are bodily sensations have non-symbolic information-conveying relations (very much like natural meaning) to some of their non-accidental companions, but *not* to the locations that are their intentional object. The directedness of sensations to their intentional object cannot be understood in terms of meaning at all. It is not analysable as, nor reducible to, either $\text{meaning}_{\text{N}}$ or $\text{meaning}_{\text{NN}}$. *In this respect* there is no difference between sensations and purely physical powers.

Finally, we can conclude, *meaning* does not divide the properties in a way favourable to the Brentano Thesis.

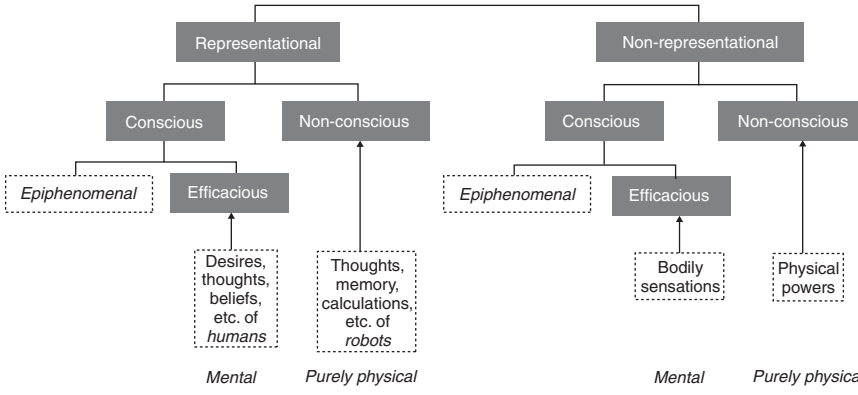

Fig. 3. Table of Intentionality

3.5.6 *Summary: The intentionality of powers*

I proposed that the directedness of dispositions to their manifestation is the directedness of intentional properties (3.2). We should take seriously the possibility of there being such a thing as PI, contrary to the Brentano Thesis. In the course of developing the hypothesis, I distinguished between intentionality that is subject to semantic evaluation ('representational') and intentionality that is not subject to semantic evaluation ('non-representational'). Each of these was in turn divided into intentionality exemplified by systems capable of consciousness (MI) and intentionality exemplified by systems not capable of consciousness. Directedness is not defined. My proposal is to treat physical intentionality as an *undefined primitive* of the theory of properties, since non-extensionality is of the essence of dispositions on my account. The resultant structure is illustrated in Figure 3.

4

Independence

> Power is one thing; its exertion is another thing. It is true, there can be no exertion without power; but there may be power that is not exerted.
>
> (Thomas Reid)

4.1 Is there a Problem about Unmanifesting Powers?

The occurrence of the manifestation of a power depends on the existence of the power, but not vice versa. Powers can exist in the absence or in the presence of their manifestations and so are ontologically independent of the occurrence of the manifestations. Call this fact about powers 'INDEPENDENCE'. We note a distinction between two senses in which powers can be independent of their manifestations. There is *token-independence* iff a disposition trope of kind *P* can exist without *its* manifestation existing. There is *type-independence* iff a disposition trope of kind *P* can exist without a manifestation of *any* trope of the kind *P* existing. These two may be thought of as converses, respectively, of two forms of dependence: token-dependence and type-dependence. The claim that something is token-dependent on something else entails but is not entailed by the claim that it is type-dependent. So token-dependence is logically stronger than type-dependence. With independence that order is reversed: the claim that *A* is token-independent of *B* is weaker than (because entailed by without entailing) the claim that *A* is type-independent of B (see Figure 4). For the rest of this study I will take the independence of powers from manifestations to be the strong type-independence.

If powers can exist when they are not being manifested, and powers are properties that owe their identity to their manifestation, then, it

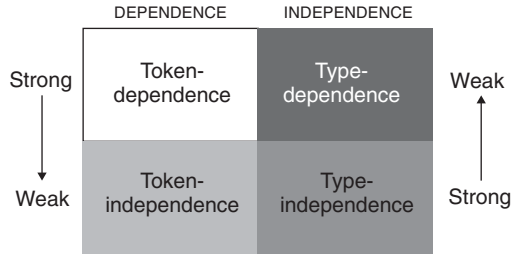

FIG. 4

would seem, they are properties whose very nature depends on something that may not exist. This is a peculiar feature for properties to have. INDEPENDENCE is in need of elucidation. In this chapter I look at two historically influential attempts at elucidation. One is the *conditional analysis*, which purports to give a definition, or an explication, of the concept of power in terms of hypotheticals. The other is *Megaric actualism*, which is the oldest example of eliminativism about unmanifesting dispositions.

4.2 INDEPENDENCE AND THE CONDITIONAL ANALYSIS OF POWERS

Can powers be analysed as being identical with, or as supervening on, some relation that holds between the bearer of the power and the manifestation event towards which the power is directed? Examples of such 'bridging relations' that occur in the literature include causation, nomic sequential regularity, and structural mediation. The conjunction of DIRECTEDNESS and INDEPENDENCE has an interesting consequence: it rules out any analysis of powers in terms of the holding of a bridging relation. For the power may exist while the manifestation does not, and on the usual understanding of what a relation is, there cannot be a relation between existent and non-existent relata.[1] So one cannot analyse *x*'s power, *P*, as entailing the existence of a causal or

[1] 'When a particular has an unmanifested power, then the particular cannot be *related* to the potential manifestation of this power because the instantiation of a relation demands that all is terms exist' (Armstrong 1997: 70, original italics). Cf. 'Dispositionality is *not* a relation between what is dispositional and what is its manifestation' (Martin 1997: 216, original italics).

nomic or structural relation between *x*'s having of a property, *F*, and the occurrence of the event, *e*, that is the manifestation of *P*, for such an analysis would imply that *x* has *P* only when *e* occurs.

If one cannot analyse a power as a bridging relation that holds categorically, can one analyse a power as a bridging relation conditionalized on the occurrence of a stimulus event? This is a very popular move that has until comparatively recently been regarded as unproblematic by most philosophers. The thought behind it seems to be the following. Since an object can have a power without manifesting it, for the manifestation to occur something additional to, something over and above, the object's having that power seems to be required. That something additional is an event that triggers or stimulates the occurrence of the manifestation. The having of the power and the occurrence of the stimulus jointly entail the occurrence of the manifestation. So the power may be analysed as that which *would* stand in the bridging relation to the manifestation *if* the stimulus occurred. If we add that the having of a power by its bearer is usually independent of the occurrence of the stimulus, then this analysis may be claimed to accommodate INDEPENDENCE.

4.2.1 *Naive conditional analysis*

Conditional analyses come in a number of versions. The simplest of them, which elsewhere I have called the 'Naive Conditional Analysis,'[2] may be formulated thus:

NCA Something *x* is disposed at time *t* to give response *r* to stimulus *s* iff if *x* were to undergo stimulus *s* at time *t*, then *x* would give response *r*.

Once upon a time we used to worry about the inexpressibility of the strong 'if' in a purely truth-functional language. Nowadays that worry seems less pressing, at least to those who admit possible world semantics for the strong 'if'. Nevertheless NCA remains open to several objections that are fatal to it. Here is a reminder.

Loss of intrinsicality. An obvious problem with NCA is that the conditional does not seem to be saying anything about what it is, *in the object*, that makes the response follow upon the stimulus. Suppose that every time stimulus *s* occurs, the Deity, having so resolved, causes the

[2] Molnar (1999).

object *x* to give response *r*. How would that show that *x* has a power to manifest *r*? This imagined case is just the one that Malebranche thought actually applied to all psycho-physical, and to all purely physical, interactions. And he was surely right in saying that *in those circumstances* the only powers that were manifested belonged neither to matter nor to mind but only to God. NCA is suitable for an occasionalist metaphysics but not for the attribution of intrinsic dispositional properties to objects. Powers are intrinsic properties of their owners (it will be argued in Chapter 6). Because it leaves this feature of powers out of the analysis, the definiens of NCA is not sufficient for the definiendum.

Unconditional manifestations. The most general problem for the conditional analysis is its inapplicability to powers whose manifestations are not responses to stimuli but of which INDEPENDENCE is still true. Many powers require a stimulus/trigger for their exercise, making it easy to forget that *not all* do. The conditional analysis, in all its incarnations, is refuted by the existence of powers that manifest *spontaneously*, without the need for stimulation. Libertarians usually describe human free will as comprising a cluster of dispositions at least some of which are capable of unconditional manifestation. According to Austin, for instance, the spontaneousness of human capacities is incorporated into the very meaning of the ordinary English word 'can'.[3] These are, of course, highly controversial claims and a philosophical position should not be regarded as established if it relied solely on such examples. More secure illustrations of unconditional powers can be taken from the natural sciences. Take from physics the example of particle decay. The muon has the capacity to decay into an electron, a neutrino, and an antineutrino. This power is exercised during the muon's very short average life (22×10^{-6} s), without there being anything external to stimulate or trigger the decay. (Is the property that manifests particle decay correctly described as a *power*? Is it not a *tendency*, or a *propensity*? According to me it does not matter what you say here, for the argument does not hinge on the differences in meaning between 'power', 'tendency', and 'propensity', but rather on what they have in common, viz. that they are all subject to INDEPENDENCE.) It could not be claimed that there is an *internal* stimulus or triggering mechanism for the decay, since the leptons are absolute simples. In any

[3] 'Ifs and Cans', in Austin (1961: esp. 231).

case, adopting a rule to the effect that all manifestations are responses to triggering events and postulating, in accordance with that rule, an internal trigger for disintegration, would generate a regress. The trigger would itself need a trigger, etc. This applies whether the bearer of the power/tendency/propensity is simple or complex. Suppose it were found, empirically, that the apparently spontaneous disintegration of some complex object, for example, an unstable atomic nucleus, is triggered by some internal mechanism. Then the problem of spontaneous manifestation would be pushed further back, from the *seeming* spontaneity of the nuclide disintegration to the *really* spontaneous operation of the internal mechanism that triggers it.

On the Copenhagen interpretation of quantum theory, the above account would need qualification. Certain events, such as particle decay, are unconditional only in the sense that they do not have any purely *physical* conditions. But *all* events at the quantum level have an act of measurement as a triggering condition. In its objective, unmeasured state a quantum system holds in superposition *all* possible values of its dynamic variables. In this state of superposition (in which the cat is robustly alive, *and* also stone dead, *and* also in every condition in between) a quantum system will maintain indefinitely its lawful evolution, in accordance with Schrödinger's equation, until subjected to measurement which then produces the 'collapse of the wave packet'. After measurement the system shows itself to be in a determinate state having only the values returned in the measurement. A notorious problem with Bohrian metaphysics is that 'measurement' is not only undefined and unexplained here, but seems incapable of getting any kind of (macro or micro) physical definition. Measurement is radically different from any other natural process and cannot be mimicked by any action of anything that is not a human being taking measurements. Just *what* it is about people, that makes the quantum-world's action uniquely conditional on their measuring behaviour, remains deeply mysterious. One can be grateful that, at the end of the twentieth century, accounts of quantum physics were emerging that hold out the serious prospect of replacing the Copenhagen story with something slightly less bewildering.

Another type of example of unconditional manifestation is provided by *continuously* manifesting powers. These are powers that are exercised for as long as they exist. When they cease to be exercised they cease to exist. They cannot be switched on or off. They have no

toggles. Rest mass is such a power according to General Relativity. Massive objects are spontaneously manifesting their gravitational power in continuous interaction with space-time.

Note that this line of criticism does not depend on reference to actual cases of unconditionally manifesting powers. The mere possibility of the existence of spontaneous manifestations is enough to refute relational analyses of powers in which the relation is conditionalized on some triggering event.

Finkishness. There is a refutation of the conditional analysis due to C. B. Martin.[4] Consider the non-permanent powers that objects can acquire or lose. These acquisitions and losses usually have causes. Let there be a non-permanent power, *D*, with '*s*' the stimulus and '*r*' the response appropriate to *D*. Now suppose that when the stimulus *s* occurs it causes the stimulated object, *x*, to acquire *D*, and that the same occurrence of *s* also triggers *D* and so brings about the response *r*. Then at some time, *t*, at which time *s* does not occur, the conditional 'If *s* were to occur at *t* then *x* would respond by doing *r*' is true, although *x* does not have *D* at *t*. Such powers are finkish and they falsify one half of the conditional analysis.

Conversely, suppose that the occurrence of *s* causes an object, *x*, that has *D*, to lose *D*. In that case *r* does not occur despite the occurrence of *s*. Then at some time *t* at which *s* does *not* occur, the conditional 'If *s* were to occur at *t* then *x* would respond by doing *r*' is false although *x* has *D* at time *t*. Such powers are also finkish and they falsify the other half of the conditional analysis.

In my estimation the objection from finkishness refutes NCA.[5] Whether it also applies to other versions of the conditional analysis, and to what extent, will be discussed below.

Quantification. We are meant to understand NCA as closed under universal quantification. But so understood the definition is wrong, for its instances are, in general, not true. It is not true of every water-soluble thing that it dissolves when immersed in water, it is not true of every fragile thing that it breaks on being lightly knocked, etc. The generalized conditional is, in most of its applications, subject to

[4] Martin (1994). Much of the material in this paper was first presented in a course on causality, jointly given at the University of Sydney by Charlie Martin and myself in the late 1960s.

[5] This agrees with Lewis (1997).

exceptions whose range is not specified.[6] What to do? Restrict the quantifier and so the scope of the definition? That would avoid the counter-examples, including the finkish ones. There are, historically, two sorts of restricted quantifier that have been proposed for use in the analysis of powers.

(1) Statistical quantification. Suppose that one analysed the dispositional state of being unlocked, in cylindrical combination locks for bicycle chains, so that the analysans included or entailed the statement 'For most times, unlocked locks are caused to open by gentle pulls'.[7] This is a frequency statement. It carries existential import. It implies that the disposition must be exercised more than once because there are no statistical truths about null populations or singletons. It also implies that the number of times at which gentle pulls cause the unlocked lock to open must exceed the number of times at which gentle pulls fail to cause an unlocked lock to open. The statistically quantified version of NCA violates INDEPENDENCE by ruling out unmanifested dispositions as impossible, and by placing a priori constraints on the ratio of responses to stimuli. Such statistical facts, about powers as the ratio of the occurrence of responses to the occurrence of stimuli, are evidently contingent facts, to be learned a posteriori. They are not facts that ought to be derivable from a definition. It looks as if one cannot write a correct definition of powers in the form of a statistically quantified strong conditional.

(2) Defeasible quantification. The use of the ceteris paribus clause, or an equivalent proviso, in the conditional definition of powers is intended to restrict the applicability of the definition to occurrences of the stimulus in circumstances in which conditions relevant to the production of the response are 'equal', or 'ideal'. What does this proviso mean? We often know how to handle particular instances of such definitions, one by one. When in an everyday context we are testing for the presence of a power in an object we use our results in combination with background knowledge about the power in question. Such empirical background knowledge can put us in a position to say that on a given occasion other things relevant to the power are equal (or not, as the case may be). This in turn enables us to make a determinate interpretation of the test results. And in a scientific context we know

[6] 'An infirmity of the dispositional idiom, or the intensional conditional, is its dependence on a vague proviso of *caeteris paribus*' (Quine 1973: 12).

[7] Lewis (1983*b*: 100).

how to deal with ideal concepts (perfectly smooth surfaces, point-like molecules, etc.). In applying the laws that describe the ideal objects' powers, we simply restore what the idealization had removed (i.e. thought away). This procedure is also applied piecemeal and it works satisfactorily. But none of this ensures an understanding of the ceteris paribus clause as it appears in NCA or any similarly quantified definition. For that we would need to be able to say, not merely what the other things are that have to be equal for solubility, or what the other things are that have to be equal for fragility, but what the other things are that have to be equal for variable *s* and *r*, i.e. for powers in general. To this end we could say that for all powers *P*, the ceteris paribus proviso is satisfied for *P* iff a sufficiency of the conditions positively relevant to the exercise of *P* is present, and all the preventers of the exercise of *P* are absent. But this is not something we could say without having prior understanding of each power within the scope of NCA, at least to the extent of knowing what is positively relevant to, and what is preventative of, the exercise of the power. If the ceteris paribus proviso, in the general sense, can only be unpacked if we understand dispositions independently of any definition in which the proviso occurs essentially, then the defeasibly quantified version of NCA falls into circularity.[8] As noted above, the circularity does not destroy the usefulness of such definitions in ordinary life or in the context of scientific investigation. But the circularity does make defeasibly quantified analyses unavailable for definitional, or explicational, purposes.

4.2.2 *Causal conditional analysis*

Many philosophers have adopted a functionalist analysis of powers, partly in the hope that such an analysis would escape the obvious difficulties faced by NCA. Functionalist analyses also have a number of variants, but I will here discuss only what I take to be their common conceptual core, expressed in the following definition:

CCA Something *x* is disposed at time *t* to give response *r* to stimulus *s* iff *x* has some property *B* that would cause *x* to give response *r* if *x* were to undergo stimulus *s* at time *t*.

CCA differs from NCA in two important respects. First, it posits a distinction between powers and their 'bases' or 'grounds'. Second, it

[8] Martin (1984: 5–6); Lewis (1997: 157–8); for details see Molnar (1967).

makes use of a bridging relation between the base and the manifestation as a way of explicating what it is to have the power. The bridging relation is generally taken to be causation, and this understanding of it has been written into CCA above. I ask three questions: (i) Is CCA safe from the effective objections to NCA?, (ii) Can one use causation to explain powers?, and (iii) Is the distinction between powers and their grounds a tenable one? Question (iii) is discussed in detail in Chapter 8, while the first two occupy the remainder of this section.

Does CCA meet the objections to NCA mentioned in 4.2.1? There were four.

Loss of intrinsicality. CCA is consistent with the base, *B*, being intrinsic to its bearer, and it is consistent with *B* being extrinsic to its bearer. Therefore one could amend CCA so as to make *B* an intrinsic property of its bearer, provided that the wider theory of which CCA is a part allows such amendment. In Chapter 8 we meet an important case in which Prior, Pargetter, and Jackson use an argument for the groundedness of dispositions that makes the causal base of a power an extrinsic property of its bearer. Clearly, the amendment is not available to Prior, Pargetter, and Jackson, or to anyone using a similar argument.

Unconditional manifestations. Every version of the conditional analysis faces the problem of unconditionally manifesting powers, including CCA.

Finkishness. Martin's argument applies also to CCA. A power is finkish if the occurrence of the stimulus determines the acquisition or the loss, respectively, of the causal base. A non-imaginary example is an electrical safety cut-out switch which turns off the *current in a wire* (= the base) when an earthed conductor touches the wire, thus preventing anybody *getting a shock from the wire* (= the manifestation). At time *t*, it is true that the wire *is live* (= disposition) although the conditional 'If one were to touch the wire at *t* one would get an electric shock' is false, thanks to the safety switch.

Quantification. Counter-examples to CCA cannot be successfully evaded by restricting the quantification on the definition in either of the two ways discussed in 4.2.1.

CCA has additional difficulties of its own, some of which are due to the attempt to analyse powers in terms of causation.

Deviant process. This is a problem for the causal analysis of powers,

suggested by A. D. Smith.[9] The causal relation is *process-unspecific*. *A* causes *B*, provided only that an unbroken causal chain extends from *A* to *B*, irrespective of how many or what kind of events form the links of that chain or what kind of causal process connects each link. But the relation between a power and the event that manifests its exercise is *process-specific* to some degree. For an object to have a power to respond in a certain way, it is *not enough* that the response should occur conditional on the occurrence of the definitionally appropriate stimulus. Suppose that knocking some object causes 'Z-rays' to be beamed on it, which in turn causes it to shatter in the way fragile things shatter when knocked. Here an *s–r* sequence occurs that satisfies the analysans, yet the shattering is not a manifestation of the fragility but of a deviant process. This objection to CCA draws attention to the fact that dispositional dependence contains something over and above causal dependence.

There are two ways in which a defender of the causal analysis of powers could respond to 'deviant process' cases. First, one could say, as Smith (1977), Prior (1985), and others have said, that the sort of causation suitable for the analysis of powers is one in which the stimulus causes the response 'directly' or in a 'standard' manner. The problem with this reply is the same as the problem already encountered in the case of ceteris paribus provisos: the attempt to understand direct causation (of the response by the stimulus) leads to circularity. We have to understand direct causation, not just for this *s–r* sequence or for that, but for variable *s* and *r*. However, the best we can do to explain direct causation *in general* is to say that, for all *s*, for all *r*, and for all *P*, an *s–r* sequence is a case of direct causation iff the *r* that follows *s* is a manifestation of *P*. An analysis of powers that depends on this understanding of direct causation in general, is circular.

The second attempt to deal with the type of case cited by Smith is to deny that dispositions have an in-built process specificity. Lewis (1998) argues that there is not just one way in which *lethal* viruses kill: some kill by directly attacking vital systems in the body, others (for example, HIV) by weakening the immune system. Both types of virus are properly called 'lethal'. The example is taken to show that process-specificity is not part of the nature of powers and so it need not occur in their definition. Against this, Molnar (1999) claims that such cases

[9] Smith (1977).

do not show that *any* causal chain leading from infection by a virus to death would be sufficient to make the virus involved a lethal one. If a cautious tyrant decreed that everyone infected by a hitherto unknown virus be put to death, a causal chain linking infection with death would exist, even if the virus in question were harmless. The moral is that process-specificity is subject to degrees and that every power has *some degree* of process-specificity. Therefore, for every power there is some way of bringing about its manifestation event that counts as a deviant process for that power. Smith's problem is here to stay and our theory of dispositions must deal with it.

Masking. Suppose one says that the causal base of a power is a 'causally operative sufficient condition for the manifestation'.[10] One of the consequences that flows from adopting such a 'complete cause' concept is that nothing can intervene to prevent the stimulus from bringing about the manifestation of the power. For, if to have the power *D* is to have a causal base which is the causally operative sufficient condition of *D*'s manifestation, then there cannot be another power, *D**, such that the exercise of *D** prevents *D* from manifesting. *D** would be a power whose exercise, in Mark Johnston's terminology, 'masked' the presence of *D*.[11] Such masking powers exist but the use of a complete cause concept in CCA rules them out.

4.2.3 *A reformed conditional analysis*

Recently, David Lewis has proposed a new analysis of dispositions.

RCA Something *x* is disposed at time *t* to give response *r* to stimulus *s* iff, for some intrinsic property *B* that *x* has at *t*, for some time *t'* after *t*, if *x* were to undergo stimulus *s* at time *t* and retain property *B* until *t'*, *s* and *x*'s having of *B* would jointly be an *x*-complete cause of *x*'s giving response *r*.[12]

The meaning of '*x*-complete cause' is as follows. Starting with the idea of the complete cause of a manifestation event, '*x*-complete cause' is obtained by restriction—'a cause complete in so far as havings of properties intrinsic to *x* are concerned'.[13] RCA makes the having of the disposition independent of circumstances that are extrinsic to *x*.

RCA improves on its predecessors in certain respects but not in others. Let us keep the score. First, RCA preserves the intrinsicality of

[10] Prior, Pargetter, and Jackson (1982: 251).
[11] Johnston (1997).
[12] Lewis (1997: 157).
[13] Ibid. 156.

powers that is sacrificed in some other analyses. Second, RCA succeeds in meeting the objection based on finkishness, at least for powers that are grounded in a distinct causal base. Powers that are not so grounded, if there are any, remain outside the scope of any conditional analysis because of the finkish cases. Third, RCA is only partly successful in dealing with the problem of masking, for although it allows a power of the object x to be masked by a power extrinsic to x, RCA still rules out *intrinsic maskers*. By this I mean that if an object has two powers, D_1 and D_2, then, according to RCA, it cannot be the case that the manifesting of D_2 prevents D_1 from manifesting, or vice versa. Greek mythology features many such cases: Tantalus whose ability to drink was masked by his power to cause all fluids he approached to evaporate, King Midas whose disposition to turn everything he touched into gold unfortunately masked his ability to nourish himself. Other common examples include the power of ingested poison masked by the power of ingested antidote; an object's attractive power masked by a repulsive power it has, or vice versa. Intrinsic maskers are everywhere once you start looking for them. (There are even cases of the intrinsic masking of intrinsic maskers.)[14] Or consider the difference between two powers: the power of seeing, and the power of seeing provided one's eyes are open and one is not asleep. The former is a simple but maskable power. It has several intrinsic maskers. The latter is a more complicated power and, let us assume, is not maskable. It is obvious that tropes of both types can exist, yet RCA excludes the maskable powers. Fourth, RCA does not deal with unconditionally manifesting powers. Fifth, RCA cannot be strengthened by restricting its quantifiers in the two ways we have considered in 4.2.1.

There is a further objection that applies generally to all causal analyses of powers. It is that such analyses pre-empt the correct account of causation in terms of powers. This important point will be developed in Chapter 12.

If powers cannot be *analysed* as conditionals, is there a fall-back position according to which powers are *conditional-entailing* although conditionals are not power-entailing? Some philosophers have thought so, arguing that it is the entailing of conditionals that distinguishes

[14] Among the satellites now in orbit is one designed to receive infrared signals from deep space. As the satellite's own heat emissions would mask the incoming signals, the antennae by which the signals are received have to be continuously cooled with liquid nitrogen. This cooling is a case of intrinsic masking of an intrinsic masker.

dispositions from non-dispositions.[15] The above considerations are also sufficient to refute this weaker thesis.

4.3 Anti-realism about Unmanifesting Powers

Good theories that explain unmanifesting powers are difficult to find. This may be used as motivation for adopting deflationary attitudes, of one sort or another, towards powers. The earliest historical example is provided by Megaran contemporaries of Aristotle who asserted that powers exist when and *only when* they are being exercised. The established name for this position is Megaric Actualism (MA). Is MA justified? Are other deflationary responses to INDEPENDENCE justified?

4.3.1 *What is Megaric Actualism?*

At *Met*. Θ 3 1046^{b}28–32, Aristotle writes:

> There are some who say, as the Megaric school does, that a thing 'can' act only when it is acting, and when it is not acting it 'cannot' act, e.g. that he who is not building cannot build, but only he who is building, when he is building; and so in all other cases.[16]

Just who these Megaric contemporaries of Aristotle were, and what else they believed, is not known. As the original writings of this school have not survived, we may never be in a position to reconstruct the wider philosophical context for the Megaric theory of causal powers. I will attempt a charitable reconstruction of MA based on the above quotation, but I make no claim that the result has any historical authenticity or value as a piece of scholarship.

If we read the sentence 'a thing "can" act only when it is acting' as meaning that an object has the power, capacity, or disposition to act in a certain specific way only when it is actually acting in that way, then the Megaric theory may be at least partially interpreted as:

MA_1 If at a time t an object x has the power to ϕ, then x exercises the power to ϕ at t.

MA_1 says that unmanifesting powers do not exist but it does not affirm or deny the existence of any manifesting powers. Although MA_1 is neutral on the question of whether any powers exist, it does seem plausible

[15] e.g. Mumford (1998: 66–84). [16] Aristotle (*Met*: 822).

that the Megarans' ontological doctrine about powers fell short of eliminativism. According to Aristotle's report 'a thing "can" act only when it is acting' implies 'he who is not building cannot build, but only he who is building, when he is building', and he adds, 'and so on in all other cases'. One natural way of reading 'only the one who is building can build when he is building' is as carrying ontological commitment to a capacity or ability to build (a conglomerate of skills) considered as an intrinsic property of the builder. On this reading the Megarans believed that there *are* powers, but they are coeval with their exercise. In addition, if the correct interpretation of 'and so on in all other cases' is in all other cases *of powers*, then we come up with the conclusion that those of the Megaric school believed, in addition to MA_1, the following:

MA_2 If at time t x ϕs, then at t x has the power to ϕ.

If all this is right then the full doctrine of MA is the conjunction of MA_1 and MA_2, namely:

Df_{12} At time t an object x has the power to ϕ iff x exercises the power to ϕ at t.

4.3.2 *The case against Megaric Actualism*

Aristotle was right to have talked of 'the absurdities that attend this view'.[17] There are at least two weighty objections to Df_{12}.

The first objection is based on the fact that powers can be acquired and powers can be lost. The process of the gaining and shedding of powers is itself not a haphazard process but causally explicable. For example, many of the more complex human skills take a lot of time and effort to acquire. It is a matter of common experience that these skills, once acquired, will be retained, and can be exercised repeatedly, until they are lost 'either by forgetfulness or by some accident or by time'.[18] It takes years of effort to learn how to play the violin well. According to MA, as I have interpreted it, the skill of playing the violin is a genuine intrinsic property of the violinist. Actualists have to say that violinists lose their skill every time they stop playing and regain it instantly every time they start. Given the nature of the skill and the difficulty in initially acquiring it, a doctrine that implies that one can instantly reacquire the ability to play the violin after having instantly

[17] *Met.* Θ 3 1046^b33. [18] Ibid.

lost it, is hard to square with experience. What kind of learning theory, or theory of how memory functions, could explain such goings and comings? These instant losses and instant acquirings would be a complete mystery. The point of noting the inexplicable nature of Megaric powers is that being so disconnected from everything we know about the behaviour of people and things, and being unintegratable into any of our best theories of mind and matter, these powers could not play a role in explaining natural phenomena, not even the occurrence of 'their' manifestations.

The Megaric actualist could reply by distinguishing the first acquisition of the ability to play the violin from subsequent reacquisitions. The reacquisitions may lack the difficulty of the original. Experience confirms that it is easier for someone to play the violin who has already learnt how to play than for someone who has not, and it is still easier for someone to play who has played often before. But the relative ease of subsequent reacquisitons is most naturally explained by the fact that the original skill leaves traces behind when it is lost through non-exercise. Such traces are dispositions to reacquire the skill, and these dispositions are capable of existing without manifesting. The Megaric actualist's problem is not solved by the reply under consideration, only shifted. For if the 'instant reacquisitions' are explained in a way that requires the postulation of capacities for such reacquisitions that can themselves exist between manifestations, then MA is made inapplicable to iterated powers (powers to acquire powers). But if we admit unactualized iterated powers why should we not admit unactualized uniterated powers? It seems arbitrary not to do so. A simpler and better explanation says that it is the originally acquired skill that persists between its exercises.

Here is the second absurdity that attends MA. There are certain obvious seeming distinctions that we all believe we can draw but which we would not be justified in drawing if MA were true. Take a sighted person who, at time *t*, is in the dark, or one who is asleep at *t*, and, on the other hand, a blind person. They have it in common that neither exercises the power of sight at *t*, while the difference between them is that one has that power at *t* but the other lacks it. Sceptics about unmanifesting dispositions must deny this straightforward account and say that there is no such distinction to be drawn: at *t* neither has the power of sight. Given a choice between accepting this conclusion and rejecting the philosophical theory from which it is derived, wouldn't one have to reject the theory?

One could allow a distinction between the person who is in the dark or asleep, on the one hand, and the blind person on the other, in terms of their respective histories before and after *t*. The blind person never exercises the power of sight and will therefore be without that power at all times before and after *t*. The sighted person does exercise the power of sight and will therefore have that power at various times both before and after *t*. At *t* neither has sight. 'Having a history of episodic seeing' is meant to be the extensional equivalent of 'being permanently sighted', while 'having a history of never seeing' is the extensional equivalent of 'being blind'. But even this weak claim for extensional equivalence does not hold up. Here's a ghoulish counter-example. Two babies are born in the dark, both sleep for a few hours after birth and both die without waking up. One of the infants had the power of sight (sound optic nerves, etc). The other was born without eyes. There is no history-based contrast between the visually unimpaired baby and the blind one, neither of whom ever exercised the power of sight. Even the qualified form of MA we are now considering commits one to saying that neither baby had the power of sight.[19]

I have given two arguments against MA. First, that actualism turns powers into nomads: they come and go, depending on whether they are being exercised or not. Second, that it stops us from distinguishing between unexercised powers and absent powers. Each of the two arguments gives good reason, on its own, for rejecting MA. Jointly they make a strong case.

The first of the arguments seems to be the more illuminating of the two.[20] Megaric powers, not being subject to INDEPENDENCE, stand in sharp contrast to real powers. It is hard to understand the concept of a power that exists precisely when it manifests and for exactly as long as it manifests. Is such a power something genuine, a property in its own right? It seems to be just a reification of the causal relation that holds whenever the power is exercised.

> Such intrinsic powers are pretty clearly products of metaphysical double vision: they just *are* the causal processes which they are supposed to explain seen over again as somehow latent in the things that enter into these processes.[21]

[19] Ayers (1968) and Prior (1985) advance similar arguments to the one given in the text, without considering the 'extensional equivalents' move. The basic idea is in Aristotle.

[20] The originator of the argument is Aristotle.

[21] Mackie (1978: 104, original italics).

This remark, in its original context, was intended as a quite general criticism of irreducible powers. In my opinion it has no force at all when applied to non-Megaric powers: powers that exist whether or not they are manifested. If an object is soluble without dissolving, as INDEPENDENCE allows, then its solubility cannot be the reification of a non-existent dissolving. However, what John Mackie says about metaphysical double vision accurately fits the *Megaric theory of powers*. Megaric powers are quite incapable of playing any part in explaining the causal interactions in which they participate, since they are themselves ontologically parasitic on those interactions. If the powers are just reifications of the interactions, they cannot function as total or partial explanations of those interactions. Since they cannot explain the phenomena that powers are normally invoked to explain, then *ipso facto* they cannot best explain them. We really have no good reason to include in our ontology such nomadic powers.

5

Actuality

> Next to the ridicule of denying an evident truth, is that of taking much pains to defend it.
>
> David Hume

Having a power is prima facie having an actual property in the same sense in which objects have actual properties that are not powers. To say that something has a power is not to say merely that some manifestation-event is possible. Powers are not merely the potentiality of some behaviour. Or so it seems according to a strong intuition shared by most of us.

For Hume *manifested* powers are identical with their manifestations:

> The distinction, which we sometimes make betwixt a *power* and the *exercise* of it, is entirely frivolous, and . . . neither man nor any other being ought ever to be thought possest of any ability, unless it be exerted and put into action.[1]

And powers, when they are *not manifested*, are not actual properties at all. They are merely the (ungrounded) probability/possibility of behaviour.

> We consider a person as endow'd with any ability when we find from past experience, that 'tis probable, or at least possible he may exert it . . . power consists in the possibility or probability of any action, as discovered by experience and the practice of the world.[2]

Together, these views amount to a deactualizing analysis of powers that has found some followers. Goodman for example: 'The peculiarity of dispositional predicates is that they seem to be applied to things in virtue of possible rather than actual occurrences.'[3] Phenomenalism, in its commonest version, is the doctrine that material objects are

[1] Hume (1739–40: 311, original italics). [2] Ibid. 313. [3] Goodman (1955: 40–1).

nothing but collections of ungrounded possibilities of perceptual episodes.

Should the appearances that speak in favour of ACTUALITY be respected? I think they should be, for two reasons. First, some modal considerations. Let the possibilist analysis be, or include, the following (which is recognizable as a modally weaker version of Megaric actualism):

Df_{13} At time *t x* has the power to ϕ, iff it is possible that *x* ϕs at *t*,

which decomposes into

A_1 If at time *t x* has the power to ϕ, then it is possible that *x* ϕs at *t*,

and

A_2 If it is possible that *x* ϕs at time *t*, then *x* has the power to ϕ at *t*.

'Possible' in the definiens of Df_{13} is used either in the sense of a restricted (relative) possibility, or in the sense of an absolute (unrestricted) possibility. Take the first alternative. If we say that it is possible for *x* to ϕ at *t* in the restricted sense of 'possible', then what we mean is that *x*'s ϕ-ing is possible relative to the initial conditions that are actual at *t*. Now 'At *t x* has the power to ϕ' does not entail anything about the initial conditions that are actual at *t*. Taking precautions to prevent the possibility of an accidental firing of a gun, say, by removing the ammunition from it, does not rob that gun of the power to fire bullets.[4] Therefore, if 'possible' is used in the sense of relative possibility, the definiendum of Df_{13} does not entail the definiens (A_1 is false). What if we take 'possibility' in the S_5 sense of absolute possibility (so-called 'logical possibility')? That will answer the objection just raised, for it is indeed the case that if at *t x* has the power to ϕ, then it is logically possible that *x* ϕs at *t* (A_1 is not false). But the reverse entailment does not hold. 'It is possible that *x* ϕs at t' does not entail 'At *t x* has the power to ϕ'. Consider a dead copper wire as it is at *t*, namely, electrically *uncharged*. If it is possible for the wire to *become* charged at *t'* then it is possible that the wire could have given someone an electric shock at *t*, without it being true that the wire was charged at *t*. Generally speaking a correct account of dispositionality must express the fact that the properties that determine the possible behaviour of an object include

[4] Cf. Mellor (1974: 173).

more than its uniterated powers (4.3.2). They also include its iterated powers. It may be possible for an object to ϕ at a time when it does not actually have the power to ϕ, if it has the power to acquire the power to ϕ together with other relevant iterated powers. This objection to Df_{13} does not depend on construing 'possibility' as relative to actual initial conditions. The objection succeeds even if 'possible' is used in the sense of absolute possibility. One half of the claimed equivalence between powers and the unrealized possibility of the occurrence of their manifestations, namely A_2, is apparently refuted.

The second defence of ACTUALITY is an elegant argument from causality due, in essentials, to Mellor (1974). Dispositions can be causes (the meaning of this claim will be discussed in Chapter 12). What is not actual cannot be a cause or any part of a cause. Merely possible events are not actual, and that makes them causally impotent. This suffices to show that powers are not to be equated with mere possibilities. The claim that powers are causally potent has strong initial plausibility. Despite this, it has been gainsaid by a few. Levi and Morgenbesser (1964), O'Shaughnessy (1970), and more recently, Prior, Pargetter, and Jackson (1982) are among the refuseniks. The latter present an important argument that will be examined, and shown to be unsound, in Chapter 8.[5]

Bearing in mind the wise words quoted at the head of this chapter, I say no more on the topic of ACTUALITY.

[5] Prior, Pargetter, and Jackson (1982: 255).

6

Intrinsicality

Powers *seem* to be intrinsic characteristics of their bearers. 'Intrinsic' is here used as defined in 1.4.5 viz. *P* is intrinsic to *x* iff *x*'s having *P*, and *x*'s lacking *P*, are independent of the existence, and the non-existence, of any contingent object wholly distinct from *x*. Powers are intuited as intrinsic by common sense, and the intuition is reinforced by the use of certain concepts, and the existence of certain practices, in science. Nevertheless more than one philosopher has suggested that powers should be analysed relationally. In this chapter we look at two examples, one old, one contemporary. The question for us is can powers and dispositions *per se* be reduced to relations?

6.1 Boyle on the Relational Nature of Capacities

Boyle used the example of a key and a lock to reinforce a contrast between secondary and tertiary qualities *on the one hand*, and primary qualities on the other. His best-known statement of the case is not without ambiguity.

> We may consider, then, that . . . whoever invented *locks* and *keys* . . . had made his first lock . . . that was only a piece of iron contrived into such a shape; and when afterwards he made a key to that lock, that also in itself considered was nothing but a piece of iron of such a determinate figure. But in regard to these two pieces of iron might now be applied to one another after a certain manner, and that there was a certain congruity betwixt the wards of the lock and those of the key, the lock and the key did each of them now obtain a new capacity; and it became a main part of the notion and description of a *lock* that it was capable of being made to lock or unlock by that other piece of iron we call a key, and it was looked upon as a peculiar faculty and power in the key that it was fitted to open and shut the lock: and yet by these

new attributes there was not added any real or physical entity either to the lock or to the key, each of them remaining indeed nothing but the same piece of iron, just so shaped as it was before.[1]

On the one hand Boyle is here arguing that in saying of the key that it is 'fitted to' open the lock, or of the lock that it is 'capable of being made to lock' by the key, we are not adding 'any real or physical entity' to either object. The objects continue to have just those primary qualities they have had all along. On this view the tertiary (and the secondary) powers do not represent a net addition to the ontological inventory. They do not exist, or are not real, or are identical with the primary qualities already present. On the other hand, when the key and the lock both come into being, then, according to Boyle, they 'each of them now obtain a new capacity'. Here tertiary powers are taken as real, but relational properties. This view is deflationary only about the intrinsicality of the powers.

In other places Boyle unambiguously asserts this extrinsicalist account of dispositions.

> I consider that . . . the faculties and qualities of things being (for the most part) but certain relations, either to one another, as between a lock and a key; or to men, as the qualities of external things referred to our bodies, and especially to the organs of sense.[2]

> For a steel needle, being applied to a loadstone, manifested itself to be capable of constantly shewing the north and the south in all seas . . . to navigators, who, by this property, which depends upon the relation that iron has to one only stone, have been able to discover the new world.[3]

I do not think that Boyle's examples can be generalized. Let us assume, for the sake of argument, that Boyle is right in claiming that the key's ability to open a lock depends on a relation between the key and the lock, and that he is also right in claiming that a compass's ability to point north depends on a relation between the needle and the (magnetic) North Pole. The same cannot be said about *all* dispositions. The fundamental reason why we cannot analyse all powers as extrinsic, on the strength of such examples, was pointed out by Leibniz in his criticism of occasionalism. There were two kinds of occasionalists. The minority, represented by Malebranche, seemed to believe that God

[1] Boyle (1666: 23).

[2] 'Of Men's Great Ignorance of the Uses of Natural Things' (Boyle, in *Works*, III: 479).

[3] Ibid. 480.

directly intervened in each situation to bring about the mind–matter and matter–matter interactions that take place. We could call Malebranche an act occasionalist. The majority view was that God causally sustained the world by willing the laws of nature and that the entire pattern of causality in the world obeyed these laws. This doctrine can be called rule occasionalism. Leibniz charged that occasionalism explains everything as due to miracles. Rule occasionalists (Arnauld, Bayle) protested that on their view the results of God's action are the nomic regularities of nature, and that a miracle is the exact opposite, a contra-nomic irregularity. Leibniz was unimpressed by this rejoinder. It may be that we can only recognize an event as a miracle if it is exceptional. Irregularity may be *epistemically* necessary for the miracle but is not *constitutive* of it. What makes an event a miracle is that its occurrence is independent of the properties of the things involved in the event and dependent only on some divine act.

> It isn't sufficient to say that God has made a general law, for in addition to the decree there has also to be a natural way of carrying it out. It is necessary that is, that what happens should be explicable in terms of the God-given *nature of things*. Natural laws are not as arbitrary and groundless as many think.[4]

The rule occasionalist is committed, as much as the act occasionalist, to explaining all changes solely in terms of extrinsic characteristics of the things involved. To avoid the charge of relying on miracles, the occasionalist would have to relate what happens to things to the nature of those things. The accidental intrinsic properties of a thing are not part of its nature. But the properties that are part of the nature of a thing are intrinsic to that thing. Decrees of the deity (laws) can only explain what happens if they are implemented. They are implemented only if they apply to things according to the things' nature. Therefore *any* non-miraculous explanation of what happens to things must relate the happenings to the intrinsic properties of the things.

Leibniz's argument has a clear bearing on the attempt to fully generalize Boyle's relational theory of dispositions. Let us say that at *t* a key,

[4] Leibniz (*Philosophical Texts*: 205, italics added). As an example of the sort of view targeted by the last sentence, see: 'There is nothing necessary or essential in the case [of gravitation], but it depends entirely on the will of the governing Spirit, who causes certain bodies to cleave together, or tend towards each other, according to various laws, whilst he keeps others at a fixed distance; and to some he gives a quite contrary tendency to fly asunder, just as he sees convenient' (Berkeley 1710: 92). Leibniz's argument is also relevant to the view in Smart (1985) that any coincidence is lawful if it occurs on a cosmic scale.

K, is made. Let L_1 be a representative member of the class of locks that at *t* become openable when they were not openable prior to *t*. Let L_2 be a member of the class of locks that were not openable prior to *t* and that do not become openable at *t*. The making of *K* bestows the disposition *being openable* on some locks and not on others. What is the principle of this selective empowering? Why does *K* stand in the disposition-bestowing relation to L_1 but not to L_2? Boyle suggests the direction in which to look for the answer: the disposition-bestowing relation is 'congruence'. Congruence is a comparative. Comparatives are founded relations that supervene on properties of the relata. The properties of the lock and the key that found their congruence are the very ones that explain why they can interact in the functionally appropriate way. If Leibniz is right, then these properties have to include some that are part of the nature of the key and the lock respectively, and are therefore intrinsic to their bearers. So for key and lock to be able to stand in the relation of congruence they each must have their *intrinsic* congruence-sustaining properties (shape, etc.). If the lock's openability is an extrinsic property, it is founded on intrinsic properties. The relativization implied in Boyle's account cannot be generalized to all powers.

6.2 Popperian Propensities

Karl Popper proposed a particular version of the objective interpretation of probability. The leading occupant of this field is the frequency theory of probability according to which, roughly speaking, the probability of the occurrence of an event of type *E* is the frequency of occurrence of *E*s in a series of trials. There is a well-known difficulty of explaining, from within a frequency theory, what it means to attribute a probability to a token event (the problem of singular probability). Popper intends his view to be one that is no less objectivist than the frequency theory but one capable of accounting for singular probabilities. Here is one succinct statement of his theory.

> Every experimental arrangement is *liable to produce*, if we repeat the experiment very often, a sequence of frequencies which depend upon this particular arrangement. These virtual frequencies may be called probabilities. But since the probabilities turn out to depend on the experimental arrangement, they may be looked upon as *properties of this arrangement. They characterize the*

disposition, or the propensity, of the experimental arrangement to give rise to certain characteristic frequencies *when the experiment is often repeated*.[5]

The probability-sustaining propensities are theoretical entities that explain observable phenomena. The analogy is with the concept of force in physics.

The concept of force—or better still, the concept of a field of forces—introduces a dispositional physical entity, described by certain equations (rather than metaphors), in order to explain observable accelerations. Similarly the concept of propensity, or of a field of propensities, introduces a dispositional property of singular physical experimental arrangements—that is to say, of singular physical events—in order to explain observable frequencies in sequences of repetitions of these events.[6]

Popper was keen to insist that the propensities that determine the probability of outcomes in certain situations were properties of those situations as a whole.

Like all dispositional properties, propensities exhibit a certain similarity to Aristotelian potentialities. But there is an important difference: they cannot, as Aristotle thought, be inherent in the individual *things*. They are not properties inherent in the die, or in the penny, but . . . properties of the experimental arrangement—of the conditions we intend to keep constant during repetition.[7]

I had stressed that propensities should not be regarded as *inherent in an object*, such as a die or a penny, but that they should be regarded as *inherent in a situation* (of which, of course, the object was part).[8]

Popperian propensities, then, have the following characteristics: (1) they are perfectly real properties (universals according to Popper); (2) they are explainers of the behaviour of objects because the having of them determines the probability of such behaviour; (3) they are *intrinsic* properties of the experimental situation in which the behaviour occurs; and (4) they are *extrinsic* (relational) properties of the objects whose behaviour they probabilistically determine. The argument in favour of (3) and (4) is illustrated by the following:

[T]he propensity $^1/_4$ is not a property of our loaded die. This can be seen at once if we consider that in a very weak gravitational field, the load will have

[5] Popper (1962: 67, original italics). [6] Popper (1978: 252). [7] Ibid. 259.
[8] Popper (1995: 14, original italics).

little effect—the propensity of throwing a 6 may decrease from $^1/_4$ to very nearly $^1/_6$. In a strong gravitational field, the load will be more effective and the same die will exhibit a propensity of $^1/_3$ or $^1/_2$.[9]

The propensity of a given throw to have a probability for a certain outcome is not an intrinsic property of the die because factors extrinsic to the die affect that probability. The propensity is intrinsic only to 'the experimental situation as a whole'. (If it should prove impossible to specify without circularity what is included in 'the situation as a whole', then this expression must be a primitive of the theory.) Propensities are a species of disposition. Do all dispositions that seem to be intrinsic to individual objects turn out to be merely relational properties of the objects and intrinsic only to a wider complex arrangement? Popper does not explicitly address this question, but there is no evidence at all that he wants to answer it affirmatively. What Popper says about propensities is not intended to, and cannot, be generalized to all powers. To see this, consider a particular die, *d*, and a particular situation, *s*. Let us say that the probability of throwing a 6 with *d* in *s* = $^1/_6$. The propensity that determines this probability is a disposition of *s* that is derived from the basic dispositions of the various objects involved in *s*. The propensity is intrinsic to *s*, but *s*'s having that propensity ontologically depends, *inter alia*, on some symmetry properties of *d* that are both dispositional and intrinsic to *d*. *D*'s having of these symmetry properties is *essential* to *s*'s having the propensity that fixes the probability of the throw at $^1/_6$.

There is an analogy here with the way scientific discoveries of the seventeenth century led to the relativization of our concept of weight. If weight seemed an intrinsic property of physical objects before the nature of gravity was understood, after Galileo and Newton it became clear that the appearance was misleading. The determinate weight of a body is a function of its mass and of the impressed forces acting on it. In relativizing one seemingly intrinsic dispositional property, essential reference to some *other* intrinsic dispositional property is required. In the case of weight the reference is to the quantified capacity to feel an impressed force. No model for eliminating the intrinsicality of *all* dispositions can be found in this relativizing-to-the-total-cause of the actual outcome. Such is the resilience of the intrinsic.[10]

[9] Popper (1962: 68, original italics).

[10] For a similar point see the brief but excellent Franklin (1986).

6.3 Are there Any Extrinsic Powers?

The argument so far has established that *not all* powers can be extrinsic properties of their bearers. It follows that one cannot adopt a definition of powers that makes them extrinsic. In the case of the key's ability to open the lock, and the lock's ability to be opened by the key, we have seen that these depend on the existence of certain congruence-sustaining powers that are intrinsic to the key and the lock respectively. With the propensity interpretation of probability, it is admittedly tempting to treat propensities for certain behaviour as intrinsic to the behaving object. Popper's critics have argued, for example, 'that the propensity for surviving another year, or 20 more years, was an intrinsic property of the constitution of a man's or woman's body and his or her state of health'.[11] He has rejected this criticism, rightly in my opinion, on the grounds that since the probability of an individual surviving for a given length of time is influenced by factors that are clearly extrinsic to that individual, the propensity that determines the probability cannot be an intrinsic property *of the individual*. But the probability of individual survival also depends on intrinsic dispositions of the individual, so precluding the possibility of relativizing all dispositions.

This negative conclusion leads naturally to the next question. Are there *any* extrinsic powers or are there *none*? I think that the conclusion that not all dispositions are extrinsic is the strongest we can draw by purely philosophical argument. We can go beyond this conclusion and conjecture that the class of actual powers does not include any, the having of which by one object depends on that object standing in some relation to another object. There are no extrinsic power properties, only extrinsic dispositional predicates. But the warrant for this conjecture would have to be empirical, not conceptual; a posteriori, not a priori. It would have to come from the best natural science we can achieve.

Here are two pointers favourable to the conjecture. First, according to basic physical theory, the subatomic particles have a limited number of essential properties, all of which are intrinsic, basic, and prima facie dispositional. The particles do not appear to have any *intrinsic and*

[11] Popper (1995: 14). It should be obvious to the reader that I am highly sympathetic to Popper's account of the metaphysics of probability. It, or something closely resembling it, is the most likely theory of the truthmakers for probability statements.

non-essential properties at all. Second, if a property of a complex object is derived from nothing but intrinsic properties of the object or of its parts, that property will itself be intrinsic. This is because derivation is an intrinsicality-preserving operation (9.1).

Ordinary language is replete with predicates that signify extrinsic powers. Take Boyle's example: the compass's capacity 'of constantly shewing the north and the south in all seas'. The description is of an extrinsic power of the needle, but the relevant properties of the needle, by virtue of which the description applies, are intrinsic to it. Given a reversal in the Earth's magnetic polarity, the needle would no longer show the north (at least not in the usual way). One might say that the needle would have then lost that very capacity that Boyle ascribes to it. But the needle's intrinsic disposition to react in a magnetic field (on which its capacity of 'shewing the north' depends) remains unchanged under any reversal of polarity. Or consider another familiar type of case, the power over a particular individual that we attribute to another (e.g. to Svengali over Trilby). Here too, Svengali's having that extrinsic power depends on other, intrinsic powers that he has. I propose a generalization of these cases. All dispositional *and extrinsic* predicates that apply to an object, do so by virtue of intrinsic powers borne by the object. All truths about the powers of objects have only intrinsic properties as truthmakers. I admit that what we ordinarily think and say often appears to contradict this. Boyle's example is fairly typical of the phenomenology of everyday dispositional thought and discourse. According to my hypothesis all genuine powers are intrinsic properties of their bearers. Then why is the attribution of extrinsic powers so common? What is it in ordinary linguistic practices that allows this? The answer is in two parts, as good forensic answers often are. First, *opportunity*. The general dispositional idiom (Quine) allows us to take any outcome (event) whatever and coin an expression that describes the disposition to bring about that outcome. However, the use of such expressions in true statements does not guarantee the existence of a corresponding power (Principle of Non-Proliferation). Second, *motive*. We select from among the indefinitely many possible dispositional predicate constructs some privileged ones. The basis of selection is pragmatic. There are certain outcomes that we single out as being of special practical or intellectual interest to us. In these cases it is often convenient, for any number of purposes, to construct dispositional expressions that ascribe to one object an

aptness to bring about these *interesting* outcomes. Shewing the north is the joint manifestation of a number of powers, some of which are intrinsic to the needle and some of which are not. Nevertheless a dispositional description like 'capacity of shewing the north' may be usefully ascribed to the needle if, for instance, we do not know what powers not borne by the needle need to be exercised for the compass to work. Or if the context allows the presence and cooperation of the other powers that are needed for the compass to work (e.g. the Earth's polarity in a particular magnetic epoch) to be taken for granted and so elided from the description of the capacity.

There seems to be an objection to INTRINSICALITY from what we ordinarily say. It is undoubtedly a fact that we can, and often do, describe objects as possessing all kinds of extrinsic powers. It is possible, however, to explain how we can truly predicate extrinsic dispositional predicates of objects *without* being committed to an ontology of extrinsic powers. I have roughly sketched such an explanation, which I take to be plausible enough to ward off this objection to the hypothesis that all genuine powers (on a sparse theory) are intrinsic properties of their bearers.

7

Objectivity

Physical powers as we normally think of them seem not to depend on how we describe, or cognize, or otherwise react to, natural objects and their properties. Both folk theory and sophisticated science appear to be committed to the view that these powers are objective characteristics of ordinary macroscopic objects. Scientific consensus on this point does not extend to the *dynamic* properties of subatomic fundamental particles (position, momentum, spin direction). According to some interpretations of quantum theory, there are no observation-independent determinate values of these physical magnitudes. On the other hand physics clearly allows that *non-dynamic* properties (rest mass, electroweak charge, spin number) are fully objective powers of the particles. Among philosophers, however, there are those who, still under the influence of Humean empiricism, continue to see the very concept of a power as anthropocentric. In view of this, one cannot get away with simply *asserting* the objectivity of (non-social) powers. The appeal to the intuitive obviousness of the mind-independence of such powers can come into its own only after we have critically deflected the argument of the anti-objectivists.

7.1 What is Objectivity?

At issue is the objectivity not just of powers but also of laws of nature and of the causal relation itself. All these involve, as an essential element, what Hume called *necessary connection*. Because of this, each of the three concepts will go the way of the other two: the objectivity of powers, and of laws, and of causality depends on the existence of wholly objective, *de re* necessary connections between distinct items.

Of the various senses of 'objective', we are interested in the one in which that word denotes mind-independence. Objectivity and its

complement, anthropocentricism, are used in this study as *ontological* characterizations. The existence of things anthropocentric allows one to infer the existence of human perception, thought, or action. Two sorts of anthropocentricity may be distinguished, depending on the nature of that inference. *Strong anthropocentricity*: *x* is strongly anthropocentric iff the existence of *x* entails the existence of people. Examples: marriage, the French language, exchange rates. *Weak anthropocentricity*: *x* is weakly anthropocentric iff the existence of *x* together with contingent, non-redundant, and true premisses entails the existence of people. Examples: watches, computers, etc.[1] To say of some object, property, or relation that it is objective is to say that its existence is independent of the existence of human perception, thought, or action. Something is objective if it is neither strongly nor weakly anthropocentric.

In this ontological sense of 'objective', there are no degrees of objectivity. Nor are there degrees of anthropocentricism. (The difference between strong and weak anthropocentricity is not a difference in degree but a modal difference.) The reason why there are no degrees of objectivity or anthropocentricity is that there are no degrees of existence. It follows that a de-objectifying theory of strong connections cannot be defended against the accusation that it is unacceptably anthropocentric, by arguing that its degree of anthropocentricism is small by some absolute or comparative standard.[2] Objectivity, like pregnancy, is all-or-nothing.

Dictionaries and landscapes are mind-dependent objects.[3] Purchasing power[4] is a mind-dependent property, as is a surname. The existence of Urdu speakers and the existence of bank accounts are mind-dependent facts. So there *are* paradigmatic mind-dependent objects, properties, relations, and facts (so-called 'institutional facts'). Rocks and lakes and electrons are mind-independent objects, spatial volume and unit electromagnetic charge are mind-independent

[1] If there is a positive non-zero probability that atoms can be arranged purely by natural forces so as to form a watch, then the inference (approximately Paley's) from 'This is a watch' to 'This is a human artefact' will require the addition of the premiss that this tiny probability is not realized in the actual world. Hence watches are only weakly anthropocentric.

[2] This defence is explicitly mounted by Menzies and Price (1993: 199); and also used, more circumspectly, by Lewis (1986*a*: 123).

[3] Martin (1993*a*: 509).

[4] Stevenson (1945: 45), where the example is credited to Max Black.

properties, and the existence of more than one galaxy is a mind-independent fact (*pace* Goodman). So there *are also* paradigmatic mind-independent objects, properties, relations, and facts (so-called 'natural facts'). On which side of this divide do powers (and causality and laws) belong? Answers to this question should respect the existence of both objective and anthropocentric facts. The reasons one might have for denying that certain facts are natural facts must not imply that there are no natural facts at all. And the reasons one might have for denying that certain facts are institutional facts must not imply that there are no institutional facts at all. Respect for the paradigms dictates that both our anthropocentricism and our objectivism must be selective, not global.

7.2 Anthropocentricism in the Analysis of Powers

7.2.1 *Hume's anti-objectivism*

Hume is the author of an influential criticism of the allied concepts of power, cause, and laws of nature.[5] His de-objectification of empirical strong connections has been widely accepted, and some philosophers even endorse the details of his argument.[6] This last fact is not so surprising, given that no one in the twentieth century has constructed an original argument for the anthropocentricity of powers.[7] Hume's own claims are, still today, at the core of the question of the objectivity of powers.

Our ideas of power and causation involve a concept of a (modally) *strong connection*.

> Shall we then rest contented with these two relations of contiguity and succession, as affording a compleat idea of causation? By no means. An object may be contiguous and prior to another, without being consider'd as its cause. There is a NECESSARY CONNEXION to be taken into consideration; and

[5] For typical examples of latter-day Humean anthropocentricism see Ayer (1980: 69); Braithwaite (1927: 467); Goodman (1995: 97); Mackie (1962: 73); Ramsey (1929: 158), and further references in Armstrong (1983).

[6] See e.g. Blackburn (1993).

[7] R. G. Collingwood's analysis of causation as manipulability by human agents implies the anthropocentricity of the causal relation but the analysis does not extend (and is not intended to extend) to powers and laws of nature.

that relation is of much greater importance, than any of the other two abovementioned. (T77)[8]

'A true cause as I understand', wrote Malebranche, 'is one such that the mind perceives a necessary connection between it and its effect.'[9] Hume agrees with this definition of causation in terms of necessary connection and he also agrees with the assessment that it is not satisfied by anything lacking the assistance of divine intervention. Hume does not really believe that anything at all satisfies the definition (Hume equals Malebranche minus God). Although his view of necessary connection is deflationary, Hume's exact conclusion is notoriously difficult to identify. At different places in his *corpus* one can find different, and inconsistent, formulations of what precisely is intended to follow from the arguments he adduces. It is possible to distinguish no fewer than three positions.

Sceptical noumenalism. Hume suggests in many places that *there are strong connections* but they are in principle *unknowable*. For example,

> I am, indeed, ready to allow, that there may be several qualities both in material and immaterial objects, with which we are utterly unacquainted; and if we please to call these power and efficiency, 'twill be of little consequence to the world. (T168)

And,

> In vain do you pretend to have learned the nature of bodies from your past experience. Their secret nature, and consequently all their effects and influence, may change, without any change in their sensible qualities. This happens sometimes, and with regard to some objects: Why may it not happen always, and with regard to all objects? (E38)

Similar implications are carried by passages at E25–6, E32–3, E72, and T93.

Anti-realism. In other places, Hume suggests a stronger conclusion, namely, that *we have no coherent concept of strong connections*: that when we use the language of powers, causes, efficacy, and so on, we do not know what we are talking about. Item:

> We never have any impression that contains any power or efficacy. We never therefore have any idea of power. (T161)

[8] Original capitals. In the remainder of 7.2, 'T#' refers to a page number in Hume (1739–40), and 'E#' refers to a page number in Hume (1748).

[9] Malebranche (1674–5: 450).

And,

> And as we can have no idea of any thing which never appeared to our outward sense or inward sentiment, the necessary conclusion *seems* to be that we have no idea of connexion or power at all, and that these words are absolutely without any meaning, when employed either in philosophical reasonings or common life. (E74)

Projectivism. Finally there is a third suggestion that is offered as a modification *cum* mitigation of anti-realism. Here Hume seems to be saying not so much that power language is meaningless, but rather that it is *systematically misleading*. The language of strong connections is misleading in so far as it purports to represent objects in the world as having certain intrinsic causal features *over and above* the regularity of their behaviour. However, our use of that language, according to Hume, is grounded in features of our own minds and not in anything that objectively belongs to things in the impersonal world. See:

> Upon the whole, necessity is something, that exists in the mind, not in objects; nor is it possible for us ever to form the most distant idea of it, consider'd as a quality in bodies. Either we have no idea of necessity, or necessity is nothing but that determination of the thought to pass from causes to effects and from effects to causes, according to their experience'd union. . . . The efficacy of or energy of causes is neither plac'd in the causes themselves, nor in the deity, nor in the concurrence of these two principles; but belongs entirely to the soul, which considers the union of two or more objects in all past instances. (T165–6)

And,

> Thus upon the whole we may infer, that . . . when we speak of a necessary connexion betwixt objects, and suppose, that this connection depends upon an efficacy or energy, with which any of these objects are endow'd; in all these expressions, *so apply'd*, we have really no distinct meaning, and make use only of common words, without any clear and determinate ideas. But as 'tis more probably, that these expressions do here lose their true meaning by being *wrong apply'd*, than that they never have any meaning . . . (T162)

In one of his moods Hume has it that powers are real but radically unknowable and hence unfunctional in our thought. Sometimes, when he is wearing a different hat, he seems to think that all our talk involving necessary connections as something over and above regularity of behaviour is just so much nonsense, fit to be committed to the

flames. And finally he also says things that suggest the following sort of view: our ordinary causal thinking refers to objects and properties in the external world, and this thinking does have truth-conditions. But the truth-conditions are satisfied by events in the psychological domain, not by events in the domain of purported reference. Causal thinking is a case of what, in psychoanalytic terminology, would be called 'displacement'. Which of these positions expresses Hume's true intentions? That question continues to be the subject of lively contemporary debate.[10] I am not interested in entering into the purely scholarly issues of that debate, but to address, as far as possible, the philosophical problems. For that purpose I formulate Hume's thesis thus:

(*S*) The concept of necessary connection cannot be applied.

This form of words is ambiguous enough to capture all three strands of Hume's thought, without preventing us from stating clearly, and examining, his unambiguous argument for *S*.

7.2.2 *Hume's argument against strong connections: Exposition*

The logical starting point of the argument to the conclusion *S* is Hume's division of 'all objects of human reason and enquiry' into Relations of Ideas and Matters of Fact. To each, a particular mode of knowledge is appropriate: propositions about relations of ideas are 'discoverable by the mere operation of thought, without dependence on what is anywhere existent in the universe'. Reasonings concerning matters of fact, on the other hand, do not have an a priori basis (E25 ff.). This division supplies Hume with his first premiss, and also governs the strategy of the argument: given this premiss, to prove that a concept cannot be applied it is sufficient to prove that it cannot be applied either on a priori grounds or on a posteriori grounds.

The second premiss is the well-known denial of the possibility of applying causal concepts on purely a priori grounds.

> I shall venture to affirm, as a general proposition, which admits of no exception, that the knowledge of this relation [of cause and effect] is not, in any instance, attained by reasonings *a priori* . . . (E27)

Again:

[10] See e.g. Strawson (1989) and Blackburn (1993).

[T]here are no objects, which by the mere survey, without consulting experience, we can determine to be the causes of any other; and no objects, which we can certainly determine in the same manner not to be causes. Any thing may produce anything. (T173)

What is it to gain knowledge of strong connections 'by reasonings a priori'? We can get a priori knowledge of the geometrical properties of spheres, for example, by inference from premisses that are available without the need to examine actual spheres in nature [cf. E25]. Similarly, to get a priori knowledge of the powers of an object we would need to be able to infer the existence of those powers from premisses that are available without prior observation of the behaviour of objects of that kind. We are never in a position to draw such inferences, Hume insists:

Adam, though his rational faculties be supposed, at the very first, entirely perfect, could not have inferred from the fluidity and transparency of water that it would suffocate him, or from the light and warmth of fire that it would consume him. No object ever discovers, by the qualities which appear to the senses, either the causes which produced it, or the effects which will arise from it; nor can our reason, unassisted by experience, ever draw any inference concerning real existence and matter of fact. (E27)

Of the various legs on which Hume's case against strong connections stands, this one is probably the sturdiest. No one has found convincing examples of propositions that are both significant items in the body of our causal beliefs and knowable a priori. Even idealists, like Ewing, who thought of causation as 'like entailment', admitted that the necessity of the causal link is not epistemically transparent.[11] And since the work of Kripke and Putnam reconciled non-idealists to the idea of a posteriori necessities, there are few philosophers, if any, who would deny Hume's entitlement to his second premiss.

The third premiss is the thought that there is not anything in our experience that entails the existence of powers. That something has a power can neither be directly (non-inferentially) perceived, nor validly inferred from anything directly perceived.

I say then, that, even after we have experience of the operations of cause and effect, our conclusions from that experience, are *not* founded on reasoning, or any process of the understanding. (E32)

[11] Ewing (1951: 164–5).

Hume had in mind what he called 'sensible qualities', bundles of which constitute the objects that, properly speaking, we experience. For example,

> Our sense informs us of the colour, weight, and consistency of bread; but neither sense nor reason can inform us of those qualities which fit it for nourishment and support of the human body. (E33)

And:

> In reality, there is no part of matter, that does ever, by its sensible qualities, discover any power or energy, or give us ground to imagine, that it could produce anything, or be followed by any other object, which we could denominate its effect. Solidity, extension, motion; these qualities are all complete in themselves, and never point to any other event which may result from them. (E63)

The sensible qualities are modality-neutral.[12] From their attribution to an object, nothing follows as to the unmanifested powers of that object. To deduce power statements from observation statements one would need additional premisses, but these are not available from observation alone. Consequently, we have no (purely) experiential grounds for asserting singular causal statements, or for ascribing powers to particulars on a single occasion. Even if the concept of power were applicable in a single case, it would not be *reapplicable* solely on the basis of what we observe. Suppose one says, 'An object having just the colour, weight, consistency, etc. of *this* object, has in the past nourished me, therefore *this* object can nourish me.' Hume replies: that an object similar in its sensible qualities to this one, has in the past been followed by a certain effect, does not entail that this object can produce an effect of that kind. Powers are (logically) capable of varying independently of sensible qualities. Therefore, similarity of sensible qualities does not justify the inference to similarity of non-sensible qualities like powers or causation or lawfulness of sequence (E35–9, T91). This Humean doctrine of the opaqueness of strong connections has sometimes been challenged, at least as it applies to the case of causation.[13] The issues around the perceptibility of powers and causation,

[12] A small qualification: all propositions, including observational ones, entail the possibility of their content.

[13] Ducasse (1924: 58–61); Harré and Madden (1975: 57–67); Armstrong (1978: 164–6); Fales (1990: 11 ff.).

no doubt, admit of a fuller examination. Here we provisionally adopt Hume's position.

We can now attempt a formulation of the whole argument:

(*A*)
(1) If the concept of power can be applied then either it can be applied a priori or it can be applied a posteriori.
(2) The concept of power cannot be applied a priori.
(3) There is nothing in our experience that entails that anything has any powers.

So,

(*S*) The concept of power cannot be applied.

The argument *A* is to be found developed in Hume's writings, save only for the formulation of the conclusion, *S*. *A* is an invalid argument, for while (2) is the negation of one of the disjuncts of the consequent of (1), (3) is not the negation of the other disjunct. But there exists a valid argument from a set of premisses including (1), (2), and (3), to *S*. It is an argument that one can attribute to Hume in good conscience. This argument includes, as additional premiss, what may be called the Thesis of Deductivism.[14] In its most general form the Thesis says that any judgement is rationally supported only by that which entails the truth of the judgement. Below we make use of a special case of this general thesis.

(*B*)
(1) If the concept of power can be applied then either it can be applied a priori or it can be applied a posteriori.
(2) The concept of power cannot be applied a priori.
(3) There is nothing in our experience that entails that anything has any powers.
(4) A concept can be applied a posteriori only if the experiential grounds for its application entail that the concept applies.
(5) The concept of power cannot be applied a posteriori [from 3 and 4].

So,

(*S*) The concept of power cannot be applied.

[14] Stove (1970).

The argument *B* cannot be found explicitly stated in Hume's works for he nowhere asserts the Thesis of Deductivism. The presumption is that he thought it so self-evident as to be not worth articulating. That presumption is generated mainly by two considerations. One, Hume could distinguish fallacious from valid reasoning and he intended to reason validly. Two, Hume's other celebrated deflationary conclusions (against induction, against practical reason, etc.) follow, not simply from the premisses asserted by him, but only from the conjunction of those premisses with the Thesis of Deductivism. Anyone who denies that Hume was a card-carrying deductivist will have to accept the premisses of *A* as the whole of what Hume had to offer in favour of *S*, and those premisses do not establish *S*. I cannot find any argument to *S* that is both valid and imputable to Hume, other than *B*. Either *A* is enthymematic and *B* is its full version, or Hume's argument against the reality of strong connections is not sound.

I have constructed a multiply ambiguous statement, *S*, to represent the various aspects of Hume's deflationary view of dispositional/causal/nomic necessity. Let us see how the argument *B* bears on the three strands of Hume's view that are encompassed by *S*.

Sceptical noumenalism. it is clear that the premisses of *B* (though not of *A*) entail that belief in the existence of strong connections has neither a priori nor a posteriori justification, and that, therefore, such belief cannot be reasonable. Strong connections may exist, but the argument purports to show that we have no reason whatever for believing in their existence.

Anti-realism. Hume has a sensationalist theory of concept formation, details of which are well known. It is that theory which, together with the premisses of *B*, leads to anti-realism about powers. Concepts are molecular or atomic, with the former depending on the latter. All atomic concepts replicate sense impressions. *Nihil in intellectu nisi prius in sensu* is applied by Hume even more rigorously than by medieval predecessors. The concept of dispositional necessity is not a molecular idea, so it must be a faint 'copy or representation' of some perception. But there is no perception of strong connections (premiss 3). So we do not have a coherent concept of strong connection, and when we use the language of powers, causes, and laws of nature, what we are saying is strictly meaningless. It should be noted *en passant* that Hume allows a sort of exception to the rule 'no impression = no idea', when he says that in some cases we can form a 'relative conception' (T68) of a thing

of which we have no impression. We can conceive a power, perhaps, but only as a *that-which*, a bearer of a relation, or of a role, or of a function. What we cannot in principle do is to become acquainted with any essential characteristics of powers. Necessarily, their nature is opaque to us. This concession raises important questions.

Projectivism. there are two distinct stages to the argument for projectivism. In the first, destructive stage, one establishes scepticism or anti-realism about strong connections. Hume thinks that the argument that I have represented as *B* does that. In the second stage one constructs an explanation of our incurable addiction to believing in the existence of the strong connections that underpin behavioural regularities in nature. Here Hume tells a psychological story about deep programming that compels humans (and other animals!) to think Causation when they are confronted with Regularity. This doctrine of Hume's has been criticized as involving circularity but I think the criticism can be resisted, along lines indicated by Russell.[15] What is important to note is the logical dependence of stage two of the argument for projectivism on the success of stage one. Projectivism is a purported answer to a question of the form 'Why is there widespread belief in the existence of *x* when there can be no grounds for reasonably believing in the existence of *x*?' Such a question cannot be raised about the belief in strong connections unless one first shows either that strong connections do not exist or, that if they exist they are in principle unknowable.

7.2.3 *Hume's argument against strong connections: Evaluation*

The weakness of the argument to *S* is that it requires the Thesis of Deductivism. As the Thesis is not asserted so it is not argued for, its truth is simply assumed by Hume. In this respect the Thesis differs from premisses (1), (2), and (3), which are supported by various considerations throughout the *Treatise* and the *Enquiry*.

What can be said in favour of Deductivism? The appeal to self-evidence cannot help the deductivist. For the appeal to self-evidence is a good-but-inconclusive argument, and the use of such arguments is inadmissible according to Deductivism. Deductivism cannot be supported by anything that does not entail it. Perhaps this explains why

[15] 'The connection of experienced past uniformity with expectation as to the future is just one of those uniformities of sequence which we have observed to be true hitherto' (Russell 1914: 220).

explicit arguments in favour of Deductivism cannot be found in the literature.[16] But this just means that Deductivism has been widely accepted in the past not because people were impressed by the reasons in its favour, but because they regarded it as too obvious to need explicit justification. It is not at all difficult to see some of the sources of the appeal of Deductivism. To name three—only valid inferences are *guaranteed* to be truth-preserving; only valid inferences are *guaranteed* to be certainty-preserving; and only (formally) valid inferences are sufficiently transparent for us to be able to *see* how and why they must preserve these values.[17]

The chief objection to Deductivism is that it is *excessively strong*. Its excess strength can be shown in two ways: by considering the kind of argument forms (logical schemata) which it rules out; and the kind of otherwise unobtainable conclusions that it licences.

As the first example of argument forms that are improper according to Deductivism, we can take Hume's own 'challenge argument'.

> 'tis impossible in any one instance to show the principle, in which the force or agency of a cause is placed. . . . If anyone think proper to refute this assertion, he need not put himself to the trouble of inventing any long reasonings; but may at once show us an instance of a cause, where we discover the power or operating principle. This defiance we are obliged frequently to make use of, as being almost the only means of proving a negative in philosophy. (T159)

By its form, the argument used by Hume has all the marks of a proper piece of reasoning. Surely the commonest and most generally satisfying method of substantiating an unrestricted negative existential generalization is to point out that falsifying instances have not been found despite the fact that we have looked for them. The defiance, then, is a prima facie acceptable, non-conclusive form of support for general negative conclusions, in, and out of, philosophy. However this manner of reasoning is disallowed by Deductivism.

We may also borrow a second example from the *Treatise* for use *ad hominem* against its author. In the case of the 'missing shade of blue' (T5–6), Hume admits that if the spectrum of all the colours except one (a particular shade of blue) were presented to someone who had never seen the missing shade, that person would be able to recognize the gap,

[16] Stove (1973: 79). [17] Miller (1949: 745–6).

and acquire a concept of the unseen shade *by inference*. Now Hume discusses this case as an exception to his general theory of the formation of empirical concepts. But the missing shade of blue also has implications for Hume's metalogic. In admitting the case as a possible one, Hume is of course endorsing a type of reasoning—interpolation—that is widely used by rational thinkers in many contexts. Too bad that interpolation, extrapolation, and all the other species of arguments from analogy are incurably invalid. A deductivist should have disallowed the case. Hume's actual reaction is a triumph of his good sense over his ideological commitments.

These two examples are representative of a very populous class of good-but-invalid arguments. Naturally, the examples do not *disprove* Deductivism. It is always open to a defender of the Thesis to maintain that either the invalid arguments are capable of being reconstructed as valid deductions, or they are, really, bad arguments, popular beliefs and practices notwithstanding. The examples do show, however, just how counter-intuitive the Thesis is. That counter-intuitiveness can be further confirmed by reflecting on the kind of conclusions which would hardly be provable without it, but which can be obtained with its aid. I select three examples from the many available. These arguments parallel, in structure and plausibility of the premisses, Hume's argument to the conclusion *S*.

(*C*)

(1_c) If the concept of an object that exists independently of us can be applied, then either it can be applied a priori or it can be applied a posteriori.

(2_c) The concept of an object that exists independently of us cannot be applied a priori.

(3_c) There is nothing in our experience that entails that anything is an object that exists independently of us.

So,

(S_c) The concept of an object that exists independently of us cannot be applied.

This argument is invalid; but a valid argument to the conclusion (S_c) is available, using premisses (1_c), (2_c), and (3_c), *plus* the Thesis of Deductivism. It would replicate argument *B*.

Next,

(*D*)

(1_d) If I can apply the concept of mind to another, then I can do so a priori or I can do so a posteriori.

(2_d) I cannot apply the concept of mind to another a priori.

(3_d) Nothing observable by me entails that there are other minds.

So,

(S_d) I cannot apply the concept of mind to another.

Finally,

(*E*)

(1_e) If the past is knowable then it is knowable a priori or it is knowable a posteriori.

(2_e) The past is not knowable a priori.

(3_e) Nothing in our observations entails the reality of the past.

So,

(S_e) The past is not knowable.

The examples show how scepticism about the external world, denial of other minds, the inaccessibility of the past, all become *provable* from a conjunction of fairly plausible premisses and the Thesis! Plenty of other examples will occur to the reader. The point for us is that the combination of empiricism and Deductivism is such an unrestrained generator of sceptical conclusions that it violates the principle of selective anthropocentricism. If Hume's argument (the only argument there is) against the objectivity of powers shows anything, it shows too much. By this argument there are no objective powers, causes, or laws. But then there are no objective properties, relations, or things. And if there are no objective things, properties, or relations then there are no natural facts. Empirico-deductivism is a bus that does not stop before reaching its destination in subjective idealism.

8

Do Powers Need Grounds?

8.1 The Thesis that Powers Need Grounds

We now turn to investigating the proposition that powers require to be grounded in other properties. The general concept of a ground for a power is that of some property that is, first, *conceptually* distinct from the power itself, and second, such that it confers the power on its bearer. The ground of a power is that property by virtue of which a thing has the power. The causal-conditional analyses mentioned in 4.2 (such as CCA and RCA) rely on this distinction. According to these analyses for something x to have a power to ϕ is to have some property B, such that if certain conditions are satisfied, the having of B causes x to ϕ. So to have a power to ϕ is to have two conceptually distinct properties: one is the role or function of causing ϕ-ing under certain conditions, and the other is the property that carries out or realizes that causal role. The latter is usually called 'the causal base'. B, the causal base, grounds x's power to ϕ just by being the realizer of the causal role of ϕ-ing under certain conditions.

What I call the thesis that powers need grounds (or, in this chapter, 'the Thesis') is the claim that *necessarily* all powers/dispositions have grounds. An alternative, restricted, version of the Thesis is briefly discussed in 8.5 below.

8.2 Motivations for the Thesis

8.2.1 *Weak motives*

The commonest solution to the puzzle of understanding INDEPENDENCE is to analyse powers via *conditionals* (4.2). When we are attributing a power to an object we are saying that the object has a property

whose nature is tied to certain behavioural manifestations, yet the object can possess the property even in the absence of the manifesting behaviour. What is the truthmaker for an attribution of an unexercised power? If one takes this question seriously at all (Ryle wouldn't), the metaphysically most conservative answer says that the occurrence of the manifestation event is determined by the ground of the disposition, conditional on the occurrence of the stimulus and perhaps other extrinsic conditions. Any conditional analysis that is more sophisticated than NCA (4.2.1) implies a distinction between the power and its ground (causal base). The reason why this is weak motivation for the Thesis is just that a conditional analysis of powers is unsound, as was argued at length in 4.2.

A second weak motivation for the Thesis comes from the idea of powers as potentialities or *unrealized possibilities*. In Chapter 5, we met the Humean version of this idea. An even older form of the same idea is Aristotelian. According to Aquinas, a change in an object is the bringing into existence of something that was only capable of existing, prior to the change. Actual existence and potential existence (the unrealized capacity for existence) exclude one another, so the unmanifesting power, on this reading, *is* just a 'potential existent' or as I have called it, an unrealized possibility.[1] If this were so, then perhaps it would be right to demand some kind of ontological grounding, in actual properties, for such a mere potentiality. But the thought that powers are not actual properties is a mistake (Chapter 5). I think that the confusion, at bottom, is between the power and its manifestation: the latter is an unrealized possibility (at times), the former is an actual property.

8.2.2 *Strong motives*

There exist much stronger reasons for adopting the Thesis than the alleged hypothetical or non-actual character of powers. The first of these concerns the explanatory value of powers. The powers of objects help to explain the regularities in the behaviour of the objects. The powers, in turn, are explained by their grounds, if they have any. Normally the properties that are the grounds of powers are fewer in number, more pervasive, and better integrated into natural science than the powers that they ground. This is what gives the grounding relation its explanatory strength. It is clear then that explanation of all sorts of

[1] Aquinas (*Summa Theologica*: 122).

regularities by nothing but ungrounded powers would be low-grade explanation at best, whereas explanation of a variety of regularities by a few ubiquitous but scientifically fundamental properties that ground a wide range of powers, would be far stronger. This provides motivation for at least *hoping* that all genuine powers have a base and so participate in the derivation of high-grade explanations of the regularities in nature.

The second strong intuition favouring the Thesis is that for many powers we are able to specify the conceptually distinct properties that constitute their ground, and we are able to give an acceptable account of the relation between the grounds and the manifestations. *Many* powers do have a known base. This is true particularly of the powers of complex objects, and arguably true of all the powers of complex objects. It is a perfectly rational impulse to want to extrapolate from this to the Thesis itself. The fact that so many powers do have bases is a datum for explanation even for those of us who reject the Thesis. Our theory must show why there are so many grounded powers alongside the relatively few ungrounded ones.

8.3 Prior, Pargetter, and Jackson's Argument for a Causal Base

Prior, Pargetter, and Jackson (1982) give an argument that is intended as a rigorous proof of the Thesis. As it is the only argument of this kind known to me I will examine it in some detail.

The argument starts from the following definitions:

> For each disposition we can specify a pair of antecedent circumstances and manifestation which together determine the disposition under discussion. In the case of fragility, the pair is (roughly) ⟨knocking, breaking⟩, in the case of water solubility the pair is ⟨putting in water, dissolving⟩ and so on for the other familiar cases. By 'a causal basis' we mean the property or property-complex of the object that, together with the first member of the pair—the antecedent circumstances—is the causally operative sufficient condition—for the manifestation in the case of 'surefire' dispositions, and in the case of probabilistic dispositions is causally sufficient for the relevant chance of the manifestation.[2]

[2] Prior, Pargetter, and Jackson (1982: 251).

The argument proceeds in two parts. First, for surefire dispositions, we are to suppose that the stimulus occurs in a possible world that is the closest to ours and therefore is deterministic and has the same laws as ours. Either the response occurs or it does not. If not, then the disposition is absent. If it occurs, then it 'follows from Determinism' that there is a causally sufficient antecedent condition operative that produced the response.[3] So the Thesis is established for deterministic dispositions and the threat of counter-examples confined to probabilistic dispositions. Prior, Pargetter, and Jackson consider a case as a putative counter-example: two rubber bands, *A* and *B*, are identical in all causally relevant respects but *A* always returns to its original shape when stretched, where *B* does not. This is alleged to refute the Thesis for probabilistic dispositions, in that we are supposedly obliged to assign different probabilities to *A*'s returning to its original shape the next time it is stretched and *B*'s returning to its original shape the next time it is stretched, despite the fact that *A* and *B* are causally indiscernible. Prior, Pargetter, and Jackson respond that the difference in probabilistic dispositions between *A* and *B* does not follow from the description of the case. If *A* and *B* are really causally identical then *A*'s past history is relevant to determining the probability of *B*'s future behaviour and *B*'s past history is relevant to determining the probability of *A*'s future behaviour. Therefore the probability to be assigned to *A* returning to its original shape the next time it is stretched should be the *same* as the probability to be assigned to *B* returning to its original shape the next time it is stretched. The case is not an effective counter-example to the Thesis. Dispositions must have causal bases.

This argument is open to several criticisms.

Prior, Pargetter, and Jackson assume at the outset the correctness of NCA as an account of what powers/dispositions are. As we have seen, NCA is refuted by Martin's finkish cases (4.2.1). Now David Lewis appears to believe that Martin's attempted refutation of the conditional analysis of dispositions can only be met by RCA, or some definition that, like RCA, makes use of the distinction between dispositions and their bases. If Lewis is right, then Prior, Pargetter, and Jackson's argument falls at the first hurdle. Since they are arguing *to the conclusion* that a causal base exists for every disposition, they cannot use *as a premiss* the very distinction between dispositions and their bases, on pain of obviously begging the question. So Lewis's response to the

[3] Prior, Pargetter, and Jackson (1982: 252).

finkish cases is not open to Prior, Pargetter, and Jackson. Their argument is *either* unsound—if they rely on NCA, *or* it is circular—if to improve on NCA they adopt RCA.

The causal base is 'the causally operative sufficient condition for the manifestation' (in the case of fully deterministic powers). This is a 'complete cause' concept, of the kind introduced by Mill, although Prior, Pargetter, and Jackson are not committed to Mill's own definition of a complete cause. The use of a complete cause concept runs into the two difficulties mentioned in 4.2: loss of intrinsicality and exclusion of masking.

Intrinsicality. Powers are intrinsic properties of their bearers. This is one of the prima facie basic features of powers that have to be saved by any analysis. The causally operative sufficient condition for almost any effect is complex because it includes everything that is both operative in producing the manifestation *and* a necessary part of a jointly sufficient condition. This ensemble of partial operative conditions will in almost all cases consist of a mixture of circumstances, including some that are intrinsic to the bearer of the disposition and some that are extrinsic to the bearer. Consequently if we equate the causal base of a power with the complete cause of its manifestation we will not be able to say that, necessarily, powers are intrinsic properties. The power becomes an extrinsic property of its bearer. This problem can be solved, in principle, by abandoning the complete cause notion in favour of a partial cause. One can just stipulate that the analysis of the causal base applies only to the intrinsic part of the complete cause. David Lewis does this in formulating his reformed conditional analysis (4.2.3). Lewis makes the causal base a '*x*-complete cause' of the response. By '*x*-complete cause' he means the complete cause stripped of all the elements that are extrinsic to the bearer of the power. Intrinsicality is regained. This move is *not* open to Prior, Pargetter, and Jackson. Suppose they adopted it and amended the definition of the causal base accordingly. Then the conclusion they are arguing for, that there must be a base for every disposition, would not be derivable. Let *e* be an event that manifests a disposition of the object *x*. The argument from '*e* occurs' and 'Determinism is true' to '*e* has a cause that is a causally operative sufficient condition' is admissible. But the argument from the same premiss set to '*e* has a cause that is the intrinsic-to-*x* part of a causally operative sufficient condition' is a *non sequitur*. The conclusion may well be true for most (or even all) dispositions, but it does not follow from the given premisses. Prior, Pargetter, and

Jackson face a dilemma. Either they use the complete cause concept and thereby lose intrinsicality, or they use a restricted cause concept and lose the demonstration of 'why a base is always necessary'.

Masking. One power, D_1, is said to mask another distinct power, D_2, if the manifestation of the former is inconsistent with the manifestation of the latter.[4] This creates a problem for a 'complete cause' definition of the base. Given that D_1 is a masker for D_2, a causally sufficient antecedent operative condition for the manifestation of D_2 must include the absence or quiescence of D_1. We are forced to say that nothing can have D_2 unless D_1 either does not exist or is inactive. So if we carefully package a fragile vase, thereby masking its fragility, we bring it about that it is no longer fragile, even though the packaging has not changed the intrinsic make-up of the vase. Prior, Pargetter, and Jackson's formulation leads to the implausible conclusion that in circumstances in which the manifestation of a given power is prevented (by other powers) that power itself cannot exist, as a matter of definition. The only (remote) possibility of a response to this objection, that I can see, is to embrace the seemingly absurd consequences of equating the base of powers with the complete cause of their manifestation. For example, one could say that a well-packaged vase is not fragile. A person who is asleep does not have the power of sight. This move runs counter to the grain of both *endoxa* and science. It is hard to see any reasonable motivation for it.

Now is perhaps the time to cash the promissory note issued at the end of Chapter 5. If one analyses the having of a power as the having of two properties (function and realizer of function), two questions arise. Which of these two properties is the power? And, which is the cause of the manifestation? Prior, Pargetter, and Jackson argue that it is the (second-order) function that is the power. (The argument is from multiple realizability.) If we say that both properties cause the manifestation, we have overdetermination of every event that manifests a power. It would seem that to avoid this undesirable commitment to overdetermination one has to make a choice between the two properties.[5] Prior, Pargetter, and Jackson opt for the base alone as the cause of

[4] Cf. Johnston (1997: 147).

[5] Lewis (1997: 152) suggests a way in which both the commitment to overdetermination and the choice can be avoided. This way involves 'appeal to some fancy and contentious metaphysics'. The details of the fancy metaphysics may be found in 'Events', in Lewis (1986*a*: 241–69).

the manifestation event. Now if the base alone is cause of the manifestation, and the power is identified with the causal function realized by that base, then the power does not cause the manifestation. That makes powers causally impotent. It is clear that *this* argument for the impotence of powers presupposes the distinction between a power and its base. If the distinction cannot be drawn for all powers, then the presupposition fails and the argument to impotence fails also.

8.4 The Missing Base

8.4.1 *The problem of the missing base*

If there are powers without properties that could be selected as their causal base, or ground, then the Thesis is in trouble. I think that this is in fact the case. There are dispositional properties that, for lack of any property to serve as their base, count as ungrounded.

The most striking fact about the powers that have grounds is that they are powers of complex objects. Traditionally, to find causal bases we look to the relations between the powers of a whole and the powers and other properties of its parts. The manifestation events of coarse macroscopic physical capacities of medium-sized objects can be explained in terms of the microstructural properties of the objects, and it has become commonplace to identify the causal bases of powers with microstructural properties. As has been frequently pointed out, if the microstructural properties are themselves dispositional, then this sort of analysis will not, by itself, achieve any ontological reduction of powers to non-powers.[6] Not that this sort of analysis is pointless. By reducing the large number of types of disposition to a few general and pervasive ones, the analysis achieves simplification and unification and so greatly increases the explanatory strength of theories. Scientific simplification does not make one's ontology more economical, it just concentrates the appearance of dispositionality without dispelling it.

The simplification of the variety of macroscopic powers to microstructural ones reaches its limit when the causal-conditional analysis is applied to the powers of the subatomic particles. At least some subatomic particles are simple. They have properties but not

[6] Martin (1994: 5); Broad (1925: 435–6); Goodman (1983: 45 n.).

parts. The strategy of selecting substructural properties as putative causal bases does not work here, nor are there any other, non-structural intrinsic properties of these particles that could be selected instead. We can provisionally conclude that a causal-conditional analysis that depends on the distinction between a dispositional property and its causal base is empirically inadequate. When the analysis is applied to the powers of macroscopic objects, one finds that the causal base consists of other, dispositional properties of their structures. When the analysis is applied to the powers of structureless entities, no causal bases can be found at all.

8.4.2 *Responses to the problem*

There are several lines of response to the charge of empirical inadequacy. One is to claim that the microstructural causal base of the fundamental powers exists but is unknown. A second is to claim that the causal base exists but is not microstructural. A third is to claim that the essential properties of the simplest physical objects are not powers and so do not need any base. I mention examples of each strategy.

A real but unknown causal base? There is no proof of the structurelessness of subatomic particles. It is an open question whether what we now take to be ultimately simple entities may not in the future reveal a deeper structure. The claimed structurelessness may only be epistemic, which would allow one to say that electrons have a substructure, although it is unknown *pro tem*. Even the possibility of 'structures all the way down' cannot be ruled out a priori. Properties that form the causal bases of the fundamental dispositions really exist, but our ability to describe them is limited by the progress that science makes in revealing the hidden deep structure of matter beyond the point reached today.

The appeal to future science gives the defence two resources. First, there is the possibility that future science will discover a set of sub-substructural non-dispositional properties that can serve as the regress-stopping causal bases for the dispositional properties of the subatomic particles. Alternatively, future science may, somehow, confirm the hypothesis of 'structures all the way down'. The world may be infinitely complex (or indefinitely complex), in which case there could be no arguments against the causal-conditional analysis from the existence of dispositions of simple objects.

Ultra-grounding. Rom Harré has suggested that physical dispositions

are 'finally to be grounded not in some ultimate level of micro-regress . . . but in the properties of the universe itself'.[7] As a model for this, we are referred to Ernst Mach's anti-absolutist analysis of matter in motion, which involves denying the intrinsicality of inertial mass, and explaining the resistance to acceleration and deceleration of a given body by the actual mutually induced accelerations of that body and every other body.[8] On this model, or on some elaboration of it, we are to think of the properties of the simple objects as grounded in global properties of the entire universe, in some sense of 'grounded'. This is how Harré proposes to reconcile the rule that powers must have a causal base, with the fact that microstructural causal bases are not available for the fundamental physical powers.

Disempowering the fundamental particles. Some philosophers have said that the intrinsic properties of the subatomic particles do not represent counter-examples to causal-conditional analyses. They should be regarded as *not being dispositions* at all. The properties in question do co-determine the behaviour of their bearers, but this determination nexus is not part of the essential nature of the property, as is the case with dispositions. If the behaviour-determining properties of the subatomic particles are not dispositions, then their lack of a causal base does not refute CCA or RCA.

8.4.3 *Evaluating the responses*

The Unknown Reduction Base. Ever since Rutherford had found 'bombardment' as a method of probing for subatomic structure, every significant increase in the level of projectile energy has led to discoveries of new, deeper levels of structure. But now there exists a strong body of evidence, from experiment and theory, to show that this history will not keep repeating itself.[9] Collisions have been produced in accelerators with energies over a hundred thousand times above the level at which new structures could have been expected to reveal themselves if history was going to repeat. Yet electrons and quarks continue to come out as point-like, structureless entities. Streams of photons directed at atoms cause behavioural changes that are only possible if the atoms have internal structure. In the case of quarks and electrons similar structure-revealing results could be expected if the particles were energized by several thousand million eV, at a rough guess, but when the

[7] Harré (1986: 295). [8] Mach (1960: 283–90).
[9] Kane (1995) surveys the evidence for structurelessness.

experiments are run electrons and quarks continue to behave like entities without inner structure. The most telling development that speaks in favour of the structurelessness of fundamental particles, in my opinion, is that the recently discovered monstrously massive top quark is also punctual.[10]

According to all indications, some subatomic particles are absolutely simple. But even if there were structures all the way down, that would only be enough to show that all powers may be grounded in further powers, but not that any are grounded in some 'categorical' properties of underlying deep structures.

Ultra-grounding. Mach and Hertz have produced dynamics for a Newtonian world in which the concept of force plays no essential part. Force is treated instrumentally: 'F' in the law $F = ma$ is simply *defined* as 'the product of the mass-value of a body into the acceleration induced in that body'.[11] There is thus no question of any property of a body being a disposition to feel and exert a force. Force, on this view, is not the right sort of thing to be the manifestation of any disposition.

Mach also wanted to get rid of inertial mass as an intrinsic property of physical particulars. He gave an account of the mass-ratio of bodies as the ratio of the accelerations mutually induced between them. The essential elements of this analysis are bodies, their spatial and temporal relations, and their induced accelerations. In Mach's system the existence of induced accelerations is a primitive empirical datum. This is how he puts it:

> *Experimental Proposition*. Bodies set opposite each other induce in each other, under certain circumstances to be specified by experimental physics, contrary *accelerations* in the direction of their line of junction. (The principle of inertia is included in this.)[12]

On this account of inertia, bodies must have the active power of inducing accelerations in other bodies, and the passive power of having accelerations induced in them. The Machian relativization of inertial mass, without reintroducing the already banished concept of force, nevertheless requires the attribution to individual bodies of the capacity to induce accelerations in each other. Here we have

[10] The mass of the top quark is 175 GeV, about the same as an atom of gold, as compared with the next most massive fundamental particle, the bottom quark at 4.5 GeV. Liss and Tipton (1997: 36–41).

[11] Mach (1960: 303–4). [12] Ibid. 303.

another illustration of the resilience of the intrinsic. Mach's treatment of inertia does not provide a model for the grounding of *all* fundamental dispositions.

Harré's own threadbare account of ultra-grounding points to the same conclusion.

> Ideally the dispositions which theoretical micro-regresses require physicists to ascribe to unobservable beings, like quarks and gluons, would be grounded, at least in principle, in observable properties of the universe. These properties would be occurrent rather than dispositional, embracing such matters as the quantity and distribution of energy fields.[13]

The in-principle-possibility of grounding the dispositions of subatomic entities in a set of properties of energy fields depends on the set including, in addition to quantity and spatio-temporal distribution, properties that constitute physical capacities for those fields. Harré is not proposing a fully developed theory of ultra-grounding but merely some pointers towards such a theory. He gives no reason for thinking that the theory can be completed by invoking only geometric or numerical or other non-dispositional field properties.

Disempowered particles. According to RCA the having of a disposition *D*, is, as a matter of analytic necessity, the having of a property distinct from *D* which realizes a certain functional role. The intrinsic properties of subatomic particles are prima facie counter-examples to RCA, because (1) they are powers, and (2) there is, for them, no distinct property capable of realizing the relevant functional role. A defence against this move is to deny (1).

Some people have said that the properties of the simple entities are law-governed but not dispositional. To motivate such a view one needs more than a purely negative description of the fundamental physical magnitudes. If we are to get away with saying that electromagnetic charge or gravitational charge are not powers, we have to give some positive account of their categorical nature. What could that be?

Physics tells us what is apt to be produced by the having of gravitational or of electromagnetic charge. It does not tell us anything else about these properties. In the Standard Model the fundamental physical magnitudes are represented as ones whose whole nature is exhausted by their dispositionality, that is, only their dispositionality enters into their definition. Properties of elementary particles are not

[13] Harré (1986: 296).

given to us in experience, they have no accessible qualitative aspect or feature. There's no 'impression corresponding to the idea' here. What these properties *are* is exhausted by what they have a *potential for doing* both when they are doing it and when they are not. There is thus a strong presumption in favour of saying that the properties of the subatomic particles are powers. The onus is on anyone who wants to overturn that presumption to give some positive characterization of the non-dispositional nature of the fundamental physical magnitudes, without ascribing to these properties features that physics does not ascribe to them.

In reply, it could be said on behalf of the causal conditional analysis of powers that the definitions in physics of the intrinsic properties of the fundamental particles are only nominal definitions and that dispositionality is only a part of the nominal essence of the properties of the fundamental particles. These properties do not have a real essence sufficiently rich to individuate them. There are only numerical differences among the monadic properties that determine, via the relevant laws, the behaviour of the simple particles. It is *not* that such properties have a noumenal character, or that they are 'a something I know not what' (Locke). Speaking literally the properties just *have* no character or nature whatever.

To fully appreciate what is wrong with this response one should note that causal conditional analyses (like CCA and RCA) are typically advanced on behalf of some reductionist thesis about dispositions. There is only a loose connection between metaphysics that is reductionist about dispositional properties and causal–conditional definitions of dispositions. Definitions like RCA are neither necessary nor sufficient for the ontological reduction of powers to properties that are not powers. They are not necessary because the ontological reduction of dispositions does not require the translation of sentences containing dispositional expressions into sentences lacking such expressions. They are not sufficient because causal–conditional definitions do not identify any reduction base. RCA is not reductionist per se, since it does not rule out the possibility that, for every disposition to which it applies, the causal base itself should be a disposition. To achieve the reduction of powers two further, empirical, conditions have to be fulfilled. First, the properties *to* which one wants to reduce powers, the reduction base, must exist. Second, the reduction base must include

some properties that are not powers, and that ultimately act as the grounding of all powers.

Bare tropes or completely featureless universals are inherently implausible. Moreover reliance on them threatens the reductionist enterprise with incoherence. For purposes of functionalist reductionism not only must each power have a causal base but the causal bases must include ones that are themselves not powers. Therefore, at the ultimate stage of a regressive microreduction, one has to say that nomological properties of the simple particles, such as electric charge and colour charge, are first-order monadic categorical properties. Only then is the regress stopped. But on the present proposal, electric charge and colour charge cannot be either first-order, monadic, or categorical since supposedly they are totally featureless and differ from other properties of simples only numerically. The problem is that the reductionist, on the one hand, must attribute a monadic and categorical and first-order nature to the properties the having of which governs the behaviour of the basic particles and, on the other hand, must deny that they have any nature at all.

8.5 What if There Are Ungrounded Powers?

The argument so far points to the unacceptability of the claim that as a matter of analytic necessity powers have bases in conceptually distinct properties. First, I believe that the only, or at any rate leading, rigorous argument for the Thesis of Groundedness is unsound (8.3). Second, our best credentialled sources of empirical knowledge suggest, to a very high degree of probability, that there are no properties that could serve as putative bases for the powers of the fundamental constituents of the physical world (8.4). What are we philosophers going to cook if the world is so unkind as not to contain all the ingredients that our recipes call for? Below, I look at three types of reaction to this quandary.

8.5.1 *The double standard*

The difficulties for the Thesis may tempt some to turn anti-realist about dispositions without a causal base. One defender of the functionalist analysis had this to say:

Something has a disposition if and only if it has a property which occupies a certain causal role. Some things may behave in a certain way but have nothing which occupies the causal role of causing such behaviour. In such a case we should say that the behaviour of this thing was instantiating a law of nature, that is, its behaviour is just a brute fact for which no further explanation can be given.[14]

This introduces a double standard. On the one hand we have macrodispositions, which are perfectly real functional properties realized by other perfectly real first-order properties. The behaviour of the bearers of these dispositions is lawfully regular precisely because it is the manifestation of the dispositions. Here we have a realist ontology of macroscopic physical objects and of their essential powers. On the other hand, when it comes to what are seemingly dispositional properties of subatomic particles, we are to say that the behaviour of the particles is not a manifestation of their powers but a brute fact. The laws describing such behaviour do not have properties of the particles as their truthmakers, the laws are just descriptions of an otherwise inexplicable regularity. If, as physics tells us, the essential properties of subatomic particles are all dispositional, then such instrumentalism about the properties will carry over into anti-realism about the particles themselves. We are landed with a picture of a curiously divided Nature. The objects and properties of the macroscopic part of the physical world are to be taken realistically, but the properties and hence also the objects of the microscopic part are not to be taken realistically.[15]

Is the ontological double standard compatible with what our current best science tells us about the basic nature of the material world? A long tradition in physics, stretching from Leukippos to Einstein, has familiarized us with a *compositional* picture of the universe. By this I mean that physics is based on the conjunction of two broad framework principles, the first of which I call Object Atomism, and the other Attribute Atomism. According to Object Atomism, complex physical systems are made up of simpler systems and these in turn of still simpler systems. Ultimately *every* enduring material entity is composed of fundamental point-particles (leptons and quarks) that are themselves absolutely simple. According to Attribute Atomism, the physical mag-

[14] Mumford (1995: 58). Mumford (1998: 168) retracts this position.

[15] Dummett (1993) also supports, cautiously and with qualifications, a double standard in physics. He arrives at his position by a different route from those who set out from the problem of the missing causal base for powers.

nitudes that characterize complex systems are factorizable into the magnitudes of the component systems. The properties of complex systems are derivative properties in the sense of 1.4.1. What follows for the double standard if we suppose that both Object Atomism and Attribute Atomism are true? If one is going to be instrumentalist about some or all of the essential properties of the fundamental particles, then one has to be anti-realist about the particles themselves. If there is no electric charge (but only 'electric behaviour'), then there is no electron. Anti-realism about the particles and the compositional model jointly imply the incoherent view that complex physical systems are composed of non-existent parts, and that the physical properties of these systems ontologically depend on properties that themselves do not exist. Therefore, we should tollens this ponens. If current best science really dictates the compositional view of the physical world, then one is only left a choice between, on the one hand, anti-realism about the essential properties of subatomic entities and consequently about the entities themselves, leading to a comprehensive denial of any physical reality; or, on the other hand, a realist acceptance of both simple and complex physical entities and their properties. The former course is explicitly taken by candid idealists like John Foster, and the latter is the normal position of scientific realism. The double standard is ruled out.

It has been argued, quite plausibly, that quantum theory undermines the version of the compositional model that I have sketched, by showing that Attribute Atomism is not unrestrictedly applicable.[16] Some metaphysicians take Bell's Theorem to show that there are complex (correlated) quantum systems whose dynamic states (position, momentum, spin direction) are not factorizable. Such states of a correlated system are emergent relative to the states of the system's components. Skipping the technical details of the argument, what is salient for us is, first, that non-dynamic properties (electroweak charge, colour charge, rest-mass) retain their status as derivative properties irrespective of how Bell's results are interpreted, and, second, that there is no compelling argument from quantum theory for modifying Object Atomism. At most one needs to give up the unrestricted version of Attribute Atomism and replace it with some restricted version. It is difficult to estimate the full extent of the revisions this would force on a

[16] Howard (1989); Teller (1989); Redhead (1995: ch. 3).

metaphysical theory based on compositional physics. But it is not too difficult to see that an appeal to Bell's Theorem will not rescue the double standard. For quantum theory still assigns to the particles essential, non-dynamic, intrinsic, dispositional properties, and that is all that my argument against the double standard requires. If one's theory leads one to be anti-realist about the ungrounded dispositions of the subatomic particles then one had better be anti-realist about the particles themselves, and that in turn commits one to a comprehensive anti-realism about the physical world. The only prima facie coherent alternatives are realism about the essential dispositions of fundamental particles and fields, or idealism. The double standard looks no less incoherent *post bellum* than it looked in the context of straightforward special relativity physics uncluttered by quantum complications.

8.5.2 *Truncating functionalism?*

Some powers are grounded and some are not. This may suggest the strategy of restricting the functionalist analysis to the grounded powers. Such a move may be supported by the reflection that *most* powers at any rate have bases. Corollary: ungrounded powers are 'atypical', 'special', and 'strange'.[17] The result of this strategic shortening of the front is a truncated version of functionalism that applies to (the many) powers with bases leaving out (the few) ungrounded powers.

Is truncating an ad hoc manoeuvre designed to save the analysis from refutation by counter-examples? It is not and it is. I believe that one can find a *principled* way of dividing the powers into those that happen to have bases and those that happen not to have bases. The former are powers of complex objects, the latter powers of simples. This division gives us a non-ad hoc way of distinguishing grounded from ungrounded powers, provided we already know what lies in the extension of 'power'. But there is another, more profound, sense in which truncating fails to satisfy the requirements of a theory of powers. Such a theory must have sufficient unity (integration) to enable us to see what makes any property a power, if it is one. What is *dispositional* about both properties that satisfy functional analyses, and (some) that do not? The question is fair. Truncating, it seems, splits the theory of dispositions in such a way that an answer can no longer be found. (My

[17] For these characterizations of ungrounded dispositions, see Mumford (1998: 144, 148 n., 168).

favoured answer is that it is the conjunction of directedness and independence that makes *any* property identifiable as a power.)

When we consider that the ungrounded powers are the essential intrinsic properties of fundamental particles, they turn out to be ubiquitous and important. All derivative powers ultimately derive from ungrounded powers. This throws a different light on the statistical bad-mouthing of ungrounded dispositions encountered two paragraphs back. There we saw how it is possible to insinuate, on behalf of truncating, that little of significance is left out by a definition that excludes the ungrounded powers. This may be correct if we consider only the quantity of types of powers. It is wrong, however, if we take into account the role the ungrounded powers play in the constitution of any world at which Attribute Atomism is approximately true.

8.5.3 *Acceptance*

Another response to the shortage of causal bases is to allow ungrounded powers full ontological status on par with all of the paradigms of respectable existents. However the acceptance of ungrounded powers is not a small matter. Ungrounded powers bring with them a host of new problems, including some *very* difficult ones. There is much work to be done.

First, our theory will need to provide a *generic* means of identifying powers as such. Further, we will have to explain the difference between grounded and ungrounded powers. The attempt will be made in Chapter 9.

Second, we have to give up *any* analysis of powers in terms of bridging relations, since these relations are meant to hold between the base of the power and its manifestation. That includes giving up any *causal* analysis of powers. We have been unable to find any clear answer to the deviant process objection to causal analyses of dispositions, so abandoning such analyses at least rids us of that problem. It is perfectly obvious that powers and causation are very closely, very intimately related to one another. If we are not going to analyse powers in terms of causation, we should try to analyse causation in terms of powers, so as to do justice to the intuitive proximity of these concepts. This project is one subject of Chapter 12.

Third, we identified two strong motives for accepting the Thesis of Groundedness (8.2.2). One was the explanatory weakness of nothing but ungrounded dispositions. The other was the existence of very

many grounded powers, pointing via normal inductive principles to the hypothesis that all powers have bases. Rejecting the Thesis creates an onus of giving a non-deflationary explanation of these motives for groundedness, and of showing how a theory that accepts ungrounded powers can still accommodate everything that is rational in the two motives. Something will be said on this in 9.1.2 and in 11.2.

Fourth, but not least, there are classic objections to ungrounded powers that seem at face value to be very strong. An exposition and attempt at evaluation is contained in Chapter 11.

9

The Ontology of Powers

9.1 Derivative Powers and Basic Powers

Some objects are complex, that is, they have simpler parts (constituents). The constituents in turn may have still simpler constituents, etc. Some properties are such that the having of them by an object, *a*, depends either on some other intrinsic properties of *a*, or on some intrinsic properties of *a*'s parts. I dub these properties '*derivative* properties'. The properties that are not derivative I call '*basic* properties'. We can also distinguish, among the properties of a complex object, those that are also properties of its constituents ('*homogeneous* properties'), from those that are not properties of the constituents but only of the complex object as a whole ('*collective* properties').

The properties of a simple object, if they are derivative, can only be derived laterally, from other properties of the object. The derivation base in these cases contains the basic (and essential) properties of the simple object. Take, for example, an object's membership of a determinate natural kind. Being an electron is derivative from such other properties as having unit electric charge, having spin $^1/_2$, etc.

The collective properties of a complex object can be either derivative or basic. The latter are the so-called emergent properties; I am not committed either to claiming or to denying that there are any. Derivative collective properties of a complex object derive ultimately from properties of the simple constituents of the object. This last relation is of particular interest to us.

9.1.1 *What is derivation?*

Earlier we defined derivation in terms of (ontological) dependence (1.4.1). Dependence itself is a relation that is similar to strict necessity in modal strength but differs from necessity in being less topic-neutral. Dependence is a strictly necessary relation that is ontologically

grounded in the nature of the relata. What sort of necessary connection is this, in those cases where a power property is derived from other powers?

We can start from a suggestion by Broad:

> A collective disposition is reducible if the presence of this property in a compound substance is logically entailed by the dispositions which its constituents manifest in other circumstances and the special relations in which they stand to each other in this substance.[1]

This statement is open to marginal improvement. First, the use of 'reducible'. Whether derivation is the same as reduction depends on what one means by 'reduction'. In 9.2.1, below, I argue that in the most important sense in which we can talk of reduction, derivation is not reduction. At any rate it is best not to identify *by definition* derivation and reduction. Second, Broad imposes the requirement that the powers in the derivation-base should have manifestations in other circumstances. This requirement is unjustified because the derivation requires only the presence of the powers of the constituents plus their relations, whether or not these powers are manifested elsewhere. The requirement for 'other manifestations' may be epistemically necessary but it is not logically or ontologically necessary. Making these amendments we get the following:

> A power is derivative if the presence of this power in the object depends on the powers that its constituents have and the special relations in which the constituents stand to each other.

The special relations are ones that determine, in each particular case, the result of the joint exercise of several powers of the constituent parts. They are not abstract or formal relations, but real physical relations that typically involve the transfer of energy (or some other conserved quantity) between interacting parts of a system. The usual examples that crop up in philosophy concern such mechanical properties of material objects (stuff) as malleability, ductility, elasticity, solubility, and so on. These derivative powers depend on intermolecular or intramolecular bonding, or on crystalline solidity, or on similar microstructural relations. For other, non-mechanical types of derivative powers, for example heat and electrical conductivity, other interactions among constituent systems will count as dependence-

[1] Broad (1933: i. 268, original italics).

sustaining 'special relations'. To generalize from these cases we could say this: *a*'s power to ϕ is derivative if the (actual or possible) joint exercise of several powers of some of *a*'s parts, when these parts stand in special relations, manifests ϕ-ing. The intentional object of *a*'s derivative collective power is the same as the intentional object of the jointly exercised powers of the parts of *a* that stand in the relevant special relations. Since the identity of a power is determined by what it is a power for (its directedness), powers that have exactly the same intentional object are identical. Derivation is, as Broad pointed out, a way of limiting the powers that have to be postulated as independently existing to a few pervasive and general types. This result fits the selective realism about power tropes that was recommended in 1.3.2.

'Derivation must come to an end'—this is true epistemically but is not a metaphysical truth; that is, it is not something provable by a priori argument. The regress of derivations need not come to an end in a Bradley world (1.3.1) if there are, in that world, objects that have uncountably many intrinsic properties available for derivation. There seems to be no apodictic argument to the conclusion that objects with uncountably many intrinsic powers must have basic powers. However, I believe that, as a matter of fact, derivation of the powers of actual physical items does come to an end (8.4.3).

Could powers ontologically depend on non-powers?[2] In 4.2 and elsewhere,[3] I have been critical of analyses that purport to provide general formulae for translating sentences containing dispositional expressions into sentences that neither contain dispositional expressions, nor implicitly rely for their intelligibility on our understanding of such expressions. However, I do not think that those criticisms are decisive. If ontological reduction does not require translatability, then the rejection of causal conditional analyses of powers leaves the question at the head of this paragraph unsettled. Setting aside questions of translatability, the main reason for thinking that actual powers do not depend on non-powers is that for powers to be so dependent there would have to be, for every power, some property on which it depends. The world however is such that the collective powers of complex objects are derivative from (depend on) the powers of their microconstituents and not on non-powers. When it comes to the basic powers of the

[2] This dependence could not be called 'derivation', since derivation is defined as a disposition-to-disposition relation, but it would be a close relative of derivation.

[3] Molnar (1999).

fundamental constituents of the physical world one cannot find any properties at all that could form a derivation base (8.4–8.5). These latter powers are not derivative, not only relative to this or that putative derivation base, but absolutely. They are ultimate powers (1.4.1).

9.1.2 *Consequences of derivation*

Simplification. The derivation of a collective disposition of an object (such as its solubility, for example) from the properties and relations of its microconstituents may be called 'reduction' in one, particularly weak, sense of the word (Broad's usage, I believe). What this weak reduction does is to minimize the basic independently existing dispositional properties. What it does *not* do is increase ontological economy. Reduction in a robust sense would shrink our ontological liabilities, but this requires that the derived properties and the properties in the derivation base should belong to different categories. Only if derivation is cross-categorial can we get ontological savings. Compare the analogous point about the functionalist analysis of powers, made in 8.4.1. Functionalist analyses are not reductionist per se since they do not exclude the systematic possibility that the causal base of any disposition is another, conceptually distinct disposition. For reduction you need functionalism plus a categorical reduction base. Henceforth I'll call the derivation of some powers from a derivation base containing other powers 'simplification', reserving the expression 'reduction' for those cases where an entire category of properties (e.g. powers, values, etc.) is shown to be identical with items in the reduction base that belong to other, different categories.

Explanatory strength. Powers are among the explainers of the behaviour of objects. The strength of explanations by reference to collective powers *before* these powers of the complex object are shown to be identical with some powers of the parts (when the parts stand in special relations) is less than their strength *after* the collective powers are shown to be derivable. Simplification typically enhances the strength of explanations of behaviour by reference to powers. It does this because when we derive collective powers from the more basic powers of the parts, we are thereby explaining the derived powers themselves. Explanation of behaviour by explained powers is better because it brings the explanandum under the cover of more fundamental regularities of nature, ones that connect the explanandum with the few ultimate powers in nature. Explanation by explained powers achieves

more of explanatory integration than does explanation by unexplained powers. So, although simplification is not a means of ontologically economizing, it has considerable epistemological significance.

Complexity. Earlier I have argued (1.4.3) that there are neither conjunctive properties, nor structural properties, if by 'structural property' we mean a property that has properties *as parts*. But there are complexities in the interrelations among the different properties of the one bearer. Are derivation relations sufficient to capture these complexities? I believe so. For instance, various dispositional properties of water, including the property *being water*, are derivable from the powers of hydrogen and oxygen atoms when these stand in the relation of forming the H_2O molecule. There is nothing else to the idea of structural properties, except this derivability of a collective property of a complex substance from properties of its constituent parts. Because we take each power involved in the derivation base for collective powers of water to be a non-repeatable particular, we are spared the problems that these collective properties create for realists about universals.[4] Another advantage of not admitting conjunctive or structural properties is that we thereby restrict mereological complexity to the familiar, well-understood domain of objects, where talk of wholes and parts is more or less unproblematic. Derivation is the rational core of the false idea that there are structural powers.

Grounding. The ground of a power, *P*, is the set of properties (all of which are conceptually distinct from *P*) by virtue of which a thing has *P*. The Thesis of Groundedness is the claim that necessarily all powers have grounds. I have argued (Chapter 8) that this claim is falsified by the basic powers of the fundamental subatomic particles that appear to be ungrounded or pure dispositions. It is obvious, however, that the Thesis of Groundedness has many positive instances. Even if not all powers have grounds, there are many powers that do. Perhaps *all* the collective powers of complex objects are grounded in properties of the parts. Or, if that conjecture is too bold, maybe all the collective properties of complex non-living objects are grounded. The Thesis is at any rate highly confirmable, and this high confirmability gives it much of its theoretical interest as well as lending it the plausibility it has. According to my proposal the grounding of powers in other properties

[4] The main problem is: how can the *one* universal be *multiply* present in a complex property (e.g. how can the one universal—Hydrogen—be present twice in the property *being a water molecule*)? The details of the problem are given in Lewis (1986*b*).

is explained by derivability. The power *P* is grounded in the set of properties *Q* iff *P* is derivable from *Q*. Derivation is the rational core of the false idea that all powers need grounds.

Intrinsicality. Derivation is intrinsicality preserving, a fact that hardly calls for elaboration. An intrinsic property of an object, *a*, cannot ontologically depend on an extrinsic property borne either by *a* or by a part of *a*. This is simply a consequence of the definitions of 'intrinsic' and 'ontological dependence', that we have had reason to accept.

9.2 Theories of the Ontology of Powers—a Taxonomy and an Interim Evaluation

Philosophers who are ontologically serious about properties as such are by no means agreed among themselves on the status of powers. Instead of consensus we get a broad spectrum of views ranging from full acceptance of dispositions as an irreducible subcategory within the category of properties, to reductionist and other deflationist approaches. We have now conducted a considerable portion of our inquiry. By way of taking stock, I am going to offer a taxonomy of the various positions taken by thinkers of a realist bent on the ontology of properties, and say something about two, related positions that I have not discussed so far. As the distinction between universals and tropes is not relevant here, I shall ignore it for the rest of 9.2, and use the expression 'property realist' to refer to all those who believe that properties exist, whatever non-nominalist theory of properties they embrace.

The basic division within the ranks of property realists is between *dualists* and *monists*. Dualists hold that there are irreducible and ineliminable differences between dispositionality and non-dispositionality as applied to properties, and that instances of both kinds exist. Within dualism there is a further division between those on the one hand who think that it is entire properties, properties as such, that are either powers or non-powers, and, on the other, those who think that it is something about properties, their sides or facets for example, that is either dispositional or non-dispositional. Monists are committed to holding that all properties are strictly of the same kind, either powers, or non-powers, or some third, neutral kind. Figure 5 crudely illustrates these divisions.

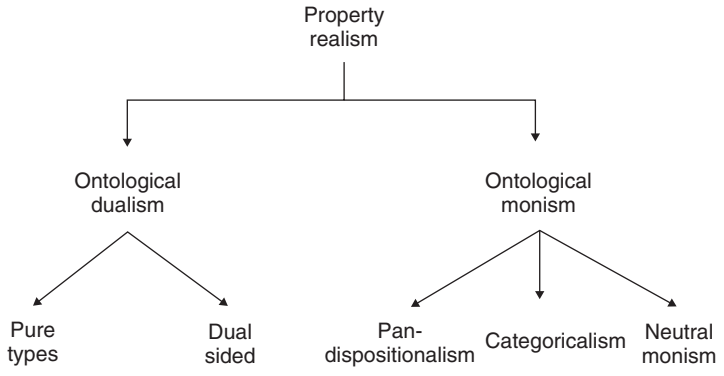

FIG. 5

9.2.1 *Dualism of pure types*

This is a standard view among philosophers that accords with a number of our common-sense intuitions. To a first approximation, its claims are these. (a) It is properties in their entirety that are either powers or non-powers. 'Is dispositional' is a whole property predicate, and so is 'is not dispositional'. (b) Being a power is part of the nature (essence) of a property, as is being a non-power. In the case of powers, their directedness constitutes their identity. Dispositional directedness determines which property a power is. (c) 'Power' and 'non-power' are correlative expressions. A non-power is *by definition* a property that is not a power. (d) The division of all properties into powers and non-powers is not only exclusive but also exhaustive. Every property (intrinsic or extrinsic) is either wholly a power or wholly a non-power. (e) There exist both powers and non-powers.

9.2.2 *Dual-sided theory*

This is a view that may not be held by anyone. It was at one stage espoused by C. B. Martin, but he has since abandoned it.[5] The salient point here is the denial of point (a) in the paragraph above. According to Martin's old view, all properties have something *about them* that is irreducibly and ineliminably dispositional, and something (else) *about them* that is irreducibly and ineliminably non-dispositional or 'qualitative' in Martin's preferred terminology. What is this 'something about' a property? One description by Martin of properties was that

[5] There are brief statements in Martin (1993*a*: 15; 1993*b*: 46–7; 1993*c*: 46).

they are 'Janus-like' in facing both ways. Another expression he used of properties was 'two-sided'. It is metaphysically incorrect to describe entire properties as powers or as qualities—'is dispositional' and 'is qualitative' are *not* whole property predicates. A power is only a face/facet/side of a property that also has a qualitative face/facet/side. The division into the dispositional and the qualitative should be thought of as classifying two sides of properties. Every property, intrinsic or extrinsic, has both. The two sides are neither reducible, either one to the other or to something else, nor eliminable. Nor are they capable of existing independently of the properties that they are sides of. (It makes one wonder why the sides are said to be *two*, not one.)

Dual-sided theory has a number of positive features. First, it satisfies the demand that when we truly predicate something intrinsic of the object there should exist an ontological ground, that is, something in the object, that makes the predication true. The truthmaker here is a side of some property or properties of the object. Ontological seriousness about sides is a positive feature of the theory. Second, dual-sided theory makes the truthmaker for attribution of powers an objective characteristic of the world, something that exists independently of being perceived, thought about, or acted on, by humans. Third, the theory guarantees that any object that has a power also has something non-dispositional/qualitative about it. For many of us that also counts as a plus.

A prima facie problem for the dual-sided theory concerns the account to be given of the relation between the two sides.[6] Is that relation contingent or necessary? If the former, then the possibility of the existence of pure dispositions, without a qualitative side, is no longer ruled out. The possibility of pure qualities, without a dispositional side, also comes into play. The generality of one's ontological theory is compromised in a way that seems ad hoc. If the relation is necessary, then it follows that the qualitative side necessitates the dispositional side and the latter necessitates the manifestation. Why not just say that the qualitative side itself necessitates the manifestation? That would make *it* dispositional of course. The power side has become redundant. This line of criticism looks very damaging, but I think that there may be a way of meeting it, at least partially. Note that almost all the fundamental physical properties are determinable. This suggests

[6] Armstrong (1997: 84) also probes this sensitive area of the theory.

the following hypothesis: the relation between the two sides of a property is necessary at the determinable level and contingent on the determinate level. This move may enable one to avoid both horns of the dilemma. But it requires that we admit to the ontology both fully determinate properties *and* determinable properties (a cheap way of doing this was suggested in 1.4.2).

The main difficulty facing the view that properties are two-sided is similar to the difficulty for reductionism highlighted by the 'missing base' objection (8.4). What and where are these qualitative sides of the essential properties of fundamental subatomic particles (or field-densities)? They are not intended by Martin to form a reduction base since he holds that the dispositional side is not reducible to the qualitative one. Nevertheless they have to exist, they have to be part of the basic ontological inventory of the world. Martin suggests the properties *shape* and *size* as exemplifying both sides. It is not hard to see what is meant: on the one hand, shape and size essentially condition *how* their bearer interacts by contact with other objects. That is the dispositional side. On the other hand, 'size and shape are the extentional limits' of their bearer, they determine its precise whereabouts. That is the qualitative aspect. Martin makes the suggestion, familiar since Descartes, that everything physical has size and shape right down to the 'ultimate constituents (whether particles, aspects of fields, or super-strings)'.[7] Democritus' atoms definitely had both size and shape. But to the best of our knowledge the fundamental constituents of our world are not Democritean atoms. They are point-like, unextended, particles (field-densities) that occupy space just by being located at spatial points.

It is important to distinguish the types of cases in which unextendedness is an idealization in physical theory, from the types of cases in which it has to be understood realistically. Galileo's law of free fall is written for bodies falling *in vacuo*. The law of the lever is written for perfectly rigid and homogeneous rods. The world contains few complete vacuums, and no perfectly rigid bodies at all. These laws, as they stand, do not deliver good predictions about the behaviour of real objects. For that purpose we need additional hypotheses that restore what was omitted in the idealization process, viz. the friction generated in the media in which bodies fall, and the elasticity measures on the actual material from which the bars of the lever are made. Idealiza-

[7] Martin (1997: 222–3).

tion is essentially oversimplification, done for the sake of being able to write the law in its most general and most transparent form. Empirical application of the law requires that we reverse, locally, and for purposes in hand, the oversimplification built into the general formula.[8] By contrast, leptons and quarks have no size, in one sense, although they do in another.

> Quarks and gluons (and electrons and photons) do not have any size or structure as far as we know today; experiments have demonstrated that quarks and leptons are at least 1000 times smaller than protons.[9]

This sentence nicely illustrates the ambiguity. Quarks and leptons do not have size = volume, but their size = mass makes them much smaller than protons. When Martin ascribes 'shape and size' to the particles, I think he is saying that they have volume. But the particles' having volume is inconsistent with their being simple (partless). The way in which we have to treat the fundamental particles as lacking volume is radically different from the idealization cases. The unextendedness of the particles is not an oversimplification or even a simplification. Nothing has been 'removed' by partial consideration and nothing requires to be 'restored' for concrete application. Prediction of the behaviour of the particles (which is statistical in any case) works to a high degree of precision without correction for volume, quite unlike the ideal type of cases. As far as I can see the 'qualitative side' of the properties of the subatomic particles eludes the dual-sided theorist as much as the categorical reduction base eludes one who would reduce the fundamental powers to non-power properties.

There are counter-moves here, of course.

One: with luck we'll discover the qualitative sides of the fundamental properties in the future. This parallels the 'unknown reduction base' response discussed in 8.4.2.

Two: the qualitative sides are epiphenomenal. There is more than a hint of this in the following passage:

> Once we recognize that the properties of nature require the qualitative as well as the dispositional, we can see that there is no alternative remaining on the road back from Pythegoreanism but to ask, 'What are the *physical* qualia (that is, qualities)?' This is not to ask for anything inconsistent with the conservation of energy or the laws of thermodynamics. The

[8] Cf. Nagel (1961: 463). [9] Kane (1995: 8).

question is meant only to indicate that mathematicizations in physical theory are partial characterizations of what is changing and at work: to make explicit the need for qualities is *not to add more work by something not measured or measurable*.[10]

Some of us are willing to admit epiphenomenal tropes to psychological theory. The question of what account one is to give of the qualities whose recognition is forced upon us in experience, remains one of the great unsolved problems in the philosophy of mind. Perhaps epiphenomenalism (in the form once defended by Frank Jackson) is the answer. But a concession concerning possibly epiphenomenal *mental* qualia is of no help to the promoter of *physical* qualia of the imperceptible fundamental properties. The alleged physical qualia are neither accessible to experience, nor 'measured or measurable' indirectly. We seem to have no experience-related evidence of their existence at all. There is nothing to push us towards belief in physical qualia, even as epiphenomena.

Three: postulation of the physical qualia is needed if we are to *understand* the explanations that natural science gives of the changes occurring at both micro-, and macro-levels. We need the qualia to know *what* is changing. The argument to enforce this conclusion is a complicated last-ditch, but only after such consideration can one arrive at one's final evaluation of the dual-sided theory.

9.2.3 *Pan-dispositionalism*

Here is an ontological position according to which every genuine property (on a sparse theory of properties) is a power, and the same is true of every genuine (unfounded) relation. This is what I call 'pan-dispositionalism'. Supporters of the position include Popper, Mellor, and Shoemaker.[11] The principal argument offered in favour of the position is an argument from the causal preconditions of our knowledge of properties. While the form of this argument is admissible, in my opinion, the intended conclusion cannot be drawn without relying on a dubious assumption. The argument has to assume that for one to know that *x* has F, F must be among the powers that bring it about that one knows that *x* has F. In Chapter 10 I criticize this claim, and attempt to show how certain properties that are themselves not powers can be

[10] Martin (1997: 222, italics in last sentence added).

[11] Popper (1959: 424); Shoemaker (1980, 1998). See also Roxbee Cox (1964).

epistemically accessible to us through the mediation of other properties that are powers.

There are objections to pan-dispositionalism that have often been taken to be fatal to it. They are examined at length in Chapter 11.

9.2.4 *Categoricalism*

This is an ontological position according to which no genuine property (on a sparse theory of properties) is a power, and nor is any genuine (unfounded) relation a power. No property or relation is essentially directed towards a manifestation, the link between a property and whatever may count as 'its' manifestation is always purely contingent. It is a familiar view, descended from Hume's 'anything may cause anything'. It has been discussed in Chapter 7, and will be further discussed in Chapter 11.

9.2.5 *Neutral monism*

Martin has decided lately that the double nature of properties (as both powers and qualities) cannot be satisfactorily formulated in the dual-sided theory.

> What is exhibited in the qualitative informs and determines what is the forness of the dispositional, and what is the forness of the dispositional informs and determines what is exhibited in the qualitative. There is no direction of priority or dependence. There is no reduction of one to the other. The only way this can be expressed is by claiming that the qualitative and the dispositional are identical with one another and with the unitary intrinsic property itself. This is perhaps a surprising identity, but frequently it happens that different representations turn out to one's surprise to be of the identical entity.[12]

Views similar to the above are advanced by Heil (1998) and Mumford (1998), both of whom indicate acceptance of the name 'neutral monism' for their position.

How does neutral monism compare with the dual-sided theory? First, neutral monism reverts to treating 'is dispositional' and 'is qualitative' as whole property predicates. What makes true 'F is a power' is not a side or facet of F, but F itself, F as a whole. Similarly, what makes true 'F is a quality' is the property F in its entirety. The very same thing is both dispositional and qualitative. How could that be, given that a

[12] Martin (1997: 216).

power is a property that is essentially directed to a specific manifestation, whereas a quality is a property that is not essentially directed to any manifestation? A quality is either not connected with anything beyond itself or is contingently connected. The descriptions 'dispositional' and 'qualitative' are prima facie inconsistent. How then can both apply to the one property? The following analogy is meant to be helpful:

> What is qualitative and what is dispositional for any property is less like a two-sided coin or a Janus-faced figure than it is like an ambiguous drawing. A particular drawing, remaining unitary and unchanged, may be seen and considered one way as a goblet-drawing and differently considered, it is a two-faces-staring-at-one-another-drawing. The goblet and the faces are not distinguishable parts or components or even aspects of the drawing, although we can easily consider the one without considering the other, or even knowing of, the other. The goblet-drawing is identical with the two-faces drawing.[13]

Does this analogy with 'seeing as' (Gestalt perception) really help to explain how contrary-seeming descriptions can be applied to something? In a way it does, but the explanation comes at a cost, and the cost may be unacceptably high. There must be some difference between a faces drawing and a goblet drawing even if one set of lines can be considered to be either or both. That difference lies in us, in how we consider the lines. Neutral monism meets the threatened inconsistency by drastically reinterpreting 'dispositional' and 'qualitative'. If being a power is fully analogous to being a goblet drawing, then powers are not mind-independent, intrinsic properties of their bearers, but mind-dependent and relational properties. Being a power has become a Lockean secondary quality, just like being a goblet drawing is. Notice that this move is not needed for the dual-sided theory. In that theory, powers and qualities are conceived of as two perfectly objective existents, namely two different sides of properties. The dispositional and the qualitative sides are intrinsic to the property bearer, and their existence is a fact independent of human thought and behaviour. By contrast, neutral monism loses OBJECTIVITY, and INTRINSICALITY, because according to it, whether an object has powers and qualities depends in part on the considerings that happen (on

[13] Ibid. 216–17. Cf. Heil (1998: 184).

what we see things as). The analysis in terms of 'seeing as' makes concepts like that of the faces drawing, or the goblet drawing, or the duck drawing, or the rabbit drawing, *response-dependent* concepts. When such an analysis is applied to dispositionality, it too becomes a response-dependent concept. Mumford (1998) appears to candidly acknowledge this point:

> I have been trying to guard against taking the dispositional-categorical distinction to be anything more than a distinction in the way we talk about instantiated properties or states of the world. The danger is projection of this distinction onto the world such that it is taken to be a division in reality rather than just a division in the way we talk about reality.[14]

In a sense the central thesis of neutral monism is not original. Anti-realists about powers have already suggested that a power is not something distinctive and intrinsic in the object but is merely a way of describing something about the object that can also be described as a non-power.[15] Reductionists or eliminativists about powers, or just plain sceptics, are committed to denying that dispositional language is ordinarily used for picking out what are mind-independent power properties. What they do say is that dispositional language, as ordinarily used, is only a *façon de parlez* for describing objects in ways that are convenient for intellectual or practical purposes on hand, but which do not serve the ontologically serious purpose of picking out real intrinsic properties. Anti-realists are entitled to take this deflationary view about dispositional language. The same move is *not* open to realists about powers. If, as I have been arguing, realism about powers carries a commitment to INTRINSICALITY and OBJECTIVITY, then neutral monism is inconsistent with realism.

A second, crucial, objection to neutral monism is the familiar one to which both the dual-sided theory, and categoricalist (reductionist) theories, are open. It is the missing base objection. If properties are to have a dual nature, with or without having sides as bearers of the natures, then each property admitted as genuine in our theory must have a non-dispositional nature that can be ascribed to it. In the case of the essential properties of the fundamental subatomic particles we

[14] Mumford (1998: 192).

[15] e.g. Mackie (1973: 136). Mumford (1998: 193–4) quotes this passage from Mackie in full. Quine (1973: 8–16) can also be read as saying something similar. The inspiration for this move goes back to Hume's 'relative conception' that was mentioned in Ch. 7.

have, on the very best of experimental and theoretical evidence, no reason for supposing that they have a non-dispositional or qualitative nature (certainly not a nature exemplified by size and shape). The postulation of such a nature does not seem to be required for the explanation of anything. Why believe in it?

10

Non-Powers

10.1 Two Questions

Are there any properties that are not powers? Are these properties such that the having of them makes no causal difference to their bearer? My answer is yes, and no, respectively. It is not immediately clear that one can coherently give these answers. If causal processes are identical with, or essentially involve, the exercise of powers, then it would seem that any properties the having of which makes a difference to what their bearers can cause, must be properties the having of which either adds to or detracts from the causal powers of the bearers. There is therefore a prima facie inconsistency in asserting that a property makes a causal difference while denying that it is a power. In this chapter, I hope to dispel this appearance of inconsistency by giving an account of non-dispositional properties and of their role in causality.

10.2 Properties that Are not Powers

The canonical name for a non-power is 'categorical property'. I find this expression seriously misleading in more than one way. Talk of non-powers as categorical properties mischievously suggests that powers cannot be categorically ascribed to objects. Such talk insinuates that an object's bearing a power is somehow a less-than-categorical fact, by contrast with the absolutely categorical fact of an object's having a property that is not a power. Another way in which calling a non-power 'categorical' can mislead is in implying that the meaning of power ascriptions can only be analysed as conditionals (a view that was criticized in 4.2). Earlier I expressed reservations about 'manifestation' but agreed to follow established usage (3.1). My present complaint cuts deeper, and in this book I forgo the use of 'categorical' in favour of 'non-power' or 'non-disposition', using these two as rough equivalents.

Not everybody agrees that there exist two kinds of properties, powers and non-powers. We have already visited (Chapter 9) categoricalist theories that are monist because they deny the existence of real powers, and neutral monist theories according to which power descriptions and non-power descriptions apply to the same denotata: properties and relations. The third form of monism I call 'pan-dispositionalism'. According to it all real properties, including relational properties, are dispositional. One important argument against pan-dispositionalism is discussed in Chapter 11. In this chapter, I concentrate on developing some positive suggestions about how certain properties can play a part in causal processes, including in our perception of them, even if they are not themselves powers.

If powers are intrinsic properties of their bearers, then any extrinsic properties borne by these property-bearers are not powers. Two questions arise here. First, are there any irreducible, ontologically ineliminable extrinsic properties, or are all the genuine properties of objects intrinsic ones (as was claimed by Leibniz)? Second, if there are genuine extrinsic properties, which ones are they? Recall the lessons of the rejection of foundationism (2.2): there are ontologically ineliminable relations. Hence there are relational properties that are constituted by their bearer standing in a relation. If we set aside the various kinds of extrinsic 'mere Cambridge properties', that are not really properties but mere predicates, then it could be plausibly said that all real extrinsic properties of an object are relational.

Pre-theoretically we regard the powers of an object as among its *portable* properties. Consider some very simple shape-shifting sequences. Socrates is sitting. He stands up. He sits down again. Pavlova stands flatfooted. She rises on her toes. She sinks back again on to her heels. These objects (the philosopher, the ballerina) have, at the end of the sequence, exactly the same powers they had at the beginning. Yet each changed in some genuine respect: they have changed temporal location, and have carried their powers from one point in time to another. This is not a modern idea. It was clearly grasped in antiquity, in relation to both time and space. *Hic Rhodus, hic salta*![1]

[1] From classical Greek folklore. A swaggerer claimed to have witnesses to prove that he had once made a remarkable leap in Rhodes, to which he received the reply: 'Why cite witnesses if it is true? Here is Rhodes, leap here!' (punningly (mis)quoted by Hegel in the Preface to *The Philosophy of Right*; correctly quoted by Marx in *The Eighteenth Brumaire of Louis Bonaparte*).

neatly suggests that spatial locations per se are not empowering or disempowering. If you can jump in Rhodes you can jump here. Of course, not all whereabouts are causally equivalent. Only if two locations are relevantly similar in what is acting in them can an object be translated from one location to the other without the translation making a difference to how it can behave. If Neil Armstrong were to say 'On the moon I leapt about like a kangaroo', it would be inappropriate to reply, 'Do it here!' Non-locational factors explain why 'here' is as good for jumping as Rhodes but not as good as the Moon. One can conclude that since it is possible for an object to be translated in space, or in time, with all its powers intact, and it is not possible for an object to be spatio-temporally translated without changing some of its genuine properties, objects must have some genuine properties that are not powers, for example those that are changed merely by spatial or temporal translation.

These common-sense intuitions have their counterpart in the scientific concept of a *symmetry operation*. A symmetry operation may be defined as an operation on a particular that at its conclusion leaves all but one of the salient physical properties of the particular unchanged. Symmetry operations include but are not confined to: translation in space, translation in time, rotation through a fixed angle, uniform velocity in a straight line, reversal of time, interchange of identical particles, etc.[2] For each of these operations on a physical system one can identify the property in respect of which the system undergoes change as a result of the operation (the 'S-property'). S-properties associated with the symmetry operations just listed are: spatial location, temporal location, spatial orientation, temporal orientation, numerical identity of parts.

The S-properties just mentioned are (mostly) relational properties, although they are not relational by definition. One of the relations in question is the dyadic one that holds between space-time on the one hand, and the space-time occupying object that bears the S-property, on the other. I will refer to such properties as '*positional* properties'. My terminology is intended to suggest the following picture. The primary occupiers of space-time are the *objects*. Tropes borne by the objects also have spatio-temporal location, but this is ontologically parasitic on the location of their bearers. On some views, properties are abstract

[2] Feynman, Leighton, and Sands (1963: 52.1–52.3).

entities in a sense that puts them outside space-time. On my view, both the parts *and* the properties of objects have spatio-temporal location, with this difference, that detachable parts, if they were detached, would still have location in their own right, whereas properties are totally dependent on their bearers for their location.[3]

All but one of the S-properties mentioned are positional properties. The interesting exception is the substitutivity-saving-physical-effects of parts of a complex physical system. Here the S-property is the numerical identity of parts. If Hugo, Hector, and Olga are three atoms constituting a water molecule, and the symmetry operation is that of replacing Hugo by Henry, then the change the molecule will have undergone as a result of the replacement is just a change in the numerical identity of one of its parts. Having Hugo as a part, or having Henry as a part, are of course relational properties of the molecule, but, unlike the positional properties that are relational and extrinsic, having a certain individual as component is a relational and intrinsic property (1.4.5). (intrinsicality does not entail that properties that are not powers must be extrinsic.) A change in a complex object that only changes the numerical identity of a part, without any changes in any of the powers of that part, is not a change in the powers of the complex whole itself. The moral is that haecceity, taken as the indefinable determinant of numerical identity, is not a power. I think that is a result that accords with intuition.

The claim that the non-powers are the S-properties can be tested against the marks of dispositionality (2.4). Positional properties, for example, clearly fail three of the tests.

directedness. A power is a power for or to some manifestation. It is defined in terms of this intentional pointing. By contrast, the location of an object is not something about it that is for or to something. The location of an object is defined in terms of a relation between the object and space-time.[4] The whereabouts of objects has no directedness, it is not an intentional property.

independence. Powers can exist when they are not exercised. But the question of whether an object could have a spatio-temporal

[3] The distinction between the sense in which objects are located and their properties are located would be explicated differently by substantivalists (absolutists) and relationists about space-time.

[4] So say substantivalists about space-time. According to relationists, the location of an object is constituted by relations between that object and all other space-time occupiers.

location with or without manifesting *its location* simply does not arise. Since locations are not defined as executable, nothing could count as the exercise of the location of an object. INDEPENDENCE does not apply to positional properties.

INTRINSICALITY. Some S-properties are intrinsic and some are not. In fact most of them are not intrinsic. On the other hand powers are essentially intrinsic, or so I claim (Chapter 6).

It should not turn out on one's analysis that non-dispositional properties are rare or esoteric, since it is very probable, even if not a priori provable, that every thing that has any properties has some dispositional and some non-dispositional properties. Clearly positional properties are maximally pervasive. Every thing is somewhere. Every event has its date. This ubiquity of non-powers is a distinct advantage to the theory, since it decisively rules out the possibility that pandispositionalism is analytically true.

10.3 The Causal Relevance of Non-Powers

Philosophers have not always succeeded in making clear the causal relevance of spatio-temporal location. It has been said, for example, 'spatial location shares with a temporal instant an absolute causal inertness'.[5] Note the serious ambiguity of this. There is a clear sense in which the remark is false: *where* objects are makes a difference to what effects they have on each other. So if 'causally inert' means 'causally irrelevant', then location is not causally inert. There is also a sense in which the quoted dictum is true: the location of an object is not among its causal powers. This is what must be explained.

Suppose we mimicked Laplace's question: what would one have to know at one point in time in order to know everything that happens at a different time? Minimally one would have to know what kind of objects there are and how many, as well as what kind of irreducible powers each have. That should enable one (in principle) to work out what the laws of nature are since the natural laws of a world have as their truthmakers the essential irreducible powers of the objects of that world. It is tempting for realists about powers to think that given the

[5] Harré and Madden (1975: 129).

objects and the laws governing their behaviour (plus a big enough computer) they have everything needed to answer the Laplacean question.[6] We would do well to resist that temptation.

Explanations of even the simplest sort of physical events require reference to the positional properties of the objects involved in the events. From the centrality of 'no action at a distance' as a framework rule of Special Relativity physics, it seems to follow that, to explain interaction between two things that do not occupy strictly the same place at the same time, we need to invoke the spatio-temporal position of the things. Special Relativity entails that causal processes between distant objects must involve the passage of a causal influence from one place to another, and, therefore, must involve the movement of something. For such processes, something must change its location. The Laplacean Demon will have to know, not only what (kinds and numbers of) objects there are and what laws describe their powers, but also *where* the objects are.

It is a contingent matter that the world contains the exact natural kinds it does, and hence it is a contingent matter that it contains the very powers it does. The material world could have included, or could even have been made up of, alien kinds of fundamental particles, not quarks and leptons. The forces exerted by these alien particles could have been subject to unfamiliar laws, for example inverse cube laws. Or the world could have contained powers such that the whereabouts of their bearers are not essential to explaining what happens, unlike explanations of happenings in the actual world that contain ineliminable reference to the whereabouts of objects. The objects could have born alien powers for which spatio-temporal translation is not a symmetry operation. This would be the case, for example, in a world in which some things really *are* grue. So 'Spatio-temporal locations are not powers' is not analytic, or even true in all possible worlds. It is a contingent truth grounded in the fact that our world happens to contain objects that are of a certain kind and so have certain powers and not others. The laws of nature supervene on those powers, and it is the laws applying to the objects of this world that fix what are the

[6] Geach, interpreting Aquinas, seems to have been so tempted: 'Given the natural agents involved, we know their tendencies; given all the tendencies involved we know what will actually happen. (Thus, given the members of a structure, we know what stresses will be set up; and given all the stresses, we know what deformations will be produced)' (Anscombe and Geach 1963: 103).

symmetry operations. The actual symmetry operations determine what are the actual non-power properties.

The non-powers mentioned in this chapter are examples identified on the basis of empirical science, not as result of conceptual analysis. What other non-powers there are, if any, is not for philosophy to determine.

10.4 How Can Properties that Are not Powers be Causally Relevant?

The fundamental powers in nature are powers to exert a force, and they are all inherently *location-sensitive*. This location-sensitivity consists, at its simplest, in the fact that the action of a particular force on an object that is not its bearer will have different outcomes on different occasions, depending *inter alia* on the distances between them on those occasions. The sensitivity is inherent, because these differences in manifestations are a consequence of the nature of the power. They are 'written into' the P-intentional object.

Consider one of the inverse square laws governing the action of forces. How do such laws exemplify location-sensitivity? Interactions between distant objects require the transmission of causal influences. A way of envisaging this is to think of a magnet that is at place p_1 exercising its power to attract a piece of iron that is at p_2 by sending some agents of causal influence to p_2 with instructions to move the iron towards p_1. The agents, unfortunately, are poor travellers. At their strongest and most vigorous when they're at home, they begin to tire and lose strength as soon they set out on the trip. The further they have to travel to get to p_2 the weaker they become. Once the agents arrive at p_2, they can move the iron towards p_1 only as far as their remaining strength permits. There is an *exact function* relating the agents' loss of strength to the distance they have to cover before they achieve contact. That function is the inverse square law.

The story is only so-so, but the metaphysical modelling it suggests is serious. It shows that the distances between interacting objects, determined by their respective locations, can affect the *outcomes* of the working of powers, without distances or locations themselves being

powers. *a*'s being at p_1 (at t_1) is not among *a*'s powers, but it co-determines the strength of the forces that *a* can exert on anything that is not also at p_1 at t_1.

We can generalize the case of forces to get a somewhat clearer idea of the so far undefined notion of 'sensitivity'. Powers that are *x*-sensitive are always powers with determinate manifestations that fall under a common determinable. *Which* determinate of that determinable is manifested on a particular occasion depends on the particular value taken by the variable factor *x*. The manifestation of the power is selected by a function from determinate values of *x* to determinates of the determinable that is the manifestation of the power. This dependence is what I mean by 'sensitivity'. We can express this in a definition:

Df_{14} F is X-sensitive iff F manifests a determinate, g_i, of the determinable G, and g_i is selected by a function, É, from values of the determinable X to values of the determinable G.

In this definition the capitalized letters are dummy variables ranging over properties: 'F' takes powers (and so intrinsic properties) as substitution instances, 'X' and 'G' range over properties that need not be dispositional or intrinsic. All three stand for determinables. The definition is not intended to exclude cases in which a power is sensitive to more than one causal difference making non-dispositional property. Example: the capacity for visual recognition is both location-sensitive and spatial orientation-sensitive. The latter sensitivity picks out a non-dispositional but causally relevant property of light, namely, the property of travelling in a straight line. Equally, the definition does not exclude cases in which more than one power is sensitive to the same causal difference making non-dispositional property. Example: magnetic and gravitational forces between two objects are both sensitive to the same factor, viz. the location of the two objects (their distances from each other).

Both powers and non-powers are causal difference makers, but not in the same way. The causal difference to an outcome that a power makes depends on, and is explained by, the nature of the power, and the causal difference to an outcome that a non-power makes also depends on, and is explained by, the nature of a power or powers. The idea expressed in Df_{14} is that non-powers are effective but their effectiveness is mediated by the powers there are.

10.5 Alternative Theories of Non-Powers

There are a number of theories of non-dispositionality that differ from the one proposed above. Here I will briefly note some of these suggestions, and comment on them.

10.5.1 *Occurrent properties*

A still influential account of properties that are not powers is the one in which they are identified with events or occurrences. Ryle, throughout *The Concept of Mind*, took it for granted that dispositions are properly contrasted with episodes, the latter being what are paradigmatically non-dispositional.[7] The intuitive idea behind equating non-powers with events is that the exercises of powers are effects and effects are events. Powers by contrast are not events. The non-dispositional properties are the ones which objects have when they are busy, whereas the having of dispositions usually completely overlaps the manifestation-events.

I canvas two arguments against the claim that occurrences are not dispositional. First, many events certainly *look* dispositional. Popper has pointed out that sugar is not dissolved unless it is recoverable.[8] Popper's point may be generalized thus: a manifestation outcome is as dispositional as the property that manifested it (although it is not dispositional for the same kind of outcome). If so, the contrast between 'occurrent' and 'dispositional' is lost.

Popper actually discusses 'dissolved' and 'broken', which are predicates that we would usually take to describe lasting states of an object rather than passing events. It may be claimed that, in a strict sense of 'occurrent', the occurrent manifestations of solubility and breakability are denoted not by 'dissolved' and 'broken' but by 'dissolves' and 'breaks'. Maybe Popper's argument only shows that the lasting

[7] '[M]erely to classify a word as signifying a disposition is not yet to say much more about it than to say that it is not used for an episode' (Ryle 1949: 112).

[8] '[E]ven "dissolved" and "broken" are dispositional. A chemist would not say that sugar or salt has *dissolved* in water if he did not expect that he could get the sugar or the salt back, by evaporating the water. And as to "broken", we need only consider how we proceed *if we are in doubt* whether or not a thing is broken—something we have dropped, perhaps, or say, a bone in our body: we test the behaviour of the thing in question, trying to find out whether it does not show a certain undue mobility. Thus "broken", like "dissolved", describes dispositions to behave in a certain regular or lawlike manner' (Popper 1959: 424–5).

state that follows the manifestation is dispositional, but not that the manifestation-events themselves, the dissolving and the breaking, are dispositional? I defer consideration of this objection to the next paragraph but one.

Second, objects have many accidental powers that can be acquired, or lost, or even regained, during the life of the object. 'Becomes brittle' clearly signifies something that is happening to the object. This event of becoming brittle is the beginning of the state of being brittle. If to be in the state of being brittle is to have the disposition of brittleness, then the beginning of being in that state is itself a case of having the disposition. This argument shows that at any rate *not all* events can be non-powers. Those occurrences that are acquisitions of admitted powers themselves count as dispositional.[9]

What of the objection to Popper noted above? Let it be accepted that 'dissolved' and 'broken' are dispositional. 'Dissolves' means 'becomes dissolved' and 'breaks' means 'becomes broken', and, according to the second argument, the events denoted by these expressions are themselves as dispositional as the states of the object of which they are the beginnings. It is highly implausible to allow that 'broken' is dispositional while maintaining that 'becomes broken' is not. If the category of events includes events (and processes and states) that are powerful, then the identification of non-powers with occurrent properties fails.

10.5.2 *Manifest properties*

Hume had argued *ad nauseam* that the presence in an object of an unmanifesting power couldn't be established by sense perception alone. Testing for the presence of the power normally involves triggering a manifestation from the occurrence of which the existence of the power is then inferred. Powers are not among the perceptible properties, they are occult by their very nature. Only the qualitative, non-dispositional properties are knowable directly, that is, by sense perception alone. Powers are not manifest but are knowable only inferentially, if they are knowable at all. What is on offer here is a theory that demarcates powers from non-powers in epistemological rather than constitutive terms.

[9] Cf. 'If "is magnetic" is full of threats and promises so is the occurrent, "becomes magnetic". Similarly with "is red" and "becomes red" ' (Levi and Morgenbesser 1964: 408).

10.5.3 *Actual properties*

According to some theories, non-powers are actual properties of their bearers but disposition terms predicate something that is a mere possibility for objects. We have already discussed this type of view in Chapter 5.

10.5.4 *Scientific properties*

The manifestation-events of coarse macroscopic physical capacities of medium-sized objects (such as solubility, fragility, elasticity, etc.) are explicable in terms of those microstructural characteristics of objects that are specified in our best confirmed scientific theories. This has given rise to a certain family of strategies in the analysis of powers: generalize the correlation of overt dispositions with microstructural properties, and either reduce the former to the latter (the strategy of analytic reduction), or use the latter to displace the former (the strategy of pragmatic replacement).[10]

The identification of non-powers with scientific properties is open to a strong objection. Broad stated the objection a long time ago with characteristic lucidity and force: the properties specified by science are themselves powers, right down to the essential properties of the fundamental particles. Consequently, reducing macroscopic dispositions to scientific properties does no more than 'reduce a number of causal characteristics which seem at first sight to be independent and disconnected to a comparatively few fundamental causal characteristics which are familiar on the large scale and are very general and pervasive.'[11]

The force of this criticism is not diminished if instead of reductively analysing powers, one deploys a strategy of pragmatic replacement of the properties described in ordinary dispositional language, by scientific properties. Quine is inclined to go this way.[12] His overt aim is to replace the individual elements of the general dispositional idiom, one by one, using (possibly primitive) terms from science. He gives this example of the replacer and the replaced:

> Innate reflexes . . . are no different in kind from postnatally conditioned reflexes. To acquire a reflex is to acquire a neural path of lowered resistance; according to my philosophy of dispositions, indeed, that path *is* the reflex.[13]

[10] e.g. Armstrong (1968: 86, 1973: 13); Quine (1973: 13, 33).
[11] Broad (1925: 435–6).
[12] Quine (1973: 8–15).
[13] Ibid. 13 (original italics).

Now 'path of lowered resistance' is *obviously* no less dispositional than 'reflex', and so the problem of dispositionality is still with us after the replacement move has been completed. It would be better to adopt the concepts supplied by science but not because the adoption rids us of powers. The good reason for the replacement is the one Broad gave: the integrating (that is, unifying and simplifying) effect of the reduction of the prolixity of macroscopic powers to a few fundamental and pervasive ones gives increased theoretical and explanatory strength.

It is instructive that deflationary theories of powers, in all varieties, fail to make capital out of equating non-dispositions with scientific properties. The main reason for that failure is that according to science the essential properties of the fundamental entities of nature are so many powers (8.4).

10.5.5 *Properties that do not entail conditionals*

According to some philosophers, 'P' denotes a power only if '*a* is P' entails some strong conditional about what *a* would do if certain conditions were realized. If there is no such entailment, then P is a non-power.[14] We have already examined this proposed demarcation in detail (4.2), and found it wanting. A reminder of the relevant part of the discussion: first, it was argued that there are powers that are exercised spontaneously, that is, unconditionally. If so, we cannot argue from the fact that '*a* is P' does not entail any strong conditional about what *a* would do if certain conditions were realized, to the conclusion that P is not a power. Second, it was argued that each proposal to date for formulating the conditional equivalent of power ascriptions is open to serious objection. If powers are not conditional-entailing per se, then of course non-powers are not identifiable with properties that do not entail conditionals.

10.5.6 *Spatio-temporal properties*

Spatio-temporal properties, which objects have simply by virtue of being in space-time, form a diverse family. They include such intrinsic properties as shape, size, volume, curvature, and angular momentum. They also include extrinsic properties such as the location, position, duration, and orientation of objects in space-time. Spatio-temporal properties (the whole family) have been put forward as candidates for the part of non-dispositions.

[14] Prior (1985: 5–10); Mumford (1998: 81–92).

The unrestrictedly general claim, to the effect that none of the broadly defined spatio-temporal properties is a power, has been rejected by philosophers as often as it has been accepted. In particular, intrinsic spatio-temporal properties are contested territory. Take the example of shape. We have already met Goodman's view that 'cubical' is dispositional. His reason for thinking that 'cubical' is dispositional is that being cubical bestows on an object the power to be measurable in certain ways but not in others. This point can be readily generalized over all measurable (observable) shapes, and can be still further extended to physical size, volume, and curvature. Still more important examples can be got from the geometric properties of the largest object of all, space-time itself. General Relativity displaces both the Euclidean theory of space (3-D, flat) and the Newtonian theory of gravitation (instantaneous unmediated action at a distance), by endowing space-time with two powers. The 'passive' power of having its global shape affected by the local action of massive space-time fillers; and the 'active' power of co-determining, by its shape, the relative-positions of all the massive space-time fillers.[15]

Geometric properties have been regarded by other philosophers as non-dispositonal. There is a particular argument that has been used in support of this view.

> Let us take as our example of a property the property of being 'knife-shaped' . . . if all that I know about a thing is that it has this property, I know nothing about what will result from its presence in any circumstances. What has the property of being knife-shaped could be a knife, made of steel, but it could be a piece of balsa wood, a piece of butter, or even an oddly-shaped cloud of some invisible gas. There is no power which necessarily belongs to all only the things having this property.[16]

Dispositions have a 'categorical irreducibility', as it is impossible to explain them away in terms of other categories such as space, time, form, process, material, property etc. For suppose that the exact shape and size of an object were known, the shapes and sizes of all its constituents, along with a list of these facts at every time. We would still know nothing about how or why the

[15] I am assuming that one can talk of space-time as having shape in a strict or literal sense of 'shape', and not merely in a metaphorical sense.

[16] Shoemaker (1980: 114). Shoemaker has since retracted this attempt to distinguish between powers properly so-called and properties like shape. See his (1998).

object would change with time or on interactions. Still less could we predict how it would respond to a new experimental test.[17]

If *all* I knew about a thing is that it carries negative electric charge, then I would be as unable to predict what happens to it as I would be if *all* I knew about the thing were its shape. This is because of the polygenicity of effects (12.1.3): the behaviour of an object is determined by the manifestations of a number of different and independent powers borne by the object itself and by other objects in its environment. The inability to predict the behaviour of an object from its shape alone is matched by an inability to predict its behaviour from its charge alone. So far, no difference has been disclosed between charge, a power, and shape, allegedly a non-power. What then is the claimed demarcating difference on which this argument relies? It can only be that charge does, and shape does not, owe its type-identity to a distinctive contribution it makes to interactions involving its bearer. This contribution is the property's manifestation, which together with the manifestations of other powers determines the behaviour of the object that has it. The argument's crucial premiss is that it is *not* essential to the nature of shape that it makes such a contribution, whereas it *is* essential to the nature of charge that it should do so. Given this premiss it *would* follow that charge is a power and shape is not.

There are good reasons why one should not accept this crucial premiss on which the argument for disempowering the intrinsic geometric properties relies. Shape determines the extent of contact-without-overlap that can occur between objects. Surely this is not a contingent fact about shape. This feature of shape is its manifestation, it is a feature the having of which is essential to its type-identity. 'An example of necessary causal relation . . . between distinct properties is *how* a square peg does not fit into a round hole the *way* a round peg does.'[18] The truthmaker for this observation is the contributions made by the *powers that are the shapes* to the interactions between square pegs and round holes, and round pegs and round holes. Similarly for Goodman's example: the powers that are shapes determine (necessitate) the suitability of try-squares and the unsuitability of some other instruments for measuring cubes. The same point can be got also from Boyle's case of the key and the lock. Or again, consider any ordinary

[17] Thompson (1988: 69). [18] Martin (1993*b*: 47, original italics).

type of mechanical interaction. It is essential to the property *shape* that the quantum of heat lost through friction is determined (in part) by the shapes of the objects rubbing against each other. I think it is safe to conclude that the argument for the non-dispositionality of intrinsic geometric properties is not sound.

Although spatio-temporal properties as such are not non-powers, this theory is far less objectionable than any of the others we have looked at in this section. I have tried to show in 10.2 that some of the most important non-powers of objects are to be found among their extrinsic spatio-temporal properties. If we restrict the identification of non-powers with geometric properties to these extrinsic ones, we will have got it (almost) right.

11

Objections Considered

11.1 Two Major Objections

In the course of developing a theory of powers to the point reached at the end of the last chapter, I have been considering various difficulties that arose in connection with points of detail. It is normal to test the strength of reasons for or against taking certain turns on the winding road of theory construction. Now we need to take account of two further objections that do not concern details but matters of fundamental principle. These objections have opposed senses. According to one, ontological seriousness about irreducible powers empties the world of something that it contains. According to the other, it imports into the world something that does not exist. The success of either objection would bar the development of a metaphysical theory that accepts irreducible powers.

11.2 'Always packing, never travelling'

The first of the central objections we are investigating asks whether the world could consist of nothing but things whose essential-intrinsic properties are only powers. It answers that it could not. The objection is directed at two targets: first, pan-dispositionalism, which is the thesis that *all* properties, intrinsic and extrinsic, are powers (9.2.3). Second, the thesis that all properties are powers *except* positional properties.

Pan-dispositionalism combined with the plausible view that all manifestations are changes in the properties of objects, evidently gives rise to a regress. The first major objection could be put at simplest, as the claim that this regress is vicious. A number of philosophers have recently constructed arguments around this claim. They include

Campbell (1976), Swinburne (1980), Foster (1982), Robinson (1982), Blackburn (1990), Martin (1997), and Armstrong (1997). The latter adds a neat contribution to the rhetoric of the argument:

> Can it be that everything is potency, and act is the mere shifting around of potencies? I would hesitate to say that this involves an actual contradiction. But it does seem to be very counter-intuitive view. The late Professor A. Boyce Gibson, of Melbourne University, wittily said that the linguistic philosophers were always packing their bags for a journey they never took. Given a purely Dispositionalist account of properties, particulars would seem to be always re-packing their bags as they change their properties, yet never taking a journey from potency to act. For 'act', on this view, is no more than a different potency.[1]

It is regressive to specify the intentional object of a power solely in terms of creating/altering another power. Why is this not a benign regress? Three of the philosophers who have used the 'always packing, never travelling'-move have given explicit reasons for taking the regress to be vicious.

11.2.1 *What makes the regress vicious: Space occupancy?*

Foster (1982) holds that material objects must have natures that enable them to be space occupants, and only objects with a non-dispositional essence can occupy space.

> [T]he only way of avoiding the regress . . . is to construe at least one of the powers as a power to affect the behaviour of some type of *substantial* space-occupant—an occupant with an intrinsic nature independent of its causal powers and dispositions.[2]

The actual refutation of pan-dispositionalism, using the concept of a substantial space occupant, may be represented thus:

(1) *x* is a physical object → *x* is a space occupant
(2) *x* is a space occupant → *x* is a substantial object
(3) *x* is a substantial object → *x* has a non-power nature

ergo

(4) *x* is a physical object → *x* has a non-power nature.[3]

Much depends here on the meaning of 'substantial'. Foster refers to physical objects as 'substantial' in a sense of that word that is very basic

[1] Armstrong (1997: 80). [2] Foster (1982: 69, original italics).
[3] This is just a fragment of Foster's overall pro-idealist argument to the conclusion that there are no physical ('material') objects.

and quite central to our ordinary understanding of objects. For this very reason, it is difficult to spell out, without patent circularity, what one means when one calls a physical thing substantial. As Eddington found, when he came to describe the first of his 'two tables' (the manifest one):

> It has extension; it is comparatively permanent; it is coloured; above all it is *substantial*. By substantial I do not merely mean that it does not collapse when I lean upon it; I mean that it is constituted of 'substance;' and by that word I am trying to convey to you some conception of its intrinsic nature. It is a *thing*; not like space, which is mere negation; nor like time which is—Heaven knows what! But that will not help you to my meaning because it is the distinctive characteristic of a 'thing' to have this substantiality, and I do not think substantiality can be described better than by saying that it is the kind of nature exemplified by an ordinary table.[4]

Without trying to define 'substantial', we can still seize hold of *one* of the elements that is agreed to be part of the meaning of the word, and that makes it suitable for characterizing our common conception of a material object: a substantial object is one that has *bulk* or *volume*. Is premiss (2) in Foster's argument admissible, if we understand 'substantial' to mean (in part) 'voluminous'?

There is a conception in folk physics of what it is for an object to fill space that is based, like everything in folk science, on experience of macroscopic phenomena. It involves the following theses. (i) *x* fills space iff *x* occupies a volume of space. (ii) *x* occupies a volume of space, *v*, only if *x* occupies every part of *v*. (iii) Whatever occupies a volume of space must itself be voluminous. Clearly, to have volume is to have some positive size and shape. Yet on the folk-theoretic picture it is not shape and size themselves that constitute the nature of space fillers. For space filling there must be something *in* that volume of space (or else we have a vacuum) and that something is what *has* shape and size. Common sense *does* regard what is differentiated from empty space—the space filler—as a substantial thing having an intrinsic nature. But on the question of whether that intrinsic nature is, in the final analysis, 'independent of . . . causal powers', common sense is non-committal in my opinion.

The common-sense view just outlined is a theory of space filling, not of space occupancy. It applies to complex (macroscopic or

[4] Eddington (1928: 5, original italics).

microscopic) objects but does not apply to simple (sub-microscopic) objects. Simple objects have no volume and do not *fill* space at all. They are in space just by having a spatial address. They are *at* a point-location. If the fundamental particles that make up the physical world are (spatially) simple, as we have some empirical reason to believe, they are space occupants without being substantial (voluminous) objects. Under the natural interpretation of 'substantial' as 'voluminous', the particles constitute counter-examples to (2).

(3) may also strike many of us as unpersuasive. I have suggested above that there is no common-sense intuition in support of a necessary connection between *being voluminous* and *having a non-dispositional nature*. Although some philosophers treat size and shape as qualitative or 'categorical' properties, the discussion in 10.5.6 was meant to cast doubt on that claim. I see no good reason at all why anybody inclined to pan-dispositionalism should take fright at (3). In any case, the inadmissibility of (2) shows, by itself, that Foster has not given a sound argument to the conclusion that space occupants must have a non-power nature.

11.2.2 *What makes the regress vicious: Conditionals?*

There is some temptation to think that things with a purely dispositional essence are too fugitive to have the substance that real objects need to have. They are somehow ontologically *manque*. One idea that feeds this intuition, for some philosophers, is the analysis of powers as merely ungrounded conditionals (the NCA of 4.2.1). Thus, for example, Blackburn:

> An electrical field can abide, certainly, but that just means that there is a time over which various counterfactuals are true. It does not give us reason to think of a different property, quietly persisting, as it were, even when the disposition is not exercised.[5]

On the assumption that a power is *nothing but* the truth of a conditional, it would be natural to reject the conception of a thing having a purely dispositional essence. Such a conception dissolves the physical

[5] Blackburn (1990: 63). In a subsequent unpublished paper ('Spreading the World', August 1997) Blackburn says that although the argument is stated in terms of the conditional analysis, this is a matter of convenience only. The argument does not depend on the truth of the conditional analysis and would go through even if powers were merely conditional-entailing (p. 16). Blackburn does not raise the question of whether the argument would still work if powers were not even conditional-entailing.

world into the holding of many strong conditionals, while seemingly undermining our ability to explain what truthmakers there are for those conditionals.

According to Blackburn, if all intrinsic properties are powers, as pandispositionalism implies, then physical objects have counter-factual essences. That means that truthmakers for all truths about actual objects will be found only at neighbouring possible worlds, and, because the regress holds in any world, the truths about our nearest neighbour world would in turn depend on what is true in *its* neighbour, etc., leading to the melancholy conclusion 'there is no truth anywhere'. Blackburn's proof depends on the assumption that one cannot have a world whose objects are characterized solely in relational terms. Holton (1999) argues that this assumption is unjustified. I want to stress another weakness in the argument. Blackburn is relying on the conception of dispositions as properties that have a purely conditional, or a conditional-entailing, nature. This conception has many serious defects (4.2). Recent work in the philosophy of dispositions has shown how hard it is to find anything salvageable in it.[6] It is questionable whether arguments that include either 'Power ↔ Conditional' or 'Power → Conditional' as an essential premiss, have any probative force.

11.2.3 *What makes the regress vicious: Lack of qualities?*

The most impressive argument for the viciousness of the regress, put forward by Martin, claims that objects must have qualities among their intrinsic properties in addition to powers, or, more precisely, that all their properties must be qualitative as well as dispositional. Only then can the objects be regarded as 'things in their own right', 'substantial space occupants', etc.

> Dispositionalists believe that all that appears to be qualitatively intrinsic to things just reduces to capacities/dispositions for the formation of other capacities/dispositions for the formation of other capacities/dispositions for the formation of. . . . And, of course, the manifestations of any disposition can only be further dispositions for. . . . This image appears absurd even if one is a realist about capacities/dispositions. It is like a promissory note that may be actual enough but if it is for only *another promissory* note which is . . . that is entirely too promissory.[7]

[6] Martin (1994); Lewis (1997); Bird (1998); Molnar (1999).

[7] Martin (1997: 215).

Martin argues that pan-dispositionalism is deficient because it reduces properties to only dispositions. This reduction removes from the ontological picture whatever is qualitative about all properties, physical as well as psychological. Pan-dispositionalism cannot accommodate *physical qualia*.

We accept the existence of qualities because acceptance is *forced upon us* in experience. One needs but to recall the immediacy, the urgency, and, above all, the *intrusiveness* of what is qualitative in perception and sensation to see that there is nothing 'theoretical' about the qualities disclosed in experience (although there *may* be something theoretical in how we locate the so-called secondary qualities).[8] The task of fitting the qualities of conscious experience into our best theories is spiked with difficulties, but the *existence* of psychological qualia is clearly beyond dispute. By contrast, physical qualia are not items in good ontological standing. In fact, we have no good reason for believing in their existence. This can be seen from two considerations. First, at the level of the fundamental constituents of matter, we are dealing exclusively with sub-observables. No qualities of the fundamental particles are given to us in experience. Consequently we would need some ampliative reason for believing in the existence of physical qualia. Second, any qualities we might postulate for the particles such as, for example, size and shape, are explanatorily idle. The only intrinsic properties needed to explain the behaviour of the electron are its powers. The most natural explanations of how electrons occupy space also make no reference to qualities. If the electron had any qualities, they would not add value to the physical explanations we can now obtain by reference solely to its dispositions and relations to space-time. Why treat as ontologically respectable what is both unobservable *and* explanatorily idle? A minimal empiricist commitment suggests that if we have neither experimental nor theoretical evidence for believing in the existence of something, then we shouldn't.

I think that Martin's claim that dispositionalism is reductionist can be resisted, on the ground that, at the quantum level of nature, there are no (wholly or partly) qualitative properties *to reduce*. In this respect, dispositionalism contrasts sharply with phenomenalism and behav-

[8] In this book I try to maintain neutrality on the many difficult questions to which this aside points. I also remain neutral on whether the psychological qualities are effective or epiphenomenal. *Solvitur ambulando*—we'll grapple with the problem when we take a walk.

iourism. Phenomenalism is reductionist about material objects and behaviourism about conscious experiences. It is very hard to deny that there are material objects or that there are conscious experiences, and therefore that there is something here for reductionism to bite on. By contrast, to want to reduce the alleged qualities of the sub-atomic particles is to cast one's line in waters where no fish swim.

Martin has also suggested that leaving out physical qualia at the level of the fundamental entities results in a Pythagorean ontology in which all is numbers, quantities, ratios, and proportions, but there is no *whatness*, no quiddity, nothing that the numbers and quantities are numbers *of* and quantities *of*. Except of course further numbers, which returns us to the regress generated by pan-dispositionalism. I think Martin's worry here can be assuaged. If the property of exerting a certain force is a definite *something* that the numbers can measure, so is being the *source* of that force. That *about the object* that makes it a source of a force is a (quantitative) power property. It is open to the dispositionalist to say that this is where the quiddity lies, this is what the numbers are numbers of. The inadequacy of that answer, if it is inadequate, cannot be demonstrated simply by reference to the dangers of Pythagoreanism.

11.2.4 *Moderate dispositionalism*

If by pan-dispositionalism one understands the theory that all properties, intrinsic and extrinsic, are powers, as we have done, then there are in fact few strict, practising pan-dispositionalists. Boscovich, to be fair to him, is not one. His position is the more common one of treating all intrinsic properties of objects as powers, but allowing the extrinsic positional properties to be non-powers. According to some philosophers, dispositionalism so restricted is still objectionable. Foster imagines a case of atoms that are mobile point-centres of a space-bending force. In this case one is apparently able to specify the intentional object of the power as something non-dispositional, viz. the alteration in the shape of space brought about by the force's action on it. Is this an adequate response to 'always packing, never travelling'? Foster says no, for the reason that:

> [T]here is no way of making sense of the claim that the space-bending forces are spatially located. It is true that, for each force, there is a point which is uniquely prominent in specifying its content—a point which forms, as it

were, the focus of the geometrical effect. But this does not suffice to give the force itself . . . any genuine location—to make it point-centred in the suggested way. If we are tempted to think of the force as spatially located, it is only because we began by conceiving of it as something which an atom exerts, the presumption being that the location of the atom is already ensured by some independent aspect (e.g. its substantial character) of its nature. The mistake is then to suppose that location is retained when the whole atomic nature is confined to the exertion of this force. Once the atomic nature is thus confined, atoms are eliminated and the space-bending force becomes merely an unlocated causal constraint on the geometry of space at a certain time.[9]

This argument crucially turns on the presupposition that entities with a purely dispositional essence cannot have spatial location in the proper sense, and that only 'substantial' entities, or their ontological dependants, can be spatial occupants. We have seen above (11.2.1) that such a claim is unjustified. In the special case of central forces for, say, gravitational effects, it is particularly easy to see that our ability to locate the source does not depend on any assumptions about the 'substantial character' of the source-object. The locus of a vector force (the point of maximum density in the relevant force field) unambiguously identifies the spatial point that the source of the force *occupies* (but does not 'fill'). The reasonable demand that moderate dispositionalism should deliver a spatial address for the source of the force can be met. The further demand that spatial location be identified with something more than occupancy is, in this case, unreasonable.

11.2.5 *Dispositionalism reassessed*

The 'always packing, never travelling' argument is an attempt to refute dispositionalism on a priori grounds. Its point of departure is a regress that is generated by the assumption that all properties are powers and, consequently, all changes in properties are only changes in powers. Now it is not self-evidently obvious that this regress is vicious (nor that it is benign). We have looked at three different attempts to convict the regress of viciousness, and have found difficulties facing each of them. None of these attempts uncovers an actual contradiction in pandispositionalism.[10] The most one could claim on the basis of the regress

[9] Foster (1982: 72).

[10] The history of philosophy contains many precedents of failed regress arguments, most notoriously the Cosmological Argument for the existence of God that is based on the claimed incoherence of an infinite regress of causes.

is that pan-dispositionalism looks anti-intuitive. Charges such as 'incoherent', and 'absurd', are not sustained.

Nevertheless I think that we should reject pan-dispositionalism, in both the full and the moderate versions distinguished above, for the a posteriori reasons rehearsed in Chapter 10. Both common sense and science recognize the existence of symmetry operations. In symmetry operations, some property of an object undergoes change (the 'S-property'), but all the powers of the object are left unchanged. It is this fact that gives us an epistemic handle on non-powers: one discovers empirically what symmetry operations there are, what the relevant S-properties are, and so one distinguishes between the actual powers and non-powers. Our world is one in which both types are amply instantiated. Pan-dispositionalism is not impossible but it *is* false.

It hardly needs saying that against the kind of a posteriori dualism I am recommending, the 'always packing'-argument is ineffective.

11.3 Humean Distinctness

Powers and their manifestations are distinct from, but also necessarily connected with, one another. Humeans completely deny the existence of such necessary linkages. Their position is that only contingent connections exist between the distinct objects, properties, and relations of a world. This is the thesis of Humean distinctness (HD). Realism about powers is inconsistent with HD in every one of its forms, including the form it takes in those combinatorial theories of modalities that presuppose the unrestricted compossibility of all real properties. Thus the second major objection to physical intentionality, that I am considering in this chapter, may be described as the claim that PI conflicts with the central principle of a certain sort of (reductive) account of modality.

How does Hume know that no two distinct tropes can be necessarily connected? Because given any two such tropes he can always conceive of the one existing in the absence of the other; and

> 'Tis an established maxim in metaphysics, *That whatever the mind clearly conceives includes the idea of possible existence*, or in other words, *that nothing we imagine is absolutely impossible*.[11]

[11] Hume (1739–40: 32, original italics).

The conceivability criterion of strict possibility (a watered-down descendant of Descartes' clear-and-distinct-conception criterion of knowledge) faces a number of serious difficulties. Reid was among the first to deliver an effective critique of the criterion in his *Essay on the intellectual powers of man*, pointing out *inter alia* how easily conceivable mathematical and geometric impossibilities are.[12] In the estimate of many of us, Hume's own reason for recommending HD is inadequate.[13] Nevertheless HD is still widely accepted. Where, then, are the new arguments by which that acceptance is supported in place of the feeble reliance on conceivability? Perhaps surprisingly, they do not exist. Twentieth-century philosophers who accept HD either follow the *Tractatus*, in treating it as too obvious to need defence, or support it by arguments of the form 'Hume says that *p*, so *p*'.[14]

Pre-theoretically HD does not look plausible. There are many types of cases that have seemed to philosophers to refute it. There are sets of properties such that having one member of the set is non-compossible with having any other member; and there are sets of properties such that having one member of the set necessitates having all the others. As a comprehensive survey of these types of cases is impracticable, I will concentrate on just two and argue that they are not merely apparent, but effective counter-examples to HD. The two examples are essentialism about natural kinds, and intensive quantities.

Essentialism. If having unit negative electric charge and having a certain mass are both essential properties of the electron, then they are not separately available for recombination. Anyone who accepts HD must reject essentialism, and vice versa. I argue for vice versa.

My first point is that anti-essentialism, as expressed in HD, has some strange consequences. Brian Ellis made this point stylishly by showing how Humean distinctness lends support to the doctrine of transubstantiation announced at the Council of Trent in 1551:

> If anyone shall say that, in the most holy Eucharist, there remains the substance of bread and wine together with the body and blood of our Lord Jesus Christ; and shall deny that wonderful and singular conversion of the whole

[12] Essay IV, ch. III, 'Of Mistakes Concerning Conception', Reid (1785: I, 375–9).

[13] I have argued the case for this judgement in Molnar (1994). For a restatement of Reid's point about geometry (with a much better example!), see Lewis (1986*c*: 90).

[14] John Mackie is one philosopher who has used the principle, in arguing against 'rationalistic dispositions', justifying the principle by little else than a straight appeal to Hume's authority. See Mackie (1973 and esp. 1978).

substance of the bread into the body, and of the whole substance of the wine into the blood, the species of bread and wine alone remaining, which conversion the Catholic Church most fittingly calls Transubstantiation, let him be anathema. (Session 13, Canon 2)

In the Eucharist the wine and the bread are supposed to become literally the blood and body of Jesus Christ, even though their species attributes, including all of their physical and chemical properties, remain just those of wine and bread. Same properties, different substances. This is no problem if you think that what a thing is, is logically independent of what it does. 'Mad if you think otherwise', comments Ellis. In the same vein, I have heard a defender of HD maintain that it was a purely contingent fact that Bertrand Russell is human as he could have been anything, even a quark. Of course these cases do not amount to a *reductio*, but they do serve to highlight the deep implausibility of HD. Anti-essentialism looks too bizarre to be true.

The second argument starts from a commonplace: the extent to which a well-conducted experiment confirms a hypothesis is not altered by any repetition of the experiment. When such experiments are repeated, it is for different reasons altogether, for example to test some equipment, or to improve the accuracy of a measurement, or for pedagogic reasons, but never for the sake of increasing the degree of confirmation of the hypothesis. In the basic sciences, results about species and genera obtained from small samples or from singletons are readily distributed over all the tokens of the natural kind(s) involved. Practitioners in these fields spontaneously adopt what I call *methodological essentialism*.[15] This research strategy has been an indispensable factor in our acquisition of knowledge of nature to a sophisticated level. What explains the success of methodological essentialism? What is it *about the world* that makes this the right cognitive strategy to adopt? Hume takes note of the relevant facts:

[W]hen by any clear experiment we have discover'd the causes or effects of any phaenomenon, we immediately extend our observation to every phaenomenon of the same kind, without waiting for that constant repetition, from which the first idea of this relation is deriv'd.[16]

[15] I use this expression in a sense unrelated to its use in Fisk (1973). What I mean by 'methodological essentialism' is, I hope, clear enough in context.

[16] Hume (1739–40: 173–4).

But, as usual, Hume substitutes for the metaphysical question, which calls for an evaluative answer, a quite different one, namely the question of why we adopt this strategy. He offers a non-normative, psychologistic answer to the ersatz question. A contemporary suggestion, in a frankly pragmatist vein, is also unilluminating:

> If you are committed to the assumption that all the internal properties of electrons are essential, this makes science a lot easier for you. You can measure the charge or mass on one, and you know it on all the others.[17]

This still does not tell us why commitment to methodological essentialism consistently results in good science. Yet the answer is fairly obvious: investigations premissed on the assumption that natural kinds have essences, that in particular the fundamental natural kinds have only essential intrinsic properties, tend to be practically successful because the assumption is *true*. At any rate, this explanation of why methodological essentialism in science works seems better than any other I have heard. In my estimate, we have here a clear reason for resolving the conflict between essentialism and HD in favour of the former.

Intensive quantities. Some of the putative counter-examples to HD are cases of the necessary coexistence of determinates falling under different determinables. Examples include: shape-size-orientation, triangularity-trilateralness, equiangularity-equilateralness, loudness-pitch, hue-saturation, velocity-direction. Other putative counter-examples to HD are cases of determinate exclusion. The examples here fall into two broad categories: quantitative properties and qualities. Necessarily, no object has two (quantitatively) differing, fully determinate weights or heights or volumes. The defender of HD may reply to the objection based on such cases by trying to show that the state of affairs exemplified by *a's being 2m long* is not a wholly distinct state of affairs from *a's being 1m long*. The reasoning is that, in the case of extensive quantities, the quantity had by a whole (2 m length) is factorizable into quantities had by its proper parts. The mereological relation between wholes and their proper parts guarantees that the two states of affairs are only partly distinct. Since HD is intended to apply solely to wholly distinct existents, 'Nothing can be exactly 1 metre long and also exactly 2 metres long' is disallowed as a counter-example.[18] Let us

[17] Cartwright (1989: 147).

[18] Cf. Armstrong (1989*a*: 78–84 for a detailed argument along these lines).

say that this defence works, at any rate for extensive quantities. How about qualities, for example, the incompatibility between '*a* is red all over at *t*' and '*a* is blue all over at *t*'? Concerning these, in *Tractatus* 6.3751 Wittgenstein suggests a method for removing the appearance of a contradiction between two elementary propositions. With some trepidation I interpret him as proposing a two-stage procedure. In the first stage, we are to make a physicalistic reduction of colours that would enable one to represent differences in colour space as differences in dynamic properties of physical particles (light). In the second stage, one can treat differences between determinate shades as differences in an (physically specified) extensive quantity along the lines indicated above. Then the two different colours would be shown by this analysis to be nothing over and above two not-wholly-distinct physical quantities, and so disqualified as counter-examples to HD. Although this Tractarian move makes additional and controversial assumptions about the physicalistic reducibility of perceptual qualia, let us, for the sake of the argument, grant it. There remains still a third category of determinate exclusion, the case of intensive quantities. If an electron has mass of 9.109×10^{-31} kg, it cannot have mass of any other magnitude. The mass of the electron, however, is not factorizable into masses of its parts since the electron has no parts. Point-mass looks like an actual example of an irreducibly intensive quantity. The incompatibility between two such (fully determinate) quantities cannot be reduced to an incompatibility between not-wholly-distinct existents. It therefore counts as an effective counter-example to HD.

One defender of the Humean thesis of the unrestricted compossibility of wholly distinct existents has candidly conceded that 'most philosophers who have considered the matter think that it is too strong to be true.'[19] It seems to me that the balance of evidence is on the side of majority opinion, in this case. I will, however, pursue the issue of Humean distinctness further in 12.2.

[19] Armstrong (1997: 140).

12

Powers at Work

> The stone which the builders rejected has become the chief cornerstone.
>
> (Matt. 21: 42)

The compelling reasons for accepting the theory of powers outlined are in the work that the concept can do in one's metaphysics. This chapter points to some of the work powers can do. I concentrate on two areas: causation and modality. But there are other areas of metaphysics for which powers can be used to advantage. This is only a start.

To summarize to this point: Fundamental physical properties have a sort of intentionality, Physical Intentionality (PI), closely analogous to, though not exactly the same as, the intentionality of the psychological (MI). The principal difference is that some MI properties have a representational content, that is how they 'point to' their intentional object, whereas no PI properties have content. Of the various philosophical reactions to PI, I have claimed that one, reductionism, is quite hopeless. When it comes to the powers of the fundamental particles we are, on the best available empirical evidence, at the bottom of the hierarchy of properties. There is nothing that PI could be reduced to. That leaves two options: eliminativism or realism. I prefer the latter position, but the material so far has not amounted to a clincher on why we should go realist about PI-properties. Such a clincher would give a powerful reason for accepting the account on offer by showing that it is capable of solving a number of really important outstanding philosophical problems. Only when we have fully worked out theories of causation, laws of nature, modality, and everything else that powers can explain, will we have the clincher. The study that is contained here is, to that extent, incomplete. Enough has been said, however, to point in the right direction and, perhaps, to direct others to find the final clincher.

12.1 Towards a Dispositional Theory of Causation

In what follows I shall take for granted the *primacy of singular causation* (cf. Tooley). By that I mean that a singular causal state of affairs is not constituted by a generalization. 'Aspirin relieves headaches' is made true by 'This aspirin relieves this headache', 'That aspirin relieves that headache', and so on for all aspirin within the domain of quantification. On the other hand 'This aspirin relieves this headache' is made true solely by the particular action of this aspirin on this particular headache. The primacy of singular causation is independent from, but will be well allied to, a dispositional theory of causation. The general idea of the dispositional theory of causation I favour is as follows.

First, there exists no fully adequate nominal definition of 'cause' (developed in 12.1.1). At least, we do not know of one. The available theories are bad in part. *Regularity*, found famously in Hume, is defeated by the singularity of the causal nexus, by which I mean that causation is intrinsic to the system of the relata. Whether event *c* causes *e* is a matter intrinsic to *e* and *c*, while the regularity theory allows that *c* causes *e* if and only if there are other events standing in appropriate relations. *Manipulability*, found in Collingwood and Gasking, is idealist, hence loses the objectivity of causation, assumes the asymmetry of the causal relation, has no *literal* application to natural causation, is, qua definition, circular. The *Counterfactual analysis*, by David Lewis, and the *Probability-raiser theory*, from Eells, Tooley, and Mellor, are both open to the Euthyphro objection: it is causal dependence that explains any counterfactual dependence and increase in probability rather than vice versa.

Second, this leaves the question: what is the a posteriori discoverable real essence of causation? It is somewhat misleading to think of this as giving us only a picture of 'what causation is in this world'. In the most general sense, causation is generative behaviour of objects that is governed by their properties. This is the essence of causation, which means it is what causation is in any possible world. The hypothesis is that causation is a natural kind.[1] That implies that the causal nexus has a kind of unity that is appropriate to a natural kind. Causation on all its occasions must be one thing and not a heterogeneous disjunction of many

[1] Strictly speaking one should say 'natural relation'. But the expression 'natural kind' is familiar and well entrenched in philosophical discourse, so it seems better to stick with it.

different things. We are looking for the causation trope that all other causation tropes resemble exactly. According to the proposal in 1.1, purely a priori knowledge will not suffice to tell us the nature of *K*, where *K* is a natural kind. A successful analysis of the concept *K* tells us which features of reality we have to select when identifying something as a *K*: the conceptual analysis of natural kinds explains reference fixing. But to learn the nature of *K*s we have to rely on current best science and/or other sources of a posteriori knowledge. Our metaphysical theory starts from, but is not exhausted by, conceptual analysis.

12.1.1 *On defining 'cause'*

Causation is among the most thoroughly studied topics in contemporary metaphysics, yet we do not know of one fully adequate nominal definition of 'cause'. All the philosophical theories of causation now in business face serious and seemingly unanswerable objections. I cannot argue systematically for this sweeping claim here, but I can assemble brief reminders of the main points that feature prominently in the modern literature.

Causation as regularity. This is the first of a number of theories we have inherited from Hume. There is serious doubt about whether constant conjunction is either necessary or sufficient for causation. Orthodox regularity theories have difficulty in accounting for that paradigm of causality, causation in a particular instance (singular causation). An even more important objection to regularity theories, one that is in fact fatal to them, is that because there exist both causal irregularities and accidental regularities, the theory is unable to deliver a distinction between *post hoc* and *propter hoc*—something that any theory of causation must do. Regularity may be a significant guide in the search for causes, but it is not constitutive of causation. Hume's great idea was born from, and in turn reinforced, a tangled mixture of epistemology and metaphysics that we are still trying to unravel to this day.

Causation as counterfactual dependence. This is based on another suggestion by Hume, viz. that causes are conditions *sine qua non* of their effects. It has proved difficult to make this idea immune to counterexamples of the stand-by causes, or of the double pre-emption, kind. The central objection, however, is again one of broad principle: we have no satisfactory account of the meaning of strong conditionals, except an informal understanding that they express some kind of 'ne-

cessary connection' between antecedent and consequent. It has not proved possible to explicate this intuition without implicit circularity: the counterfactuals that state the dependence of some events on others are themselves made true by the existence of some causal nexus between the events in question. David Lewis has made a heroic effort to defend a reductive idea of counterfactual dependence that could be used in a non-circular definition of causation. Lewis's analysis of counterfactuals, in terms of overall comparative resemblance between possible worlds, succeeds in avoiding the trap of circularity, but only at the expense of making the account of causation irredeemably anthropocentric. Many of us regard this loss of objectivity in the analysis as an indication that Hume's alternative theory of causation also leads to a philosophical dead-end.

Causation as human production/prevention of events. This was introduced by Collingwood (1940), and later generalized and defended by Gasking (1955). Of all the theories of causation that still have followers, it is perhaps the weakest. It de-objectifies causation. It assumes the asymmetry of causation as a datum to be explained (on this, see below, 12.1.2). It has no *literal* application to natural causation removed from the possibility of human manipulation. It is, qua definition, circular.

Causation as the enhancing of chances. On this view 'causation is that . . . relation that determines the direction of the logical transmission of probabilities'.[2] People have cited cases of causes that reduce, rather than raise, the probability of their effects, as counter-examples to this theory. The theory lacks the generality required of an analysis of the concept. There is even a problem with its application to those causes that do increase the probability of their effects. For purposes of this theory one needs objective, as against merely subjective, probabilities. What is the explanation of such probabilities? Not the classic (Reichenbachian) frequency theory, for reasons canvassed in 6.2. A more plausible explanans of objective probability may be something like a Popperian propensity, which is an overall dispositional characteristic of the 'test' situation. It is this propensity that fixes the probability of a given outcome in that situation. If this is anywhere near the mark, and propensities determine probabilities, while the latter constitute causes, the reference, within a theory of causation, to the 'direction of the transmission of probabilities' is simply *otiose*. The theory of

[2] Tooley (1987: 251).

causation as *that which enhances the chance of effects* collapses into one which explains causation in terms, ultimately, of propensities, that is, powers. In the explanation of causation, 'probability raising' is either useless (inapplicable) or redundant.

Causation is a hugely important, all-pervasive feature of reality. Our search for a definition of it is faring badly. I suggest that the reason for this is precisely that causation is a natural kind, and that when we conceptualize natural, as opposed to artificial, kinds we do so primarily for purposes of reference fixing (1.1). The concept itself is rough-and-ready, as nominal definitions of natural kinds often are. 'Cause' can be adapted for use in local circumstances, for purposes on hand, without the need for a perfectly general definition. It seems in fact that it is not possible to give a comprehensive and consistent systematization of *all* the conceptual data.

12.1.2 *The contested characteristics of causation*

In this section I ask which of the alleged conceptual facts about causation should our metaphysical theory try to cover and which should it ignore? This will support my conclusion that there is no purely *descriptive* analysis of the concept. All theories are *revisionary* to some extent, that is, they do not merely report/record 'the concept we have'. I think we should accept as final our inability to make sense of causation by purely analytic, a priori, means. It is not an intellectual catastrophe, because we have a posteriori access to causes. We *know from physics* what causation is, even if we do not know it from philosophy alone.

This is the background to the following subsection of this chapter in which I indicate some of the elements from which an understanding of the relation of powers and causality may be constructed.

Much of this (see Tables I and II) is obvious and uncontroversial. I'll discuss two of the points that are not.

A. *Denying self-causation* (*I.a.ii*)

What could motivate someone to think that self-causation is possible?

First, someone may think that it is logically possible that there should be extended closed causal loops: 'e_1 causes e_2, e_2 causes e_3, e_3 causes e_1.' This is not a pure case of reflexive causation, only of causation that is reflexive *if* it is transitive. To get a clear example of reflexive causation per se, one would have to find a case of a *minimal*

closed causal loop, that is, a case of e_1 causing e_1. Such examples are scarce.

Second, someone might take a case of *ex nihilo* creation to be reflexive causation. I find it hard to see the justification for such a move. Since a cause cannot act before it exists, and an effect does not exist until it is caused, self-causation has to be *instantaneous* and *simultaneous*. How does this differ from the *uncaused* appearance of the event? I don't mean, how can we tell, but what is the *fact of the matter* in the differentiation between x instantaneously popping up out of nothing on the one hand, and on the other, x causing itself? Self-causation is ontological bootstrapping and that seems objectively no different from a causeless happenstance. It is hard to argue for something as obvious (the dictum standing at the head of Chapter 5 seems apposite here too).

Finally, if you are Humean and believe that anything can cause anything, then you cannot afford to deny the possibility of self-causation. The rest of us may think that this just strengthens the case against Humean Distinctness.

I. Formal (logical) Attributes

		Description	Definition	Complete cause	Partial cause	Comment
(a)	(i)	**Reflexive**	$C(x,y) \rightarrow C(x,x)$	0	0	No self-causation.
	(ii)	*Irreflexive*	$C(x,y) \rightarrow \sim C(x,x)$	1	1	
	(iii)	*Non-reflexive*	$\sim[C(x,y) \rightarrow C(x,x)] \wedge \sim[C(x,y) \rightarrow \sim C(x,x)]$	0	0	
(b)	(i)	**Symmetrical**	$C(x,y) \rightarrow C(y,x)$	0	0	Mutual causation is possible.
	(ii)	*Asymmetrical*	$C(x,y) \rightarrow \sim C(y,x)$	0	0	
	(iii)	*Non-symmetrical*	$\sim[C(x,y) \rightarrow C(y,x)] \wedge \sim[C(x,y) \rightarrow \sim C(y,x)]$	1	1	
(c)	(i)	**Transitive**	$[C(x,y) \wedge C(y,z)] \rightarrow C(x,z)$	0	0	Some causal chains have transitive links, some do not.
	(ii)	*Intransitive*	$[C(x,y) \wedge C(y,z)] \rightarrow \sim C(x,z)$	0	0	
	(iii)	*Non-transitive*	$\sim\{[C(x,y) \wedge C(y,z)] \rightarrow C(x,z)\} \wedge \sim\{[C(x,y) \wedge C(y,z)] \rightarrow \sim C(x,z)\}$	1	1	

II. Non-Formal Symmetry Attributes—A. *Temporal Orientation*

		Description	Definition	Complete cause	Partial cause	Comment
(a)	(i)	**Forward causation**	A cause must precede its effect.	0	0	There is no a priori restriction on the temporal orientation of causation.
	(ii)	*No backward causation*	A cause must occur not later than its effect.	0	0	
	(iii)	*Omni-directionality*	A cause can occur before, after, or simultaneously with, the occurrence of its effect.	1	1	

II. Non-Formal Symmetry Attributes—B. *Compositional Orientation**

(b)	(i)	*Sideways causation*	$\sim[C(x,y) \rightarrow \sim(\exists z)(x \in z \wedge y \in z)]$	1	1	One part of a whole can cause another part.
	(ii)	*Downwards causation*	$(\exists z)(x \in z) \rightarrow \sim C(z,x)$	1	1	A whole cannot cause its part(s).
	(iii)	*Upward causation*	$C(x,y) \rightarrow \sim(x \in y)$	1	1	A part cannot cause the whole of which it is a part.

* The symbol '$\in$' is used to mean 'is a proper part of ——'.

B. *Denying asymmetry* (*I.b.ii*)

This is based on the 'two cards leaning on each other' case, which I interpret as Pollock (1976) does, viz. as a case of mutual-simultaneous causation.[3] Frankel (1986) disputes this interpretation.

Consider the card-house example. Let t, an interval during which the King and Queen both remain in place, be divided into intervals $t_1, t_2, \ldots t_n$, such that the intervals between each t_i and t_{i+1} are as small as desired. This approach will depend on the controversial assumption that (at least in this case), cause and effect are not simultaneous but rather (possibly instantaneously) successive.

[3] Pollock (1976: 173).

Let K_1 = The King's standing during t
Q_1 = The Queen's standing during t
K_2 = The King's standing at t_i
Q_2 = The Queen's standing at t_i.

On the above representation, K is not the cause of Q, nor is Q a cause of K (i.e. there is no mutual causation). However, K_1 is a cause of Q_2, Q_1 is a cause of K_2, and in general, K_{i-1} is a cause of Q_i and Q_{i-1} is a cause of K_i. Indeed, K and Q are not even counterfactually dependent on one another. Rather than one bi-directional causal chain:

$K \leftrightarrow Q$

there are two causal chains:

$K_1 \rightarrow Q_2 \rightarrow K_3 \rightarrow Q_4 \ldots . \rightarrow K_{n-1} \rightarrow Q_n$

$Q_1 \rightarrow K_2 \rightarrow Q_3 \rightarrow K_4 \ldots . \rightarrow Q_{n-1} \rightarrow K_n$.[4]

These two causal chains do not specify a cause for either K or Q. Instead they specify a cause for K^* and Q^* respectively, where

K^* = The King's standing during t_2–t_n, and
Q^* = The Queen's standing during t_2–t_n.

K^* and Q^* are only proper parts of K and Q in that they omit the first period of each, namely K_1 and Q_1. It seems that in order to show that K and Q are not each other's cause, Frankel interprets the two-cards case so that neither K nor Q is assigned any cause whatever! This is the *reductio* to which the rejection of mutual causation is exposed, if we follow her proposed analysis of this case. Her other suggestion, to the effect that the appearance of mutuality can be dissolved by redescribing cause and effect, also misses the mark: causation is a natural, description-independent relation.

It is worth noting that another type of example of simultaneous causation sometimes mentioned by philosophers, does not succeed. Richard Taylor suggested that the motion of the locomotive is simultaneous with the motion of the caboose it is pulling, and Charlie Martin has made a similar proposal about the turning of the key and the turning of the lock. These cases do not work because they need the transfer of energy at a *finite rate* from one point to other distant ones. Simultaneous movement could only occur if the bodies that push and pull, and those that are being pushed and pulled, were perfectly rigid. The bodies however can only be perfectly rigid if there could be *instantaneous*

[4] Frankel (1986: 365–6).

transfer of energy between distant points. Taylor's and Martin's cases involve counter-nomic idealization. Any actual cases of this sort only appear to be simultaneous but are not really so, while the cases where we imagine simultaneity involve physical impossibilities. I cannot think of any good examples of simultaneous causation involving changes in dynamic quantities. Simultaneous, and mutual, causation belongs to what David Armstrong aptly called 'supporting causality': cases that involve causal exchange by contact and consist in the maintenance of a static equilibrium: the mutual causal dependence of two states of affairs. Unfortunately, the division of the domain of causation into the dynamic and the supporting only provides sufficient conditions for distinguishing those instances of the causal relation that are not symmetrical from those that are. Necessary and sufficient conditions would be good to have, but I don't think we can find them.

12.1.3 *Effects are polygenic; manifestations are not*

Coarse macroscopic (or microscopic) events that have causes—that is, events that are effects—are typically not identical with the manifestation of a power. Events are typically not what a power manifests but what a number of different powers in combination manifest. Events are typically *polygenic*. I take the term from Dupré (1993) who in turn takes it from genetics: '*Polygenic*. Determined by many genes at different loci, with small additive effects.'[5] It seems that no matter how we divide an organism into phenotypic traits, 'many genes will typically contribute to the production of a trait'.[6] Consequently, in genetics polygenicity is the rule rather than the exception. I use 'polygenic' in an extended sense, to indicate that this aspect of the production of traits is also commonly to be found outside genetics, in the production of events of all kinds. The converse of *polygeny* is called *pleiotropy*: that one gene typically contributes to the production of many traits. I will also use 'pleiotropy' in an extended sense. This allows us to say that powers are pleiotropic. They make a contribution to many effects. The same power must always make the same contribution, however, no matter how different the effect. This is not to be confused by the confused issue of single versus multi-track powers (see 12.1.4, below).

The immediate consequence of recognizing polygeny and plei-

[5] Thompson and Thompson (1980: 356–7). [6] Dupré (1993: 123–4).

otropy is that we must sharply distinguish between *effects* and *manifestations*. Many powers typically participate in the production of *any* complex event. Conversely, each power participates in the production of many different types of event. Manifestations are isomorphic with powers because each power gets its identity from its manifestation. Effects, that is, occurrences that have causes, are not isomorphic with the exercise of powers, considered distributively. A manifestation is typically a *contribution* to an effect, an effect is typically a *combination* of contributory manifestations. In other words, events are usually related as effects to a collection of interacting powers. Each power has one manifestation, each manifestation is the product of the exercise of one power. Of course, this contributory manifestation does not determine the effect on its own. The effect depends on the exact 'mix' of contributions by *all* the contributing powers. Effects are always events, something that happens, but there is a sense in which the exercise of a power need not yield the manifestation as a distinct, free-standing 'occurrence-substance'.

Polygeny and pleiotropy are very important in understanding the nexus between powers and causation. The relation between *manifestations* and powers differs from the relation between *effects* and powers. In the case of an effect, one can distinguish partial cause(s) from the complete cause. In the case of manifestations of a power no analogous distinction applies. Manifestations are strictly isomorphic with, and necessarily linked to, the properties that they are manifestations of. Not so effects.

These points can be illustrated by a simple example. Two draft horses are pulling a barge by ropes, one from one side of the canal, the other from the opposite side. The direction of the pull by each side is at an angle to the canal itself. The outcome is that the barge moves straight ahead, in the direction of 'C' in Figure 6, although nothing pulls it along the straight line. This shows the difference between manifestation and effect neatly: the manifestation of each horse's power is a force along an angled direction, but no movement along this direction occurs, only the combined force of the two pulling sides is effective and it results in a straight-ahead movement.

Of the classics, only Mill recognized the importance of polygeny for the theory of causation. He noticed that polygeny is 'almost universal, there being very few effects to the production of which no more than

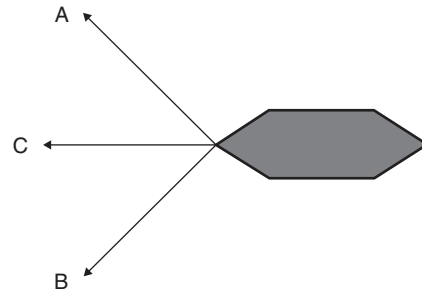

Fig. 6

one agent contributes'.[7] Mill tells us that there are two types of cases in which 'several agents' contribute to the one effect. In the first type, which he calls *Composition of Causes*, 'we can compute the effects of combinations of causes, whether real or hypothetical, from the laws which we know to govern those causes when acting separately'.[8] In the second type of polygeny, exemplified by chemical reactions, these computations cannot be performed, and the effects of the cooperation of several agents are 'surprising', for example, the known laws of the properties of oxygen and of hydrogen do not jointly imply the properties of water. Is this difference between the types of polygeny a reflection of merely epistemic differences? Is it just a matter of our not knowing the 'laws of combination' that govern individual substances when they enter into chemical combinations? Or is there a fundamental, metaphysical difference at work here? Mill, as I read him, refrains from deciding this issue: he would like to think that at bottom nature is everywhere ruled by Composition of Causes, but he cannot dismiss the evidence that suggests the possible ineliminability of surprising effects.

The important question, for us, is what happens when a number of distinct powers combine to yield a single effect? What is it for manifestations to combine? Mill has an answer but it is, as Cartwright (1983) suggests, unlikely to be true. Speaking of the composition of forces in physics, which for him is a special case of the Composition of Causes, Mill writes:

> In this important class of cases of causation, one cause never, properly speaking, defeats or frustrates another; both have their full effect. If a body is pro-

[7] Mill (1893: Book III, ch. VI). [8] Ibid.

pelled in two directions by two forces, one tending to drive it to the north and the other to the east, it is caused to move in a given time exactly as far in both directions as the two forces would separately have carried it; and is left precisely where it would have arrived if it had been acted upon first by one of the two forces, and afterwards by the other.[9]

Mill is being the naive realist here: according to his interpretation of Figure 6, if, in the interval t_1–t_2, horse A pulls the barge at an angle towards the northern shore of the canal and horse B pulls it at an angle towards the southern shore, then in that time the barge will move first (?) towards the northern shore as if horse B were absent, and then, second, towards the southern shore as if horse A were absent. At t_2, the barge will have reached the point, nearer to C, that results from the *succession* of these two movements. Both component forces result in movements that are real in the sense that they actually take place. The trouble for the naive realist's story is that if the forces are exercised simultaneously, then these separate motions do not actually take place. The only *actual motion* of the barge is along the straight line towards C.

Nancy Cartwright's own proposed solution to the combinatorial puzzle is frankly instrumentalist:

> The vector addition story is, I admit, a nice one. But it is just a metaphor. *We* add forces (or the numbers that represent forces) when we do calculations. Nature does not 'add' forces. For the 'component' forces are not there, in any but a metaphorical sense, to be added; and the laws that say they are there must also be given a metaphorical reading.[10]

Cartwright goes on to suggest, correctly I believe, that the laws of force that apply in these cases do not describe total behavioural outcomes for objects, but describe those properties of objects that are responsible for the behaviour. The problem for anyone who would be instrumentalist, or otherwise anti-realist, about the component forces is how to contain the anti-realism so that it does not engulf the nomological properties themselves and, eventually, their bearers.

The distinction between the *telos* of an action and the unintended consequences of an action in the individual case, as well as in the social case (where the outcome of *every* collective action represents the failure of *some* of the intentions with which people participated in it),

[9] Ibid. [10] Cartwright (1983: 59, original italics).

parallels the distinction between manifestations and effects in the physical (general) case. Just as the outcome of social (collective) action is intention-independent, in the sense at least that the outcome is neither the whole, nor a part, of something that was intended by *all* the agents who collaborated in bringing it about, so a typical physical macro-effect is not itself the manifestation of one disposition, but the outcome of the joint (interactive) exercise of a bunch of powers not one of which has that outcome as its manifestation. Perhaps the question of social atomism (the Vico-Anderson question) has an answer—polygeny. While ontologically there is nothing over and above individuals and their properties (actions), *causally* there is.

12.1.4 *Single-track versus multi-track powers?*

I want to keep the issue of the polygenic–pleiotropic divide, in respect of powers, distinct from the issue of single and multi-track powers. Ryle once observed that 'some dispositional words are highly generic or determinable, while others are highly specific or determinate'.[11] Since then it has become orthodox to say that there exist two sorts of powers, 'single-track' and 'multi-track'. For example, Mackie (1973) holds that there are these two sorts of dispositions, while agreeing that 'this distinction is not a very sharp one'.[12] He gives these examples:

> Fragility is manifested only by the object's breaking upon some sort of impact, but a high temperature is manifested by the thing's feeling hot, by the response of a thermometer in contact with it, and perhaps in other ways as well . . .[13]

To what is the distinction intended to apply? To dispositional descriptions (predicates)? As we saw (1.3.2), it is always possible to make the description of a manifestation more determinate. If then by 'single-track' powers we mean ones whose manifestation can only be given by a unique, fully determinate description, then it appears that one cannot find any single-track dispositions. All power *predicates* are multi-track. If, on the other hand, the distinction is applied to properties, a different problem arises. This is evident in Mackie's example: a thing with high temperature feels hot only in possible worlds that contain heat-sensitive creatures; and it elicits responses from an adjacent thermometer only if there is a thermometer in contact with it. These outcomes are only *contingently* related to the having of a high temper-

[11] Ryle (1949: 114). [12] Mackie (1973: 122). [13] Ibid.

ature. If they were manifestations, their connection with the disposition would be *necessary*. The examples of the plural manifestations of the so-called multi-track dispositions, are therefore not manifestations at all.

12.1.5 *Laws of nature*

There are two kinds of conceptions of laws of nature:

(A) *Transcendent laws*—imposed, legislated, extrinsic: e.g. divine legislation (Berkeley, Burke, etc.).
(B) *Immanent laws*—descriptions of the grounds for necessary connections among existents.

I take it that (B) is the only conception of laws of nature that the analytic metaphysician will entertain. The question then arises of what, if anything, is the immanent grounding of a law of nature. In my view, it is powers. More needs to be said, however. Specifically, we must say whether laws 'describe' powers, or supervene on powers.[14] Because fundamental powers are *pleiotropic*, and the explananda events are *polygenic*, there is good reason to say that 'direct' determination does not hold: there are no single powers which are, by themselves, sufficient to explain the typical manifestation outcomes we are interested in explaining. We cannot say, therefore, that a law is simply a description of a kind of power. This leaves the supervenience relation as the victor. Laws of nature supervene on (are necessitated by) the simple powers of the objects of the world. Powers are the truthmakers for the laws. Behaviour is determined holistically, by (i) the totality of the relevant (necessary) laws, and (ii) the totality of the relevant (contingent) initial conditions.

12.1.6 *Summary*

Causation is a natural kind. Unlike other natural kinds that are objects—stuff or things—causation is a natural kind relation. Because of this, the distinction between conceptual criteria (nominal essence) and metaphysical nature (real essence) applies. The former is, as ever, only 'for the most part and approximate'; the latter is in terms of powers of the participating objects.

[14] Cf. Bird (1998) on multi-track dispositions.

12.2 Modality

12.2.1 *The options: Reductionism versus eliminativism versus primitivism*

The live options in the philosophy of modality are reductionism, eliminativism, and primitivism. Primitivism is the doctrine of the irreducibility and ineliminability of modality. Reductionists and primitivists agree that there are important modal facts with which philosophy must reckon, but while reductionists believe that modality can and ought to be reductively explained, primitivists hold, in agreement with eliminativists, that reductive analyses do not work. The eliminativist's picture is that there are no modal facts at all, contrary to the other two positions, so there is nothing either to be explained reductively or to be adopted as metaphysically primitive. I support a position broadly sympathetic to primitivism.

Although there are significant differences among various reductionist analyses of modality, the motivation of all such theories appears to have a common core. It is the belief that modality stands in need of explanation and only reductive accounts can offer a satisfactory explanation of modal facts. For example,

> If . . . you wish to use unexplained modalities to construct a variety of theories, that is fine. But such theories cannot help us in explaining the nature of truthmakers for modal truths.[15]

The principle behind this remark appears to be this: the nature of the truthmakers for statements involving a concept, C, can only be explained by theories in which C has no essential occurrence as a primitive. As there cannot be a non-circular theory which contains nothing but elements defined in terms internal to itself, it follows that a theory which explains the nature of the truthmakers for statements applying C, must contain some primitive(s) other than C. Having some primitive(s) in your theory is unavoidable, the philosophical task is to find a principled method for selecting primitives. You can be reductionist about modality only at the cost of adopting some other unexplained concept(s) as fundamental in your theory. It is a trade-off among primitives. Being told that primitives cannot explain the nature of the truthmakers for their applications does not help in finding the best deal in this market.

I propose three regulative principles (criteria) that between them are

[15] Bigelow (1988: 44).

meant to do justice to our philosophical intuitions about when the selection of a particular concept as a theoretical primitive may be justified. I state the criteria very informally, more or less as rough sketches. Each of them applies only ceteris paribus. There is no proof that the joint application of these criteria will yield a unique answer in every situation in which we are constructing a theory. I simply hope that that will turn out to be the case, or, if not, then at least there will be some easy to find and obvious supplementary criteria which can be applied as tie-breakers. Of course such supplementary criteria should not be invoked purely ad hoc but must have some general justification.

(i) *The historical test*. There are two parts to this criterion. First, the primitives of a theory are to be chosen preferentially from among those concepts which have a history of having been subjected to sustained, long-running attempts at reduction. Truth, for example, or causation. Second, these attempts are adjudged to have failed or at least not gained anything like general acceptance among philosophers who share broadly similar methodological assumptions. The thrust of criterion (i) is that primitivism about a concept is to be seriously considered, whenever reductionist accounts of the concept are themselves in trouble.

(ii) *Explaining the irreducibility*. The historical failure of reductionist analyses must itself be satisfactorily explained. We must be able to show that there is a strong underlying reason why the efforts at reduction have not succeeded, or have not been widely accepted. The traditional way of doing this has been to argue that the concepts which resist reduction are of such fundamental and pervasive character as to make it impossible or extremely difficult to find a reduction-base. As all the reasonable candidates for the reduction-base are themselves tainted with the to-be-reduced concept, attempts at reduction fail through circularity. Irreducible, or apparently irreducible, concepts tend to be of great centrality to science and to common sense, and it is this centrality that explains the irreducibility. Truth and causation are again examples, but so are existence and resemblance and modality itself.

(iii) *The clarity and distinctness test*. Primitives are the undefined and therefore least explained parts of a theory, the parts whose role is as definiens of the other parts. It seems natural therefore to expect that the concepts that figure in theory without benefit of (non-circular) definition should not be mysterious or opaque to pre-theoretical

understanding. We must have some kind of intuitive grip on the primitives which we do not gain from, but bring to, the theory, although the theory may in turn extend and/or amend and/or deepen and/or reinforce our prior hold on the primitives. So a reasonable rule may read thus: from among the candidates thrown up by the application of the first two criteria, select the smallest subset which serves the theoretical purpose in hand and which meets the condition that its members are pre-analytically clear, deeply entrenched, widely used, and familiar concepts. Admittedly these are somewhat vague instructions. How familiar and clear one finds a concept depends on one's background knowledge and attributions of familiarity and clarity may therefore vary from person to person. However, I do not think this vagueness should be exaggerated, it is not total and may be controlled for. For instance, background knowledge is not indefinitely variable but has its invariants both cross-culturally and interpersonally. It is probable that 'what everybody knows' will include grasp of the very concepts that cover many perfectly general, obvious, pervasive, and fundamental features of the world, just the sort of concepts that are apt to serve as candidates for primitiveness in one's metaphysical theory. I do not see epistemologically based vagueness as vitiating the clarity and distinctness test.

My defence of the irreducibility of modality involves a two-stage strategy. First I must show that 'necessity' satisfies the three criteria just laid down. In doing this I shall be siding with eliminativists against reductionists to argue that reductive analyses are all crucially defective. Then I will change sides in this three-cornered struggle and join reductionists in arguing that the wholesale denial of modal facts has quite unacceptable costs. The failure of reductionism does not justify eliminativism. Primitivism thus emerges as the default position once we have good reasons for rejecting the alternatives. This leaves still another important question about modality to be settled. Philosophers sometimes suppose that there are many different kinds of necessity (logical, physical, etc.). Are they right? I think that they are not, that necessity is non-generic.

12.2.2 *Reductionism (1): Combinatorial theories*

Combinatorialism (for example, the doctrine of modality contained in the *Tractatus*) is the theory that the world consists of various elements which occur in certain combinations that have a determinate form (a

de re logical form, as it were). It is convenient to regard the ultimate distinct elements of the theory as atomic (although convenient it is not necessary to do so as combinatorialism without atoms can work). A statement of possibility is one which states that some elements exist in some combination having the proper form. If the statement is true, then what it states is possible because it is actual. If the statement is false, then what it states is a mere possibility. In either case, combinations and recombinations of the given elements yield all the possibilities. Such is a highly condensed résumé of the combinatorial theory of modality for present purposes. I hope it contains enough to secure a context for the discussion below.

According to combinatorialism all the atomic elements are unrestrictedly recombinable. This is the content of Hume's 'Distinctness Thesis' (DT), the famous denial of necessary connections holding among distinct existents.[16] DT is essential to combinatorialism but also a source of serious difficulties for it. The combinatorialist cannot allow that there are (simple) properties which necessarily coexist or which necessarily fail to coexist, on pain of introducing modal facts inexplicable combinatorially. Yet prima facie there are many properties that exclude one another and many properties which necessarily co-occur. Combinatorialism is threatened by a tidal wave of counter-examples.

Combinatorialists at large have not taken up arms in defence of DT, with the honourable exception of Armstrong who does discuss a range of cases in which the incompatible properties are determinates falling under a common determinable.[17] The strategy is to treat these as structural universals linked with extensive quantities. An object cannot have two different weights or heights or velocities or other determinates falling under a quantitative determinable, because the universal which is the lesser quantity is a proper part of the universal which is the larger quantity and therefore an object cannot coinstantiate both. This invokes the mereological principle of the necessary non-identity of a proper part with the whole. According to Armstrong the non-identity is analytic, that is, it follows from the meaning of 'proper part'

[16] I take the name 'Distinctness Thesis' from Caroline Lierse. Hume gave two versions of DT. A causal version—Anything may cause anything—and a generalized metaphysical version—There are no necessary connections between distinct existences. The modal character of both formulations is obvious.

[17] Armstrong (1989*b*: 77–86).

and 'whole'. For disposing of intensive quantities, to which this treatment cannot be applied neat, two suggestions are made. There is first a claim that apparently intensive quantities are only superficially so and they may be reducible to extensive quantities. Second, there is a suggestion that intensive quantities may be dispositional. Finally, for secondary qualities, e.g. colour incompatibilities, it is argued that these are really structural universals, appearance of simplicity notwithstanding, of primary qualities, and that the incompatibility of the secondary qualities is itself reducible to the incompatibility of the underlying (quantitative) primary qualities.

A combinatorialist may want to explain determinate exclusion as the impossibility of applying a whole structural universal and a proper part of that universal to the same individual and in turn explain this impossibility in terms of analyticity. Or a combinatorialist may want to leave the mereological incompatibility unexplained, as a primitive necessary relation. The former alternative raises the question, is analyticity an adequate explanation of necessity? (I am not asking Quine's question.)

In order to understand the relation between analyticity and necessity we need to use a distinction such as that between sentence and statement (Strawson, 1952) or character and content (Kaplan, 1978). I shall use the terminology 'sentence' and 'proposition'. The essence of the distinction is that it is the sentence that is the bearer of meaning and the proposition that is the bearer of truth and hence of modality. Sentences and propositions are not isomorphic, for one sentence may express different propositions and different sentences may express the same proposition (*pace* those who postulate indeterminacy of translation). Since analyticity is meaning-linked truth-value, it can be defined as the property some sentences have of guaranteeing the truth of propositions expressed in their use:

S is analytic $\equiv_{df} (\forall x)(\forall o)(\forall P)[(x$ uses S on occasion $o) \Rightarrow (x$ uses S on occasion o to assert $P \supset P$ is true)]

Kaplan (1979) has pointed to certain sentences containing demonstrative expressions which satisfy this definition but which express only contingent propositions. 'I am here now' is a specimen. Clearly every utterance of this sentence expresses a contingent proposition that is true solely by virtue of the meaning of the sentence uttered.

Thus we have a class of analytic contingent propositions. The most famous member of this class is of course Descartes' 'I exist':

> Thus have I now weighed all considerations enough and more than enough; and must at length conclude that this proposition 'I am', 'I exist', whenever I utter it or conceive it in my mind, is necessarily true.[18]

Sentences containing demonstratives are not the only members of the class of analytic contingent propositions. For example, 'More than four things exist.' This demonstrativeless sentence is also one which on all occasions of utterance will yield a proposition that is true and contingent.[19] What these cases show is that 'p is analytic' does not entail 'p is necessary', and that if one wants to explain the necessity of a proposition one has to do more than point to the fact that its truth is due solely to the meaning of the sentence used to assert it.

On the alternative view we do not explain the part–whole relationship as analytic or as anything else, but use it as a modal primitive. This leaves two options. First, we make the primitive part–whole relationship foundational for the whole of our combinatorialism, perhaps along the lines of Bigelow (1988), which defines entailment as the containment of one universal by another, and from entailment then generates all the other modal concepts in the usual manner. Such a theory cannot be reductionist, of course, because it uses a mereological relation (the part–whole relation, or, 'containment') as a modal primitive. Williams (1963) who introduced the idea of 'entailment is containment' certainly did not think of it as something capable of explaining modality in a reductionist sense. Neither do I and for very much Williams's sort of reason: the part–whole relation is an 'intrinsic constitutive' relation and therefore when a particular, *a*, is part of another particular, *b*, *b*'s containment of *a* is a necessary fact whose necessity is

[18] Descartes (1641: Second Meditation). Need one say that Descartes did not think of himself as a necessary being, and that the 'necessarily' qualifying the 'true' relates that truth to each occasion of utterance?

[19] Kaplan allows for these demonstrativeless analytic contingent propositions, since in his Logic of Demonstratives, the Principle of Necessitation ($\vDash\phi \Rightarrow \vDash \Box\,\phi$) fails even for formulas with stable characters. The examples he gives are 'Something exists' and 'Something is located somewhere' (Kaplan 1979: 93). I once mentioned the phenomenon of analytic contingent propositions to David Armstrong (though not under that label). See his discussion of the example I gave—'Nothing exists'—at Armstrong (1973: 49). Today I would not use 'Nothing exists' or 'Something exists' as examples because their contingency has been questioned.

independent of any identifying descriptions given to *a* or *b*. (Believers in universals are free to say the same about the containment of one universal by another.) To reduce entailment to containment is therefore to reduce one modal concept to another. The second option is to dilute a combinatorial account of modality by adding to it, for some purposes, a mereological modal primitive. In order to reconcile their theory with the use of such a non-combinatorial modal concept, combinatorialists must drastically reconstrue DT. DT now excludes necessary connections only between wholly distinct existences, and here 'wholly distinct' is defined in such a way that a fully determinate quantitative property (or property reducible to a quantitative property) instantiated by some individual object is not wholly distinct from any other different quantity of the same property instantiated by any other object (or the same object at a different time). Restricting DT in this manner seriously reduces the range of application of combinatorial theory. It gives rise to modal dualism: the modal facts of the world are divided into two populous classes, one containing the facts involving only non-overlapping properties, the other containing the overlapping ones and a mixture of overlapping and non-overlapping ones. Only facts belonging to the first of these classes are explicable combinatorially, facts belonging to the second are to be explained by a mereological principle which has a modal status not derivable from combinatorialism and which therefore provides an independent constraint on the range of permissible recombinations.

We now have arrived at a version of DT heavily trimmed down from 'No necessary connections between distinct existences' to 'No necessary connections between wholly distinct existences'. This retreat is a response to counter-examples to DT of the determinate exclusion type. I have argued that it is not an adequate response, but I now want to turn to even more serious difficulties for DT arising from counter-examples that are not of the determinate exclusion sort. There are numerous cases of the necessary coexistence of determinates falling under different determinables. Examples include: shape-size-orientation, triangularity-trilateralness, equiangularity-equilateralness, loudness-pitch, hue-saturation, momentum-direction. Since the necessary connections here hold between what are (at least prima facie) different properties, solutions involving structural universals and reduction to the part–whole relation are not available (11.3). As far as I can see the combinatorialist's best, or perhaps only, chance concerning pairs of neces-

sarily connected properties is to deny that there are really pairs of distinct properties here. Unless such a programme of denial can be carried through DT may be discredited altogether. These are crunch cases for Humean metaphysics.

Start by noticing that 'necessary coexistence' covers two types of cases which we need to distinguish. First, when two properties, F and G, are so related that necessarily whatever has F also has G and vice versa, I will refer to them as 'necessarily conjoined'. Second, when F and G are so related that necessarily whatever has F also has G but not vice versa, I will refer to G as 'necessarily accompanying' F (or F as being 'necessarily accompanied by' G). Within the class of necessarily conjoined properties we can draw a further distinction, between determinables whose determinates are isomorphic in some quantitative dimension on the one hand, and determinables whose determinates show no such isomorphism, on the other. I will call the former 'co-varying properties', and the latter 'independently varying properties'. Being an *n*-sided closed figure and being an *n*-angled closed figure are co-varying properties, while pitch and loudness are independently varying properties.

Each of the three types of necessarily coexisting properties has a different bearing on DT. If F and G are conjoined co-varying properties, none of the determinates falling under these determinables (F_1, F_2, ... , F_n; G_1, G_2, ... , G_n) is available for recombination individually, they are only available pairwise: ($\{F_1 \Leftrightarrow G_1\}, \{F_2 \Leftrightarrow G_2\}, \ldots, \{F_n \Leftrightarrow G_n\}$). If F and G are conjoined independently varying properties, their determinates may be recombined but each object that has a determinate F must also have some determinate of G and vice versa: ($\{Fi \Rightarrow Gi\}$, $\{Gi \Rightarrow Fi\}$). Finally, if F is necessarily accompanied by G, then all determinates of G are freely available for recombination, but each object that has a determinate of F must be have some determinate of G: ($\{Fi \Rightarrow Gi\}$). Necessary connections of each of these three types, if they hold among distinct properties, are inconsistent with DT since they all restrict recombinability in some way, although they do not do it in the same way. It remains to evaluate the combinatorialist's claim that the allegedly distinct and necessarily connected properties are not really distinct. For this we need a criterion of property identity.

In recent times some philosophers have suggested an identity criterion for properties in terms of causal powers. The criterion provides a sufficient condition, which roughly speaking states that if apparently

distinct properties denoted by two non-synonymous predicates are the same power (make the same contribution to the behaviour potential of an object), then they are really identical, and a necessary condition: if two properties differ in the powers they confer on objects, then they are really two, and not one (think of this as the Indiscernibility of Identicals applied to properties).[20] It is important to see that the criterion (at any rate as I am going to use it) is not one in terms of occurrent causes and actual effects, but in terms of causal potentials/powers that have full-blown ontological status even when unmanifested. An object can have two properties, F and G, whose actual contribution to the effects produced by the object are the same, viz. nothing, because both F and G are unmanifested powers. The criterion is strong enough to distinguish F from G in this case, as it should. Using causal powers to individuate properties is a very attractive strategy, particularly for those of us who are ontologically serious about properties. If properties are real entities (whether universals or tropes), then they should come under the Platonic umbrella of being powerful. The powers criterion of property identity is consistent with the plain theory. It also has the further virtue of giving a metaphysical underpinning (in combination with the causal theory of perception) to our empirical knowledge of the world. A great bonus!

How does the criterion apply to the cases given above? Take 'accompaniment' first, for it is the easiest. Anything with speed must have direction although there can be vectorial forces that do not involve motion. Take an object moving at speed in a certain direction. It is evident that the powers that an object has by virtue of its speed are quite distinct from the powers it has by virtue of its direction (as ordinary road users well know). Since speed and direction are different powers, on the powers criterion of property identity they must be different genuine properties.

Very similar considerations apply to conjoined independently varying properties. Audiologists measure hearing loss in units that combine frequency (in MHz) and volume (in decibels). This is because the capacity of sound to produce hearing is a function of two uncorrelated quantities: sounds outside a certain frequency range are inaudible to

[20] This is the 'short' version of the criterion. Perhaps we need the 'full' version proposed by Shoemaker: 'F' and 'G' denote the same power iff being F is a power for the same manifestations as being G, *and* being F and being G are themselves manifestations of the same power(s) (cf. Shoemaker 1980: 135).

humans at any volume, just as sounds of any frequency are inaudible if they are below a threshold volume. There are also interpersonal differences in the way our hearing receptors react to pitch and loudness, for example people do not lose hearing uniformly over all frequencies. All this shows that the causal powers of sound due to pitch differ from those due to loudness. On the powers test pitch and loudness are shown to be non-identical.

Finally, and most controversially: cases of conjoined and co-varying properties. With these, the prima facie case for identity is the most promising, just because the fully determinate property instances are necessarily conjoined and cannot occur without each other. Here too, however, I think a strong case can be mounted for non-identity based on dispositional differences. Take the example of any suitably paired determinates of the determinables being an equilateral triangle and being an equiangular triangle respectively. The argument for their distinctness is based on one empirical premiss and two reasonable philosophical assumptions.

(1) We sometimes correctly perceive that a triangle is equilateral without at the same time perceiving that it is equiangular, and vice versa. The measurement of the sides and the measurement of the angles of a triangle are quite separate operations that apply different metrics to different quantities (length in one case and proportions of arc in the other). The measurements can be performed independently of one another.

(2) Veridical perception depends on the perceived thing causing certain effects in the perceiver. If the perceptual content of an observation of the sides of the triangle differs from the content of an observation of the angles of the same triangle, then, given the correctness of both observations, the difference itself depends (at least in part) on some causal factor in the triangle observed.[21] (This is the causal theory of perception, applied to the case in hand.)

[21] Putative counter-examples here may be claimed to arise from 'seeing under the aspect of' or 'seeing as' (e.g. Wittgenstein's duck-rabbit). If at first I see the figure as a duck, and then I see the figure as a rabbit, the difference is surely not due to anything in the figure since the figure remains unchanged! However, for this very reason we cannot talk here of veridical perception: seeing the figure as a duck is neither correct nor incorrect, as seeing it as a rabbit is neither correct nor incorrect—the two different ways I see the figure depend entirely on how I am constituted and not on any differences in external causes. Hence 'veridical' does not apply. This is quite consistent with admitting that if I perceive the figure as 'the standard psychology textbook illustration which can be seen as a duck or as a

(3) If what we perceive when we measure the length of the sides of a triangle differs from what we perceive when we measure its angles, and if this difference is, at least in part, a difference in effects caused by the triangle, then it is natural to assume that such a causal difference is due to some different properties of the triangle. And there are no good candidates for such a role other than the sides and angles of the triangle themselves. These properties are the ones that confer on the triangle the powers of manifesting the appearances of the equal sides and of the equal angles. This comes from the thesis, developed above, that the causal relation is reducible to, or explicable as, the manifestation of powers of the objects involved in the causal sequence of events.

These three premisses, combined with the powers test of property identity, yield the conclusion that equilaterality confers different powers on a triangle from equiangularity, and therefore they are distinct properties.[22] One source of resistance to this conclusion, I suspect, is a nominalistic reading of logic. A nominalist will only countenance first-order logic, and in first-order logic it is just not possible to directly express propositions that contain properties as values of variables or as singular referential terms. For example, identity statements of the form:

(1) F-ness = G-ness

are not directly translatable into the language of the first-order predicate calculus. In first-order logic you can only make claims about the identity or non-identity of the extensions of predicates. The only adequate seeming equivalent for (1) and kindred propositions is

(2) Necessarily $(\forall x)(Fx \equiv Gx)$

that asserts the necessary coextensiveness of F and G. This is the nominalist's substitute for the genuine identity asserted in (1). (2) is the closest you can come to giving an identity criterion for properties in first-order terms. It is close, but not close enough. To take properties

rabbit', I would be perceiving it veridically, whereas if I perceived the same figure as, say, a horse, I would be perceiving it non-veridically. This is because the first of these two perceptions involves identifiable causal factors in the figure which operate when I recognize 'the duck-rabbit illustration', and which fail to operate in the misperception as a horse case.

[22] A somewhat similar argument, in terms of causal relations, not powers, is given by Sober (1982), and criticized in Reinhardt (1989).

ontologically seriously is to apply Leibniz's Law (the Indiscernibility of Identicals) to them. If we can find any dispositional differences among necessarily coextensive properties, then we can use Leibniz's Law to show that, although (1) entails (2), (2) does not entail (1). Thus we can reject the substitute criterion offered by the nominalist as not giving a sufficient-and-necessary condition of property identity. Of course, care needs to be taken in the application both of the 'same powers, same property' criterion and the 'different perceptual effects, different powers' move. In order to make sense of these we need clear identity conditions for powers themselves.

In these examples we have been discussing properties that have some claim to be regarded as important characteristics of basic objects dealt with in the physical sciences (momentum-direction, frequency-acoustic volume, equilaterality-equiangularity) and as such likely to be among the simple constituents of other, more complex powers, rather than candidates for reductive elimination. They are certainly not artificial or contrived properties.

It seems very likely that the Humean combinatorialist's strategy of denying that apparently distinct but necessarily connected properties are not really distinct, in a sense damaging to DT, does not succeed. I cannot really prove that there are absolutely no other ways a Humean could deal with these crunch cases, but all the evidence (short of proof) points to that conclusion and hence to the falsity of DT.

There are problems for combinatorialism independent of DT. One of these concerns the ontological status of the unactualized combinations. What is the nature of the truthmaker for 'It is possible that *p*' in cases where *p* itself is false? There are a number of different types of answers on record in the literature. One might begin a taxonomy of these answers with the major distinction between (non-eliminativist) philosophers who treat *being* as generic and those who treat *being* as not generic. Among the former belong those who, following Meinong's Theory of Objects, distinguish between two kinds of *being*, *Dasein* and *Sosein*, with the objects that are the truthmakers for statements of mere possibility having *Sosein* but not *Dasein*. (Although these objects lack *Dasein*, they can be the subjects of singular reference, which is what justifies one in thinking of *Sosein* as a kind of being.) I have nothing to say about theories of this kind. Among philosophers who treat *being* as non-generic and 'existence' as univocal, there is a major bifurcation between those who think that mere possibilia exist,

and those who think that mere possibilia do not exist but are only represented. I will discuss an important theory according to which mere possibilia exist in the next section. Here I want to comment on theories that specify the truthmakers for statements of mere possibility as objects in the actual world.

According to the theory proposed by Adams (1974) possible worlds are world-stories, that is maximally complete consistent sets of propositions which between them describe non-existent whole worlds. Anything that any proposition *p* states is a mere possibility if and only if *p* is a member of one of these sets that are world-stories. The problems of this sort of view are well known. To mention but three: (i) The theory postulates propositions as mind-independent quasi-Platonic bearers of meaning ('objective propositions' in Russell's phrase). There is no reason to think that such things exist. (ii) The theory presupposes the undefined modal concept of consistency. As David Lewis points out, if the theory is intended as a reductive account of modality, which it is, then it fails because of circularity.[23] (iii) The theory has difficulties giving a unified account of the ontology of realized and unrealized possibilities. The latter are members of a set of propositions, but a realized possibility, something that is possible because it is actual, is not a member of a set of propositions because the actual world is not a set of propositions. Since 'possible' is not ambiguous, it is hard to see why we should be forced to accept a dualistic account of its semantics.

Some representational theories of possible worlds, known as 'fictionalist' theories, escape the problems of postulating Platonic propositions. According to fictionalism, world-stories are made up of ordinary meaning-bearers, naturalistically understood (sentences or statements or constructs out of these, as against objective propositions). The possible worlds are ontologically on par with any other fiction: stories that are told, novels that are written, etc. We are invited to think of the possible worlds as useful fictions, not unlike the ideal entities of scientific theories (gases made up of molecules of zero dimension, frictionless planes, etc.). The strengths of fictionalism are, first, that it does not platonize. Second, that it allows such unrealized possibilities as there are to supervene on, and be determined by, what is actual. (The combinatorial formation rules of the fiction tie the merely possible to the actual.) However, fictionalism has some serious

[23] Lewis (1986*c*: 150–1).

problems. First, an actual fiction—a story actually told—is a human artefact, the product of people's activities. To make possibilities ontologically depend on fiction is to rob possibilities of their objectivity.

We believe, and are right to believe, that much of what is possible and what is impossible is determined by the inherent nature of things that exist independently of human narrative effort. Suppose that there exists a very particular shade of purple such that no flower has ever been exactly that shade of purple. Surely the possibility that there should be a flower with just that shade of purple does not depend on whether anybody has told a story or made a stipulation. That possibility exists (or not as the case may be) quite independently of what fiction is generated by anybody. Fictionalism makes unjustified metaphysical concessions to literary pretensions. The world is not a story, nor are the world's possibilities stories. So while fictionalism ties mere possibilities to actualities, they are the wrong kind of actualities, namely mere yarns spun.

Another problem for fictionalism worth mentioning is that if fictions are the ontological ground of possibilities, then there are too few fictions. One needs isomorphism between the unrealized possibilities and their ontological basis in actuality. But what if the content of the actual stories told is numerically finite, while the unrealized possibilities are infinite? We cannot tell stories with numerically finite content that entail an infinite number of possibilities because we are not entitled, at this stage of proceedings, to a modal primitive like entailment. Infinitely many possibilities, fictionally grounded, require the enumeration within the fiction of an infinite number of combinations, which is impossible. One can conclude that there is no isomorphism of the required sort. I believe that these two difficulties for fictionalism are insurmountable.

There is another difficulty which besets all combinatorial theories and which, although well known, is worth mentioning here. It may be called the problem of the necessity of form. The combinations of the elements postulated by the theory must respect a certain form or structure that is invariant across all possible worlds.[24] Take a theory whose elements are individual particulars and properties. Now a property, F, can be a way an individual, *a*, is; a fact we can express as '*a* is F'. But an individual cannot be a way a property is; so it is impossible that there

[24] *Tractatus* 2.022.

should be something we could express as 'F is *a*'. Or again, if F is an *n*-placed property, then it must always be combined with exactly *n* particulars.[25] These and other formal constraints on combinations are necessary facts and we should be able to explain their necessity combinatorially. But this we cannot do, since form is precisely what constitutes something as an admissible combination of the elements posited by the theory and therefore form cannot itself be explained as a further combination. The problem of the necessity of form is that, for combinatorialism to be true, certain necessary facts must obtain whose modal status cannot be combinatorially explained. Combinatorialism, if true, is false. Wittgenstein 'solves' this problem by his distinction between what is sayable, on the one hand, and what cannot be said but only shows itself, on the other. All modal facts are unsayable. It can be a fact that *p* is possible yet the explicit assertion of this fact is nonsense. The unspeakable possibility of *p* can only reveal itself, for example it reveals itself by *p*'s not being the negation of a truth-functional tautology. That objects necessarily exist only in *Sachverhälte* shows itself by the fact that words can only occur meaningfully in *Sätze* and never by themselves. Indeed, the whole combinatorialist theory qualifies as unsayable. This 'solution', then, is part of what makes Tractarian combinatorialism viciously self-referential. It was famously damned by Ramsey's remark that what cannot be said cannot be whistled either.

Armstrong makes three suggestions towards resolving the problem of the necessity of form.[26] They are not mutually consistent. The first is that formal necessities of combinatorialism (and of logic in general) should be regarded as analytic. Remarks made above on analyticity apply here too. Explanations of necessity in terms of analyticity are at best only the beginnings of an explanation, given the non-empty category of analytically true but contingent propositions. Armstrong's second suggestion is that formal truths about combinations are, appearances notwithstanding, neither necessary nor contingent. This makes a major concession to eliminativism. Logical truths have often been thought to be the paradigms of necessary truths. If you give up the idea that the theorems of logic are necessary, why should you cling to the hope that anything else, which is bound to be less topic-neutral

[25] This is Armstrong's Principle of Instantial Invariance (Armstrong 1989*b*: 40).
[26] Ibid. 138–40.

than logic, will turn out to be necessary? It will be very difficult to concede logic to the eliminativist and to hold out on anything else. Quine has got you! The third and final suggestion is that formal necessities are modally primitive. In my opinion this is the way to go, but it involves (as Armstrong frankly acknowledges) abandoning the reductionist project and substituting for it a less ambitious 'attempt to systematize and organize the theory of the unanalysable modal data'.[27]

12.2.3 *Reductionism (2): Stark realism about worlds (Lewis)*

According to a proposal by David Lewis there are worlds other than the actual world, in the plain, literal sense of 'are'. These worlds are very much like our world in some respects: they are the mereological sum of the things they contain, and they are, severally, actual to those who inhabit them and non-actual to all those that do not. The possibilities unrealized in our world, the world we call 'actual', have truthmakers which exist in these worlds. (So this is a theory that says that mere possibilia exist.) Each world is unified by the spatio-temporal interrelatedness of all the things in it, and the many worlds are distinguished from one another by spatio-temporal, and therefore causal, separation. There are enough worlds to ensure that every possibility is realized in some world, thanks to DT which is adopted as the principle of plenitude and generously extended to include alien individuals and properties. Modality as unrestricted quantification over everything that exists, actual and non-actual, yields an analysis according to which '*p* is possible' comes out as 'There is a world at which *p*', and '*p* is necessary' equals 'At all worlds *p*'.

It is a requirement of a realist theory of modality that it should include a guarantee of isomorphism between all the possibilities there are and their ontological grounds. 'What is the truthmaker for "*x* is possible"?' must have an answer for each and every value of *x*. If your general answer to 'What makes it the case that something is possible?' is 'a world', then there had better be just as many worlds dreamt of in your philosophy as there are possibilities in heaven and earth. That is the requirement of plenitude.[28] Lewis adopts DT as his principle of plenitude. He postulates as many worlds as there need to be for the unrestricted recombination of all the existing things, actual and alien.

[27] Ibid. 140. [28] Lewis (1986*c*: 87 ff.).

That gives plenty of worlds, enough anyway to plug any gaps in logical space. There are no holes where a world could be but isn't.

I have argued that DT is false, in its original Humean version.[29] Here I do not press that point against the use of DT. I urge another objection. DT is quite clearly a modal principle. It says that it is possible for anything to coexist or fail to coexist with anything else. Are we entitled to use such a modal principle of plenitude in constructing a theory that is meant to 'explain the nature of the truthmakers for modal truths'? The choices are: (i) you do not insist on plenitude. Then logical space may be left gappy and one cannot infer 'Impossible *p*' from 'At no worlds *p*'. (ii) You find a non-modal principle of plenitude that gives you enough worlds to quantify over. You are welcome to try. In the meantime, there is option (iii): invoke DT to specify the domain over which unrestricted quantification yields modal truths.[30] 'To specify' means here 'to define the extent of', so in the many worlds theory the extent of the domain of quantification is defined as sufficient to include one world for every possible recombination. That makes the theory circular and circular theories cannot function as reductions. Lewis himself urges this point, sucessfully in my opinion, against ersatz theories like those of Adams. *Et tu quoque*.

Unrestricted quantification will only yield necessary statements if we take as values of our variables the right kind of objects. Unrestricted quantification over objects that do not have, individually or collectively, any necessity-sustaining properties, cannot establish, by itself, any distinction between the contingent and the necessary. To gain an understanding of what the right kind of objects might be we should start by looking at what are certainly the wrong kind of objects. That *p* is true at Africa, America, Asia, Australia, and Europe, does not entail that *p* is necessary. Truth-at-a-continent is not necessity-sustaining. By that I mean that there is nothing about being true at Africa, etc. that determines the modal strength of the truth. 'No donkey talks' is true at all the continents but this does not determine whether it is necessarily true or contingently true. That *p* is true at Earth, Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto, does not entail that *p* is necessary. Truth-at-a-planet is not necessity-sustaining. That *p* is true

[29] Lewis in fact qualifies DT: recombination is restricted to what the size and shape of space-time permits (Lewis 1986*c*: 89).

[30] Lewis admits (simple) alien particulars and properties and these cannot be got from recombination alone. So his principle of plenitude is DT + aliens.

at all the stars and planets and moons and other stellar objects of the Milky Way does not entail that *p* is necessary. That *p* is true at all the galaxies and at all the points between and outside the galaxies does not entail that *p* is necessary. Generalizing, we can say that quantifying over any or all parts of a world still leaves open the question: is the statement so quantified necessary or is what it states a cosmic coincidence (*pace* Smart)? We see therefore that the wrong kind of objects to quantify over to derive the necessary truths are the parts of a world. What happens if we then quantify over the parts of many worlds? Recall that what makes objects part of a world is their spatio-temporal interrelatedness and nothing else, and what makes an object part of one world and another object a part of another world is the objects' spatio-temporal separation and nothing else. Other worlds differ from the actual world (apart from the contained states of affairs) only in spatio-temporal (and consequent causal) separation. Now if we extend the scope of our quantifiers to include the parts of these other worlds, in addition to the parts of the actual world, will we have thereby closed this open question? I think the answer is that we will not have done so.

Consider Popper's renowned example of an accidental generalization

(3) All moas die before reaching the age of 50.

If the scope of the quantifier in (3) is taken as restricted to parts of a world, then on the resultant reading (3) does not come out as necessary. According to Lewis's many worlds theory, when the scope of quantification is extended from parts of a world to parts of all the worlds, the resultant reading entails that (3) is necessary. The difference between the parts of the actual world (the world of which we happen to be parts ourselves) as a domain of quantification, and the parts of all the worlds as a domain of quantification, is said to be just the fact that certain parts of the multiverse are spatio-temporally separated from one another, in a way in which no part of a world is separated from any other part of the same world. Worlds other than ours supposedly contain only parts that have no intrinsic necessity-sustaining properties, just as, according to the reductionist, no part of the actual world has any intrinsic necessity-sustaining properties. Much the same sort of objects, events, and states of affairs exist on all sides of the separating divides (if this were not so, we could not think of the parts of one world as being possibilities for another). The modally relevant

difference between world-parts is only a difference in separation. How could this difference ground such a significant modal shift as that between contingent (3) and necessary (3)? Given that what the multiverse contains is, in some sense, very much like what the actual world contains, only compartmentalized into spatio-temporally and causally incommensurable units (the worlds), how could the enlarged domain of quantification secure modal differences where none existed before? It cannot as far as one can see. The following seems possible: none of the indefinitely many worlds contains a moa that is 50 years of age or older and yet (3) is contingent. The fact that the worlds are spatio-temporally and causally separated, just this fact by itself, does not look capable of ruling this out. Something more is needed to block such a case, something that could be the ontological ground of modal differences, unlike separation, which does not provide such ground.

My main objection to the many worlds theory of existent mere possibilia is in the form of a dilemma. The first horn of the dilemma is this: if Lewisian modal realism just says that there is a set of non-duplicated worlds spatio-temporally separated from one another, then modality is not analysable as unrestricted quantification over those worlds. There are two ways of putting this conclusion, depending on what view you adopt about the meaning of 'actual'. If you agree with Adams (1974), van Inwagen (1980), Armstrong (1989*b*), *et al.*, that actuality is an absolute characteristic of worlds and that there is no sense of 'actual' in which more than one world can be actual, then you will express the conclusion of the argument so far by saying that no matter how many spatio-temporally separated island universes there are they are all actual and, therefore, unrestricted quantification over their parts is modally no different from restricted quantification over a domain that consists of just the parts of one of the islands (ours). On the other hand, if you agree with Lewis that 'actual' is indexical, like 'here' or 'now', and that in judging a world to be actual we are attributing to it the relational property of containing us, then you can express the conclusion by saying that while for me to quantify over all the worlds, actual and non-actual, is to quantify over a domain that includes the world-parts that are separated from me as well as those that are not separated from me, such quantification is modally still not any different from quantifying over a domain that includes only the world-parts which are not separated from me. I have tried to remain neutral on 'actual'. My point is that whichever way you go on that issue, separa-

tion alone does not justify the claim that unrestricted quantification over the separated items yields necessity.

On the other hand there is Lewis's statement that the worlds are 'ways in which a world could be',[31] and that is certainly a modality-saturated description of what a world is. So the doctrine of many worlds may be taken as saying first, that each of the worlds is a possible world, possible not by stipulation but by its very nature, and, second, from the principle of plenitude, that the multiverse has the collective attribute of containing all the possible worlds. These are of course necessity-sustaining properties par excellence, and quantification over entities having these properties will preserve the modal distinctions which need preserving. Now '*p* is necessary' comes out as 'At all possible worlds *p*', which eminently succeeds in capturing the concept of strict necessity. The problem for this interpretation of the doctrine of the plurality of worlds is that it cannot be offered as a reductive account of modality. On this interpretation of the theory, one modal concept is analysed in terms of another, but there is no breaking out of the family circle of interdefinable modal notions. The second horn of the dilemma, then, is that unrestricted quantification over entities having necessity-sustaining properties turns out to use some modal concepts as primitives. On this horn of the dilemma the possibility of the reduction of modality is lost and only a non-reductionist explanation of modality remains in prospect.

I conclude that the theory of many worlds as the ontological grounding for mere possibilia, when formulated without explicit or implicit circularity, fails an elementary test of adequacy for theories of modality (the theory must account for the distinction between different modes). When this defective formulation is repaired, as is easily done, the theory passes the test, but is forced to rely on at least one undefined modal notion. Inadequate to the task or adequate but circular, therefore. Such, briefly, is my main reason for thinking that Lewis's model of many worlds is another failed attempt to analyse modality reductively.

12.2.4 *Eliminativism: The regularity theory of logical truths*

So far in this part of this chapter, I have argued that the major types of reductionist accounts of necessity all face serious, perhaps insuperable,

[31] Lewis (1986*c*: 86).

difficulties. If you regard unreduced necessity as inherently suspect, the failure of reductionism may lead you to conclude 'So much the worse for necessity'. Modal nihilism often flourishes just when reductionism flounders. I wish to argue that a move in this direction is mistaken. Eliminativist conclusions are not justified by the failure to arrive at a convincing reductionist account of necessity. My argument is basically that the theoretical costs of eliminativism are far too high. It is quite obvious that modal concepts play a central role in the work of understanding in the spheres of philosophy, science, and everyday life. Forewarned that 'next to the ridicule of denying an evident truth, is that of taking much pains to defend it',[32] I will not enter risky and unrewarding pleas for the obvious. I propose instead to 'assemble reminders' of some of the beliefs that we would be forced to give up as the price of accepting modal scepticism.

Rational norms. The basic distinction between good inferences (deductive or non-deductive) and bad ones is that we get some rational assurance that truth is transferred from the premiss-set to the conclusion in the case of good inferences, whereas in the case of bad ones we have no such assurance and if in the course of bad reasoning we should pass from true premisses to a true conclusion it would only be by accident more or less. The difference between rationally good and bad inferences is a difference between non-accidental and accidental truth preservation. In other words it is a modal difference. Normally this modal difference is captured in the definition of 'validity'. The goodness of a deductive argument consists in its validity, a valid argument being one whose premiss-set is inconsistent with the negation of its conclusion. According to all (non-sceptical) logicians this is a necessary condition of validity and according to most it is also a sufficient condition.

Confirmation, forensic reasoning, and scientific testing. The rational norms interdicted by eliminativism are not confined to those expressed by 'validity', 'fallacy', 'logical probabilification', 'contradictory', and their kin. Also included is the cluster of normative concepts used in assessing claims to have confirmed or tested some hypothesis. The paradigm here is 'relevance' (in Keynes's sense). The use of

(α) '*e* is favourably relevant to *h*'

[32] Hume (1739–40: 176 (*Treatise* I.III.14)).

is to rationally justify one's belief that the statement *e* provides (some degree of) evidential support for the hypothesis *h*. To play this role (α) has to be necessary.[33] If that is so then eliminativism disqualifies (α) from playing that role.

All methods of coming to know one thing by way of knowing another thing involve inference. If the modal sceptic deprives us of a workable concept of entailment or logical probability, how will we rationally amplify knowledge beyond what is immediately given in sense experience?

Alternatives to the actual. 'It is uncontroversially true that things might be otherwise than they are.'[34] Uncontroversial it may be but uncontroverted it is not. Spinoza controverted it. Sceptics about modality are committed to controverting it. Quine: 'everything is what it is, ask not what it may or must be.'[35] As an example take the distinction between the merely non-existent and the impossible. Modal eliminativists are committed to denying that an event which has not happened could have happened, or that one that is not happening could be happening. Idioms such as 'could have happened but didn't happen' or 'is not happening but can happen' may have their pragmatic uses according to eliminativists, or they may reflect our epistemic situation when we do not know what to expect, but they do not state any facts, they do not reflect any mind-independent feature of reality. This of course blocks any attempt to take seriously the distinction between what is merely not the case and what is impossible. But if we are deprived of that distinction, then the distinction between nomological and accidental truths also has to be given up. The principal difference between a law of nature and a statement whose truth is merely accidental, no matter how general the latter statement is, consists in this: the negation of a law is impossible whereas the negation of an accidental truth is false but possible. (The stock example here is the pair of falsehoods 'There exists a sphere of enriched uranium one mile in diameter' and 'There exists a sphere of gold one mile in diameter' with the former impossible and the latter possible.) With that distinction goes the distinction between nomological and accidental sequences. The eliminativist pays the price.

Counterfactuals. Counterfactuals comprise a species of propositions

[33] If it is not, then the Lewis Carroll regress gets going (see Carroll 1895).

[34] Lewis (1973: 84). [35] Quine (1981: 174).

that state something about the non-actual. It is however a philosophically distinctive and important species, and deserves discussion beyond what has been said above about its genus.

Dispositions (powers). If *a* has the disposition to ϕ, then *a* has some property/ies which are necessarily related to the action of ϕ-ing. The modal sceptic cannot allow powers—as Quine knows and emphasizes.

Determinism/indeterminism. If the determination of an event means its necessitation in accordance with some law then, since we have lost laws already to the modal sceptic, no event is determined. But if indeterminism means that an event, having occurred without anything determining its occurrence or its qualities, could have not occurred or could have occurred but with different characteristics from the ones it has, then, since scepticism has taken from us the right to legitimately contrast the actual with the merely possible, indeterminism is also ruled out.

Forward planning of actions (cf. Cartwright on effective strategies).[36] The quest for effective strategies relies on a series of modal notions: causation, prevention, interference, etc. Can they all be purged of modal content? If not, scepticism will stifle practical reason.

Personal responsibility. There is a pervasive view, by philosophical and legal moralists as well as social and psychological scientists, that personal responsibility is (i) subject to degrees; (ii) is diminished by constraints which reduce the range of alternative actions open to the agent; (iii) disappears altogether when there are no alternatives left. According to modal scepticism, personal responsibility is an inapplicable notion (not because of determinism of course) but because there are no alternatives to the actual.

Denial. '*Sub specie aeternitatis* there is no necessity and no contingency; all truth is on a par.'[37] So concludes Quine, dean of eliminativists.

Consolation prizes. The Wartime Rationing Strategy: take away the real goods and provide substitutes that do not taste the same. Hume's version: there is no necessity in the world but we are programmed to believe in it anyway. Note well how sincere eliminativists are living refutations of this! In Quine's version, the appearance of the necessity

[36] Cartwright (1983: Essay 1).

[37] Quine (1990: 140). Exactly the same view of modality was held (for un-Quinean reasons) by my first teacher in philosophy, John Anderson. I also interpret John Stuart Mill as having been a sceptic about modality.

of modal notions can be explained (away) pragmatically: scientific theorizing follows the path of least disturbance, etc.

12.2.5 *Conclusion*

Necessity is conceptually central to science and common sense, so someone is sure to try and make a philosophical living out of inverting this obvious truth. But this is a tried and trusted dodge. In Hume 'The necessity of causal connexions enables us to infer the future from the past' is inverted to 'Our habit of inferring the future from the past is all there is to causal necessity'. 'A true empirical generalization together with premisses expressing particular matters of fact enables us to infer further matters of fact' is inverted and becomes 'Licensing an inference from one particular matter of fact to another is all there is to the truth of empirical generalizations' (Schlick, Ramsey, Ryle). 'It is possible to perceive material objects that exist' is converted to 'Objects are the permanent possibility of sensation' (Mill). So unsurprisingly Quine says 'Conceptual centrality of logic and maths to science is all there is to necessity.'

There is a pattern here: some piece of objective reality has characteristic effects on and in humans. You then turn around and define this piece of reality in terms of its effects on humans, thereby making it mind-dependent. Inversion hysteria is a kind of subjectivizing of reality, a kind of subjective idealism.

As regards modality, the failure of the strategies discussed above suggests truth is a form of modal primitivism. 'Primitive' means undefined, not unexplained or unjustified. This will be neither reductionist nor eliminativist. Instead, it warrants *de re* necessities: necessities in nature. Such *de re* necessities require truthmakers and it seems that it will be real powers which provide such truthmakers and, once again, display their centrality to much of modern metaphysics.

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Index

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