

FREEWILL, DETERMINISM AND THE SCIENCES

I. INTRODUCTION

Philosophers and others have often debated whether we have freewill: i.e. whether (in a sense I shall try to elucidate) our power to choose between X and Y is radically undetermined, so that if we choose X we yet might have chosen Y, and *vice versa*. My concern is not with that question but with a hypothetical one which arises from it: *if* we had such freewill, what implications, if any, would that fact have for the sciences. My argument concentrates on the social sciences, since the phenomena with which they deal inevitably involves human choice.

It is widely held that freewill would make social science impossible. Thus Professor May Brodbeck, after speaking of how we may in practice use informal "insight" to understand each other, goes on to say that, by contrast:

it remains for the systematic social sciences to provide the laws and theories by which to confirm or refute our intuitive causal judgments. Scientific determinism is the view that every event occurs in some system of laws such that *if* we knew these laws and the state of the universe at any time, then we could explain the past and predict the future. This frame of reference includes,

as it consistently must, human actions which, therefore, can be the object of scientific study.¹

This clearly indicates that *unless* this “frame of reference” includes human actions, they could not properly be the “object of scientific study.” Science, on this view, implies determinism in the phenomena with which it deals. The social sciences must include the phenomena of human choices. If those phenomena are undetermined, the social sciences are impossible.

In philosophy of social science, the issue is usually debated between the “tough minded,” such as Brodbeck, who advocate a unified method for natural and social sciences, and the “tender minded,” who speak of the need for insight and for unique methods in the social sciences. My position is, by contrast, that *no* defensible view of either the natural or the social sciences can require determinism. I do not suggest that social scientists and others should not be determinists, if they have reasons for believing determinism to be the case. But they are not committed to determinism merely because they believe that their discipline must be scientific in even a thoroughly tough-minded sense. *A fortiori* the tender minded are not so committed either. My main argument starts in Section III, but there seems so much confusion in the debate that I first try to offer some clarification.

II. CLARIFICATIONS

1. What is meant by the notion that freewill would make social science “impossible”? Here the important distinction is between “in practice” and “in principle.” The latter notion is the relevant one. To try to calculate in practice just where a particular rock will come to rest after a landslide is as unprofitable as to calculate just how a particular swinging voter will make up his mind. Yet with the rock the ordinary determinist laws of mechanics apply, so that *if* we could feed in all the relevant data we could in principle deduce just where it would

¹ Brodbeck, 1968, p. 669. For convenience I shall select references to this volume whenever appropriate.

come to rest. Though our calculations about human phenomena may be less reliable, the crucial issue is not any such difference of degree, but whether we here meet a conceptual barrier to doing even in principle what we could in principle do about the rock; and whether, if we do meet it, it would make social science impossible.

2. "Freewill" must be distinguished from the wider notion of "free." To say that something or someone is free is, in my view, a remark which has specific meaning only in a specific context. What there is in common between a free country, a free sample, a freewheeling bicycle and free love, is only that they are *not* being restricted or constrained or interfered with in some sense, and only the context can supply the sense (Franklin, 1968, pp. 30-36).² Most senses are compatible with determinism. An ordinary citizen is free in a sense in which a prisoner is not, but that fact is quite compatible with the sociology of crime. Someone who overcomes a neurosis has a new freedom, but to achieve that freedom may be the goal of a Freudian psycho-analyst whose theory is determinist. Some of these senses of "free" may be at least as important as "freewill," and how to maximize our freedom may often be a crucial question. However if these were what we had in mind by "freewill," then the answer to our problem would be "No" in a straightforward way. Freedom presents no conceptual barriers here to make social science impossible.

3. The freewill debate between "determinists" and "libertarians" has been posed in many ways, and no way is free from possible misinterpretation. Thus it is said that determinists assert and their opponents deny that all events, including human choices, are caused; but the correct analysis of causation is a conceptual morass. It is said that libertarians assert and determinists deny that a man who freely chooses to do X really could have done something else, namely Y; but the analysis of "could

² My point applies equally to "negative" and "positive" concepts of freedom, in the sense used by I. Berlin, 1958. Both positive "freedom to" and negative "freedom from" must ultimately be defined in terms of absence of interferences.

have done something else” is another morass. Again determinism may be defined as the claim that all events are in principle predictable; but as Popper (1950) and others have shown, this too has unsuspected complexities. Brodbeck (see first quotation) defines it in terms of a capacity in principle both to explain and to predict, thereby involving debates about explanation as well as prediction.

Yet surely there is a single central point. The libertarian claims, and the determinist denies, that given the actual agent and his actual situation of making a choice, it is possible that either of at least two things might happen, i.e. that the choice might be either X or Y. The claim is that:

in the case of an undetermined choice there is, in the whole process of deliberation, decision and consequent action, at least one point of time where the total situation is not a sufficient condition for the immediately subsequent one. In other words, given the existing total situation, either of at least two things might happen; for example, at some point during the course of deliberation the agent might switch his attention from one consideration or might continue to dwell on it, or at the point which marks the end of deliberation, he might decide to do X or to do Y.³

It is this that would be said to make social science impossible.

4. I am not asking who is right, but only whether libertarianism *would* make social science impossible. Yet I must now say something about the arguments for each view. I have argued elsewhere that each rests at bottom on certain fundamental considerations (Franklin, 1968, esp. Chs. I, III, XIII, XIV). Without assuming that now, I shall mention some points I shall later need.

Libertarians appeal to many and sometimes conflicting considerations: to our power of new and creative response to both intellectual and practical challenges; to conceptual points about the very notion of making a decision; to what must be the case if we are to be held responsible for our actions; and so on.

³ Franklin, 1968, p. 12. This formulation is not really free from possible misinterpretation either; e.g. “total situation”, “sufficient condition”, and “might” could require further elucidation.

What these have in common is the conviction that our future is not just a product of our past history and social conditioning, and that, no matter how influential the latter may be, we are not bound by them in such a way that our choices could not be other than they will be. So they present a sense of “free” such that we are not free in *this* sense unless it is genuinely possible that the outcome might have been different.

Determinists may take two positions in reply: either denying that creativity, responsibility, freedom, etc., really occur; or else agreeing that they do, but arguing that they are compatible with (and may even require) determinism. Again many reasons are offered; there are debates about the analysis of causation, about the scope of science, about the nature of explanation, etc.. Yet again I think there is a common core. It is that to know (and hence to be able to explain) why X happened, we must know why X *rather than anything else* happened, and hence why the occurrence could *not* have been different. On this view, an undetermined event (including a choice) would be in principle inexplicable, and hence of course inaccessible to scientific explanation.

5. Since determinists may *either* reject the relevant ordinary notion of freedom (responsibility, creativity, etc.), *or* argue that the ordinary notion is compatible with determinism, there is a problem of terminology. Those who maintain the compatibility are often called compatibilists or reconciliationists or dissolutionists. Those who reject the ordinary notions are often and unfortunately simply called determinists, though William James called them “hard” (as opposed to “soft”) determinists. In any case we have two issues: whether or not our actions are determined, and whether or not we are free, etc.. The possible combinations are:

	determined	not determined
free (responsible, etc.)	compatibilist (soft determinist) (reconciliationist) (dissolutionist)	libertarian
not free	(hard) determinist	

The bottom right possibility is not found, since it goes against the central concerns of each side as mentioned in 4.⁴

While the hard determinist rejects all talk of freewill, not only the libertarian but also the compatibilist often claims to preserve it—the former by denying determinism, the latter by reconciling the two notions. Now in our present context “free-will” is clearly used in the libertarian sense. For if the compatibilist is right, freewill, being compatible with determinism, poses no specific problem for the social sciences.

6. Finally there is a less commonly noted point which is crucial for my argument. The term “determinism” has two sorts of application, which we may call ontological (concerned with being) and epistemological (concerned with knowledge). We say that given *phenomena* are determined; this is an ontological claim that the total situation can have only one outcome. We also speak of a determinist *science* or *theory*; this is an epistemological sense, indicating that the knowledge we get from the theory implies that the result could not have been different.

At the epistemological level some theories are determinist, using laws which allow only one outcome for any individual case. Others are inherently non-determinist; in particular, no statistical law can give a determinist outcome in any normal individual case. However ontological determinism is a further matter. Suppose we use in statistics the example of an unbiased coin landing heads or tails. Then *relative to our theory* which way it lands on any particular occasion is random. But despite epistemological indeterminism, the outcome of each individual throw is in principle ontologically determined, even if we cannot make the calculations; given the precise details of initial thrust, mass, etc., the outcome could not have been different. For we have another theory, namely classical mechanics, which is determinist and which applies to the phenomena. Epistemological

⁴ Because the concepts (especially “responsibility”) are not clear-cut, there can be demarcation disputes; e.g. if a compatibilist position offers an account of responsibility which reconciles it with determinism, it may be replied that this is not the concept of responsibility which we in fact have, but a new surrogate concept. It is then a further question whether or not the purported compatibilism is best seen as a version of hard determinism, since it rejects our (actual) concept of responsibility.

determinism implies ontological; if a correct theory shows phenomena to be determined, then they are. Ontological *in*determinism implies epistemological; if phenomena are not determined, there cannot be a correct theory which shows they are.⁵ However, ontological determinism does not imply epistemological; non-determinist theories, such as statistical ones, may apply to phenomena that are in fact determined.

III. LEVELS OF INVESTIGATION

We are to ask whether ontologically undetermined freedom would make social science impossible. My strategy is to argue that even tough-minded science does not presuppose determinism, so I here adopt a tough-minded view of science. Putting aside all claims of special requirements for the social sciences, the following criteria are at least sufficient for science as we classically know it: that its claims should be empirically testable; that it should establish laws or invariances in the phenomena; that the variables used should be amenable to precise measurement and mathematical treatment; and that the invariances should be systematically interrelated so as to yield a coherent body of knowledge. We could summarize this by the slogan that science seeks empirical, quantifiable, and systematic invariances. Some such invariances are epistemologically determinist, such as those of classical mechanics, while others concern statistical probabilities and are therefore indeterminist, such as quantum mechanics.

This, however, is a purely formal characterization of science, without reference to its content. When we consider the latter, it is clear that scientific investigations, like their pre-scientific forerunners, fasten on different patterns in the phenomena. Their relations could be classified in more than one way. I shall chiefly consider what I shall call different levels—i.e. patterns

⁵ Hence libertarians are committed to denying either that the events in our brain totally determine our thoughts, or that classical determinist physics and chemistry apply without qualification to brain-events. For an argument to this effect, cf. Eccles, 1953. For further discussion, cf. also Franklin, 1968, pp. 28-30, 143, 304-5.

related in terms of the relative sizes of the entities involved, so we have macro- and micro-levels of investigation. For example, a biologist may use Mendel's laws and refer to genes, while a biochemist may deal, at a micro-level, with the chemical structure of a gene.

If we combine these two points in our conception of science, we see that not all levels are epistemologically determinist, and that at some levels epistemological indeterminism is unavoidable. Indeed not only may a given level inherently fall short of determinism, but its explanations may depend on the fact that it does. The theory of evolution depends on two facts: firstly, that a large enough majority of offspring are sufficiently like their parents to ensure that the species is stable; and secondly that there is enough variation between offspring to permit favourable variations to survive at the expense of others. If the phenomena were completely determined in the sense that offspring were always exactly like their parents, evolution would be impossible. No doubt biologists assume that individual variations have a determinist explanation at a biochemical level, yet the determinist theory *cannot* be at the macro-level, but only at a micro one.

This is determinism at a micro-level, but the opposite also occurs. Quantum mechanics is probably the most powerful and successful theory in our most powerful and successful science. Yet the Uncertainty Principle makes the theory non-determinist at the micro-level, though statistical principles operate to produce the classical paradigm of all determinist theories at the macro-level of classical mechanics.⁶

To drive home the complexity, consider the simple example of a fly caught in a spider's web. We might say that the outcome is determined and the fly cannot escape. Yet at this level the detail of each movement of the fly and the spider is unpredictable. So here there is epistemologically a macro-determinism superimposed on a micro-indeterminism. Further, we believe that in principle each movement is determined at the physiological or biochemical level by minute events in their central

⁶ The correct interpretation of quantum mechanics is highly complex and controversial, but this does not affect my present point.

nervous systems. Yet below that level of determinism again the individual particles of which the molecules of their C.N.S.'s are ultimately composed, are subject to the Uncertainty Principle. Thus in so small a phenomenon as a spider's catching its food we have, epistemologically, a determinist macro-level (fly will be killed) superimposed on a non-determinist micro-level (details of struggle) superimposed on a determinist micro-micro-level (phenomena of C.N.S.) superimposed on a non-determinist micro-micro-micro-level (Uncertainty Principle). And moving upwards we have the non-determinist probability that this spider will catch enough flies to survive, and perhaps (in given circumstances) the determined certainty that the species will survive in that area.

Thus arises the central challenge to the view that science implies determinism. Whatever we believe about whether, in the *ontological* sense, all phenomena in the universe are determined, if all science is to be in principle determinist, then our theories must all in principle be *epistemologically* determinist at every level at which we may wish to investigate the phenomena. And this seems plainly false. Frequently, to achieve epistemological determinism even in principle we would have to move to another level.

IV. SOME ELABORATIONS

Two further points need elaboration before I turn to some further implications for the social sciences.

Firstly I have assumed that statistics can sometimes lead from an epistemological micro-non-determinism to a macro-determinism, as in quantum and classical mechanics. But, it may be objected, if we start with a non-determinist level then strictly speaking we can never achieve determinism. For example, the statistical theory of coin-tossing is non-determinist, not only in the sense that in 6,000 throws it does not predict *exactly* 3,000 heads, but in the much stronger sense that it does not even rule out the possibility of 6,000 heads, but only makes it unthinkably improbable. Similarly the kinetic theory of gases only makes it unthinkably improbable that a given body of gas will

not obey the gas laws. So we can never properly speak in such cases of a macro-determinism.

I shall here dodge this issue, by pointing out only that if correct, it would tell at least equally against my opponents. For the Uncertainty Principle cannot currently be given any determinist interpretation. Thus if science required determinism, and statistical patterns could never achieve it, we could not have any science at all; or at least none which was derived from or reducible to micro-physics.

Secondly, within epistemological determinism there is surely an important difference between "The fly will be killed," and the description in mechanics which would entail "The coin will land heads." The former determines the result but leaves open much intermediate detail; the latter, if we could get it, determines every aspect of the coin's movement.

In this context Brodbeck, borrowing from Bergmann, introduces the term "perfect knowledge":

A description of a system is complete if, given that description at any one time, we can by means of laws infer its state at any other time ... If nothing that makes a difference, no "relevant variable" has been omitted from the laws of the process, then from its state at any one time, we may infer its state at any other time. If we knew all this, then we would have what Bergmann aptly calls "perfect knowledge." (1968, p. 341).

She and Bergmann further classify "imperfect knowledge" in various ways (1968, pp. 371-2, 375-9, 415-36).

The notion is important but, as I shall later indicate, I find the terminology dangerous. "Perfect" seems to be introduced in the sense of "complete" or "needing no addition," much as grammarians talk of the perfect tense. However it suggests, without arguing for it, a further evaluative flavour of an *ideal* standard of knowledge by which all else should be measured. To avoid this I shall, within epistemological determinism, speak of "determined in detail" to refer to "perfect knowledge," and of "determined in outline" when only some eventual end state of a process is determined by the theory. Classical mechanics is an obvious example of the former, as the fly in the web is of the latter.

If we cannot say that only one outcome is possible, whether in outline or in detail, we must abandon (at the epistemological level) the term “determinism”; e.g. if we think there is any chance of the fly’s escape, we cannot say its death is determined. We have other words for non-determinist relationships; “A influenced B”, “A was a factor in B”, etc.. So now we have two distinctions: one within determinism, between being determined in outline and in detail; and another between determinism as a whole and non-determinist calculations of influences, trends, probabilities, etc..

Further, there are various cases of being determined in outline. Sometimes we can derive a determinist macro-pattern from a statistical micro- one, thus demonstrating the irrelevance of the micro-details. But in other cases we have no relevant statistical theory, as in our claim that the fly cannot escape the spider. The latter case depends on an informal (though still empirically based) notion of *relevance*, that the finer details are irrelevant because they cannot ultimately prevent the emerging macro-pattern.

To sum up: in the epistemological sense only some sciences are determinist. Of these some are determinist in detail for the individual case, and others only determinist in outline for statistically large enough samples or for certain ultimate results. Determinism in outline may depend either on statistics or on an informal notion of what is relevant to the outcome. Other sciences are normally non-determinist (though perhaps achieving determinism for special cases). Non-determinist sciences vary widely as to how far they can statistically quantify their talk of influences, trends, probabilities, etc.. This classification of sciences with respect to determinism does not neatly correlate with their usefulness, with the insight they give us, with their mathematical sophistication, or with the elegance and power of their theories.

V. APPLICATIONS TO THE SOCIAL SCIENCES

Since freewill would imply ontological indeterminism, it implies some level of epistemological indeterminism too. However, as we have seen, lack of epistemological determinism would not

make the social (or any other) sciences impossible. An argument that science must reject freewill would have to rest on one of two claims. One would be that, even though much science is epistemologically indeterminist, ontological indeterminism is for some reason scientifically intolerable (cf. Sec. VI). The other would be that the actual epistemological indeterminism which freewill would involve, would place disastrous limits on at least the social sciences. I examine the latter claim now, together with some other issues.

1. All that freewill would formally rule out would be determinist invariances implying that the outcome of a choice could not have been different; i.e. it would rule out only the model of, e.g., classical mechanics. It would be compatible with sciences of individuals and of society far more powerful and reliable than many natural sciences. Since it would recognize the influences of our social conditioning, it would also be compatible with achieving complete determinism in special cases where normal free choice does not operate, as when food is placed within reach of a starving man. Finally, it would be compatible with any social theory based on statistics, even if the theory were determinist in outline; for the freewill of the individual would appear merely as a margin of error when the sample was too small.

Freewill would not even rule out any claim that there were holistic, irreducible, social laws which unalterably determined the future of society. The laws would show only that our actions, whether undetermined or not, were *irrelevant* to the outcome, like those of the fly in the web. Certainly people accepting such laws are unlikely to accept libertarianism, and *vice versa*, for these are rival pictures of the nature of man and of society. Yet if people should hold both viewpoints (that there are such holistic laws and that we have freewill), they would not on this point be formally inconsistent.

Thus far, the answer to the question I have posed must surely be that, when so much impeccable science is epistemologically indeterminist, there is nothing in the mere notion of a limit to determinism deriving from freewill which would pose a threat to the social sciences.

2. It is natural, however, to ask further whether there *are* barriers in principle to determinism in the social sciences. Though answers are extremely difficult, and are likely to be proved wrong by future developments, the question is legitimate. To ask it is to move from my question whether the *ontological* indeterminism of freewill *would* make these sciences impossible, to whether any other factor *does* make *epistemological* determinism impossible here. I shall now briefly discuss this.

With human choice the same situation notoriously provokes different responses in different individuals, or in the same individual at different times. Faced with a prowler on a dark street, one person will scream, another run, another adopt a karate stance, etc.. The relevant variables which present psychological and sociological techniques could even in principle identify, seem ones which usually give us probabilities only. This is true even if, e.g., the limits of individuals' responses, or their actual responses to special situations, may be known with virtual certainty. Now if we contemplate achieving full determinism in the individual case, surely our thoughts turn to a micro-level. Would we not have to know the whole structure of each brain, and compute its neuronal interactions? If so, it is not at the level of social science that we could achieve full determinism.

Further, massive problems arise from the fact that we are studying ourselves, and hence that our predictions may be self-fulfilling or self-destroying, our selection or relevant variables influenced by our social conditioning, etc.. In particular there are the problems which novelty and invention raise for the limits of prediction. Individuals and society react so strongly on each other, that we logically could not know what effect future inventions will have, without first inventing the inventions ourselves. How, for example, could we begin even broadly to predict what individual behaviour or society will be like, when the standard means of transport is the successor to the successor to the automobile?

Even if we emphasize how far new inventions, etc., are a function of changing social factors, the relevant question about prediction remains that of whether the function can in principle be computed in advance. Suppose we could show that it was im-

possible to invent the modern computer before 1930 and impossible that it should not be invented by 1960. This would indicate that the invention was determined in outline (though in practice the premises would be no more than plausible, and hence the conclusion no more than probable). But could that occurrence have been predicted even in principle in 1900 without first inventing the intervening technology between 1900 and 1930? If not, then the future is surely at least epistemologically undetermined.

This suggests that the position of the social sciences is likely to be parallel to that of evolution theory. Each must accept as a datum that changes will occur, and each will concern himself with how such changes are likely to work themselves out. For each there will remain an element of sheer novelty which could be further explained, if at all, only at another level.

Some have used these considerations to argue that social phenomena are inherently undetermined. That is an ontological, not epistemological, conclusion and surely it does not follow.⁷ Conceivably at some level—e.g. the physico-chemical interaction of the molecules which together constitute the human race and its environment—the whole process is determined. But it seems that *at the levels at which social sciences operate*, epistemological determinism is probably unattainable. For reasons given, that should not worry social scientists at all.

VI. ONTOLOGICAL ISSUES

To many social scientists and others, all this will seem beside the point. For, they would say, whatever may have to be conceded about epistemological indeterminism at various levels, libertarians are committed to an ultimate ontological indeterminism. And that is a notion which no-one, or at least no scientist, can rationally accept. On this I shall finally comment.

⁷ Often, though not always, the invariances with which we work will apply only provided the agent is not aware of them. This points to a sense in which knowledge gives freedom from social forces. However this is not the freewill issue. Cf. Sec. II, 2.

1. The heart of determinism, I suggested in Sec. II, 4, is that either we can in principle know why this *rather than that* occurred, or else the occurrence would be in principle incomprehensible and inexplicable. So any lack of explicability is an invitation to provide a further and fully determinist answer. To show there is, e.g., a .84 probability that an X is a Y, given that it is a Z, is *ipso facto* to raise the further question of why *this particular* X is one of the majority—or of the minority as the case may be—and only a completely determinist theory can answer that.

To this, libertarians make various replies (cf. Sec. II, 4 and Franklin (1968, pp. 216-221, 256-259, 297-301). However, even if we agree with the determinist, the point is irrelevant to the social sciences. For often to obtain a determinist answer even in principle (if we could), we would have to move to another level. And then usually we would not be doing *social* science.

2. Next, as a typical defender of determinism, I consider Brodbeck. Her starting point is the connexion between comprehensibility and explicability (see 1 above, and particularly the covering law model of explanation. In her 1968, pp. 363 *et seq.*, she emphasizes the need for a deductive connexion between the *explanans* and the *explanandum*. For only then will the *explanans* show that this rather than something else had to occur.

Now in fact I find the covering law model unconvincing in some contexts, but that issue involves the dispute between tough- and tender-minded social science. So my present point is only that the covering law model itself recognises three versions of explaining/predicting: the deductive-nomological, the deductive-statistical and the inductive-statistical.⁸ In the deductive-nomological type, the laws used in the *explanans* apply without exception to the individual case, to yield Brodbeck's "perfect" knowledge (cf. Sec. IV) and complete determinism. However, when we use statistical invariances, we can obtain

⁸ Sometimes the latter two are collapsed, so as to give only deductive and inductive-nomological forms. Contrast, e.g., Hempel as quoted in Brodbeck at pp. 180-185 (which is a dual classification) and at p. 398 (which is a triple one).

only one of the other forms. We may keep the deducibility, and have a deductive-statistical explanation; i.e. we may *deduce* from our laws and initial conditions that the *probability* of an X's being a Y, given that it is a Z, is .84. Alternatively, we may explain/predict the individual fact that this X is/will be a Y, but must then abandon the deducibility and use an inductive argument: this X is, or probably will be, a Y because, given that it is a Z, there is a .84 chance it would be. These two forms are non-determinist.

Hence there is a crucial extra premiss required for Brodbeck's argument to determinism. This comes from that notion of "perfect knowledge" which only deductive-nomological explanation can supply. It seems clear that for her such knowledge is "perfect" not only as "complete" but also in an evaluative sense. It is the *ideal* of knowledge, and in particular of scientific knowledge.⁹ When this view is added to the defense of deduction we reach her conclusion. Science seeks ideal knowledge, i.e. perfect knowledge, i.e. knowledge such that we can completely predict the future and explain the past, i.e. determinism.

Yet surely, even if we wish to be as tough-minded as we can, this is more tough-minded than we can seriously be. It is an unrealistic ideal for science itself, and has been ever since statistics entered the scene. We might grant that (in the descriptive sense) statistical theories fail to achieve "perfect" knowledge, and even that perfect knowledge is the ideal when achievable, but this does not make statistical investigations less scientific. We may hold, if we like, that the lion is the king of beasts, but we cannot reasonably disparage our cat for being a lion *manqué*.

3. The conviction that science requires determinism has strong and understandable historical roots. Determinism and admiration for science have often gone hand in hand, while libertarians have often seen scientific knowledge as threatening their values. Hence, to many determinism and science still seem natural allies. However I am arguing in effect that this view today

⁹ This ideal is undoubtedly held by many others who would not necessarily employ the term "perfect knowledge". Cf. Sec. VI, 4.

runs into increasing difficulties. As an example, those who see determinism as the only rational ideal are presumably committed to claiming not merely that there *may* be, but despite current scientific opinion that there *must* be, a correct theory which would make micro-physics fully determinist. They can hardly claim to gain support from the scientific viewpoint if they treat science so cavalierly.

Behind this example lies a deeper point. The invariances which we can even in principle hope to achieve, are dependent on the form of our enquiry. At the beginning of modern science, mechanics isolated a few measurable variables that completely determined the movements of bodies while ignoring their other features. Later successes in chemistry and physics depended on another important device. Micro-entities were postulated such that each was *exactly* like all others of the type; if a difference emerged a new type was created—an isotope of an element, a new physical particle, etc.. Both approaches permitted the discovery of determinist invariances of enormous power and scope, but only because the phenomena were susceptible to such treatment. Since then, the greatest successes have come from moving into new fields with appropriate new methods. There is the supremely successful use of statistical invariances in quantum mechanics and elsewhere; the use of deliberately over-simplified models to handle variables which are too complex to be computed; the promises of new approaches through systems theory, etc.. In such fields the techniques that led to classical determinism are in general inapplicable; e.g., to treat humans as we treat chemical atoms would require the creation of a new type for each person. Yet surely even a tough-minded approach should regard it as a merit and not a defect of science that it can advance into new sorts of invariances in new fields. From this standpoint, the view that science presupposes determinism seems to be fixated on earlier successes and to be now a handicap to understanding what science essentially is.

4. Next we must note again that the debate about freewill is easily confused with others, especially in the social sciences (including psychology). In particular there is the problem of alleged *depersonalisation*. Some theorists aim to explain all

human behaviour in terms of notions like stimulus and response, drive reduction, class interests, etc.; others protest that this treats the human individual as less than a responsible person. The protest often takes the form of claiming that we are responsible beings who can freely choose; and the defense replies that such protests are unscientific.

Yet however important this issue may be, it is not here relevant; it concerns the tough- *versus* tender-minded debate, but not the determinism *versus* freewill one, nor the question of whether science presupposes determinism. Allegedly depersonalising views will certainly be tough-minded; but they could consistently accept everything I have said about levels, and need expect no more than statistical invariances at the macro-level of human behaviour. Conversely the most tender-minded sense of the complexities of human motivation can go with a compatibilist, and hence determinist, view of freewill; and in the case of contemporary philosophers (if not social scientists) it often does so.

5. Many people, whether or not they can put a finger on any flaw in the argument, will still find my position totally unconvincing. A partial answer lies in the complexities of the debate. All philosophical positions draw part of their strength from criticizing alternative views (e.g. Brodbeck not only defends determinism but criticizes libertarianism—1968, pp. 669 *et seq.*), and the final assessment is extremely difficult. Yet more seems involved. The prolonged inconclusiveness of philosophical debate has in fact often been made the basis for an invidious contrast between philosophy, which cannot solve its problems, and science, which can. I have argued elsewhere (Franklin, 1968) that ultimately this is because philosophical conflicts both manifest, and flow from, different views of man and the world which are so deeply embedded that to their proponents they typically seem basically unquestionable. However my concern is not to defend that view (which is itself as controversial as any), but only to make two points.

Firstly, the present difference between my opponents and myself is of just the sort I am discussing. A training in tough-minded science is a particular sort of social conditioning (as

such scientists would surely agree), and it is one which often makes determinism seem basically unquestionable. My own approach to philosophical questions—doubtless as a result of my own conditioning—is of a different sort. I would argue for the desirability of training oneself to grasp the power of viewpoints opposed to one's own. In the present case, this would involve the attempt to see the possible attractiveness of whatever viewpoint we did *not* accept, whether libertarianism or determinism. However, secondly, I am not here concerned to persuade any tough-minded determinist to feel the power of libertarianism, or *vice versa*. Rather, I am struggling to separate the apparent metaphysical impasses from the question of what is required for even a tough-minded scientific methodology. And for that purpose, just as we can put aside the differences between tough- and tender-minded approaches to social science, so we can put aside the depths of the freewill problem. If we ask whether the scientist is committed *qua* scientist to determinism, the answer is "No." If particular scientists are so committed, then they are committed as philosophers (albeit usually amateur ones). I have not here seriously discussed the merits of that philosophy, but it is not to be confused with a commitment to science.

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