Book Reviews

Having Reasons: An Essay on Rationality and Sociality. **By Frederick Schick. Princeton: Princeton University Press, 1984. Pp. x, 158. $22.50. Paper: $7.95.**

Schick offers two main things in this book: The first is his own version of the theory of rationality. The second, at least equally important in his eyes, is an argument designed to show that not only do theories of this sort not cover all actions, for some actions are not done for reasons; such theories do not cover all reasoned choices. There is at least one important sort of reasons—falling under the general head of "sociality"—that cannot be identified with the agent's own interests, as rationality requires.

There is some algebra in the book; and sometimes the reader must ascend with complex logical ideas to dizzyingly general views of patterns of possible choices. Yet much more than most authors on decision theory Schick discourses pretty steadily in English prose—exceptionally elegant prose lit up by an engaging variety of anecdotal examples. The elegance is deceptive in the sense that what Schick expresses so simply is so often something that cannot be taken in without pondering. However, any reader prepared to read as closely as unceasingly careful writing deserves to be read will find in the book access to the highest pleasures that philosophy affords—those of following, step by step, the orderly unfolding of an intricate scheme of thought, in which each step has been carefully meditated by a subtle mind.

Such pleasures often come in large measure regardless of upshot or final conviction. They do here. They are augmented along the way by dozens of illuminating observations on topics of current philosophical attention, some of them of perennial philosophical interest. Chief among the current topics, naturally, are those that belong to the *problématique* (to use a word that I picked up from philosophers in Quebec) of rational choice. Schick's treatment of Newcomb's Problem will serve to illustrate his skill and penetration. Schick allows that a person faced with the two boxes might be so bewitched to begin with by the thought of having the million dollars that she would want from the beginning to take just that box. But then, Schick holds, she would not be making a choice at all, much less a rational choice. To make a choice, the agent must face an issue

with options none of which he wants, to begin with; but one of which he may come to want (or prefer) after reflecting on what they signify for his interests. If taking just the first box (which will contain $1 million if he takes it and the nearly infallible genie foresees that it alone will be taken) and taking both boxes (which assures the agent of $1000 and give him only a very small chance $1,000,000) are genuine options for the agent, and the agent chooses rationally, he will, Schick maintains, choose both boxes. For it is the utility not of the options in all aspects taken together, but only in those aspects to which the agent's acting one way or another makes a causal difference that is decisive for rational choice. Whether the genie will foresee her choice of the first box and put the $1 million there is quite outside the agent's control, however, much utility may hang upon it. The best that the agent can make of the issue, comtemplating the utilities hanging upon the causal sequels of her options, is to try the assured $1000 plus the small chance of $1 million.

Intuitively, applied by themselves without an intricate theory behind them, the stress put upon having genuine options and the decisive weight given to the utilities of their causal sequels might have gained some headway with the analysis of Newcomb's Problem. In Schick's case, they are both leading characteristics of a thorough-going theory of rationality, which is developed in the book and deployed therein to meet as well other challenges to an agent's being able to choose rationally when choosing rationally, that is to say, to promote his own interests, is all that is called for. But is it always all that is called for? Schick argues that it is not. Agents may be observed quite often to choose options because they are thinking of others' interests, aiming sometimes to promote those interests, sometimes to injure them. Then, Schick claims, the agents are choosing socially. They come to want what they want because they take other people's interests into account.

Rationality does not require this. Rationality requires at most that agents take precautions in the pursuit of their own interests about other people's reactions. Where a person's utilities are entirely unaffected, apart from these precautions, by her estimates of other people's interests, rationality would preclude her from taking those interests into account in her choices.

On the other hand, sociality may operate through rationality. If Adam comes to want something because Eve wants it, (as Schick says of this particular couple, they "go back a long way"), say, less pain and peril in childbirth, he thereby acquires what Schick calls a "responsive" interest in it. If Adam now has to choose between alternative ways of reducing for Eve the pain and peril, this responsive interest of his will help determine which of those ways he will rationally choose.

Can sociality be reduced to rationality operating with responsive interests? Support for such a reduction comes not only from the demand for a comprehensive theory of choice, which will cover all possible reasons, but also from the principle that every reason that an agent has for choosing must be a reason of his own, which comes home to him. Schick may

underestimate the power of this principle; but he is in a strong position to oppose reduction. He can point out that social reasons come home to the agent as closely as nonsocial ones; and that an agent's being motivated by the one requires no more explanation than her being motivated by the other. Schick himself puts most reliance on the formal argument that in cases like Adam's above responsiveness in what a person wants presupposes sociality as a reason for coming to want it, leaving sociality distinct; and on a variety of examples in which reduction is either question-beggingly redundant (Titmuss's blood donors giving without thought of return) or entirely unsuitable (the Jews shunning pigs because God wanted them to and doing this was so far in His interest; Milgram's subjects carrying on, administering shocks, under the experimenter's increasingly savage requirements; people acting from loyalty to the dead). What interest of God's, Schick asks, even if they had made His desire to have pigs shunned their own, could people have thought remained to be advanced causally by the shunning? What causal difference would they be making by taking that option?

Moreover, Schick's way of handling these matters, keeping sociality distinct, may be looked upon as a useful precaution against the confusion, to which beginners in ethics are so prone (and not beginners only) between the motives for acting being in the end motives of the agent's own (the tautologous truth in the principle cited above) and (a desperate falsehood) the motives for acting being in the end merely selfish motives. On this point, a distinct provision for sociality favors the prospects of agreement upon an ethics that is founded on ample mutual concern and gives objectively defensible weight to the interests of everyone affected.

Sociality alone, however, will not take us to such an ethics. For it embraces malicious reasons as well as benevolent ones. Schick does construct a notion of what it is to have an ethics and to be committed to it. Having an ethics is to want a certain pattern of sociality to prevail, under which the extent to which everyone in the group that is bound by the pattern is to look to other people (and to which others) in making choices is prescribed issue by issue. The pattern wanted may not be the pattern that does prevail, surer to be of interest to social science than to be approved by any ethics. Being committed to an ethics follows from wanting a pattern as an ideal; for if it is a person's own ideal, she herself is "drawn" into it, applying the prescriptions in it for herself, when she confronts one or another of the issues covered by the pattern. This (as Schick intends) still falls short of arriving at an objective ethics. Different persons may adopt very different ethics, ranging from complete autonomy—in which the ideal pattern involves no degree of concern with other people at all—to complete "subservience"—in which every person's interests are completely subordinated to some others.

Are any of these ethics better founded than others? Schick would leave this question for other writers to deal with, in other books. What he does say, however, intimates a surprising and (I think) unnecessary skepticism about finding a better answer than subjective inclination. He mentions the

possibility of imposing certain conditions of universality, solidarity, and reciprocity on admissible ideal patterns; but considers these conditions, too, to be matters for subjective preference. Even patterns that prescribe spiteful choices he would reject simply by maintaining, "We don't want any spite patterns to hold . . . no such patterns are ideals *for us*."

There is, to say the least, a lot more to be said in favor of constructing an ethics entirely on the benevolent side of sociality, and of accepting conditions like universality, solidarity, and reciprocity as prerequisites of being able to recommend an ethics to everyone affected. They are conditions (as Hume for one has shown) already accepted, with the sentiment of humanity, in received moral discourse; and contractarian theory, past and present, goes some distance toward showing how accepting them promotes reasoned interpersonal agreement. Schick might retort that the sentiment of humanity and wanting agreement in ethics are subjective matters. So they are. So is a preference for social science over astrology as a basis for predicting human choices. One thing that Schick has done for us in developing the notion of sociality is open up new lines of argument in ethical theory that rationality (often invoked abstracting even from responsive interests) has been in no position to exploit. So his book leads to new light in ethics, in addition to casting new light upon reasoned choices. A reader stands to gain from it not only the pleasures *en route*, but pleasures in the upshot as well, and a good deal of final conviction.

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Spreading the Word: Groundings in the Philosophy of Language.   By Simon Blackburn.   Oxford: Clarendon Press, 1984.   Pp. xi, 368.

The philosophy of language is arguably the most central area in this century's anglophone philosophy, possibly because of the "linguistic turn" our studies took at the century's beginning, when philosophers began thinking about their problems in terms of the meaning of various types of discourse. This makes it vital to philosophical study that there exist a solid introductory book in the area, but one has not existed until *Spreading the Word*, which is thus of enormous importance.

The rarity of this sort of book is not hard to explain. Because there has been so much writing and philosophical progress in the area, it has become exceedingly complex: the latest monographs written for philosophers are usually quite specialized, and presume a familiarity with a core of existing concepts and arguments which only specialists in the area can manage. And, as usual, the great recent progress in the area has made the problems that remain deeper, more incomprehensible, and seemingly more insoluble. So introductions, are often superficial, shying away from what's difficult and from what needs substantial preparatory explanation as background. And because philosophy of language is seen to be the core

of philosophy of anything, the subject-matter of any survey tends to spread out unmanageably. In addition, the variety of concerns in the field seems to make an organizing over-view impossible. Introductory surveys thus either exclude several central areas, or are disorganized grab-bags of superficial reports of what has been thought. This book, however, covers just about all the main concerns and accomplishments of the century, organizing them into a satisfying and comprehensive structure. Blackburn does not try merely to report what everyone has said; his approach is rather to *do* philosophy, to struggle through the issues and problems himself (reporting, however, along the way, on the most important positions others have taken.) As a result, the reader finds out not just what has been said, but why it was said, and gets a real understanding not just of the answers, but also of the questions. An additional advantage of this approach over that taken by the introductory survey is that in doing philosophy, Blackburn makes significant progress in several areas, producing at least the beginnings of new arguments and insights. The book is an extraordinary achievement.

The first paragraph of Chapter 1 maps the structure of the field with a triangle whose three corners represent persons, language, and the world. The line between persons and language represents one of the major concerns of philosophers of language, and the line between language and the world the other. The first looks for explanations of what it is for language to express what we mean to say; the second of what it is for language to represent, to be true of, the world. The third line of the triangle, connecting speakers directly to the world, represents the attempt to explain what the world is like (metaphysics) and how we can know about it (theory of knowledge, of evaluation, of mind). Part I concentrates on the first line, and Part II on the second, but throughout considerations rapidly spread to the third.

Blackburn's treatment of the first line begins with a discussion of a historically common attempt to answer the question of how a natural world containing physical things and people can also contain *meanings*—the position that we mean things when we contain something internal that represents them. Considered here are the empiricists' position that we mean when we have internal pictures of external things, the contemporary arguments of Fodor and Quine, and Chomsky's arguments that users of language need an innate linguistic structure. Very briefly put, Blackburn's main argument against an internal-representation analysis of meaning is that this results in a vicious regress: this analysis must then say why the internal representations mean things in the world. He also gives an extended and enlightening treatment of Wittgenstein's private language argument, which some think kills the internalist view. He does a fine job of explaining this obscure argument, and of arguing that it is not as convincing as many think.

An alternative to the internal-representation view is that language means because it follows objective public rules. Skepticism about the

possibility of knowing that public rules are followed by our own, or someone else's, meaning-attempts arise in different ways from Goodman's grue-argument, and from Quine's thoughts about radical interpretation. Blackburn explains and generalizes these positions, and argues for a view of rule-following that to some extent diffuses these skepticisms. Concluding Part I is a discussion of the "speech act" (Griceian) analysis of speakers' meaning, which attempts to give an account of what bits of language mean by considering the peculiar and unique kinds of things that speakers (and writers) *do* when they use language, and the public conventional rules that make it the case that the arbitrary noises and marks they produce can do these things. Blackburn is somewhat sympathetic to this view, and tries to answer its critics, though he argues that it leaves important questions unanswered: how can it be that words mean things, and asserted sentences mean facts? These are the questions of reference and truth, which are taken up in Part II.

Part II begins with a chapter on realism and anti-realism, and one on evaluation (ethics, aesthetics, etc.). Realism is the position that an area of discourse describes the real nature of the mind-independent world; various anti-realisms argue that some area's judgements project the mind's own categories and concepts on a world which contains nothing to which they correspond. These considerations lead directly to the next chapter considering evaluative judgements, clearly a prime candidate for an anti-realist treatment; the following chapter discusses correspondence, coherence, and pragmatic theories of truth. Anti-realists think of certain sorts of assertions as expressions of attitude (e.g., emotivism), or as consequences of somewhat arbitrary mind-dependent structural considerations (Quinian holism, or the coherence theory of truth); or they interpret them as reducible to a different set of assertions which really do talk about the world as it is (reductionism), or deny them meaning or truth altogether. Blackburn defines and argues for a middle-ground on these issues; he thinks that anti-realism isolates us from a world we clearly have contact with, but that accommodations to anti-realist arguments need to be made. He distinguishes perspectives from which coherence and correspondence theories each make sense.

These first three chapters of Part II contain much that is interesting, important, and original; however, I feel that they are somewhat inessential to this book, and can be skipped by an overworked reader. Here, more than in the other sections, Blackburn takes us away from what's most narrowly called philosophy of *language*, concerning himself instead with the third line of the triangle. Here also (especially in Chapter 6, "Evaluations, Projections") he tends to be compressed and somewhat obscure and difficult. These chapters certainly have great philosophical value, for specialists as well as beginners, but one can survey philosophy of language proper without them.

The remainder of Part II addresses the classical problems of linguistic truth and reference head-on. It includes an extended discussion of Tarski's

famous suggestions for the proper form of a theory of truth and reference in a language: roughly that it can be constructed out of sentences which give truth-conditions for that language (e.g., the theory of English will include such sentences as " '*Penguins waddle*' is true if and only if penguins waddle.") These suggestions have achieved a certain infamy among those philosophers who find them vacuous as a theory of reference or truth; Blackburn appreciates this criticism, and explains carefully what he thinks a Tarskian theory does and does not do.

Considered also in these chapters are the relative merits of "bottom-up" and "top-down" (i.e., starting from words and phrases or from whole utterances) approaches to truth and reference; analyses of proper names (Kripke's "rigid designation") and definite descriptions (e.g., 'the man drinking a martini'); and the issues of extensionality/intensionality, singular thoughts/universal thoughts, and reference/description. All these issues are absolutely central to contemporary philosophy of language (and each is far too complicated for me even to begin to describe them here). As usual, Blackburn's treatment of each reveals clearly what the questions are, and argues for what he takes to be some correct solutions.

All the many issues Blackburn treats in the book are deep and complex, but he manages to explain them amazingly briefly, comprehensively, and clearly. Each section is given an invaluable short bibliography listing the most central primary sources for the beginner (annotated regarding difficulty.) The book is difficult, as it must be, but it is written with clarity, grace, and wit, and with a deep and admirable concern for the comprehension of the intelligent beginning reader; no other book I know gives that reader such a good chance to fight his way into the center of this important field.

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Quantum Theory and the Schism in Physics.   By Karl R. Popper. (Vol. III of *The Postscript to the Logic of Scientific Discovery)* 1982, ed. by W.W. Bartley III, New Jersey: Rowman and Littlefield, 229 pp. + xviii.

Karl Popper may well be our greatest living philosopher, and is certainly a seminal figure in the philosophy of science. Yet, and this may strike scientists as odd, he rejects both of the outstanding bodies of theory to emerge in our century, relativity theory and quantum mechanics, and he does so in the name of scientific realism. In his own words:

> My arguments are partly rational, partly *ad hominem*, and partly even ethical. It seems to me that the attack on realism, though intellectually interesting and important, is quite unacceptable, especially after two world wars and the real suffering—avoidable suffering—that was wantonly produced by them; and that any argument against realism which is based on modern atomic theory—on quantum mechanics—ought to be silenced by the memory of the events of Hiroshima and Nagasaki (p. 2).

Putting aside irrelevancies like these, does Sir Karl have valid scientific or philosophical objections to the antirealist position?

Probably his strongest argument is to be found in the long Preface, where he attempts to show quantum theory and relativity at loggerheads with each other. If he is right about this, then the antirealist would necessarily lose support from one or the other body of theory, since they purport to be describing the same physical universe. Popper's tactic here is to review the situation in atomic physics in the mid-1930s and thereafter, more or less as follows.

The 1935 paper by Einstein, Podolski, and Rosen (the EPR Paradox) noted that the equation stating Heisenberg's uncertainty relations, which on the Copenhagen interpretation applies to all measurements of elementary particles, implies that if we measure either the position or the momentum of a particle fragment (say part of a pi-meson that disintegrated in outer space, some time after the disintegration), that measurement also gives us knowledge of the position or momentum of the other fragment, even though the latter is moving away at near luminal velocity in another galaxy. In order for this to come about, according to the authors of EPR, there would have to be an instantaneous influence of the measurement upon the distant fragment, which in turn implies action at a distance: a clear violation of the Locality Principle enshrined in the special theory of relativity. The EPR paper therefore concluded that, contrary to the claims of von Neumann, Bohr, Schrödinger and others, quantum theory is "incomplete," and that there must be forces at a deeper level of reality ("hidden variables") needed to account for this finding.

However, as Popper points out, the disagreement remained at an impasse for some time; there was, after all, no way to check experimentally the position or momentum of the distant fragment. But in the 1950s David Bohm applied the same argument to the spin or polarization of particles, and in the 1960s J.S. Bell showed how this feature of particle behaviour could be tested in experiment at suitable distances. By the mid-1970s several such tests were made by physicists like A. Aspect and A. Shimony, and the "inequality" Bell predicted (intended to reveal hidden variables) did not appear: a clear victory for the Copenhagen interpretation over local realistic theories.

Now at this point one could expect a falsificationist like Popper to give up realism, at least at the level of microparticulate reality. Instead, he recommends abandoning the Locality Principle, i.e. special theory of relativity! Speaking of an analogous experiment of his devising, where our knowledge of the position of particles emitted from a source such as positronium in one direction turns out to yield verifiable knowledge of the scatter of particles in the opposite direction, he concedes that if that were the case:

> This *could* be interpreted as indicative of an action at a distance; and if so it would mean that we have to give up Einstein's interpretation of special relativity and return to Lorentz's interpretation and with it

Newton's absolute space and time. We need not, in that case, give up any formula of special relativity theory. For special relativity is an interpretation of a formalism; and the same formalism can be interpreted either by special relativity or by Lorentz's view that we have an absolute space and time but cannot detect it, for reasons that are revealed by the formalism. Whereas special relativity theory, in Einstein's interpretation, says that simultaneity has no absolute sense; that if we do not have any way of detecting absolute space and time—if its detection is indeed excluded by the formalism—then we should not assume that it exists (p. 29).

Go back to Newtonian physics and the mysterious Lorentz transformations? Popper appears to forget that without special theory we would not have general theory of relativity, and without general theory of relativity we would have no way of, *inter alia*, correctly predicting the angle of deflection of sun rays passing in proximity to a large body, or of accounting for the anomalous precession of the perihelion of Mercury. Such stunning predictive successes can hardly be set aside because of an admittedly very queer finding in the effects of our observing the world of the very small.

But in fact Popper makes it abundantly clear in many places in this book (e.g. pp. 26, 94, 181, 204) why he is so ready to dispense with relativity theory. If there is no absolute time, distinct from the spatial characteristics of material objects or particles, if instead all the continuants of the universe coexist as worldlines displayed in a spacetime manifold that has no past, present, or future, then at this level of description of physical reality time is unreal, change is unreal, and free will is an illusion fostered by our subjective ignorance of those segments of our bodily worldlines not yet revealed to the gaze of our consciousness. Indeed it is Popper's concern to defend belief in human freedom that motivates his stalwart indeterminism, even if, as a scientific realist, he is understandably uncomfortable with observer-dependency in atomic theory (such as the observer him/herself collapsing a particle's wave function in Schrödinger's famous equation).

However if one does not intrude metaphysical prejudices into the discussion, and particularly if one excludes Newtonian assumptions from one's thinking, then the "schism" in physics that Popper writes about in this book may be seen as bogus after all. Let us assume that *both* relativity theory, with its deterministic implications, and quantum mechanics, with its resolute indeterminacy at microlevel, are true. How can they be reconciled with each other?

Surely every microevent, indeterministic as its provenance may be, nevertheless exists in the spacetime manifold as a segment of a Minkowskian worldline. That means that what we call a "future" segment of a particle's worldline is co-real with its "present" and "past" segments; without absolute space and time, as in the Newtonian model, what we call the future is *necessarily* singular, because it is, so to speak, already "written" in the spacetime manifold, even if at microlevel it is indetermi-

nistically produced. Thus no event can occur differently than it does, not even microevents which are in principle as indeterministic as you will. Put too simply, at the micro- as well as the macrolevel the future exists like the as yet unread portions of a manuscript; you cannot predict exactly the words on the next page, but they are there, and none other. It is in this way, I suggest, that modern physics retains its fundamental unity.

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Le modèle ER, Un système de catégories destiné à l'analyse des enterprises de recherche, **Chapitre I: 'Problématique, objectifs et stratégie du projet d'analyse'. By Normand Lacharité. Université du Québec à Montréal, 1981. Pp. 398.**

Plato has Socrates argue, in the *Charmides*, that a science of sciences is impossible, and that if it were possible it would be useless. Philosophers of science, and in this grand and already fruitful 'research enterprise' Normand Lacharité among them, work to prove him wrong.

Canadian philosophers have known that Lacharité was at work on a monumental project in the philosophy of science ever since he sketched its *problématique* in his Presidential Address to the Canadian Philosophical Association in 1977; his audience was struck by its generality and ambition.

The present volume confirms that impression. It is subtitled 'Chapter I', the first of four projected chapters of Book One. Lacharité intends that when we reach the fifth volume we shall begin Book Two, devoted to applications of the model ER to actual scientific research. In Book Four, many volumes later, we shall conclude with a theory of philosophical conflicts in which all current controversies will be reduced to failures to perceive aspects of science already accounted for in the general model. Thus, although the scope remains enormous, the schematism is richly elaborated and the work abounds with ingenious detail.

It might appear that this scheme postpones what is philosophically most interesting until a much later date, and indeed one would prefer to have Lacharité's views on current controversies rather sooner than Book Four. Nonetheless, his starting moves are themselves of such philosophical interest, and his Chapter I written with such power and clarity, that those who care about philosophy of science must attend to what he writes.

Apart from a long appendix surveying relevant contemporary literature in French and English, the present volume has three sections. Let me begin at the middle. The second section proposes that when modern epistemologists approach the sciences they focus too closely, not achieving a sufficiently global point-of-view. Both the concepts and the theories of science are *products* of human activity, and the sciences must therefore first appear as research *undertakings* (84).

These *Entreprises de Recherche* (ER) are construed so generally that the usual boundaries of disciplines, and of schools and historical periods, as well as such philosophical distinctions as that between representational and theoretical discourse, may all be ignored at this stage (107). It will only later become possible to assess their legitimacy.

On the other hand, certain limits define such undertakings from the beginning. An ER is to be specified as a 'system of determinants' (109), the point of which is to make determinate what the objects *are* which the research studies, and how they are distinct from other things. This may be done either in the way that gravitational theory determines that *there is* gravitational force, or in the way that a theory of heat determines (not that there is heat, but) *what* heat *is*. It is at this level that objects (e.g., gravitational phenomena, crimes) are first really treated as unities; at the same time the ERs (e.g., theory of gravity, criminology) are themselves unified, as dealing with *an* object, a research area, a system of determinants.

We learn in the third section more about what Lacharité expects to gain from this generality: a diet of examples so rich and free of pre-categorization that his ultimate system will have a proper place for each of them. Conceived as unities, ERs paradigmatically are themselves objects, but ones of a special sort: they are objects which have objects (214). This immediately invokes different levels of objectification, and thus the constant presence of higher-level reflection, which in turn imposes a constant awareness of practical activity.

Lacharité defends a *praxeological* philosophical position, but expanded to what he apologizes for calling a 'researchological' one (94-106). What this means can be clarified by seeking its roots. These are found in the volume's first section.

Lacharité begins (9 ff.) by arguing that objects may not pre-exist with all their determinants, but may be partly determined by the discourses in which they can be described and/or scientifically explained; these, in turn, may be given shape by the research practices which make *them* real.

Philosophy of science cannot begin, as in some circles it tries to do, with the presumptions that there are objects, and that an event at its simplest is an object with a property, and that an action is an event with some further specification. Philosophy properly begins not with objects (material or mental), nor with epistemological concerns regarding them, but with *actions*. The given, so to speak, is that we do act in various ways. Only this makes possible our conceptualization of objects. There are no three-dimensional objects in our world if we cannot grasp, move around, see from other angles, and so on. Similarly there are no objects of our sciences if we cannot observe, hypothesize, and test.

Thus it is proposed that the 'object', without which there is nothing for sciences to study, is a category dependent on prior realities, on our practices and in particular on our research activities. If Lacharité's re-searchological account is correct, then objects are no more simply *given* or discovered than they are *purely constructed*.

A hasty critic might claim that Lacharité has thus prejudged some of the 'postponed' disputes: that between realism and anti-realism regarding the objects of science, for instance. On the contrary, he has fruitfully set the stage for the claim that the sciences are so varied that neither of those, nor any single view, can be adequate. About the proper conclusions of such debates, however, he has just begun to fight.

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How the Laws of Physics Lie. By Nancy Cartwright. Oxford: The Clarendon Press, 1983. Pp. viii, 221. $16.00. Paper: $7.95.

How the Laws of Physics Lie collects nine essays of Professor Cartwright's: new versions of four previously published, four forthcoming, and one entirely new. From a useful variety of aspects all of these efforts strike against the same guiding assumption in the philosophy of physics: that the world is, fundamentally, a tidy place. Cartwright argues that the elegant and simple physical laws which appear at the most general level of scientific discourse are literally false, and that they cannot be made true without extremely complicated qualifications, revisions and provisos— making them both 'messy' and less general. Cartwright's thesis has two major repercussions: that fundamental laws cannot take part in Hempelian covering-law explanations, for such laws are required to be true (Essay 2); and that a standard argument for scientific realism (inference to the best explanation) cannot be carried through, for the model of explanation which sanctions this inference has mistaken the explanatory role laws play. Cartwright rightly disassembles the supposed connection between laws that explain and laws that are true (Essay 5). These results impel her to provide an account of explanation (Essay 8), an argument for a mitigated scientific realism (*passim* and especially Essays 4, 5, and 7), and a solution to the measurement problem in quantum mechanics (Essay 9).

To illustrate these theses, let us begin with this last claim. For Cartwright, the measurement problem is solely a function of the mathematization of the quantum theory. The equation which best covers the phenomena, the Schroedinger equation, has the form of a wave function. Within this picture of the phenomena, "measurement" is the collapsing of the wave packet, with a subsequent and inevitable loss of information. Cartwright's program, however, cuts the connection between such fundamental equations and what is countenanced as real. For her, the problem is not one of measurement but of characterization. And characterization is shown to be a pseudo-problem—a product of taking "the mathematical formulation of the theory too seriously" (196). We simply are not (and should not be) committed to the reality of the relationships described by such equations. The virtue of such increasingly abstract models is not

their truth, but rather their utility, "where at least the behaviour of the model can be understood and the equations can not only be written down but can be solved in approximation" (145). To provide an explanation is to construct a model, a *simulacrum*, whose virtues are not those of a realistic picture (facticity) but of ease of mathematization and extension to other phenomena. It is not truth which saves the phenomena, according to Cartwright, but organization.

Cartwright attempts to divorce her position from a complete Duhemian (and van Fraassian) instrumentalism by distinguishing laws that are (merely) theoretically explanatory (which, on her view, need not be literally true) and those which are causally explanatory. While the latter can be tested by manipulation in controlled experiments, the truth of the former can be justified only by an inference to the best explanation.

What's wrong with inference to the best explanation? After examining *the* classic case—Jean Perrin's inference from the various experimental determinations of Avogadro's number to the reality of atoms—Cartwright concludes that Perrin did not (and could not) infer the *truth* of the explanatory laws, but made "only an inference to the most probable cause" (85). Although this causal inference is legitimate, "there is no connection analogous to causal propagation between theoretical laws and the phenomenological generalizations which they bring together and explain" (85). That is, while explanatory *causes* are made true by the phenomena they explain, non-causal explanatory *laws* bear no such relation to the phenomenological laws they explain. The latter relationship is solely one of unification and summarization. And this is because physics encourages a multiplicity of such theoretical frameworks, but allows only a single causal story. Since a causal story implies the existence of causally efficacious entities, we are entitled by such inferences to conclude in favour of their reality. While truth (à la Duhem and van Fraassen) is an "external" characteristic of good theoretical explanations, good causal explanations, in contrast, have "truth built into them." (91)

Here is the heart of the matter. In Essay 5 (Cartwright (again, via Duhem) elicits (what she takes to be) the fundamental mistake in the assumption lying behind both inference to the best explanation and the covering-law model of such explanations. That is, that phenomena fall only *roughly* into natural kinds; that, in fact, they are genuinely different (95). The fundamental laws implicit in the covering-law model are an attempt to unify what only appear to be similar phenomena—any such unification is merely an artifact of our theorizing, and provides no grounds for the truth of such laws. It is only through the systematic distortion of reality that such explanatory unification is achieved. The universe is, indeed, untidy on this view.

Cartwright is a pragmatist. What exercised her at the start were the lengths one had to go to get any of the pure, elegant and simple fundamental laws to square with the rough and ready world of experimentation. Her insight is to see that this gerrymandering is not just a product of particul-

arly awkward theories, or recalcitrant data, but rather the result of theorizing in general, theorizing informed by a particular metaphysical picture. The picture Cartwright draws permits only a mitigated realism, a realism derived from the fact (if it is a fact) that only causal laws yield the "hands-on" practical strategies of theory *application*.

Although these essays were individually conceived, and most are, (or will be) available elsewhere, their collective effect serves to amplify and make clear Cartwright's central themes. That alone makes this collection worthwhile. The sympathetic rendering of the (too often underrated) Duhemian view of physics is an additional bonus. My only reservation concerns Essay 6, where the mathematical niceties of small signal amplification, exponential decay, and the Lamb shift, overwhelm the reader and the argument. Her points are well taken without it.

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