Karl Marx's Theory of History

A DEFENCE

Expanded Edition

BY

G. A. Cohen

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CHAPTER IX

Functional Explanation: In General

(1) *Introduction*

THE PRESENT chapter is more philosophical than any of the rest, and non-philosophical readers are likely to find it particularly difficult. Most of them will wish to proceed immediately to Chapter X, where functional explanation is discussed with greater reference to historical materialism. Chapter X is not philosophically technical, and it does not presuppose this one. The present chapter is justified because, beyond the disquiet about functional explanation felt by social scientists and historians, which Chapter X seeks to allay, there exists a deep strictly philosophical scepticism, felt no doubt by very many, but articulated by philosophers, and it is appropriate to confront that scepticism in a book which has made free use of the functional-explanatory mode.

For historical materialism has been presented as a functionalist theory of history and society, most obviously in Chapters VI and VIII. The former said that production relations have the character they do because, in virtue of that character, they promote the development of the productive forces; the latter, that the superstructure has the character it does because, in virtue of that character, it confers stability on the production relations. These are large functional-explanatory claims.

Here are some explanatory sentences of apparently similar structure, from various fields:

> Birds have hollow bones because hollow bones facilitate flight.
>
> That robin on the fence has hollow bones because hollow bones facilitate flight.
>
> Shoe factories operate on a large scale because of the economies large scale brings.
>
> This rain dance is performed because it sustains social cohesion.

A rain dance was performed yesterday because social cohesion was threatened yesterday, and the rain dance reinforced it.

Protestantism achieved strength in early modern Europe because it promoted the development of capitalism.

The intelligibility of these statements creates a *prima facie* case for the existence of a distinctive explanatory procedure, in which reference to the effects of a phenomenon contributes to explaining it. It is generally thought that the case collapses on further scrutiny, that each such remark is either misguided, or, if sound, then only by virtue of compressing or pointing to one or other *familiar* kind of causal story. We judge that the general opinion is ill-considered. The alternative view, that a single properly distinctive form of explanation is advanced in these sentences, deserves more examination. We shall hypothesize that there is a *special* type of causal explanation advanced in these and like instances, deriving its peculiarity from generalizations of distinctive logical form.

Explanations which possess the distinction we seek have been called 'functional explanations', and there is a large literature on the meaning of the statement-form 'The function of x is to ϕ'. It is widely assumed that such statements are, by virtue of their meaning, functional explanations,[1] but we shall not make that assumption: we shall not identify attributing a function with providing a functional explanation. We shall, moreover, maintain that it is possible to characterize the nature of functional explanation while offering no analysis of the statement-form 'The function of x is to ϕ'.

Following a terminological prelude, which stipulates a preferred sense of 'explanation', we show (section (3)) that there is functional explanation in that sense, and we separate the task of characterizing it from that of analysing function-attributing statements, which we forsake. In section (4) the concept of a *consequence law*, here claimed as the basis of functional explanation, is introduced. Section (5) concerns the confirmability of functional explanations, and section (6) defends them against a likely scepticism. Section (7) vindicates functional explana-

[1] Though, as we shall see (p. 252), those who hold this view do not all mean the same thing by 'explanation'.

tion in social science against criticism due to C. G. Hempel.

(2) *Explanation*

Consider a request or question of, or transformable into,[1] the form 'Why is it the case that *p*?', '*p*' being an empirical sentence, to the effect, e.g., that copper conducts electricity, that $S=\frac{1}{2}gt^2$, that Napoleon was defeated at Waterloo, that birds have hollow bones, that the Hopi have a rain dance in their cultural repertoire, that this Hopi group performed a rain dance last Tuesday. Call such a request or question a *why-question*, and an answer to it a *why-explanation*. (A why-explanation need not be correct to qualify as such.)

Not all demands for explanation admit rephrasal in the form of a why-question. 'Explain the rules of chess', uttered by one who wants to know what they are, not why they are what they are, is a case in point. So is 'Explain what is happening in Northern Ireland', from one who knows only that something remarkable is going on, and is not inquiring into its causes. So too is 'Explain the structure of DNA', if the speaker will be content with an answer not disclosing why it is structured as it is. So indeed is 'Explain the function of the liver', if no more than a list of the useful services it performs is sought. These requests for explanation may be called *what-questions*.

An answer satisfying a request of the second kind may also be a correct reply to a why-question. 'He was in the trough of a manic-depressive cycle', which might be offered in response to 'Explain what mental state Napoleon was in at Waterloo', might also be used to explain why Napoleon was defeated at Waterloo. But uttering it with why-explanatory intent carries commitments and liabilities of a kind which are absent when it is used to answer a what-question only.

Hempel holds that all genuine explanations answer why-questions. We do not follow suit in hereby legislating confinement of the term 'explanation' to what answers a why-question.[2] 'Explain', 'explanatory', etc., will be similarly restricted. We do not, like Hempel, deny that non-why-explanations are explanations, or assert that they are explanations in a different sense,

[1] A request or question is so transformable if and only if casting it in that form preserves its intent.

[2] This legislation comes into force in section (3).

but we just elect not to call them such, since our interest is in why-explanations.[1]

Authors who call statements of the form 'The function of x is to ϕ' 'functional explanations' disagree about which of our two kinds of explanation they provide. Most of those who have tried to analyse such statements equate them with statements ascribing useful effects to x. For them 'the function of x is to ϕ' is equivalent to a subform of 'the beneficial effect of x is to ϕ', a subform, since no one says that *all* beneficial effects are functions.[2] A functional explanation of x is, on their account, an explanation of the function of x, a clear, systematic description of a restricted class of its useful effects. It is not an explanation of x by reference to those effects. It does not purport to say, for example, why x is to be found where it is. In this view 'the function of the liver is to promote digestion' carries no implication that the liver is in the body *because* it promotes

[1] For Hempel's view, see *Aspects of Scientific Explanation*, pp. 334, 414, and 'Explanation and Prediction by Covering Laws', pp. 125 ff.

Hempel is wrong when he contends that 'explanation' (etc.) is ambiguous across why-explanatory and other occurrences. He presents himself as analysing the concept of explanation, or at least the or a central concept of explanation. But in fact he is investigating the conditions of adequacy of one *kind* of explanation, the why-explanatory kind. The distinction would be tedious were it not that, misdescribing what he is doing, Hempel replies ineffectively to those who criticize him on the assumption that what he offers to analyse is the concept of explanation as such. A general analysis of the concept is less interesting than Hempel's enterprise. Probably to explain is, quite simply, to make clear, so that to explain why is to make clear why, to explain what is to make clear what, etc. Hempel is really concerned with the conditions under which we may be said to make clear why something is so.

Nor may Hempel correctly say that his concern is with *scientific explanation*. Not all scientific explanations are explanations-why, and not all explanations-why are scientific explanations. A good explanation of the structure of DNA is a scientific explanation, but it need not explain why anything is so. On the other hand, why-questions occur and are answered pre-scientifically, and science, Hempel would agree, is but a more rigorous and more theoretical body of doctrine available for answering them. An account of scientific explanation-why is incorrect if it represents it as different in principle from ordinary explanation-why. Hempel respects that condition, and in so far as his account is right and wrong, it is similarly right and wrong for both contexts.

[2] A typical benefit theorist is John Canfield, who writes: 'A function of I (in S) is to do C *means* I does C and that C is done is useful to S.' For example, '(In vertebrates), a function of the liver is to secrete bile' means 'the liver secretes bile, and that bile is secreted in vertebrates is useful to them'. 'Teleological Explanation in Biology', p. 290. (Canfield's analysis does not make all beneficial effects functions because of special restrictions—see ibid., p. 292—on the meaning of 'useful' in the *analysans*.)

digestion: it just explains *what* the function of the liver is.[1]

Dissenting from these accounts is Wright, who thinks that it belongs to the meaning of statements of the form, 'the function of x is to ϕ' that they are answers to why-questions, and are therefore functional explanations in our preferred sense of 'explanation'. He accordingly rejects all analyses which identify ascriptions of function with ascriptions of (special sorts of) beneficial effect.

In section (3) we dissociate the question of the analysis of functional ascriptions from the question of the nature of functional explanation, and we adopt a posture of neutrality on matters of analysis. A preview of the standpoints to be distinguished: for the 'benefit theorists' and for Wright, but not for us, a functional ascription *is*, as such, a functional explanation. For Wright and for us, by contrast with them, a functional explanation answers a why-question. Unlike Wright, we do not contend that function attributing statements answer why-questions by virtue of their meaning; but unlike the benefit theorists, we hold that they do answer why-questions under certain conditions.

(3) *Function-statements and Functional Explanations*

Abbreviations: A *function-statement* ascribes one or more functions to something. A *benefit-statement* ascribes one or more beneficial effects to something. A *precedence-statement* says of one event that it preceded another event.

Larry Wright opposes analyses of function-statements which reduce them to benefit-statements of one or other kind. He claims that these analyses fail to note that function-statements always serve to answer why-questions:

> (1) . . . functional ascriptions [i.e. function-statements] are—intrinsically if you will—explanatory. Merely saying of something x, that it has a certain function, is to offer an important kind of explanation of x.[2]

[1] It is unfortunate that some philosophers use 'functional explanation of x' to mean 'explanation of the function of x'. As Christopher Boorse has remarked, one might as well call an explanation of a person's marital status a *marital explanation* of that person. (For explication of the usage, see Scheffler, *Anatomy of Inquiry*, pp. 52–3, and for protest against it, see ibid., p. 123.)

[2] 'Functions', p. 154.

Accordingly, Wright holds that it is part of the meaning of 'The function of x is to ϕ' that 'X is there because it ϕ's'.[1] Every function-statement is suited to answer a question of the form 'Why is x there?'

Wright gives two arguments for (1), only the second of which will be examined here.[2] We shall show that it supports not (1) but this weaker thesis:

(2) At least some function-statements are intended as explanatory.

The premiss of Wright's argument is the 'contextual equivalence' of such questions as 'What is the function of the heart?' and 'Why do human beings have hearts?' He does not elucidate 'contextual equivalence', but we may agree that, 'in the appropriate context', 'The function of the heart is to pump blood' answers both questions mentioned. But what is the appropriate context? Wright does not say, but clearly it is one governed by a belief that an answer to the function-question will explain why human beings have hearts, will, that is, answer the stated why-question.

Now this argument supports (2) and not (1), as a parallel demonstrates. Similar 'contextual equivalence' may obtain between the questions 'What preceded event e?' and 'Why did event e occur?'. The answer to both might be 'Event e was preceded by event f'. This shows—what needs no showing—that an event may be explained by a precedence-statement. It does not show—what is false—that precedence-statements are inherently explanatory.

This does not *disprove* (1), for the belief on which the 'contextual equivalence' between the function-question and the why-question rests might be conceptually grounded. But it does prove that Wright's argument supports the weaker thesis (2) only. It no more substantiates (1) than does the 'contextual equivalence' of function-questions and benefit-questions establish that benefit-statements entail function-statements, a conclusion Wright would reject. 'Why do human beings have hearts?' is contextually equivalent to 'What is the function of

[1] 'Functions', p. 161, with slightly different symbolism.

[2] See ibid., pp. 154–5. Wright's first argument turns on a supposed analogy between functional ascriptions and statements assigning goals to conscious agents. It cannot be assessed without more discussion of the explanation of animate agency than would be justified here.

the heart?' but the latter is contextually equivalent to 'What good does the heart do?' Thus an argument precisely similar to Wright's would prove exactly what he wishes to deny.

Wright's argument nevertheless provides some support for the weaker thesis, (2) ('At least some function-statements are intended as explanatory'), which we wish to affirm. And here is a further argument for (2), which does not involve the vicissitudes of interrogation. Sometimes a speaker who asserts a function-statement also cites comparable and contrasting cases in a manner reminiscent of explanation at large, and finds himself faced with counter-examples as one does when one is purporting to explain something. In uninvited commentary on a cow's long tail, a man points out that its hairy back attracts flies, and that one function of the tail is to keep them off. For contrast he cites the pig, whose sleek back is less enticing to insects, and whose curly little tail simply protects its anus. Finally, he exhibits the wild boar, rather pig-like, but sporting a substantial tail at the end of its unpiggishly hairy back. His friend may then point to the stubby tail of the hairy moose, thereby challenging what he said about the cow.[1] If, in saying it, the original speaker had intended only to indicate a benefit accruing to the cow from the tail, the case of the moose would be irrelevant: the cow is not worse off than he claimed because it is better off than the moose. The dialogue, being quite natural, shows that function-statements are, at least sometimes, intended and received as explanatory claims.

Two differences from Wright's position will now be remarked. First, though we maintain that there is functional explanation, we do not assert that every true function-statement correctly answers a why-question, still less that function-statements are explanatory as a matter of their meaning. Secondly, we do not restrict functional explanation to a select range of *explananda*. Wright does so restrict it, since for him a function-statement pre-eminently explains why the functional item 'is there'. On the view to be developed here, a functional explanation is *logically* in order in answer to any why-question. It could explain why a certain event occurred, why a particular thing has a certain property, why something regularly behaves in a certain

[1] For help in constructing this dialogue, I thank Gideon Cohen, who thinks the roe deer is an even better example than the moose.

manner, and so on, without restriction: note the heterogeneity of the examples with which we began on pages 249–50. Only the facts decide whether a why-question has a functional answer, not the structure of the question itself.

The account of functional explanation to be given in section (4) supplies no analysis of the meaning of function-statements. We ask, 'What renders an explanatory function-statement explanatory, whether or not every function-statement is explanatory?' An analogy will clarify the nature of the question. Consider the following:

(4) Event *f* brought about event *e*.
(5) Event *f* preceded event *e*.

To assert (4) is to venture a causal explanation of *e*. To assert (5) is to do so in certain circumstances, to wit, when an explanation of *e* is sought or promised. Now what makes (4) explanatory is the same as what makes (5) explanatory when it is explanatory, namely some relevant true generalization: that there is one is *entailed* by (4), and *implied* when (5) is uttered as providing an explanation of *e*. (4) entails

(6) There is a true generalization in virtue of which, because *f* occurred, *e* occurred.[1]

(5) does not entail (6), but proferring (5) as an explanation of *e* commits one to (6). (6) makes both (4) and (5) explanatory, even though (4) is explanatory as a matter of meaning and (5) is not.

Now consider

(7) Event *f* led to event *e*.

The meaning of (7) may be difficult to decide. Specifically, it is unclear whether it entails (6).[2] But it should now be evident that we can say what makes (7) explanatory (to wit, (6)) if or when it is, without deciding whether it entails (6). The question of the analysis of statements (4), (5) and (7) is distinct from the question what makes them explanatory, when they are.

We return to our object of inquiry:

[1] Less briefly: there are types of event T and T' such that *f* was of type T and *e* was of type T', and whenever an event of type T occurs, an event of type T' occurs.

[2] Readers who think otherwise will concede nothing substantial if they agree to pretend it is unclear.

(8) The function of x is to ϕ.
(9) The beneficial effect of x is to ϕ.

According to those Wright criticizes, (8) entails a refined version of (9), and nothing else, and is, like (5), not inherently explanatory.[1] According to Wright (8), like (4), by nature explains, and so cannot be equivalent to anything like (9). If we ask, as proposed, 'What makes explanatory instances of (8) explanatory?', we are not obliged to decide between these rival views. And to emphasize our escape from the issue of meaning, we may change the question to: 'What makes explanatory instances of (9) explanatory?'

The change may be justified by recourse to the analogy. Though (5) is not by nature explanatory, in asking what is needed to make it so one is investigating the nature of causal explanation. So, similarly, an appropriately refined (9) does not by nature explain, but in asking what makes it explain when it does, one is investigating the nature of functional explanation, whether or not some refined form of (9) gives the *meaning* of (8).

To summarize. Wright criticizes those who analyse functions as benefits for failing to acknowledge the existence of functional explanation. We concur, but the analysis of functions as benefits might nevertheless be correct. We adopt a neutral posture towards benefit-statement analyses of function-statements. We agree with Wright that such analyses are not accounts of functional explanation, but we withhold from him agreement that function-statements inherently explain and that therefore no such analysis is correct.[2]

[1] Though, as we saw (p. 252), many of them nevertheless *call* (8) a 'functional explanation', but the terminological policy laid down on p. 251 is now in force. (They call (8) a functional explanation because it *explains what* the function of x is.)

[2] I am, in fact, disposed to reject Wright's claim that function-statements are explanatory by virtue of their meaning. It appears to me that, often enough, when the life and human sciences attribute a function to an organ or a physiological process or a social custom, no more is intended by 'function' than '(possibly hidden) beneficial effect'. What is indicated is a service the item performs as though it were intended to do so—from which it does not follow that it is there *because* it performs that service.

It is certain that sociologists apply 'function' to hidden beneficial effects they do not think explanatory. In the course of the 'Hawthorne Experiment' (a study of a factory) there occurred a significant and at first unexplained rise in the morale and productivity of the factory's workers, the cause of which was in time identified

When is a function- or benefit-statement a correct answer to a why-question? A precedence-statement correctly answers one when an appropriate generalization of familiar form is true. We shall propose that function- and benefit-statements do by virtue of generalizations of a somewhat special form.

(4) *The Structure of Functional Explanation*

What makes a benefit-statement explanatory? More precisely: what makes a benefit-statement explanatory in whatever way a generalization linking the successive events makes a precedence-statement explanatory? We claim only *that* a generalization makes a precedence-statement explanatory, *how* it does being (even more) debatable.[1] But some remarks on the character of the generalization are appropriate.

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as the experiment itself: the workers liked being studied. In his seminal paper on 'Manifest and Latent Functions' Robert Merton describes this beneficial effect as a 'latent function' of the experiment. Yet he cannot think it was conducted because of its probable effect on factory morale. (Also symptomatic of lack of explanatory intent is the common use—in biology and sociology—of 'dysfunction' as an antonym of 'function', uncomplemented by a suggestion that the fact that x is dysfunctional calls for a special explanation of its presence.)

Non-explanatory occurrences of 'function' appear to abound in uses of the term which Wright regards as peripheral. According to him (ibid., p. 141), one should first analyse 'the function of x is to ϕ' and then treat 'a function of x is to ϕ' as true when more than one thing meets the discovered criteria. This strategy he thinks superior to its opposite (analyse 'a function' and apply 'the function' when only one thing meets the criteria) since, he says, there are many peripheral uses of 'a function'. He does not examine why this is so. If the term has a copious peripheral use, why does it resist the definite article in that use?

No doubt Wright prefers 'the function' because he is interested in functional *explanation*, and 'the function' has a more explanatory ring. But the latter may derive as much from the article as from the noun. If, absent during the previous interchange, one hears it said that 'the event preceding e was f' the incidence of 'the' makes it a safer bet than otherwise that the speaker thinks f brought e about. But it would be improper to analyse 'the preceding event' as explanatory and then segment 'a preceding event' into central (because explanatory) and peripheral (because not) cases.

Now *the* preceding event need not be explanatory. The focus licensing 'the' may be different: thus the event might be the clown's act preceding but not explaining the sea lion's on a certain evening at the circus. But is 'the function' different? Perhaps it means, roughly, 'the chief beneficial effect', and it is only pervasively—not conceptually—true that what makes a beneficial effect chief and so the function is that it is explanatory.

For good criticism of Wright's analysis, some of which parallels the above, and for an alternative account of functions (as contributions to goals) on which we have not tried to comment, see Boorse on 'Wright on Functions'.

[1] The most familiar thesis in the latter debate is Hempel's: see p. 272.

It is usually supposed that the generalization must be a matter of law, and that tenet is adopted here. It is widely recognized that it need not be known for the precedence-statement explanation to be true and justified; that it may admit of exceptions; that it may relate event-types individuated by descriptions other than those used in the precedence-statement to identify the particular events: the generalization conferring an explanatory role on '*f* preceded *e*' is rarely 'Whenever *F* occurs, *E* occurs'.[1] (George's having drunk four cups of coffee may explain his subsequent sleeplessness even though not everyone who drinks four cups of coffee is sleepless afterwards.)

The truth about what makes precedence-statements explain is complex. This could impede our inquiry, for we seek to answer 'What makes benefit-statements explain?' in an analogous way, and it would be awkward to have to construct an analogue which reflects all the complexity of the model. We therefore sacrifice accuracy to simplicity and seek an analogue in the case of benefit-statements to the simplest justification of a precedence-statement's explanatory role: where '*f* preceded *e*' is explanatory because whenever *F* occurs, *E* occurs.[2]

A benefit-statement assigns beneficial consequences to some item. Let us generalize the question 'What makes benefit-statements explanatory?' by asking instead: what makes citation of consequences, be they beneficial or not, explanatory? What are the truth conditions of what we may call a *consequence explanation*? We return to functional explanation proper on page 263.

Our proposal is that a consequence-statement explains when it relates to a *consequence law* in whatever way an explanatory precedence-statement relates to a pertinent law. A consequence law is a universal conditional statement whose antecedent is a hypothetical causal statement. A consequence law relevant to the explanation of an event (as opposed, e.g., to the explanation of an object's having a certain property) takes this form:

[1] We use small letters to represent phrases denoting particular events, and capital letters to represent phrases denoting types of event. Where the small letter and the capital letter are the same, the denoted particular event belongs to the denoted type in virtue of the meanings of the phrases denoting them. Thus anything of the form '*e* is of type *E*' (e.g. 'the collapse of the bank was a collapse of a bank') will be true *ex vi terminorum*.

[2] Some of the complexity ignored below will be catered for in section (7).

IF it is the case that if an event of type E were to occur at t_1, then it would bring about an event of type F at t_2,
THEN an event of type E occurs at t_3.[1]

The antecedent of the conditional is itself a conditional, to wit the *minor* conditional, the *major* conditional being the whole statement.

The temporal ordering of t_1, t_2, and t_3 will differ in different consequence laws. In no case will t_2 precede t_1, and in no case will t_3 precede t_1. If causes can be contemporaneous with their effects, then t_1 may or may not precede each of t_2 and t_3, and t_2 may precede t_3, succeed it, or be identical with it. If causes necessarily precede their effects, t_1 always precedes each of t_2 and t_3, but all three relations between t_2 and t_3 (precedence, succession, identity) remain possible.[2]

By deleting 'IF' and replacing 'THEN' by 'IF' we obtain the form of a consequence law stating a necessary condition of the occurrence of an event of a certain type. (This corresponds to reversing the direction of the unboxed arrow in the formal version given in note 1 below.)

A consequence law supporting the explanation of an object's having a certain property (e.g. a species' having a certain organ) would be relevantly analogous in form to the one given above, with mention of types of events being replaced by mention of properties:

[1] More formally:

$$(\exists x)(Ex \text{ at } t_1 \ \Box\!\!\rightarrow\ (\exists y)(Fy \text{ at } t_2)) \longrightarrow (\exists z)(Ez \text{ at } t_3),$$

where 'x', 'y', and 'z' range over events, '$\Box\!\!\rightarrow$' is a connective expressing hypothetical causation, and the unboxed arrow is to be interpreted in whatever is the right way of interpreting the arrow between the antecedent and the consequent of a statement of natural law. 't_1' and so on are temporal variables, related as stated in the next footnote.

Not all of my more logical colleagues agree that the above is the correct formal version of what appears in the text, and the wrangle, in which I am an innocent observer, continues as this book goes to press.

[2] Causes cannot succeed their effects, but whether a cause must precede its effect is a philosophical question on which we need not form a judgement here. If causes can be contemporaneous with their effects, the temporal possibilities in the above schema are: $t_1 = t_2 = t_3$; $t_1 = t_2 < t_3$; $t_1 < t_2 = t_3$; $t_1 < t_2 < t_3$; $t_1 < t_3 < t_2$ ('$<$' is short for 'is earlier than'). If causes must precede their effects, only the last three orderings are possible, and references to contemporaneous causes in the rest of this chapter should be construed as references to causes which are immediately succeeded by their effects.

IF it is true of an object o that if it were F at t_1,
then it would, as a result, be E at t_2,
THEN o is F at t_3.[1]

(The same temporal possibilities as were listed for the event law form hold here too.)

To convey the role of consequence laws in explanation of events, we propose an analogy between 'e occurred because f occurred, since whenever F occurs, E occurs' and 'e occurred because of its propensity to cause F, since whenever E would cause F, E occurs'.

Consider the examples with which we began on page 249. In light of our proposal we contend that, contrary to what is sometimes said, those remarks do not purport to explain causes by effects. They are not mirror-images of ordinary causal explanations. Rather, and very differently, it is the fact that *were an event of a certain type to occur, it would have a certain effect*, which explains the occurrence of an event of the stated type.

To get a particular law-statement of the first form explicated, let E = a performance of a rain dance of kind R, let F = a rise in social cohesion, and suppose $t_1 = t_3$, which precedes t_2 by a short period. Then the law-statement says:

Whenever performance of rain dance R would bring about, shortly thereafter, a rise in social cohesion, rain dance R is performed.

It is false that, in an explanation relying on such a generalization, the resulting social cohesion is put forth as explaining the performance of the rain dance. Instead, the performance is explained by this dispositional fact about the society: that if it were to engage in a rain dance, its social cohesion would be increased.

In informal explanatory remarks, such as those on page 249, an event subsequent to the one to be explained may be cited, but only, we claim, in evidence of a disposition which holds before (or at least not after) the event to be explained occurs, the purport of the remark being that the prior or concurrent disposition explains the occurrence of the event. *It can be explanatory to cite the effect of the rain dance, not because its effect*

[1] (x) $[(Fx \text{ at } t_1 \ \Box\!\!\rightarrow Gx \text{ at } t_2) \longrightarrow (Fx \text{ at } t_3)]$ is the formal version.

explains it, but because the fact that it had that effect allows us to infer that the condition of the society was such that a rain dance would have increased its social cohesion, and it is implied that that inferrable condition occasioned the performance of the dance. (Subsequent events are commonly cited in informal explanatory remarks. An example from non-functional explanation: the question 'Why was he looking so terrible yesterday?' may be satisfactorily answered by 'He died of cancer today'. That answer can be appropriate, not, of course, because today's death by cancer explains yesterday's sickly appearance, but because today's death by cancer allows inference of a cancerous condition yesterday which, the respondent implies, accounted for yesterday's sickly look.)

To get a particular law-statement of the second form explicated, let o be the species cow, let F = long-tailed, let E = possessed of the power to swish flies away, and let $t1 = t2 = t3$. We then obtain a consequence law-statement relevant to the explanatory claim—see page 255—that the function of a cow's long tail is to swish away flies. Of course that explanation is not in fact supported by a law so neatly generalizing it,[1] but recall our decision (p. 259) to go for simplicity of presentation. 'George was sleepless because he drank four cups of coffee' is not supported by 'Whenever a man drinks four cups of coffee he is sleepless', since that is false. Those who find probabilistic weakening of the latter plausible may adopt that course here too, though a more reasonable policy would be a retreat to a law sketch.[2] It is a question about explanation in general how to back up a particular explanatory claim when it is not supported by an easily recovered generalization. We need claim only that, whatever the right course is, it can be pursued in the case of consequence explanation.[3]

[1] Nor is the rain dance explanation supported by so simple a law as that given on p. 261. For other possibilities, see section (7).

[2] A 'law-sketch' is a law-like generalization in which some (but not all) of the antecedent properties are specified only by reference to an object which has them. For example: anyone who drinks four cups of coffee and is relevantly like George suffers sleeplessness thereafter. For the cow case: any species which is relevantly like a cow and which is such that if it has a long tail it has, as a result, the power to swish away flies, has a long tail.

[3] Some would reject explanations of features of organisms (or societies) in terms of their adaptive value on the ground that organisms (and societies) frequently fail to acquire adaptive features. Adaptive failure certainly is frequent, but an

This being the form of the laws presupposed in consequence and so[1] in functional explanation, we readily see that not every causal connection enables formulation of a functional explanation of the occurrence of the cause, quite apart from whether or not the cause benefits anything. It is virtually always true that if lightning occurred it would bring about thunder, but lightning occurs only infrequently. So lightning is not consequence explained and hence not functionally explained by its propensity to cause thunder. There is decisive reason for denying that lightning is functionally explained, independently of the fact that it has no function.

To summarize afresh: in a consequence explanation a dispositional fact explains the incidence of the property (or event-type) mentioned in the antecedent of the hypothetical specifying the disposition. A consequence explanation of the *striking* of a brittle tumbler (that is, one which, struck sufficiently hard, would break) would be in order if it were true as a matter of law that its being brittle raised the probability of its being struck. It would be wrong to think so, but not, we claim, because of the form of the thought.

What distinguishes functional from consequence explanation? In our view, a functional explanation is a consequence explanation in which the occurrence of the *explanandum* event (possession of the *explanandum* property, etc.) is functional for something or other, whatever 'functional' turns out to mean. Thus consequence explanations which are functional explanations may be conveyed by statements like 'The function of x is to ϕ', whatever may be the correct analysis of the latter.

An evident corollary of the present account: the fact that the consequence it cites is functional is not a fact about the structure of functional explanation, which is just that of consequence explanation in general.

But it might be claimed that no consequence explanation is ever offered which is not also a functional explanation. If

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objection to functional explanation on that basis conflicts with our standard explanatory practices. For what one might call 'causal failure' is also common. Jones couldn't sleep because he overate, even though plenty of people sleep after overeating. Similarly, then, the cow may have a long tail because a long tail is functional for it, even though it would also be functional for a moose, and moose lack them.

[1] This slide is defended presently.

functionality is, as claimed, not germane to explanatory structure, why are all tendered consequence explanations functional explanations?

All explanation operates against a background of theoretical presupposition to which candidate explanations which satisfy structural and confirmational criteria must conform. The presuppositions of early modern physics, for example, included a principle forbidding action at a distance, and Newton's laws of motion, despite their theoretical economy and predictive success, were not regarded as explanatory, not even by Newton, because they were thought to violate the constraint on explanation the principle imposed. The restrictive presupposition was in time abandoned, so that Helmholtz could write in the mid-nineteenth century: 'To understand a phenomenon means nothing else than to reduce it to the Newtonian laws. Then the necessity for explanation has been satisfied in a palpable way.'[1] In earlier days Newton's laws were structurally sound but were considered materially inadequate for explanation.

We may similarly distinguish structural and material aspects of functional explanation, and our account of the former is not impugned by its neglect of the latter. The background against which consequence explanation is offered in biology or anthropology or economics is a conception of species or societies or economic units as self-maintaining and self-advancing, and consequence explanations are accordingly accepted only when they are also functional explanations. If we had background belief representing entities as self-destructive, we might accept consequence explanations which deserved to be called 'dysfunctional explanations'. It is not, indeed, evident that all of us lack such belief. If one way of taking psycho-analytic explanations which go beyond the pleasure principle to posit unconscious self-destructiveness is correct, some already have it. To elaborate would mean discussing the relation between consequence explanation and explanation of human action, which would take us too far afield.

Thus the fact, if it is a fact, that all plausible consequence explanations are functional explanations, does not tell against an account of the structure of functional explanation which abstracts from its functional character.

[1] Quoted by Hanson, *Patterns of Discovery*, p. 91.

(5) *Confirmation*

The confirmation of consequence explanations and laws raises no unusual problems. To stick to simplifying statement, the law-statement (and hence the explanation it would support), is confirmed by instances satisfying its major antecedent and consequent, and disconfirmed by instances satisfying its major antecedent only. A complication arises in assessing whether the major antecedent is satisfied, since it attributes a dispositional property. We therefore confront the problem of counterfactuals, but not in any novel way.

Thus suppose we wish to test the claim that the average scale of production in the *shoe* industry expanded because of the economies attending large scale in that industry. We may know of the *garment* industry that if it were to expand the scale of its production, economies would result. So the major antecedent of this consequence law-statement, which would support the claim about the shoe industry, is satisfied in the case of the garment industry:

> Whenever an expansion of scale would lead to economies, an expansion of scale occurs.

We then predict satisfaction of the major consequent in the case of the garment industry, the fate of the prediction being a test of the hypothesized law. If the prediction that scale will expand is falsified, there may be a suitable way of modifying the law-statement. The counter-example may motivate adding a conjunct to the major antecedent which says, e.g., that adequate funds to finance scale expansion are available.

So much for simple forms of confirmation. There are, of course, more complex ones, which cannot be surveyed here. It is sufficient to observe that unsimple ways of testing causal explanations will have their counterparts for the special kinds of causal explanation consequence explanations are.

A causal explanation of familiar form may be assessed without explicit examination of possible causal laws, and the same is true here. Professional intuition may respond to a particular functional-explanatory hypothesis: 'Such an item would have a similar effect in this other case too, yet we do not find it there'; or: 'and having searched for it, we have found it'.

It is of the utmost importance to note, particularly with regard to some Marxian functional explanatory claims, that a consequence explanation may be well confirmed in the absence of a theory as to *how* the dispositional property figures in the explanation of what it explains. In other terms, we may have good reason for thinking that a functional explanation is true even when we are at a loss to conjecture by what means or mechanism the functional fact achieves an explanatory role. We return to this point at the end of section (6), after we have faced and answered a sceptical challenge.

(6) *Are any Functional Explanations True?*

If we are right, there exist functional explanatory claims (see section (3)), their structure is as stated in section (4), and they may be tested as outlined in section (5). *But we have not yet shown that any such claims are true.* Our account of what a functional explanation is might be correct, yet there might be no true functional explanations. Indeed, some—if there are any—who accept our account might take it as a proof that there are no true functional explanations. They might say that dispositional properties never contribute to explanation in the asserted manner. Those who allow that, abstractly speaking, they could, might deny that they ever do in the world as we know it.

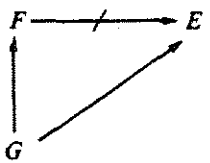
But we hold not only that the structure of functional explanation is as was claimed, but also that some explanations having that structure are correct. We must now defend this thesis against a likely scepticism.

The sceptic to be answered here would treat all supposed examples of functional explanation as really and only involving natural selection, or negative feedback mechanisms, or the results of conscious choice, and so on. He would say that what is truly explanatory is a phenomenon or process the relevant description of which involves no citation of the dispositional characteristics we favour. Confronted by what we called 'consequence laws' and 'consequence explanations', he would say that the first are at best non-explanatory generalizations and the second are not explanations at all.

The sceptic can accept the concept of a consequence generalization. He must even admit that there are true consequence generalizations: an abundance of them hold in natural history.

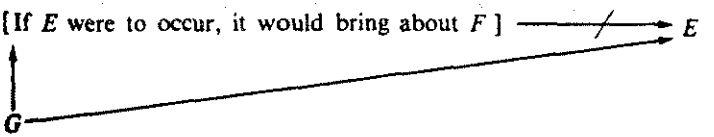
By a consequence generalization we understand a (possibly mere) correlation between a dispositional property and a concurrent or subsequent incidence of the property mentioned in the antecedent of the hypothetical specifying the disposition. That is a coherent concept and it is exemplified. The controversial question is whether such a generalization, even one which is a law, ever has any explanatory power.

Not all lawful generalizations are explanatory. Suppose it is a law that whenever F occurs, E occurs. An occurrence of F will nevertheless not explain an occurrence of E, if, for example, there is a third type of event, G, which causes each of F and E, and causes E other than by virtue of causing F. Pictorially, we would then have:



the arrow here representing a causal relationship. For example, let F be a barometer reading at t_1, let E be the weather at t_2, and let G be the atmospheric pressure at t_0 ($t_0 < t_1 < t_2$). Whenever the barometer reads thus and so, the weather will be such and such, but it is false that barometer readings explain weather conditions. The barometer reading is only a *concomitant*, not an explanation, of the subsequent weather.

The sceptic claims that the dispositional property (the fact that were E to occur, it would cause F) is never more than a concomitant of the occurrence of E. The dispositional property is only a concomitant when what causes it to obtain is what causes E itself, and not by virtue of causing the disposition to obtain, as in this picture:



The sceptic says that what is pictured above is true of all consequence generalizations. His thesis may be formulated as follows:

> Whenever a correlation holds *between* the fact that were E to occur, it would bring about F, *and* E, there is a G which causes the disposition (were E to occur, it would bring about F) to hold, which also causes E, and which does not cause E by virtue of causing the disposition to hold. Hence such a disposition is never more than a concomitant of E.

Here is an example of an apparently correct functional explanation which, on closer inspection, confirms the sceptical thesis.

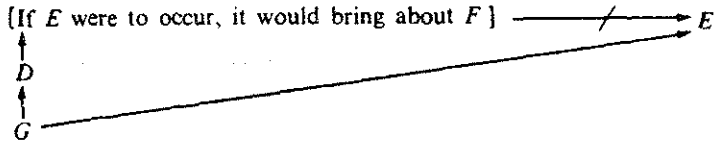
Some flowers close their petals just when doing so will prevent wastage of their fragrance, thus enhancing their reproductive chances. Their reproduction depends on visitations by insects attracted by the fragrance. They close their petals at the onset of night, when the insects have retired. It looks as though the petals close because the closure is preservative, and that is a functional explanation.

Let E = petal closure, and let F = fragrance preservation. Then it is true that whenever E would cause F, E occurs.

The sceptic predicts that there is a G which (1) causes the petal closure to be fragrance-preserving, (2) causes the petal closure, and (3) does not cause the latter through causing the former.

Now the 'immediate' cause of the fragrance-preserving value of the petal closure (of the fact that E would cause F) is the departure of the insects, but the departure of the insects does not cause the petals to close. The plants are quite insensitive to presence or absence of insects. Hence the departure of the insects (call it D) is not the required G.

But further examination does reveal a relevant G. For what stimulates the closure of the petals is the reduction of light associated with the onset of night, and that reduction also causes the insects to leave, and therefore, by the transitivity of causation, causes the petal closure to be fragrance-preserving. The reduction of light is the G predicted by the sceptical thesis. Pictorially:



A functional explanation of the closure of the petals on a particular occasion would, accordingly, be a pseudo-explanation. But the result cannot be generalized. It is false that dispositional facts are never more than concomitants of what functional explanations claim they explain.

Two sorts of consequence generalization are supported by the fossil record, current observation, and inferences therefrom. In the first, or *diachronic* case, it is true at a time t that were a species to have a certain feature it would fare better, and true at a later time $t+n$ that the species has the feature. (More precisely, the disposition obtaining at t raises the probability of the truth at $t+n$ of the antecedent of the hypothetical specifying it.) In the second, or synchronic case, the time when the feature would be valuable and the time when it obtains are the same. We shall argue that in the diachronic case the generalization provides a genuine explanation, though in the synchronic case it does not.

An illustration of the diachronic case. A population of giraffes with a mean neck length of six feet lives in an environment of acacia trees, on whose leaves they feed. The height of the trees makes it true that if they now had longer necks, their survival prospects would be better. They subsequently come to have longer necks. So far all we have is evidence of a consequence generalization. But if Darwin's theory of evolution is true,[1] then the fact that were they to have had longer necks, they would have fared better, contributes to explaining the elongation. The environment selects in favour of variants with longer necks precisely because it is an environment in which longer necks improve life chances. On no construal can that dispositional fact be reduced to an unexplanatory precursor of the acquisition of the feature. Its explanatory relevance to the elongation of the neck is entailed by the Darwinian theory.

Or consider the plants discussed a moment ago, but change the question from 'Why do those plants now close their petals?' to 'Why did that species of plant acquire its sensitivity to light and darkness?' The answer will include the fact that were it to have had it in the past, it would have prospered better. Specimens having it were favoured, by virtue of that dispositional fact, over those lacking it.

[1] Though not *only if* it is true. Alternative theories give different accounts of why the dispositional feature is explanatory: see p. 271.

The sceptic says that the dispositional property is only correlated with what *really* explains the change in the species' equipment. In the giraffe example, what causes the longer-necked variants to be favoured, and thereby causes the species neck length to increase, is, he says, the presence of the trees, a quite undispositional circumstance.

We can agree that it is the trees which, aided by the chance genetic variation, cause the neck of the species to grow. But what is it about the trees which makes them have that effect? Answer: where trees are of the given height giraffes with longer necks would prosper better. The dispositional fact is an essential element in the explanatory story.

Turn now to *synchronic* natural-historical consequence generalizations. They do lack a genuine explanatory use. The species has the desirable feature because it was desirable earlier, not because it is desirable now. The current adaptive value of the feature, unlike the fact that it would have had adaptive value in the past, is causally irrelevant to its presence. If the environment were now different, so that the feature lacked value, the species would still have it. The flowers would continue to close their petals even if the insects suddenly changed their habits. Synchronic functional explanation in natural history is pseudo-explanation. The dispositional fact is merely correlated with the feature to be explained.[1] By contrast, had the disposition not obtained in the past, the species would not now have the feature. The diachronic explanation is genuine. Hence the sceptical thesis is false. There are true functional explanations. (And some of them, we contend, are provided by historical materialism.)

If someone says, 'That cow has a long tail because a long tail is good at swishing away flies', his remark is ambiguous across true and false interpretations. If he is assigning explanatory significance to the particular service provided by the tail to that particular cow, what he says is false. If, instead, he means that the cow has a long tail because such tails provide such service,

[1] The correlation holds because environments change slowly. If a feature would be adaptive now, it would probably have been adaptive in the past. If the species now has the feature, that is because it was adaptive in the past. The past adaptive value of the feature explains its current incidence and, because of environmental stability, probabilifies its current adaptive value. So the current adaptive value of the feature is an unexplanatory concomitant of its presence.

then what he says is sketchy but true, and the sketch is filled in when we add that, from an explanatory point of view, it is *past* occasions when tails would give such service which are relevant.

The sceptic holds that whenever a functional explanation appears to be apt, appearances are deceptive, and in fact some one of a short list of non-functional explanations applies (see p. 266). In the case of the characteristics of biological species, the correct alternative to functional explanation is supposed to be Darwin's theory, or, rather, a modern development of Darwin which draws upon genetics unavailable in his day.

In our view, Darwin's theory is not a rival of functional explanation, but, among other things, a compelling account of why functional explanations apply in the biosphere. It is possible to know *that* x explains y, and yet find it very puzzling that x *should* explain y, through failure to see *how* x explains y. Among Darwin's achievements was an attractive theory of how the fact that a facility would benefit a species helps to explain its acquisition.

Darwin discovered the way in which functional facts about the equipment of species contribute to explaining why they possess the equipment they do. In a different account, for example that of Lamarck, the functional facts would get their explanatory power from quite different considerations.[1] Both doctrines acknowledge the explanatory relevance of the dispositional features we have emphasized. What we have are rival theories of why a consequence explanation holds, not rival alternatives to consequence explanation.

We may say that these theories provide contrasting *elaborations* of natural-historical consequence explanations. Our experience of the world assures us that wherever a consequence explanation holds, it has some or other further elaboration, and we contend that the sceptic misconstrues as various alternatives to functional explanation what are in fact various more complete forms functional explanations may take. One object of Chapter X will be to propose directions of elaboration of Marxian functional-explanatory claims. But such claims may be rationally tenable before suitable elaborations are available. If a Marxist says that the bourgeois media report industrial conflicts in a style which

[1] For more on Lamarck, see Ch. X, pp. 288–9.

favours the capitalist class *because* that style of reportage has the asserted tendency, he may be able to justify his explanatory claim even when he cannot yet display *how* the fact that reportage in the given style favours the capitalist class explains the fact that industrial conflicts are reported in that way.

(7) *Consequence Explanation and the Deductive-nomological Model*

A consequence explanation relates to a consequence law in whatever way explanations relate to laws. It is not our task to say what that relation is. But it may be clarifying to exhibit how consequence laws figure in explanations on the supposition that the correct answer to the question here suspended is Hempel's. For Hempel every satisfactory and fully explicit explanation is an argument, either deductively valid or inductively sound, and containing among its premisses at least one statement of law. Only one of the arguments thus licensed, the deductive-nomological (*D-N*) will be considered here.

The simplest *D-N* argument contains two premisses, one a law of conditional form, and the second a statement instantiating the antecedent of the law and thus together with it enabling deducibility of an instantiation of its consequent, which is the *explanandum*. An elementary consequence explanation, *D-N* construed, would contain as first premiss a consequence law and as second a statement asserting an instantiation of its major antecedent. The schema, where what is to be explained is the occurrence of an event of a certain type, would be as follows:

L IF it is the case that if an event of type E were to occur at t_1 then it would bring about an event of type F at t_2, THEN an event of type E occurs at t_3.

C Were an event of type E to occur at t', it would bring about an event of type F at t''.

E An event of type E occurs at t'''.[1]

[1] Or:

L $(\exists x)(Ex \text{ at } t_1 \mathrel{\square\!\!\rightarrow} (\exists y)(Fy \text{ at } t_2)) \longrightarrow (\exists z)(Ez \text{ at } t_3)$
C $(\exists x)(Ex \text{ at } t' \mathrel{\square\!\!\rightarrow} (\exists y)(Fy \text{ at } t''))$

E $(\exists z)(Ez \text{ at } t''')$

The symbols are to be read as in fn. 1, p. 260 except that 't' and so on denote particular times, the relations between which are just those required to make E follow-logically from L and C.

In his 'Logic of Functional Analysis' Hempel himself explores *D-N* presentations of functional explanations. He first construes function-statements as benefit-statements in which the functional item is said to ensure 'the satisfaction of certain conditions . . . which are necessary for the proper working of' some system.[1] He then seeks a *D-N* derivation of the presence of the item, whose operative premiss is that it fulfils one or more of the system's needs.[2]

In our view—and here we trespass into assessment of the *D-N* model itself—the derivation Hempel seeks would not be an explanation even if it were successful, no more than *deriving* a flagpole's height from the length of its shadow, the position of the sun, and the laws of optics, would *explain* its height. For Hempel, the conjunction of a law about a system to the effect that it survives only if some condition *C* is satisfied and a statement saying that the system *is* surviving *explains*—what it doubtless *entails*—the fact that condition *C* is satisfied. If Hempel were right, the law that mammals exist only if there is oxygen in the atmosphere, in conjunction with the fact that mammals exist, would explain the fact that there is oxygen in the atmosphere; and that consequence of his theory is quite unacceptable. It is equally unacceptable to represent the fact that mammals exist, in conjunction with a law that hearts are necessary to their existence, as explaining their possession of hearts. Their possession of hearts may not be explained, and hence may not be functionally explained, in that manner.[3]

So much by way of critical aside. For Hempel, if the derivation of the presence of an item is, as a derivation, sound, then it also qualifies as an explanation. But he argues that in typical cases where functional explanations are offered, an effective derivation is unavailable. The deduction is either invalid,[4] or valid but with a disappointingly unspecific con-

[1] *Aspects of Scientific Explanation*, p. 305.

[2] The schema he suggests reads as follows:

(a) At time *t*, system *s* functions adequately in a setting of kind *c*
(b) *s* functions adequately in a setting of kind *c* only if a certain necessary condition, *n*, is satisfied
(c) If trait *i* were present in *s* then, as an effect, condition *n* would be satisfied
(d) (Hence), at *t*, trait *i* is present in *s*. Ibid., p. 310.

[3] Compare the point about societies and religions made at pp. 281–2 below.

[4] The schema of fn. 2 is clearly invalid: see *Aspects*, p. 310.

clusion, what is deduced being not that the functional item exists, but that some one or other of a (possibly unspecified) set of need-satisfiers exists.[1] The trouble arises because in typical cases something other than the functional item whose presence is to be explained might have satisfied the need. The item is a sufficient condition of its satisfaction, but a valid derivation of it would require that it be a necessary condition. Applied to the claim, taken as explanatory, that the rain-making ceremonials of the Hopi fulfil the function of reinforcing group identity, Hempel's basic point is that 'the function of the rain dance might be subserved by some other group ceremonial'.[2]

The point does not penetrate arguments instancing the schema on page 272 above, for they do not essentially contain benefit-statements, nor, *a fortiori*, statements to the effect that something satisfies a need. But it is reasonable to expect that, though aimed at something else, the point can be redirected against our different form of *D-N* argument. Let us accordingly examine how it might affect the latter.

Suppose, then, we have not Hempel's *D-N* candidates for the rain dance case, but a *D-N* argument whose law premiss is: if a rain dance would reinforce group identity, a rain dance is performed.[3] Hempel's point would not fault the derivability of the desired conclusion. But it might create doubt that the law premiss is true.

This is not because the law states—it does not—that only a rain dance would reinforce group identity. Hempel's point does not contradict the law. But it makes it dubious: why should the rain dance's potential suffice for its actualization when other ceremonials with similar potential are not actualized?

We are not, of course, obliged to vindicate this particular explanation. But since it is typical enough of functional

[1] In the alternative schema, (a) and (b) are as in fn. 2, p. 273 and (c) and (d) are replaced by:

(c′) *I* is the class of empirically sufficient conditions for *n*, in the context determined by *s* and *c*; and *I* is not empty

(d′) (Hence), some one of the items included in *I* is present in *s* and *t*.

Ibid., p. 313.

[2] Ibid., p. 311.

[3] Note that our *explanandum* is the performance of a rain dance on a particular occasion, not the presence of the rain dance in the society's cultural repertoire. Treatment of the latter would be exactly analogous to what follows, but the first is easier to handle.

explanations, it is worth outlining how it might be defended against what Hempel says.

Hempel's point may be correct, but it is far from obviously correct: it only seems so. It is not obvious that performance of a ritual other than a rain dance would reinforce group identity among the Hopi. It may be that such rituals reinforce only under certain conditions, which are met by rain dances alone in the cases where rain dances and not other rituals occur. One plausible condition is that the ritual be part of the traditional repertoire of the tribe. If rain dances have this property only when other rituals do not, then other rituals, contrary to Hempel's claim, will lack comparable reinforcing potential among the Hopi. If this is so, the original explanation retains whatever plausibility it had. Nothing Hempel says would tend to fault it.

But suppose Hempel is right that alternative ceremonials would reinforce Hopi group identity. We may then retreat to a second line of defence, as follows.

Hempel's point now being granted, the law as originally stated becomes suspect, but a modified version of it which retains the consequence-legal element may nevertheless hold. The original major antecedent, which describes the rain dance's potential, is now insufficient to imply that a rain dance is performed. But perhaps we obtain a sufficient condition by adding a conjunct to the major antecedent, one stating, e.g., that a rain dance is part of the traditional repertoire of the society in question. Neither this nor the rain dance's potential, we are supposing, by itself suffices for the performance of a rain dance, but together they do. The revised law-statement says: if a rain dance would reinforce group identity *and* rain dancing belongs to the society's tradition, then a rain dance is performed. If the *C*-statement is also revised, by addition of a corresponding conjunct, we are again able to derive the original *explanandum*.

Note that tradition (or whatever condition—it might be a less obvious one—we appeal to) plays a different role in the second defence from what it did in the first. There it was a condition of a ritual's integrating effect that it be a traditional one. Tradition generated an argument for retaining the original law-statement. In the second defence it is allowed that

tradition is not required for a ritual to have an integrating effect: rather if a ritual would have that effect, *and* it is traditional, then it is performed.

The evidence may be unfavourable to both lines of argument. Then a third defence becomes appropriate. It is to admit that the law does not hold, even in qualified form, and regress to one which says that if a (here unspecified) ceremonial would reinforce group identity, then some or other such ceremonial is performed. We may then deduce not the original *explanandum* but merely that some or other appropriate ceremonial is performed. The price of this loss of specificity is not as great as Hempel might contend.[1]

Hempel has himself frequently stressed that every explanation fails to account for innumerable properties of the *explanandum* phenomenon. Whether the respect in which it is explained represents an achievement depends on our interests. When glass breaks, we care little about the pattern its bits make, and are therefore satisfied with an explanation of why it broke at all, which is usually as far as we can get anyway. So similarly an anthropologist may find it interesting that some or other ceremonial is performed at all, and, having functionally explained that, he may proceed to investigate its specific character without pretence that it too is functionally explained. Given that they perform a ritual, there may be no *functional* explanation why it is this ritual rather than that, and yet that they perform a ritual may be functionally explained.

It is, then, no more a condition of sound functional explanation than of sound explanation generally that phenomena be explained in some ordained measure of specificity. Hempel emphasizes the point for the general case, but he wrongly fails to apply it to the functional instance.[2]

Hempel's basic claim is that the reinforcing power of the rain dance does not explain why the Hopi perform it, since other

[1] He would presumably call the result 'rather trivial'. See *Aspects*, p. 314.

[2] The same considerations show that Charles Taylor makes the position of what he calls 'teleological explanation' more difficult than he need by requiring that the fine structure of the *explanandum* (how fine he fails to say) be captured teleologically. See *The Explanation of Behavior*, p. 9 n., and 'The Explanation of Purposive Behaviour', p. 55 n.

Readers of Taylor will have realized that the concept of a consequence law is in some respects a development of his concept of a teleological law.

ceremonials would have the same effect. Because the example is typical of functional explanations, the claim becomes a critique of functional explanation as such. Here is a résumé of our response to that critique, in language which does not presuppose our particular theory of functional explanation.

(i) It is easy to overestimate the availability of substitutes for a given functional device. The fact that ceremonials which are not rain dances reinforce social cohesion in other tribes does not show that they would do so among the Hopi. In general: if device d fulfils function f in system s, and device d' fulfils the same function f in a distinct system s', it does not follow that d' would fulfil f if it occurred in s.

(ii) Suppose, though, as will sometimes be true, that d' would fulfil f in s. Then the fact that d fulfils f in s is unlikely to explain its presence there. But d's presence might still have a *partly* functional explanation. For example: the facts of genetic variation are part of the explanation why a species developed a certain adaptive feature, the other part being its adaptiveness. (Other features would have been just as adaptive, but the genetic variation excluded them.)

(iii) Where responses (i) and (ii) both fail, we might still be able to sustain a functional explanation, not of the presence of d, but of why some or other item which fulfils function f is present, that is, of why there is an x in s such that x fulfils f in s. It is not trivial to say: the cow has a device which dispatches flies because such a device dispatches flies—even though that is not why what it has is a *tail*.

materialism is, moreover, revolutionary, in two respects: it predicts large-scale social transformations, and it claims that their course is violent.

To say that forms of society rise and fall according as they advance and retard the development of the productive forces is to predict massive transformations of social structure as the productive forces progress. The master thesis of historical materialism (thesis (b) of p. 134) puts the growth of human powers at the centre of the historical process, and it is to this extra-social[1] development that society itself is contrained to adjust. The conservative tendency of functionalism lies in its functionally explaining institutions as *sustaining* (existing) society. There is no conservatism when institutions, and society itself, are explained as serving a development of power which prevails against forms of society resisting it.

The theory is also revolutionary in that the means whereby society is transformed is class conflict. Transitions do not occur quietly and easily. Society adjusts itself to nature through access to power of a new class. Class struggle is a large part of the answer to the question: *how* does the fact that a new economic structure would benefit the productive forces explain its actualization? We must now consider such '*how*-questions' more generally.

(4) *Elaborations*

We argued in Chapter IX (pp. 269 ff.) that sound functional explanations apply to the development of biological species. The theory of chance variation and natural selection does not displace functional explanation in that domain. Instead, it shows, *inter alia*, why functional explanation is appropriate there. The theory entails that plants and animals have the useful equipment they do because of its usefulness, and specifies in what manner the utility of a feature accounts for its existence.

Now in the absence of such a theory we shall still observe provocative correlations between the requirements of living existence and the actual endowments of living things, correlations fine enough to suggest the thesis that they have those endowments because they minister to those requirements. We can rationally hypothesize functional explanations even when

[1] In the sense of Ch. IV.

we lack an account which, like Darwin's, shows how the explanations work, or, as we put it in Chapter IX (see p. 271), even when we lack *elaborations* of the explanations. A satisfying elaboration provides a fuller explanation and locates the functional fact within a longer story which specifies its explanatory role more precisely.

Now the fact that functional explanations may reasonably be proposed, in the light of suitable evidence, but in advance of an elaborating theory, is very important for social science and history. For functional explanations in those spheres often carry conviction in the absence of elaborative context. And it would be a mistake to refrain from taking those explanatory steps which are open to us, just because we should prefer to go farther than our current knowledge permits.[1] *If*, for example, the pattern of educational provision in a society evolves in a manner suitable to its changing economy, then it is reasonable to assert that education changes as it does because the changes sustain economic evolution, even when little is known about *how* the fact that an educational change would be economically propitious figures in explaining its occurrence. To be sure, there are grounds for caution pending acquisition of a plausible fuller story, but that is not especially true of functional explanations.

For it is not only explanations of functional cast which, though accepted as explanations, are yet felt to require further elaboration. We are frequently *certain* that *p* explains *q* yet unclear *how* it explains it. Someone ignorant of the contribution of oxygen to combustion may yet have overwhelming evidence that when a match, having been struck, bursts into flame, it bursts into flame *because* it has been struck, for all that his ignorance prevents him from saying how it is that the friction leads to ignition. So similarly, to return to functional explanation, one ignorant of genetics and evolutionary theory, will, when he finds species of insects regularly developing means of resisting pesticides introduced into their environments, naturally conclude that they develop those means because they are protective, although he can say nothing more. Perhaps historians and social scientists never record cases of adaptation as unarguable as the biological ones. But the rest of their explanatory hypothesizing is also based on less impressive

[1] Cf. Plekhanov, *The Monist View*, p. 330.

evidence than what natural scientists are in a position to demand.

Functional explanations, then, have intellectual validity and value, even if it is said that 'they raise more questions than they answer'. For they answer some questions, and the further ones to which they give rise point research in the right direction.

But now let us examine some ways in which functional explanations may be elaborated.

Consider once again an industry in which average scale of production expands because of the economies large scale brings. We imagined (p. 280) this explanatory judgement being passed without detailed knowledge of a connection between the fact that scale yields economies and the (consequent) fact that scale expanded. Two elaborations readily suggest themselves.

First, we can suppose that the industry's decision-makers knew that increased scale would yield economies, and that they enlarged their producing units out of awareness of that functional fact. The functional fact would then play its explanatory role by accounting for formation of the (correct) belief that an increase in scale would be beneficial; that belief, together with a desire for the relevant benefits, being a more proximate cause of the expansion in size. For obvious reasons, we call this a *purposive* elaboration of a functional explanation.

In the above elaboration we neither assert nor deny that the industrial units operate in a competitive environment. The decision makers might be Gosplanners, setting the course of an industry wholly subject to their will. But purposive elaboration can also apply in a competitive setting, in which case among the known benefits to be had from expanding scale might be the very survival of each of the firms in question.

In a competitive economy a purposive elaboration is, as noted, possible, but so is a second important form of elaboration. Imagine a competitive economy in which a certain industry would function more efficiently under increased scale, but suppose the managers of the industry's firms are ignorant of the fact. Then if mean scale expands, it is not because anyone seeks the economies increased scale promises. Still, some firms increase the scale of their producing units, perhaps because prestige is attached to size, or because the move is seen as a

way of reducing tension between managers; or suppose that there is no intention to increase scale, but, in certain firms, an ungoverned drift in that direction. Then we could not say of any particular firm that its scale grew because of the associated economies. But the functional fact might still explain a change over time in the industry's scale profile, if only those firms which expanded (for whatever reason) would have succeeded, in virtue of having expanded, against the competition. Competition is bound to select in favour of firms whose practice is efficient, regardless of the inspiration of that practice. In the case described, we have what may be called a *Darwinian* elaboration of a functional explanation, for these are its salient elements: chance[1] variation (in scales of production), scarcity (in virtue of finite effective demand), and selection (on the market of those variants which, by chance, had a superior structure).

A third kind of elaboration may be called *Lamarckian*. In Lamarckian biological theory, by contrast with that of Darwin, the species evolves in virtue of evolution within the life history of its specimens, which acquire more adaptive characteristics, and transmit them to offspring.[2] An organ not fully suited to the creature's environment becomes more suited as a result of the struggle to use it in that environment. (An example would be teeth becoming sharper as a result of regular chewing on food best chewed by sharp teeth.) The suggested elaboration is not purposive, because it is not the intention of the organism so to alter its equipment: it is altered as a result of a use which is not intended to alter it, but which reflects the environment's demands. Nor is the elaboration Darwinian. The initial varia-

[1] This designation does not imply that the variation is uncaused or inexplicable. What is meant by 'chance' is that the explanation of the variation is unconnected with the functional value of greater scale. Darwin calls genetic variation *chance* only because it is not controlled by the requirements of the environment.

[2] Following Ritterbush (*Overtures to Biology*, p. 175), we may distinguish between the *acquisition* of inheritable characteristics and the *inheritance* of acquired characteristics, and it is the former which interests us here: we are not concerned with the transmission of features from one social entity to another. Lamarck is relevant for his concept of an adaptation to the environment which is not mediated by a prior chance variation. The movement towards the adaptation is from the beginning controlled by the environment's demands.

Lamarck's specification of the mechanism of adaptation, in terms of 'the influx of subtle fluids', is also irrelevant here. What has social application is the concept of plasticity, of organs being able to develop new uses under new constraints.

tions, which are then preserved, do not occur by chance relative to the environmental requirements, and there *need* not be any competitive pressure on the organism, expressing itself in differential survival rates as between well- and ill-equipped specimens.

A fourth form of elaboration—really a special case of the first—is appropriate in cases of *self-deception.* By contrast with the second and third forms, the functional fact operates through the minds of agents, but unlike paradigm purposive examples, it does so without the agents' full acknowledgement. An elaboration of this form for the economies of scale case would be quite fanciful, but it is relevant to Marxian theory, as will be seen.

The above classification is not exhaustive, and the types of elaboration reviewed admit of combination with one another: there are often several interlaced routes from the functional fact to the fact it explains. C. Wright Mills contrasted 'drift' and 'thrust' in social development,[1] and it is easy to envisage agglomerations of the two. Thus, returning once again to economies of scale, there could initially be an unplanned drift to greater average size, controlled by competition, and later a perception of the functional relationship, with increasing thrust as a result.

(5) *Marxian Illustrations*

Our discussion will be confined to two central topics: the generation and propagation of ideology, and the adaptation of the economic structure to the productive forces.

When Marxists venture functional explanations of ideological and superstructural phenomena, they are often accused of espousing a 'conspiracy theory of history'. A Marxist says 'it is no accident that' left-wing commentators receive little space in major American newspapers, or that British trade union leaders end their careers in the House of Lords. He is then criticized for imagining that an omnicompetent élite exercises fine control over these matters. He sometimes tries to forestall the response by disclaiming an assertion of conspiracy, but too commonly he fails to say in what other fashion phenomena like those mentioned are explained by the functions they serve.

[1] See *The Causes of World War Three.*

Our discussion of non-purposive elaborations of functional claims suggests ways of filling that lacuna, but it is also necessary to point out that Marxists can be too sensitive to the charge that they perceive conspiracies. There is more collective design in history than an inflexible rejection of 'conspiracy theories' would allow, and richer scope for purposive elaboration of Marxian functional theses than that posture recognizes. Thus, while ideologies are not normally invented to fit the purposes they serve, a fairly deliberate and quite concerted effort to maintain and protect an *existing* ideology is not unusual. According to Christopher Hill, nobility and gentry in seventeenth-century England doubted they 'would still be able to control the state without the help of the church', and, therefore, 'rallied to the defence of episcopacy in 1641 . . . for explicitly social reasons'.[1] Ruling class persons of no special devotion to an Anglican God frankly professed that the established church was required to ensure political obedience, and acted on that inspiration. Or, to take another example, when a high state functionary, reflecting on the unequal distribution of information in society, concludes that 'this inequality of knowledge has become necessary for the maintenance of all the social inequalities *which gave rise to it*',[2] he may be expected to see to the persistence of an educational structure which reproduces ignorance in the right places.

Conspiracy is a natural effect when men of like insight into the requirements of continued class domination get together, and such men do get together. But sentences beginning 'The ruling class have decided . . .' do not entail the convocation of an assembly. Ruling class persons meet and instruct one another in overlapping *milieux* of government, recreation, and practical affairs, and a collective policy emerges even when they were never all in one place at one time.

There are, of course, many shades between the cynical[3] handling of ideology just emphasized and an unhypocritical commitment to it, and a division of labour between lucid and *engagé* defenders of dominant ideas can be quite functional. If

[1] *Reformation to Industrial Revolution*, pp. 153, 92. Cf. *Change and Continuity*, p. 191.

[2] Jacques Necker, as quoted at *Theories of Surplus Value*, i. 307.

[3] What was cynical was not the belief that the existing order ought to be defended, but the use of religion in its defence.

awareness of the true name of the game penetrates too far down the élite, it could leak into the strata beneath them. There is always a mix of manipulation, self-deception, and blind conviction in adherence to an ideology, the optimal proportions varying with circumstance.

All classes are receptive to whatever ideas are likely to benefit them, and ruling classes are well placed to propagate ideologies particularly congenial to themselves. But before an ideology is received or broadcast it has to be formed. And on that point there are traces in Marx of a Darwinian mechanism, a notion that thought-systems are produced in comparative independence from social constraint, but persist and gain social life following a filtration process which selects those well adapted for ideological service. Thus it is true but in one respect unimportant that the idea of communism has been projected time and again in history,[1] for only when the idea can assist a viable social purpose, as it can now, by figuring in the liberation of the proletariat, will it achieve social significance. There is a kind of 'ideological pool' which yields elements in different configurations as social requirements change.

Yet it is unlikely that ideas fashioned in disconnection from their possible social use will endorse and reject *exactly* what suits classes receptive to them. Here a Lamarckian element may enter, to make the picture more plausible.[2] In Lamarck's theory the equipment of the individual organism is somewhat plastic, for it changes under environmental challenge when it is put to a novel use. Because of the delicacy of intellectual constructions, sets of ideas enjoy a partly similar plasticity: one change of emphasis, one slurred inference, etc., can alter the import of the whole. Such 'Lamarckian' possibilities are intimated in Marx's review of the numerous uses to which a self-same Christianity is liable,[3] and it is not because 'liberalism' is an ambiguous term that its presumed teaching varies across space and time. And if it is true of revolutionaries that

[1] *German Ideology*, p. 51.

[2] Plekhanov invoked Lamarck in the service of historical materialism: 'In the same way must also be understood the influence of economic requirements, and of others following from them, on the psychology of a people. Here there takes place a slow adaptation by exercise or non-exercise . . .' *The Monist View*, pp. 217–18.

[3] See 'The Communism of the Paper *Rheinischer Beobachter*', p. 82.

> just when they seem engaged in revolutionising themselves and things, in creating something that has never yet existed, precisely in such periods of revolutionary crisis they anxiously conjure up the spirits of the past to their service and borrow from them names, battle cries and costumes in order to present the new scene of world history in this time-honoured disguise and this borrowed language,[1]

then it is perhaps not only for the reason Marx states that they so behave, but also because the only symbols and thought-forms available are those which come from the past, and which they must now adopt and adapt.

Chapter VI upheld the thesis that transformations of economic structure are responses to developments within the productive forces. Production relations reflect the character of the productive forces, a character which makes a certain type of structure propitious for their further development. We denied that this formulation removed class struggle from the centre of history, saying instead that it was a chief means whereby the forces assert themselves over the relations, and challenging those who assign a more basic role to class struggle to explain what else determines the rise and fall of classes (pp. 148–9). Those remarks constitute a preliminary elaboration of the functional explanation of forms of economy, which must now be extended.

Classes are permanently poised against one another, and that class tends to prevail whose rule would best meet the demands of production. But how does the fact that production would prosper under a certain class ensure its dominion? Part of the answer is that there is a general stake in stable and thriving production, so that the class best placed to deliver it attracts allies from other strata in society. Prospective ruling classes are often able to raise support among the classes subjected to the ruling class they would displace. Contrariwise, classes unsuited to the task of governing society tend to lack the confidence political hegemony requires, and if they do seize power, they tend not to hold it for long.

Sometimes, too, as in the gradual formation of capitalism, the capacity of a new class to administer production expresses

[1] 'The Eighteenth Brumaire', p. 247.

itself in nascent forms of the society it will build, which, being more effective than the old forms, tend to supplant them. Purposive and competitive elements mingle as early growths of capitalism encroach upon and defeat feudal institutions that would restrict them. There is also adaptive metamorphosis. For example: a pre-capitalist landed ruling class in an epoch of commercialization requires finance from a not yet industrial bourgeoisie. When landlords cannot meet the commitments engendered by their new connections, they lose their holdings, so others, in fear of a similar fate, place their operations on a capitalist basis. Some see what is required for survival, and undergo an alteration of class character; others fail to understand the times, or, too attached to an outmoded ideology and way of life, fight against the new order, and disappear.

The ideological and superstructural supports of the old order lose their authority. The sense of oppression and injustice always latent in the underclass becomes more manifest, encouraged by the class whose hour of glory is at hand, and the dominating illusions become pallid. Marx supposed that the ideological defences of existing conditions begin to collapse when those conditions no longer accord with productive growth. Thus

> when the illusion about competition as the so-called absolute form of free individuality vanishes, this is evidence that the conditions of competition, i.e. of production founded on capital, are already felt and thought of as *barriers*, and hence already *are* such, and more and more become such.[1]

In similar spirit, Engels opined[2] that ideas of equality and rectification of injustice are perennial, but that they achieve historical power only when and because there is contradiction between the productive forces and the production relations. The class able to take hold of the forces rides up on the resentment of the exploited producers.

Recall the distinction (Chapter III, section (8)) between a change in economic structure which institutes a new dominant relation of production, thus altering the economic structure's type, and a lesser change, which leaves the latter intact. We

[1] *Grundrisse*, p. 652. [2] *Anti-Dühring*, p. 369.

have been looking at the more dramatic case, the replacement of one type of economic structure by another. But adaptations of the economic structure falling short of total transformation also occur. One such change was the legislated reduction of the working day in Britain, which modified the dominant relation of production, by altering the space in which the wage bargain between bourgeois and proletarians was to be struck.[1]

Marx states two reasons for the contraction of the working day effected by the Factory Acts, and he establishes no bond uniting them. Having presented his reasons, we shall sketch a possible connection between them, which will suggest a generalization about the way functional requirements sometimes assert themselves.

The reasons: 'apart from the working-class movement that daily grew more threatening, the limiting of factory labour was dictated by' the need to 'curb the passion of capital for a limitless draining of labour power'.[2] These are cited as separate forces, whose confluence produced the Factory Acts. (Marx does not say whether either would have been enough without the other.)

Marx conceived that the health of the system required a brake on capitalist exploitation, which was reaching a pitch inimical to the reproduction of the labour force:

> . . . capital is reckless of the health or length of life of the labourer, unless under compulsion from society. To the outcry as to the physical and mental degradation, the premature death, the torture of overwork, it answers: Ought these to trouble us since they increase our profits?[3]

Here 'capital' is capital embodied in the individual capitalist, and the behaviour ascribed to him is imposed by the regime of competition, a set of 'external coercive laws having power over every individual capitalist'.[4] The coercion of competition can be countered only by the coercion of society, in the shape of its political guardian, the relatively responsive capitalist

[1] In the classification of p. 86, this illustrates the second kind of type-preserving change of economic structure.

[2] *Capital*, i. 239.

[3] Ibid. i. 270. In comparable fashion, overintensive capitalist farming threatens the productivity of the soil: see ibid. i. 239, 265, 507, iii. 603, 792.

[4] Ibid. i. 270.

state. The state must intervene because, despite the behaviour forced upon the capitalist, 'the interest of capital itself points in the direction of a normal working day'.[1] 'Capital' in this last excerpt refers to the system as opposed to its members, or to the capitalist as stake-holder in, not puppet of, the system. Large capitalists, whose positions are relatively secure, and whose enterprises would survive—or improve—under additional state constraint, often rise to the stake-holding attitude, and press upon the state the need for reform.

The capitalist state, legislator of the Factory Acts, is, then, the eye of the otherwise blind capitalist, the stabilizer of a system capitalist activity itself endangers. The needs of the system cannot be attended to by dispersed entrepreneurs severally driven to maximize individual profit. Collected in the state, they may see, and see to, those needs, and may respond to working class demands which suit those needs but which they necessarily repel in civil society.

Let us now take stock. The workers demand remission of exploitation because they want to live; the state grants it because capital needs living labour. The suggested generalization (not a universal law) is that substantial changes in economic structure which favour the immediate welfare of the subordinate class occur when the class fights for them *and* they increase—or at least preserve—the stability of the system (for reasons independent of allaying a felt grievance of the exploited[2]). The elements are connected because ruling class perception of the need for change is quickened by the pressure of underclass demand, and the latter gets bigger in consequence.

Class insurgency is more likely to achieve its object when the object has functional value, a fact which bears on the undialectical question whether it was systemic need, or, on the supposed contrary, militant struggle, which accounted for the coming of welfare capitalism. A reform essential to capital's survival can also qualify as a 'victory of the political economy of labour over the political economy of property'.[3] There is

[1] *Capital*, i. 266.

[2] That is, the change is functional for the system other than because it reduces the anger of the proletariat. Recall the distinction (p. 53) between being willing and being able to work, which is relevant here.

[3] 'Inaugural Address of the W.M.I.A.', p. 383. That is how Marx described the Ten Hours Bill.

victory when capitalism is able to sustain itself only under the modification the reform imposes on it.[1]

[1] Merton ('Manifest and Latent Functions', p. 104) requires of items to which functions may be assigned that they be 'standardized, i.e. patterned and repetitive', for example: 'social roles, institutional patterns, social processes, cultural patterns, culturally patterned emotions, social norms, group organization, social structure, devices for social control, etc.' There is no good reason for this restriction, as the case of the Factory Acts shows. It is possible to offer functional explanation of a particular event, such as the passage of a bill, or, for that matter, an enactment of a social role on a particular occasion, or a change in a cultural pattern, which is not itself a cultural pattern, and which may occur because of its salutary consequences for the culture.

In our view, no special type of phenomenon or fact is by nature an object of functional explanation (see Ch. IX, pp. 255–6).