Goodman, Nelson. 1983 [1954]. Fact, Fiction, and Forecast. 4th ed.
Cambridge, MA: Harvard University Press.

anyone else; and the easier course of accepting an unsubstantiated and even dubious assumption much more sweeping than any actual predictions we make seems an odd and expensive way of justifying them.

2. *Dissolution of the Old Problem*

Understandably, then, more critical thinkers have suspected that there might be something awry with the problem we are trying to solve. Come to think of it, what precisely would constitute the justification we seek? If the problem is to explain how we know that certain predictions will turn out to be correct, the sufficient answer is that we don't know any such thing. If the problem is to *find* some way of distinguishing antecedently between true and false predictions, we are asking for prevision rather than for philosophical explanation. Nor does it help matters much to say that we are merely trying to show that or why certain predictions are *probable*. Often it is said that while we cannot tell in advance whether a prediction concerning a given throw of a die is true, we can decide whether the prediction is a probable one. But if this means determining how the prediction is related to actual frequency distributions of future throws of the die, surely there is no way of knowing or proving this in advance. On the other hand, if the judgment that the prediction is probable has nothing to do with subsequent occurrences, then the question remains in what sense a probable prediction is any better justified than an improbable one.

Now obviously the genuine problem cannot be one of attaining unattainable knowledge or of accounting for knowledge that we do not in fact have. A better understanding of our problem can be gained by looking for a moment at what is involved in justifying non-inductive inferences. How do we justify a *de*duction? Plainly, by showing that it conforms to the general rules of deductive inference. An argument that so conforms is justified or valid, even if its conclusion happens to be false. An argument that violates a rule is fallacious even if its conclusion happens to be true. To justify a deductive conclusion therefore requires no knowledge of the facts it pertains to. Moreover, when a deductive argument has been shown to conform to the rules of logical inference, we usually consider it justified without going on to ask what justifies the rules. Analogously, the basic task in justifying an inductive inference is to show that it conforms to the general rules of *in*duction. Once we have recognized this, we have gone a long way towards clarifying our problem.

Yet, of course, the rules themselves must eventually be justified. The validity of a deduction depends not upon conformity to any purely arbitrary rules we may contrive, but upon conformity to valid rules. When we speak of *the* rules of inference we mean the valid rules—or better, *some* valid rules, since there may be alternative sets of equally valid rules. But how is the validity of rules to be determined? Here again we encounter philosophers who insist that these rules follow from some self-evident axiom, and others who try to show that the rules are grounded in the very nature of the human mind. I think the answer lies much nearer the surface. Principles of deductive inference are justified by their conformity with accepted deductive practice. Their validity depends upon accordance with the particular deductive inferences we actually make and sanction. If a rule yields inacceptable inferences, we drop it as invalid. Justification of general rules thus derives from judgments rejecting or accepting particular deductive inferences.

This looks flagrantly circular. I have said that deductive inferences are justified by their conformity to valid general rules, and that general rules are justified by their conformity to valid inferences. But this circle is a virtuous one. The point is that rules and particular inferences alike are justified by being brought into agreement with each other. *A rule is amended if it yields an inference we are unwilling to accept; an inference is rejected if it violates a rule we are unwilling to amend.* The process of justification is the delicate one of making mutual adjustments between rules and accepted inferences; and in the agreement achieved lies the only justification needed for either.

All this applies equally well to induction. An inductive inference, too, is justified by conformity to general rules, and a general rule by conformity to accepted inductive inferences. Predictions are justified if they conform to valid canons of induction; and the canons are valid if they accurately codify accepted inductive practice.

A result of such analysis is that we can stop plaguing ourselves with certain spurious questions about induction. We no longer demand an explanation for guarantees that we do not have, or seek keys to knowledge that we cannot obtain. It dawns upon us that the traditional smug insistence upon a hard-and-fast line between justifying induction and describing ordinary inductive practice distorts the problem. And we owe belated apologies to Hume. For in dealing with the question how normally

accepted inductive judgments are made, he was in fact dealing with the question of inductive validity.[2] The validity of a prediction consisted for him in its arising from habit, and thus in its exemplifying some past regularity. His answer was incomplete and perhaps not entirely correct; but it was not beside the point. The problem of induction is not a problem of demonstration but a problem of defining the difference between valid and invalid predictions.

This clears the air but leaves a lot to be done. As principles of *de*ductive inference, we have the familiar and highly developed laws of logic; but there are available no such precisely stated and well-recognized principles of inductive inference. Mill's canons hardly rank with Aristotle's rules of the syllogism, let alone with *Principia*

[2] A hasty reader might suppose that my insistence here upon identifying the problem of justification with a problem of description is out of keeping with my parenthetical insistence in the preceding lecture that the goal of philosophy is something quite different from the mere description of ordinary or scientific procedure. Let me repeat that the point urged there was that the organization of the explanatory account need not reflect the manner or order in which predicates are adopted in practice. It surely must describe practice, however, in the sense that the extensions of predicates as explicated must conform in certain ways to the extensions of the same predicates as applied in practice. Hume's account is a description in just this sense. For it is an attempt to set forth the circumstances under which those inductive judgments are made that are normally accepted as valid; and to do that is to state necessary and sufficient conditions for, and thus to define, valid induction. What I am maintaining above is that the problem of justifying induction is not something over and above the problem of describing or defining valid induction.

Mathematica. Elaborate and valuable treatises on probability usually leave certain fundamental questions untouched. Only in very recent years has there been any explicit and systematic work upon what I call the constructive task of confirmation theory.

3. The Constructive Task of Confirmation Theory

The task of formulating rules that define the difference between valid and invalid inductive inferences is much like the task of defining any term with an established usage. If we set out to define the term "tree", we try to compose out of already understood words an expression that will apply to the familiar objects that standard usage calls trees, and that will not apply to objects that standard usage refuses to call trees. A proposal that plainly violates either condition is rejected; while a definition that meets these tests may be adopted and used to decide cases that are not already settled by actual usage. Thus the interplay we observed between rules of induction and particular inductive inferences is simply an instance of this characteristic dual adjustment between definition and usage, whereby the usage informs the definition, which in turn guides extension of the usage.

Of course this adjustment is a more complex matter than I have indicated. Sometimes, in the interest of convenience or theoretical utility, we deliberately permit a definition to run counter to clear mandates of common usage. We accept a definition of "fish" that excludes whales. Similarly we may decide to deny the term "valid induction" to some inductive inferences that are commonly considered valid, or apply the term to others not

usually so considered. A definition may modify as well as extend ordinary usage.[3]

Some pioneer work on the problem of defining confirmation or valid induction has been done by Professor Hempel.[4] Let me remind you briefly of a few of his results. Just as deductive logic is concerned primarily with a relation between statements—namely the consequence relation—that is independent of their truth or falsity, so inductive logic as Hempel conceives it is concerned primarily with a comparable relation of confirmation between statements. Thus the problem is to define the relation that obtains between any statement S_1 and another S_2 if and only if S_1 may properly be said to confirm S_2 in any degree.

With the question so stated, the first step seems obvious. Does not induction proceed in just the opposite direction from deduction? Surely some of the evidence-statements that inductively support a general hypothesis are consequences of it. Since the consequence relation is already well defined by deductive logic, will we not be on firm ground in saying that confirmation embraces the converse relation? The laws of deduction in reverse will then be among the laws of induction.

Let's see where this leads us. We naturally assume fur-

[3] For a fuller discussion of definition in general see Chapter I of *The Structure of Appearance*.

[4] The basic article is 'A Purely Syntactical Definition of Confirmation', cited in Note I.10. A much less technical account is given in 'Studies in the Logic of Confirmation', *Mind*, n.s., vol. 54 (1945), pp. 1–26 and 97–121. Later work by Hempel and others on defining *degree* of confirmation does not concern us here.