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CONTEMPORARY PHILOSOPHY OF SOCIAL SCIENCE

By Brian Fay. Oxford: Blackwell Publishers, 1996, 266 pp.

In a broad sense, Hegel's dialectic involves three steps: (1) One or more concepts or categories are taken as fixed, sharply defined, and distinct from each other. (2) When we reflect on such concepts, contradictions emerge in them. (3) The result of this reflection is a new, higher category, which embraces the earlier categories and resolves the contradictions involved in them.

In the spirit of Hegelian dialectic, Brian Fay's *Contemporary Philosophy of Social Science* attempts to provide answers to many of the traditional philosophical problems in the social sciences. In a textbook fashion that is accessible to undergraduate and graduate students alike, Fay offers a multicultural/dialectical approach to social inquiry that is designed to eliminate the traditional dualistic way of thinking that currently dominates the philosophy of social science. He argues that the complex phenomena that emerge out of a global market economy, in which different cultures continually interact with one another, cannot be understood simply by constructing two competing views where one is compelled to accept one or the other account based on which one is more strongly supported by the natural sciences. Rather, he proposes that social phenomena can be better understood by incorporating the cogent elements of both views. The result is a more comprehensive analysis of human social phenomena in a multicultural world. In Fay's own words, "the basic question of philosophy of social science today ought not to be whether social inquiry is scientific; rather, it ought to be whether understanding others—particularly others who are different—is possible, and if so, what such understanding involves"(p. 5).

Strategically, Fay poses a question at the beginning of each chapter (e.g., Ch. 5: Does Our Culture or Society Make Us What We Are?). Then, he offers two traditionally competing approaches to answering the question (e.g., Holism vs. Atomism). He proceeds to reveal both the plausible and implausible aspects

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of the competing views. Fay then suggests that an appropriate answer to the question under consideration is one that includes the plausible aspects of both of the competing views (e.g., the correct answer—Structuration—to the question posed in Chapter Five includes the atomistic insistence on the importance of agency in human life, and the holistic insistence on the significant ways culture and society mold human activity). This same dialectic methodology is applied throughout the text to various other questions and their accompanying competing views (e.g., relativism and objectivity, culture and society, rationality and intelligibility, self and other, etc.) in order to synthesize a more persuasive answer.

I offer a few critical comments of Fay's work. First, Fay does an excellent job in the introduction to the text of presenting his multicultural approach to the philosophy of social science. However, in the process of dismantling many false dichotomies in each chapter through the dialectical process, Fay forgets to remind the reader how his synthesized resolutions fit within his multicultural approach. For example, at the end of Chapter One, Fay concludes by noting that sensitivity and the ability to decode the meaning of others' experiences are necessary in order to understand the lives of other people (p. 28). But how does this conclusion specifically tie in with his multicultural analysis? Fay provides no answer. In fact, Fay omits such answers throughout the text until he offers a final summary in the last chapter. As the book stands, I would suggest to the reader to first review the last chapter of the book, which provides a nice summary of the text and how the conclusions in each chapter fit within a multicultural perspective. After reading the last chapter, the many arguments concerning each question posed in each chapter, and the corresponding conclusions drawn, will be all the more illuminating.

More substantively, Fay argues in Chapter Two that the self is fundamentally a social entity. According to Fay, (1) the self is alienated (i.e., distant) from its own consciousness, and (2) self-consciousness itself owes its origin to the existence of other entities. Given these two premises, Fay concludes that the self is "interdependent with others and should be conceived as an on-going activity of self-creation . . . occasioned by interaction with others" (pp. 39-42). In the first premise, Fay is suggesting that the alienated self is created from the conflict that can arise between first-order desires (e.g., I want to eat chocolate cake) and second-order desires (e.g., I want to maintain a nutritious

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diet). It is not at all clear why a conflict between first-order and second-order dispositions produces an alienated self. It could just as well be the case, using Fay's own dialectic strategy, that a better understanding of one's self results from such dispositional conflicts. The result is a much healthier self (not an alienated self) that is able to understand the reasons behind particular decisions (e.g., I will refrain from eating the chocolate cake because improving my health is more important to me). Conflict or tension does not necessarily entail alienation.

The second premise is also problematic. Let us grant the existence of self-consciousness. How are we to determine the origin of such an entity? Fay's answer is not falsifiable. Since we cannot ethically keep infants in isolation and observe whether or not self-consciousness can emerge without others present, it does not seem possible in practice to test the validity of Fay's hypothesis (but perhaps such testing is possible in principle). The possibility of self-consciousness emerging independently of others should not be ruled out, given the difficulty of testing Fay's hypothesis. The criticism here is not to suggest that Fay's analysis is implausible; rather, the suggestion is that we must be careful about ontological claims regarding entities that we know so little about given our own epistemic constraints (which are partly due to ethical constraints). Since both of Fay's premises require much more experimental support than is currently available, his conclusion that the self is essentially social loses some of its force.

Furthermore, Fay presumes, as I noted above, that self and society are opposite sides of the same coin. It is this philosophical point about the inter-relatedness of self and other that leads Fay to conclude that interactionism, which "encourages a dynamic commingling in which parties constantly change" (p. 234), is the appropriate form of cross-cultural exchange. But even if self and other are inextricably tied together (although, as I hinted above, the tightness of this bond is nebulous), it is not at all clear how this fact entails the kind of cross-cultural interaction that Fay envisions (pp. 241-43). It is possible that the self that emerges out of the interaction with others rejects any continued interaction; or it may prefer to interact only with the intent to dominate others rather than learn from them as Fay would hope. An affirmation that self and society are closely intertwined may not produce the kinds of interaction with others that Fay envisions (pp. 235-45). Even if we commend

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Fay for his hopeful vision of a global economy that is more deeply connected at the human level than it currently is, he still moves a little too quickly here.

On a more positive note, Fay correctly reminds the reader that all people “share a background of deep similarity” (pp. 82-90). I take Fay’s point to be that since all humans share a similar evolutionary history, they possess similar principles of cognition and basic beliefs that transcend cultural differences—that is, when we attempt to interpret the behavior of people from different cultures, Fay correctly indicates that it is acceptable to assume that they engage in both deductive and inductive reasoning and that they share with all other humans basic epistemic and perceptual capacities (e.g., feel and avoid pain, categorize things, communicate, etc.). In fact, it is because of these shared similarities that there is scope for Fay’s multicultural approach. This approach pushes for a kind of interaction that strives not only to engage other people from different cultures but also to challenge and question one another in order to learn (pp. 240-41). It is refreshing to see Fay address this biological point which is frequently ignored by extreme relativists and distorted by some sociobiologists. Hopefully, Fay’s future endeavors related to the social sciences will explore, with much greater detail than this work does, the social implications of man as an evolved organism.

For those who are wont to explore the many questions that philosophers of social science are most interested in examining, I would definitely suggest Fay’s book. He clearly articulates and assesses many of the difficult arguments in the philosophy of social science, and provides ample references for those who wish to explore this literature more extensively. Although one may not agree with all of Fay’s conclusions, his multicultural/dialectical method clearly reveals the weakness of only working within a dualistic framework. If one wishes to better understand the intricate nature of human interaction within our global market economy and the causal connections of this complex interaction, and at the same time accepts that most answers will be provisional ones, then Fay’s brand of multiculturalism will provide much food for thought.

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TIME, CHANGE, AND FREEDOM; INTRODUCTION TO METAPHYSICS

by Quentin Smith and L. Nathan Oaklander. London & New York:
Routledge, 1995, 218 pgs.

PHYSICS AND METAPHYSICS: THEORIES OF SPACE AND TIME

by Jennifer Trusted. London & New York: Routledge, 1991, 210 pgs.

Metaphysics and science have always been strange bedfellows. The exact relationship between the two has been notoriously difficult to determine, but in the twentieth century, philosophers have become painfully self-conscious of the tensions between these two intermingled types of inquiry. These two books, *Time, Change, and Freedom* and *Physics and Metaphysics*, attempt to address topics that intersect both metaphysics and science in ways that should be expected to shed light on their troubled relationship. The former is a dialogue focusing on conceptual problems about time—a subject on which there has been revolutionary insight in the twentieth century—as a way to motivate a discussion of most interesting metaphysical problems. Smith, the author of the introduction, writes, “From the beginning, time has played a central role in ontological studies” (p. 2). The force of the dialogues is to establish this thesis by connecting debates over time with the problems of identity, change, God, fatalism, and freedom. Trusted’s book is a history of the relationship between metaphysics and physics from the Middle Ages to the present. She states her thesis succinctly: “In this book I hope to show that metaphysical theories are not only not irrelevant, they are absolutely essential to scientific inquiry” (p. ix). For Trusted, science and metaphysics are a perfectly compatible couple. As the subtitle to her book indicates, she also discusses issues concerning time, but her approach is distinctly historical where Smith’s and Oaklander’s is conceptual. Read together they quite compliment each

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other, one's strength bolstering the other's respective weakness.

The authors are obviously at pains to distinguish metaphysics from science. Consider first Smith's and Oaklander's dialogues. Smith characterizes the difference thus:

One reason for this difference between science and metaphysics is that scientific theories lead to predictions of observations that can be used to settle disputes . . . However, the subjects that are studied in metaphysics do not lead to predictions of observations and consequently, disputes in this field must rely on logical argument from premises and try to demonstrate logical fallacies in the argument of their opponent . . . The process of argument and counter-argument tends to go on indefinitely; consequently, progress in metaphysics is measured not by definitive results but by the increasing sophistication of the theories that defenders of opposing positions develop (p. 5).

This is a disappointing start that diminishes the power of much of the ensuing debates. That statements do not make predictions in isolation is one of the philosophical truisms of the twentieth century. If holism is not to be denied, then it is difficult to see how the ability to make predictions will separate science from metaphysics. Apparently 'metaphysical' content could always be part of a theory that, as a whole, makes predictions; but then the distinction between science and metaphysics vanishes. A philosophical treatment of time would be inseparable from a discussion of scientific theories of time.

In these dialogues on time, however, what one finds is a barrage of 'logical arguments,' and reflection on this style provides some hint at the difference between science and metaphysics. A metaphysical claim, unlike a scientific one, might be one such that it and its negation is consistent with any theory rich enough to make predictions. But what content does that leave to metaphysics? The belief that electrons are real and its negation—that electrons are not real, but convenient fictions—are both consistent with scientific theory, but does one want to say that the belief in the reality of electrons is a metaphysical as opposed to a scientific belief? The metaphysical issues encountered in this book are all, in one way or another, modal matters; they involve establishing what could be the case. Metaphysics sticks to logic and

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conceptual analysis and pays little attention to empirical matters, though Smith sees little tension here: “Philosophical metaphysics is both consistent with, and in part based upon, current scientific theory, and uses logical argumentation to arrive at its results” (p. 1). There is a dilemma here. Smith distinguishes science from metaphysics based on the ability to make predictions, which ultimately blurs the line between metaphysics and science. On the other hand, his style of metaphysical argumentation seems to suggest that metaphysical issues are modal whereas scientific problems are empirical. In this view, how metaphysics could be based upon science is a mystery. Empirical theories purport to describe the actual world, metaphysics investigates what could be the case in some possible world. The only constraint science places on metaphysics comes from the demand that what is possible be consistent with what is actual. Smith and Oaklander want science to be relevant, but they argue in such a way that it is hard to see how it is. One gets what one would expect, a book dense with logical argumentation where none of the premises so much as hint at any details of scientific theories, though vague scientific ideas sometimes motivate the narrative. A discussion of Einstein’s theory of relativity is relegated to an appendix, where it is ironically kept separate from the ‘logical argumentation’ of the metaphysics that is supposed to be in part based on current science. Consistency seems to be the only standard for evaluating metaphysical theories, and this goes a long way toward explaining why these dialogues leave one with the feeling that one will never determine the metaphysical truth—since consistency hardly determines truth. To be left with such feelings is unfortunate since most of the issues discussed in this book are interesting, important, and perhaps resolvable.

Smith and Oaklander divide time as authors of the dialogues. Smith authors Part I “The Finite and The Infinite” as well as the appendix “Physical Time and the Universe.” Oaklander contributes Part II “Time and Identity” and Part III “The Nature of Freedom.” The dialogues begin with the question of whether time began, which moves naturally to the second dialogue concerning the possibility of an infinite past and future. Dialogue 3 raises the question, “. . . if all change comes to a stop at some time in the future, must time come to an end?” (p. 35). Whether time is substantial or relational is clearly a modal matter: “If one and the same time could have been occupied by entirely different events, then it is not dependent for its existence on the events that occupy it. It

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is an independent item or 'substance' . . ." (p. 39). This issue is left unresolved. "It is possible that this could happen . . . But that does not show that the substantial theory is true in the actual world" (p. 42). This response leaves the reader confused. The debate over substance is precisely over what could be the case albeit in the actual world. Again, the authors gloss over the tension between science and metaphysics to the detriment of the dialogues.

Dialogue 4, addressing questions of God and eternity, marks a sharp change of subject. This discussion introduces the ideas of the tenseless theory of time: ". . . according to which nothing has any properties of presentness, pastness or futurity. Events merely stand in relations of earlier, later and simultaneity" (p. 50), and the tensed theory "that time consists of a future, present and past" (p. 47) and "that being fully real and being present are logically equivalent" (p. 183). Whether the tensed or the tenseless theory of time is true is the central metaphysical issue of the book and the thread connecting almost all other metaphysical debates in the dialogues. This thread is especially obvious in the dialogues concerning time and change. Dialogue 5 wonders how change is possible, while Dialogue 6, on the passage of time, turns the issue into a conflict between two conceptions of time. An equivocation between the existence of certain events and the nature of time exacerbates confusion.

What is real, what exists, are those events that exist now, at the present moment. Past events did exist, but exist no longer and future events, even if they will exist, do not yet exist. Thus according to this conception, temporal becoming is the continual coming into existence of what did not previously exist and the continual going out of existence of what presently does . . .

On the other hand, when we conceive of time in its static aspect, as involving unchanging temporal relations between events, we are viewing time from a point of view outside time. From this God-like perspective all events are equally real, having the same ontological status, and in some sense "co-exist" in the network of temporal relations that constitute the history of the universe. Given this conception, there are no ontological differences between past, present and future events (p. 71).

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Is this about time or events in time? Events in time do have the same ontological status. They are equally real; they simply exist at different times. Existence is relative to time, so events exist only at a time. But this point shows nothing about the nature of time. Events in time come to be and cease, but time itself need not.

Dialogue 7 digresses from time and change to rehearse the usual problems of personal identity, bodily and psychological continuity. The issue of time returns in Dialogue 8: "Today we would like to explore what connections there are, if any, between the tensed and tenseless theories of time, on the one hand, and the substance and relational views of identity on the other" (p. 106). This discussion of the tensed theory of time continues and compounds the confusions of Dialogue 6. The issue concerns how the whole X can exist at a time when only a temporal part of it exists at a time. This confuses what X is at a time with the whole history of X. At a given time, X exists, not part of X, though over time this X is identical to an earlier appearance of X. Either a relational or a substantial view of identity over time admits as much. X is wholly present at t because at t that is all there is to X. Am I not wholly present now because all the events of my life are not present now? The confusion comes from the insistence that on the tenseless theory of time all events in time co-exist and on the tensed theory only what is present is wholly real.

The thread of the tensed versus the tenseless theory of time that runs through these dialogues is running thin when Dialogue 9 takes up the issue of whether the law of excluded middle is incompatible with free will, though the thesis at issue is whether ". . . the tenseless theory of time is incompatible with free will" (p. 118). That future-tense claims have now a determinate truth-value implies only that the future will take a determinate course not that the future course is determined. But what if God knows all truths? Is that incompatible with free action? These questions motivate Dialogue 10, though one should have learned the lesson. If determinate truth-values do not determine the future, then God's knowledge of determinate truth-values could do nothing more to determine the future. Effort to stress the debate between the tense and the tenseless theory continues. God, according to Boethius and Aquinas, is aware of all events in time simultaneously, in an act analogous to perception. This plausible suggestion is rejected with the following: ". . . if it is analogous then

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it follows that what is presented to God is either simultaneous or possesses the property of being present (or both). And that is absurd, since it implies that the entire course of history is occurring NOW” (p. 137). Confusion reigns, and a student’s thoughts are sure to be hopelessly muddled. God does not see all events as simultaneous but as temporally related. A big difference separates “Simultaneously, God sees all events and their temporal relations” and “God sees all events as simultaneous.” This distinction is ignored as the dialogue turns to God’s temporal eternity and the tensed theory “which treats the past as fixed and the future as open” (p. 138). This move, made only to keep alive the debate about the tensed theory, is a useless digression since the solution was already obvious in the previous dialogue. Dialogue 11, which leaves time behind, is a good introduction to the problems of free will and determinism, though with little suggestion of a solution.

The author’s insistence that time is crucial to most interesting metaphysical issues distorts much of the metaphysical debate in a way that is especially detrimental to a beginner. Perhaps the analysis of basic things will involve some mention of time, but admitting as much hardly commits one to telling the nature of time. These dialogues may well instill in a student a pejorative picture of metaphysics – ‘the increasing sophistication of the theories’ mistaken for mere sophistry. The student may well turn to science for the details of time, but a look at Smith’s appendix will suggest, quite rightly, Trusted’s thesis that modern cosmology abounds in speculation.

Trusted distinguishes three aspects of metaphysics. “The first aspect, speculative conjecture, might be called the Popperian aspect. Popper argues that speculative conjectures about the world are metaphysical if they cannot satisfy his test of falsifiability” (p. ix). The second aspect of metaphysics involves fundamental presuppositions: “some presuppositions are so fundamental that we do not seriously question them: for example that there are physical objects and that there are causal relations”, and “fundamental presuppositions are necessary to provide a framework whereby we interpret the world” (p. x). The third aspect involves “. . . mystical beliefs which do not purport to offer physical descriptions but which claim to show a greater reality beyond sense experience . . . Religious beliefs in the existence of a personal or impersonal God or gods are also examples of this kind of metaphysical belief” (p. x). With these aspects, Trusted distinguishes metaphysics and science, a

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move necessary to any substantive thesis that metaphysics is absolutely essential to science. Yet she also admits “. . . that objective facts, interpretative theories, metaphysical assumptions and religious faith are all too closely connected to be separated . . .”(pp. 1-2), which is too much. If metaphysics and science cannot be clearly separated, then the thesis that “metaphysics is absolutely essential to science,” becomes the trivial “science is absolutely essential to science.”

Like Smith and Oaklander, Trusted is not as sensitive as she should be to the difficulties of clearly distinguishing science and metaphysics in light of holism. Any belief can be held unfalsified if one is willing to make changes in one's other beliefs. So, the most 'scientific' of beliefs will count as metaphysical. Holism likewise affects her other aspects of metaphysics. Considering metaphysical beliefs to be fundamental presuppositions will not distinguish metaphysics from science if theories as wholes are tested against experience. 'Fundamental' presuppositions are simply those beliefs of our theory we are least willing to abandon in the face of recalcitrant experience, but if experience is defiant in the face of many changes in the theory, the theory may be jettisoned along with its fundamental assumptions. Such a move may be hard to imagine for the belief that there are physical objects, but the various fundamental presuppositions that Trusted sees at work in the history of science all seem to be principles involved more directly in the specific content of scientific theories—albeit ones that cannot be tested directly against experience or in isolation. Her third aspect is more vague. Metaphysics does “. . . not purport to offer physical descriptions but . . . claim[s] to show a greater reality beyond sense experience” (p. x). The belief in electrons is about a reality beyond sense experience, but it hardly suggests a non-physical, mystical reality. The phrase “greater reality beyond sense experience” does little work; the third aspect seems to characterize metaphysics in terms of religious content, hardly a necessary condition for metaphysics.

Rejecting empiricism and holism with it, one might see metaphysics as concerned with modal matters—of necessity and possibility—while science concerns only the actual world. This distinction would explain why metaphysics is not empirical as well as why it is fundamental—it provides the conceptual foundations for our empirical inquiries. This idea leads naturally to the belief in things not tractable in physical terms—thus to what Trusted

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calls the 'mystical.' The distinction between science and metaphysics would become one of kind not degree, but the question of how the two are related becomes much more troublesome. Of course, beliefs about what is possible constrain beliefs about what is actual. In that way, metaphysics will influence science, and perhaps that is all Trusted is after, but then she cannot admit that metaphysics and empirical theories are too closely related to be separated.

Implicit in Trusted's book one can identify a fourth aspect of metaphysics. Throughout she seems to portray metaphysics as beyond rational debate; metaphysical beliefs represent social biases and no rational means will adjudicate metaphysical disagreements. She writes, "We are inevitably affected by social customs and assumptions that correspond to the earlier influence of the Church. Posterity may find these as irrelevant as we find medieval religious beliefs and Church doctrines but Posterity will have its own dogma" (p. 14). The implication is that modern science had no good reasons for rejecting the religious assumptions of medieval science and posterity will have no good reasons for rejecting those of today's science. Trusted's idea that physical theories are full of metaphysics sometimes seems to make her skeptical of a rational assessment of their ultimate truth. Though her history indicates progress in science, it is not an objective notion of progress independent of how we 'construct' the world. This aspect of metaphysics adds new substance to how metaphysics influences science, but nothing in her history substantiates such pessimism. Trusted's loose use of the word 'metaphysics' allows her to slip from one 'aspect' of the term to another without ever taking seriously enough the question "What is metaphysics?"

If one puts these methodological and conceptual qualms aside, Trusted's book will provide a nice tour winding through the history of philosophy and science from medieval times to the present. Chapter 1, "The Ordered Cosmos," describes the influence of religious beliefs on medieval science up to 1300. The conception of God gave rise to a conception of the universe fit for science: ". . . though the philosophy of the schoolmen was unsympathetic to critical inquiry, their view of God as perfect and unchanging and of His Creation as perfect and orderly, encouraged explanations in terms of regularities rather than divine caprice" (p. 5). Religious ideas, endowed with sacrosanct authority, also encouraged specific scientific endeavors: "It was held that sunlight illuminated the world just as spiritual light illuminated the mind and soul of

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Man and since knowledge of truths came directly from illumination by divine light, i.e., by revelation, it was believed that the study of physical light from the sun might also illuminate the mind” (p. 9). Thus the importance of optics in medieval science is inseparable from the content of metaphysics, though it is disappointing that Trusted emphasizes this connection and ignores any details of what optics was like at the time. The metaphysical connection is suggestive but much too vague without some details of the science. Motion, as conceived by Aristotle, was the other respectable topic of medieval science. Unlike her discussion of light, Trusted gives the details of Aristotle’s ideas about motion, but she also omits how medieval metaphysical or religious beliefs motivated the issue of motion. The chapter concludes stressing “. . . that in the Middle Ages natural philosophers regarded inquiry as entirely subservient to Faith” (p. 13).

Chapter 2, “Old Beliefs and New Ideas,” begins with Roger Bacon and Grosseteste who “. . . based their views, at least in part, on direct observation and both made discoveries that supplemented Aristotelian physics” (p. 16). However, “Bacon argued that the classical writings should not be treated as setting absolute bounds on what could be known” (ibid.). In perhaps the best sections of the book, this chapter culminates with Copernicus’ revolution, where one learns that Copernicus thought of himself as improving on Ptolemy’s basic scheme. “Today we speak of the Copernican revolution, yet this was emphatically not how it appeared to Copernicus himself” (p. 24). At his time, his model “. . . was generally held to be nothing more than a device for saving the appearances and most astronomers did not accept it as a physical description” (p. 25). At the end of the sixteenth century, “It was clear that fundamental changes had to be made to the calculating scheme [of the orbits of the planets] but the scholastic, the Aristotelian, paradigm remained undisturbed” (p. 34).

The Renaissance marked a loosening of the authority of the Church and Aristotelian logic became unfashionable as well. Abandoning this standard led to chaos. “When the logical tradition of syllogistic argument was dismissed as pedantry, fantastic theorizing could run riot; there was no way of distinguishing constructive imaginative speculation from superstition and all ancient legends and myths could be held to have equal merit” (p. 21). Much of the science of the day thus had elements of superstition and magic. Chapter

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3, "Chaos," takes up the influence of the magical *Corpus Hermeticum*. "One feature of the Hermetic writings was the importance accorded to the sun" (p. 37), and this mysticism influenced Copernicus. Kepler's universe with its elliptical orbits ". . . was an improvement on the Copernican scheme since it was a source of more accurate prediction, but as a physical description it was subject to the same criticisms" (p. 48). Only with Galileo's new conception of matter and motion was the Copernican revolution complete, though like Feyerabend, Trusted points out ". . . Galileo begged the question. His inertial theory was based on metaphysical assumptions that could no more be justified than those of his critics unless the Copernican theory were assumed to be correct" (p. 54). Note again how Trusted dubiously equates metaphysical assumptions with ones that cannot be proved more reasonable than the competition. Nonetheless, Galileo does mark an interesting epistemological turn: "He argued that nature was also the book of God; it ranked with the Scriptures as a source of knowledge and might be less difficult to interpret. By implication then, natural philosophers who studied nature were in a better position than clergy to understand the true meaning of God's words in the Bible" (p. 55).

This turn leads, in Chapter 4 "The Search for a New Order," to Descartes, the scientific revolution of the seventeenth century, and "the fundamental metaphysical belief of modern science" . . . "that the universe and all that is in it [excepting human beings] is a vast machine operating in a way that can be described by physical laws" (p. 61). One of the best chapters of the book, Chapter 5 "The Grand Design," tells the story of the conceptions of physical laws from Descartes to Leibniz and Newton. After Galileo, ". . . force came to be related to changes in motion rather than to muscular effort" (p. 84), though Descartes' laws ". . . related 'quantity of motion' to the size, not the weight of bodies" (p. 85). Newton finally rectified this mistake with his conception of mass as density of matter. Newton's physics was full of metaphysics however: "Not only did his reliance on the constancy of his laws of nature depend on God's will, but his metaphysics directly involved God's nature" (p. 102). Newton's physics was full of metaphysics in more than its religious aspect, but Trusted is too quick to argue, "That formula [$F=ma$] represents a methodological rule, perhaps even a metaphysical principle. For we can never observe motion free from all interference (true inertial motion) and so we

have no direct experience of it; nor can we give a logical demonstration whereby the principle is established on rational grounds” (p. 95). Newton’s formula is perhaps a metaphysical principle because it can neither be verified by “direct experience” nor proved by logical demonstration? This false dichotomy would make most scientific claims metaphysical by default. The same problem arises when one tries to say why it is a methodological principle. Is a methodological principle in any important sense not empirical by definition? Later, Trusted claims that Newton “. . . defined force in terms of acceleration so that the relationship $F=ma$ is not a genuine empirical law” (p. 97). The slip from methodological rule to definition is telling. Such ‘definitions,’ which help provide the content of a physical theory, clearly are revisable in the face of falsifying experience. Trusted’s sloppy sense of ‘metaphysics’ allows her to see so much metaphysics as inseparable from science.

Chapter 6, “The Age of Reason,” and Chapter 7, “The Age of Experience,” are primarily interludes into the history of philosophy. “By the eighteenth century, . . . all propositions had to have the support of reason if they were to be accepted. Thus, natural theology which, in the seventeenth century, had been seen as a prelude to revelation . . . came . . . to be seen replacing revelation” (p. 109). In the nineteenth century, “. . . the empiricist thesis that knowledge of the world must be based on observation was firmly established; the confidence was that perception could be truly objective and that, by taking care, other laws of nature, as absolute and certain as Newton’s laws of motion, would be revealed” (p. 128). This empiricism culminated in scientism and a contempt for metaphysics.

After these interludes, Chapter 8, “Problems: Energy and Ether,” returns to science and the nineteenth century, but after all the talk of empiricist philosophy, one finds that the scientists were more akin to the seventeenth century rationalists: “Joule’s appeal to divine constancy is in the same spirit as that of Descartes and Leibniz. For Joule and his contemporaries and successors the First Law of Thermodynamics was not an empirical law that would be subject to correction but a metaphysical postulate. Experimental findings were interpreted so as to conform to it; they could not show it to be false” (p. 146). The First Law of Thermodynamics is supposed to be metaphysical in all of Trusted’s aspects: (1) not refutable; (2) a fundamental principle for interpreting experience; and (3) based on religious beliefs. But

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thermodynamic theory as a whole is testable. If the theory failed to make accurate predictions, then it would need revision. Even if the First Law of Thermodynamics is a principle for interpreting experience, it may still be abandoned in the face of enough deviant experience. Moreover, Joule's religion may have made his law more plausible to him, but it was not essential. God has had to give, but thermodynamics remains.

Nineteenth century science postulated the ether as the medium for the transmission of light, but problems with the ether created a crisis eased in the end by Einstein. This "Revolution" is the well-worn subject of Chapter 9. Trusted concludes: "It has come to be accepted that in different frames of reference measurements must be observer dependent but even so common sense concepts of space and time and mass have had to be reassessed. The physical theories of the twentieth century are based on a new set of metaphysical presuppositions as to the nature of the world. . ." (p. 178). The play in Trusted's sense of metaphysics is now so loose that it has become trivial. These conclusions of physical theory have "come to be accepted" because of good reasons, empirical evidence. They provide a new understanding of time, space, and mass in the actual world. If this is metaphysics, then science is metaphysics; but by now the reader has lost any sense of 'metaphysics' as distinct from actual science.

Chapter 10, "Physics and Metaphysics," continues to find metaphysics intermingled with modern physics, but one really begins to wonder what Trusted is thinking when she tries to pin the postulate of God on Einstein's physics simply based on the fact that he said, "Then I would have been sorry for the dear Lord," when asked what he would have thought if one of his predictions had failed. She says: "Descartes thought that God guaranteed the uniformity of events and had given mankind the power to discover the laws of nature; Newton thought also of a uniform process of events, overseen by God, a God who supplied the physical framework of an absolute space and time. Einstein referred to 'the dear Lord' as the ultimate master of the cosmos" (p. 186). How one can take this statement as "more than a metaphorical reference to God" is hard to imagine, and Trusted gives no reason for her bold reading.

In the end, she does address an interesting metaphysical presupposition of science: "The assumption is that there is an objective order, perhaps an order divinely ordained, and that humanity is capable of discovering that order and

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arriving at ultimate truth” (p 188). The story has now come full circle, an interesting assumption connects all scientific endeavors. Could science understand the world without assuming order and regularity? Might this assumption impose a metaphysical vision onto a reality that is diffuse and chaotic so that science misses the mark of truth? These are interesting questions, but Trusted’s unwillingness to distinguish clearly between metaphysics and science leaves us where we began.

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