

WW BARTLEY

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## APPENDIX 2. LOGICAL STRENGTH AND DEMARCATION

### 1. *The Problem of Demarcation Reconsidered*

With the first publication of this book, I proposed a generalization of Karl Popper's theory of falsification.<sup>1</sup> This generalization, having to do with a separation between justification and criticism that transcends the separation between verification and falsification, has been useful, and nowadays Popperian thought is most often presented and interpreted in terms of it.

Almost as soon as I had achieved this generalization, however, I began to feel uncomfortable about parts of Popper's early work. This is hardly surprising: indeed, one of Popper's themes is that any broader theory will both explain and correct earlier theories. The part of Popper's thinking that I felt most uncomfortable about was his theory of demarcation.<sup>2</sup>

Demarcation is an important issue in philosophy of religion, and in the examination and critique of ideology. The story of the philosophy of religion in this century, and to some extent in earlier centuries, is indeed the story of the response to a series of criteria of demarcation brought forth in judgment on religious utterances: criteria of meaningfulness, empirical character, verifiability, and so on.

In this appendix, I consider anew the problem of demarcation. Although the discussion involves some correction to Popper's account of demarcation, it presupposes the approximate validity of Popper's own results, and could not have been carried out without them.

### 2. *Demarcation and Justification*

The fundamental problem to be considered is that of distinguishing between a good idea and a bad idea, a good practice and a bad practice. This may be called a *problem of demarcation*.

<sup>1</sup>For a recent statement, see my "Critical Study: The Philosophy of Karl Popper. Part III: Rationality, Criticism, and Logic", *Philosophia*, Israel, February 1982, pp. 121-221.

<sup>2</sup>W. W. Bartley, III, "Theories of Demarcation between Science and Metaphysics", in I. Lakatos and A. E. Musgrave, eds., *Problems in the Philosophy of Science* (Amsterdam: North-Holland Publishing Co., 1968), pp. 40-119.

The reader who is familiar with such problems as they are treated in contemporary philosophical literature is asked to pause here and note that I am *not* at the moment speaking of a demarcation *between science and metaphysics*, or a demarcation *between meaningful and meaningless utterances*, or of any demarcation other than the one specified: between a good idea and a bad idea, between a good practice and a bad practice.

In a simpler world, one might solve such problems without any explicit recourse to philosophy. For example: if faced with a choice between one idea and another, or one course of action and another, I might simply ask my friend Harry which to choose. Or I might flip a coin. This procedure could, of course, be said implicitly to involve a primitive theory of criticism, and to that extent a primitive philosophy. The theory—whether expressed or consciously entertained or not—is that any idea that Harry approves is good; and any that he disapproves, bad. Or similarly for heads and tails.

We do not live in so simple a world. Yet our own, complicated, answers to the problem of demarcation are no better: rather, our approaches are arranged so as to preclude the possibility of satisfactorily answering the problem. We live in a world contaminated by a particular philosophical idea about how *any* such demarcation would have to be obtained. I call this “justificationism”. In brief, it is the view that the way to criticize an idea is to see whether and how it can be justified. Justificationism deeply permeates all Western culture, and virtually controls all traditional, modern, and contemporary philosophy. This idea shapes the thinking of Plato and Aristotle, of Descartes, Spinoza, and Leibniz, of Locke, Berkeley, and Hume, of Kant and Hegel, of Whitehead and Russell—and also of Wittgenstein, Carnap, Ayer, Ryle, Austin, Quine, Husserl, Heidegger, Barth, Bultmann, Tillich, or almost any other philosopher one might want to name. It shapes phenomenology as much as it does the so-called analytical philosophy that is more characteristic of the English-speaking countries. All these periods, men, and movements participate in what I call the “justificationist metacontext”.<sup>3</sup>

The word “justify” is not essential here. A variety of other words and phrases have been used for the same purpose, including: verify, probabilify, confirm, make firm, validate, vindicate, prove, make certain, show to be certain, make acceptable, authorize, defend.

Such justification—or whatever it may happen to be called—involves the following:

- (1) an authority (or authorities), or authoritatively good trait, in terms of which final evaluation (i.e., demarcation of the good from the bad) is to be made;
- (2) the idea that the goodness or badness of any idea or policy is to be

<sup>3</sup>See appendix 1 and “Rationality, Criticism, and Logic”.

determined by reducing it to (i.e., deriving it from or combining it out of) the authority (or authorities), or to statements possessing the authoritatively good trait.<sup>4</sup> That which can so be reduced is justified; that which cannot is to be rejected.<sup>5</sup>

The first step is already found in the decisions made by asking Harry or tossing a coin. The second step moves beyond this.

Note that these requirements do not speak of *rational* justification, in the sense of a justification that might be approved by rationalists or scientifically minded individuals. Justification is sought by rationalist and irrationalist alike. Rationalism and irrationalism have justificationism in common. Justificationism has the same structure, and the same requirements, whether the authority in question be the local wizard, the Ouija board, sense-observation reports, or the light of pure reason.

### 3. The Justificationist Pattern of Demarcation

Many superficially very different theories of demarcation conform to this underlying justificationist pattern. Consider this check list, which consists of demarcations proposed primarily within the Western rationalist traditions:

| good traits            | bad traits               |
|------------------------|--------------------------|
| true                   | false                    |
| probable               | improbable               |
| clear and distinct     | unclear and indistinct   |
| demonstrable by reason | undemonstrable by reason |
| empirical              | unempirical              |
| verifiable             | unverifiable             |
| meaningful             | meaningless              |
| scientific             | unscientific             |

Which indicators of goodness and badness are taken most seriously depends on in which part, and in which period, of the justificationist metacontext one finds oneself. Thus, for Descartes, good ideas are demarcated from bad ones by finding which can be reduced to clear and distinct

<sup>4</sup>Compare Bertrand Russell, *The Problems of Philosophy* (London, 1912), p. 58: “knowledge concerning what is known by description is ultimately reducible to knowledge concerning what is known by acquaintance”, and p. 109: “Our derivative knowledge of truths consists of everything that we can deduce from self-evident truths by the use of self-evident principles of deduction.” Or as Rudolf Carnap writes: “This requirement for justification and conclusive foundation of each thesis will eliminate all speculative and poetic work from philosophy. . . . It must be possible to give a rational foundation for each scientific thesis. . . . the physicist does not cite irrational factors, but gives a purely empirical-rational justification. We demand the same from ourselves in our philosophical work”. *The Logical Structure of the World* (Berkeley and Los Angeles: University of California Press, 1967), Preface to the First Edition, p. xvii.

<sup>5</sup>Cf. Russell, *Problems*, p. 111: “It is felt by many that a belief for which no reason can be given is an unreasonable belief. In the main, this view is just.”

ideas; for Hume, good ideas are demarcated from bad ideas by finding which are empirical, i.e., which can be reduced to reports of sense observation. And so on. As to bad ideas, on some demarcations they are simply undesirable in some respect: being confused, unclear, or poorly related to evidence, and so on. On other demarcations, they are much worse: e.g., straying beyond the bounds of human understanding or of human language.

The items on the list have a staying power. Thus, even though clarity and distinctness are now commonly regarded as insufficient, they are, in and of themselves, still prized. As to *truth*, although no modern philosophy claims a criterion of truth, all still agree that truth is a good trait, when it can be had. Yet truth is certainly not sufficient: a falsehood of high content may be preferable to a trivial or tautologous truth.<sup>6</sup> The focus of attention in modern and contemporary philosophies has, however, been on probability and on the last four items on the list. Most forms of positivism and empiricism, for instance, agree that good theories will be of high probability, and will also be empirical, verifiable, meaningful, and scientific. Demarcations focusing on *science* have been of prime importance since Kant.

The examples given are those most important within Western philosophy and the rationalist tradition. Such justificationist resolutions of demarcational problems are, however, by no means restricted to philosophy and science: they invade every aspect of our culture.

Theologians would cite among good demarcational traits: endorsement by the Bible, or by the Pope, or by some other religious authority. Others, both in and out of religion, would appeal to "conscience" and "the inner light". Still others, arguing from political ideologies, might find such traits as authorization by class interests (however that might be figured) as hallmarks of good theory and practice. Rationalists and irrationalists alike are justificationists.

#### 4. Problems of Logical Strength

*Any theory of demarcation, any theory of criticism, that is set up in this way can, potentially, produce a problem of logical strength.*

What is meant by a problem of logical strength?

The problem of logical strength arises when the statement or policy under evaluation, although not in conflict with the authorities, has a logical strength greater than that of any authority or combination of authorities, which hence cannot be reduced to or derived from the authorities, and

<sup>6</sup>See Popper, *Conjectures and Refutations*, pp. 229–30.

which must therefore be rejected as not sanctioned by the authorities.<sup>7</sup>

This is, of course, only a *problem* when proceeding in this way causes one to *reject something that should obviously be retained*.

It is, however, not anticipated that any such problem will arise. Justificational accounts of demarcation are set up with the expectation, with the presumption, that the authorities will be sufficient to sanction all good theories and policies, and that statements or policies that are *not* reducible to the authorities are simply to be rejected.

*In fact, however, such problems arise all the time.* Much of the history of philosophy, and almost all of the history of epistemology, is the history of problems of logical content.

This thesis could be illustrated with virtually every demarcational approach tried hitherto in the history of philosophy. And the whole history of philosophy could be rewritten in terms of this insight. For reasons of length, I shall restrict my discussion in this appendix to showing this for *empiricist* approaches to demarcation, which have usually taken sense-observation reports as authoritative.<sup>8</sup>

#### 5. Logical Strength: An Elementary Lesson

Before explaining how these matters work, we need to consider the notion of logical strength.

What is meant by logical strength?

The idea is so elementary that some readers may protest any explanation. Yet the idea is also so important, and plays so crucial a role in this discussion, that I ask readers to forgive a brief review.

Statements differ in their logical strength or content; that is, some statements say more than others. For instance, the statement: "John is tall" says less than the statement: "John is tall and thin".

Or to take a more interesting example, the statement: "This normal die will turn up 3 on the next throw" is stronger than the statement: "This normal die will turn up either 3 or 5 on the next throw." And this latter statement, in turn, says more than: "This normal die will turn up either 1 or 2 or 3 or 4 or 5 or 6 on the next throw." This last statement, in fact, makes

<sup>7</sup>Another way of putting this is to say that such statements "possess a surplus meaning over against their evidential basis; they are not equivalent with or reducible to . . . any set of actual or possible confirming statements". See Herbert Feigl, "Existential Hypothesis", in *Philosophy of Science*, vol. 17 (1950), p. 45.

<sup>8</sup>It will not be necessary in this connection to challenge the authorities themselves. In a discussion of the problem of logical strength, the authorities under consideration (whether they be sense observation or intuition or whatever) need not themselves be questioned—not even when, as is always the case, they are highly questionable. For the problem of logical strength is independent of the question of the virtue of the authorities, and arises even when the authorities are granted as unimpeachable, unquestionable.

no assertion whatever; although it is certainly true, its content is nil.

Considerations of logical strength play an important role in valid argument and derivation (and thus in justification). It is an elementary point of logic that a valid derivation is one in which, when the premises are true, the conclusion must also be true. If any given conclusion can be validly derived from (or reduced to) a particular premise, then it is equal to or else logically weaker than the premise. By the same token, in such an argument the premises are equal to or logically stronger than the conclusion. In no circumstances may a stronger statement be validly derived from a weaker one.

Since I have mentioned that statements *equal* in strength may be derived one from the other, it may be useful to take as our first example of a valid argument such a case. Thus:

Premise: My cat is Siamese

Conclusion: My cat is Siamese

is a valid derivation. Here the premise and conclusion, being identical, are equal in strength. And it is obviously impossible for this derivation to be invalid. Here is a clear case in which it would be impossible for the premise to be true without the conclusion's being true as well.

Consider another example of a valid argument:

Premise: My cat is Siamese  
(and)  
My cat is male

Conclusion: My cat is Siamese.

Here is an example of a valid argument in which the premise is not equal to but stronger than the conclusion, richer in content than the conclusion. And here again, the argument is valid precisely because when the premise is true then the conclusion *must* be true.

To produce an example of an invalid argument, we may easily juggle our example. Thus the argument:

Premise: My cat is Siamese

Conclusion: My cat is Siamese and male

is invalid. The conclusion is stronger than is the premise. Although both premise and conclusion here *may* be true, that is a contingent matter having nothing to do with the validity of the argument: the conclusion here *need not* be true when the premise is true. The possibility that my cat is both Siamese and female is not excluded by this argument.

## 6. The Traditional Problems of Epistemology as Problems of Logical Strength

We are now in a position to return to the program announced in section 4 above: to illustrate, with particular attention to empiricism, the claim that many traditional problems of philosophy are problems of logical strength: that these central problems of philosophy are little more than illustrations of different sorts of situations in which a desired and desirable conclusion is too strong to be derived from the available authorities.

To illustrate the range of applicability of my claim, I select for detailed consideration two problems from different parts of philosophy: the first, *the problem of induction*, is a problem of the philosophy of science; the second, the *is/ought* problem, is a problem of ethics. The well-known "mistake" of deriving evaluative (ought) conclusions from descriptive (is) premises has in common with inductive reasoning at least this much: both arise from attempts to derive stronger conclusions from weaker premises.

In both inductive reasoning and in the so-called *is/ought* mistake, we have statements the merits of which must be decided—in the first instance these statements being scientific projections about the future (or "universal statements") and in the second instance the statements being of an evaluative character. The problem in both cases is to "justify" such statements, taken as the conclusions of arguments of justification, when it can be shown that the available justifiers, or statements which might be used as premises in such a justifying argument, are not sufficiently strong to entail the statements in question.

Take a straightforward example of inductive argument:

Premise: Mars is a planet and moves in an ellipse  
Jupiter is a planet and moves in an ellipse  
Earth is a planet and moves in an ellipse

Conclusion: All planetoid objects move in ellipses.

This simple textbook illustration of inductive reasoning is of course invalid. There may well be some planetoid object in our very large and possibly infinite universe which does not move in an ellipse. It is possible for our premises to be true, and our conclusion to be false. More broadly than our particular example, the problem of induction is that universal laws of science, applying as they do to an infinite number of cases, cannot be derived from a finite number, however large, of observation statements.

Now consider the kind of argument that one might and indeed can find treated in books on ethics:

Premise: I like  $x$   
 Conclusion:  $x$  is good.

The argument happens to be invalid. Those who discuss such arguments sometimes suggest that they are invalid *because* a conclusion about goodness or value has been derived from statements about matters of fact or past experience: that the mistake or even fallacy has been committed of deriving an "ought" statement from an "is" statement. But this is not why this particular argument is invalid. This argument is invalid simply because, as it stands, there is no relation between the premise and the conclusion. The argument can be formalized in various ways: e.g.,

$$p \rightarrow q$$

or alternatively,

$$A \text{ is } B \rightarrow A \text{ is } C.$$

In either case, *any argument of this logical form* would be invalid, *independently* of any question about the evaluative or factual character of the premises and conclusion.

The premise and conclusion can, of course, be related through augmenting the premise thus:

Premise: I like  $x$   
Whatever I like is good  
 Conclusion:  $x$  is good.

The argument is now valid. But it is no longer an example of attempting to derive an evaluative conclusion from premises which are purely factual. For the second premise is itself an evaluative statement.

Moreover, a problem completely parallel to the problem of induction—namely, a problem of logical strength—arises with regard to the second premise. For how would one justify it? Try this:

Premise: I like  $x$  and  $x$  is good  
I like  $y$  and  $y$  is good  
I like  $z$  and  $z$  is good  
 Conclusion: Whatever I like is good.

This argument, too, is invalid. But once again, the reason why it is invalid has nothing to do with the presence of factual statements in the premise and an evaluative statement in the conclusion. In fact, the premise statements are not purely factual. But even if they were themselves purely factual, the argument would remain invalid just because it is inductive; and an inductive argument is invalid because its conclusion is stronger than the collective strength of its premises. Here in one argument we find an evaluative conclusion and a straightforward example of inductive reasoning. In our

examples, it has been impossible to derive an ought statement from an observational premise without adding, as an additional premise, another statement which itself is too strong to be derived from empirical observation reports.

Many other traditional problems of epistemology exactly parallel the problems of induction and the is/ought problem. These other problems include, among others, the problems of justifying:

- (1) the existence of bodies and objects in the world, or even of the external world itself, independent of our sense observations thereof;
- (2) the continued real existence of the personal self;
- (3) the existence of other minds independent of our sense observations thereof;
- (4) the uniformity of nature: i.e., the expectation that the future will follow the same laws as did the past;
- (5) the existence of the past;
- (6) the existence of matter;
- (7) the existence of physical space independently of our sense perception thereof;
- (8) the existence of time independently of our perceptions and measurements thereof;
- (9) the principles of science, however these may be understood—as principles of induction, verification, causality, logic, whatever.

This is no arbitrary listing of epistemological problems. These are the problems treated by Bertrand Russell in his classic work, *The Problems of Philosophy* (1912) and by Sir A.J. Ayer in his *The Problem of Knowledge* (1956) and *The Central Questions of Philosophy* (1973). They are Hume's epistemological problems.

These apparently different problems are in fact one and the same problem, applied to different subject matters. Hence there are two crucial difficulties in traditional justificationist epistemology: (1) The authorities offered are too weak to justify some of the most obvious and important ideas of science and everyday life. In this consists the problem of logical strength. (2) The authorities are hence evidently unable to demarcate good ideas from bad. In this lies the failure of traditional epistemologies to solve the problem of demarcation.

All attempts to resolve this situation have neglected to deal with the underlying structure which generates it and have, instead, tried one of the following alternatives:

- (1) They have attempted to *strengthen* the authorities by supplementing them with *a priori* or other principles—as in Bertrand

Russell's *a priori* principle of induction—so as to permit a deduction or reduction in terms of this principle; or

(2) they have attempted to *weaken* the requirement that the justified statements be logically reducible to the authorities. For example, the justified statements might only be “inductively” related to the justifiers—thus once again making use of some principle of induction. Or—to mention a currently fashionable approach—the justifiers and justified statements may be linked informally through the alleged rules of the alleged “language game” which is in play.<sup>9</sup>

### 7. Turning the Tables: Nonjustificational Criticism

It is the justificationist structure in which the problem of demarcation is embedded which generates all the difficulties we have considered. These other problems are wholly created by, arise *automatically* from, and are rendered insoluble by the presuppositions of justificationism. The problem of induction, for instance, *arises* only when the problem of demarcation is approached justificationally. And the same is true of the other problems. It is unconscious and uncritical justificationism which is the chief reason why the problems of philosophy are so often said to be “perennial”—which is a polite way of saying that they never show any progress, let alone are solved.

In fact, a nonjustificational approach—one dispensing with both of the two requirements mentioned in section 2—is not only possible, but is the usual practice in science. To have effective criticism, it is not at all necessary (a) that one have unchallengeable, uncriticizable authorities; or (b) that good ideas be reducible to, derivable from or justifiable by such authorities.

To show this, let us try out two proposals:

*First*, let us propose that all the individual steps of our arguments—our logically valid arguments—be considered not as authoritative or justified in any way, but as *unjustified conjectures or hypotheses*.

*Second*, let us momentarily stand the argument structure on its head, as it were. Let us put the hypothesis which is under consideration among the premises of the argument, and put the observational reports which are to be brought in criticism of it in the conclusion.

The second suggestion may seem arbitrary, since any argument can—through the simple manipulation of certain logical rules for denial, contraposition, and such like—be reversed. To make the contrast for which I am aiming, therefore, I need a steady point of reference. For this purpose, I use

the argument that was employed in section 6 above to illustrate inductive reasoning:

|                         |  |
|-------------------------|--|
| Observational Premises: | Mars is a planet and moves in an ellipse<br>Jupiter is a planet and moves in an ellipse<br>Earth is a planet and moves in an ellipse |
| Conclusion:             | All planetoid objects move in ellipses.  |

This argument is invalid. As shown above, its premises, even if true, do not ensure the truth of the conclusion, which is of a logical strength greater than the combined strength of the premises.

So take this valid argument instead:

|             |  |
|-------------|--|
| Premises:   | All planetoid objects move in ellipses<br>Mars is a planetoid object |
| Conclusion: | Mars moves in an ellipse.  |

Now, suppose that the conclusion is found to be false—that Mars is observed (a total of six sightings will do) *not* to move in an ellipse. The falsity of the conclusion is retransmitted to at least one of the premises (one of which is the universal law) by means of the logical rule of the retransmission of falsity from conclusion to premises.<sup>10</sup>

We can sum up the difference between the first—inductive and invalid—argument, and the second—valid and deductive—argument, by asserting that it amounts to an *asymmetry between verification* (a form of justification) and *falsification* (a form of criticism). Although it is impossible validly to verify (or justify) a scientific law in terms of observational statements, it is possible validly to falsify a scientific law in terms of observational statements. Another way of saying this is that a valid falsifying relationship, but not a valid verifying relationship, is possible in the “inductive direction”, i.e., in an argument from singular observation statements to universal statements of scientific law.

The proposal just stated is, in essence, Popper's solution of the problem of induction.<sup>11</sup>

<sup>10</sup>Now that the point has been made, matters can of course be put differently, with the observational information among the premises, thus:

|                         |  |
|-------------------------|--|
| Observational Premises: | It is not the case that Mars moves in an ellipse<br>Mars is a planetoid object |
| Conclusion:             | It is not the case that all planetoid objects move in ellipses.                |

<sup>11</sup>This is, of course, only a brief summary of the solution and should be interpreted in terms of the elaborate presentation, restrictions, and qualifications in *The Logic of Scientific Discovery*. I believe not only that there is an asymmetry between verification and falsification, but that they are conducted in different metacontexts. See appendix 1.

<sup>9</sup>This would be the approach of Renford Bambrough in his “Unanswerable Questions”, *Proceedings of the Aristotelian Society*, 1966, pp. 151–72, esp. pp. 165–66.

Note the following features:

(a) There is no longer any problem of logical strength: a falsifying relationship is deductively possible between a weaker and a stronger statement.

(b) This is an account of criticism, of how a scientific law may be contested in terms of experiential or experimental evidence.

(c) There is no authority; and thus the first requirement is not needed. The agent of criticism, the observational report, is *also* conjectural, non-authoritative (see appendix 3 below).

This might be contested on the grounds that the test is made *in terms of* the observational statement. This is so, but does not imply that it is authoritative. To test a particular theory, one determines what sorts of events would be incompatible with it, and then sets up experimental arrangements to attempt to produce such events. Suppose that the test goes against the theory—as it did in our hypothetical example. What has happened? The theory definitely has been criticized in terms of the test: the theory is now *problematic* in that it is false *relative to* the test reports; whereas the test reports may *at the moment* be unproblematic. In that case, the theory may be provisionally and conjecturally rejected because it conflicts with something that is unproblematic or less problematic. Does this prove or establish or justify the rejection of the theory? Not at all. Test reports here are hypothetical, criticizable, revisable—forever—just like everything else. They may *become* problematic: they are themselves open to criticism by the testing of their own consequences.

(d) Hence the criticism in this case is nonjustificational. There is no question of proving or justifying the scientific law, or of somehow combining it out of observation statements. Nor is there any question of rejecting it on the grounds that it is not justified. The scientific law is, rather, presumed from the outset to be unjustifiable. Thus the second requirement is not needed.

(e) The problem of induction has disappeared. There is no problem of induction because there is no induction. Instead, there is conjecture and attempted refutation.

## 8. How Other Problems Are Resolved: Realism

The other problems mentioned earlier disappear along with the problem of induction. That statements about other minds, morality, the external world, and the like, are unverifiable, unjustifiable conjectures is no longer relevant. Everything is unjustifiable, and lack of justification is no longer grounds for

objection. The question, rather, is how—within a nonjustificational framework—such statements may be criticized.

The resolution of these other problems proceeds in a way parallel to that of the problem of induction. But there are also some differences. Scientific laws had potential observational falsifiers: i.e., singular statements of existential form asserting that an observable event is occurring in a certain region of space and time. Popper calls these observational statements that conflict with scientific laws “basic statements”. Many of the other controversial claims of traditional epistemology, unlike scientific laws, do not have potential observational falsifiers; they do not conflict with basic statements. Thus realism, the theory that there is an external world independent of human perception, is not testable in Popper’s sense. The statement, “There exists an external world independent of human perception” is a *purely existential statement*.<sup>12</sup> Such statements are compatible with any observation whatever. The observation of a world independent of observation is precluded from the start.

This does not mean, however, that scientific information and evidence are irrelevant to the examination of realism. For it turns out that the denial of realism—i.e., *idealism*, the theory that there is no external world independent of human perception, that all reality is created by and composed of human perceptions—although also compatible with all basic statements, is *incompatible with some universal laws of science*. Among the laws in question are those of biology and evolutionary theory.

Related to this is a powerful argument against idealism (and thus for realism) that is curiously neglected in the philosophical literature. This argument arises particularly from studying and comparing the cognitive apparatuses of various life forms. According to evolutionary theory, we and other life forms have evolved in our diverse ways while coping with a common environment. The various cognitive structures employed by humans, animals, and insects make no sense individually or collectively in their mutual integration, in the way in which they complement one another, check and partly compensate for the inadequacies of one another, in their hierarchical arrangement and controls, except by reference to a common external world in which they function, which they attempt in various ways to represent, and in interaction with which they have evolved. Each cognitive structure—such as kinesthetic sense, vision, language, scientific representation, and others—can be explained in terms of natural-selection

<sup>12</sup>For discussions of purely existential statements, see Popper, *Logic of Scientific Discovery* (London: Hutchinson, 1959), sec. 15; J. O. Wisdom, “The Refutability of ‘Irrefutable Laws’”, *British Journal for the Philosophy of Science*, 1963, pp. 303–6; J.O. Wisdom: “Refutation by Observation and Refutation by Theory”, in I. Lakatos and A. Musgrave, eds., *Problems in the Philosophy of Science* (Amsterdam: North-Holland Publishing Company, 1968), pp. 65–67; J.W.N. Watkins: “Confirmable and Influential Metaphysics”, *Mind* (1958), pp. 345–47; “Between Analytic and Empirical”, *Philosophy*, 1957; and “When Are Statements Empirical?”, *British Journal for the Philosophy of Science*, February 1960.



survival value only by reference to the others and to an external world. From the height of our own complex cognitive structures we can even see how the spatial and other cognitive equipment of various other life forms approximate, in however imperfect a way, to devices more elaborately and complexly developed in ourselves.

A hypothetical external world that exists independently of our senses clearly plays a crucial role here. Evolutionary theory claims the existence of a world millions of years prior to the appearance of human life or human perception as we know it. We need such an external world, and a history of interaction with it, in order to explain why our cognitive and perceptual structures are the way they now are; hence the contention that there is no reality apart from that created by human perception is, from the point of view of evolutionary theory, simply absurd. If one, however fastidiously and "justifiably", omits the external world, one is left with an inexplicable miracle, a piece of "preestablished harmony". Thus it can hardly be said here, as the philosopher Herbert Dingle wrote in defending idealism in physics: "the external world plays no part at all in the business, and could be left out without loss of anything . . . It is thus a useless encumbrance. . . a will o' the wisp, leading us astray and finally landing us in a bog of nescience."<sup>13</sup>

Of course some idealist might dispute this argument, saying—let us suppose—that we had created out of our perceptions animals with cognitive apparatuses which *appeared* to be adjusted to the exigencies of an external world even though there is no such world. This megalomaniacal argument reminds one of those religious believers who, in the nineteenth century, defended seven-day creationism against geological discoveries on the grounds that God created a "pre-aged" world, one that contained structures that appeared to be fossil remains—just to try our faith. To be sure, one cannot conclusively disprove idealism: i.e., one cannot justify the contention that idealism is false. Thus one may not be able to convince a particular idealist. But one cannot conclusively disprove scientific laws—or anything else—either. Ad hoc and other defensive strategies may be invoked in defense of any and all theory and speculation.

<sup>13</sup>Herbert Dingle, *The Sources of Eddington's Philosophy* (Cambridge: Cambridge University Press, 1954), p. 25. For the biological and evolutionary accounts referred to, see Donald T. Campbell, "Evolutionary Epistemology", in P. A. Schilpp, ed., *The Philosophy of Karl Popper* (La Salle: Open Court, 1974), p. 414; K. R. Popper, *Objective Knowledge* (London: Oxford University Press, 1972); Konrad Lorenz, "Kant's Doctrine of the A Priori in the Light of Contemporary Biology", in L. von Bertalanffy and A. Rapoport, eds., *General Systems, Yearbook of the Society for General Systems Research*, 1962, pp. 112–14; Konrad Lorenz, *Behind the Mirror* (New York: Harcourt, Brace, Jovanovich, 1973); and W. W. Bartley, III, "Critical Study: The Philosophy of Karl Popper: Part I: Biology and Evolutionary Epistemology", *Philosophia*, September–December 1976, pp. 463–94; and W. W. Bartley, III, "Philosophy of Science", in Asa Kasher and Shalom Lappin, eds., *New Trends in Philosophy* (Tel Aviv: Yachdav, 1982; and New York: Humanities Press, 1984). See also my "Philosophy of Biology versus Philosophy of Physics", in *Fundamenta Scientiae* vol. 3, no. 1 (1982), pp. 55–78; and my "The Challenge of Evolutionary Epistemology", in *Proceedings of the 11th International Conference on the Unity of the Sciences* (New York: ICF Press, 1983), pp. 835–80. See also my "Knowledge Is a Product Not Fully Known to Its Producer".

In sum, the relationship between realism and observational evidence seems to be the following, indirect one: realism itself is untestable. However, the denial of realism, i.e., idealism, is contradicted by certain well-tested laws of science; and these are in turn testable by basic statements. Thus current scientific results leave hypothetical realism in possession of the field.

### 9. Factual Information and Moral Claims

The previous two sections have argued, with two examples, that traditional epistemological problems that were insoluble within a justificational approach can be resolved on a nonjustificational critical approach. Since we are concerned with illustrating the difference between the way in which sense observation is treated by traditional empiricism and the way in which it can be treated on a nonjustificational approach, we have concentrated on the ways in which observational evidence relates nonjustificationally to scientific laws and to the doctrine of realism.

In the present section I want to note how observational and other factual information relate to the evaluation of moral statements. And I do so just because many philosophers have been led, by the impossibility of justifying moral statements by factual statements, to deny that there is ever any connection between fact and value, and indeed even sharply to discourage any exploration of the possible logical connections between factual and evaluative statements. Rather, they accept G. E. Moore's verdict that "No truth about what is real can have any logical bearing upon the answer to the question of what is good in itself". Or they go so far as Hume, and declare that logic and reason play no part in moral argument.<sup>14</sup>

Yet this is clearly false. Truths about facts do bear logically on matters of value. A moral statement can sometimes be *rebutted* by factual statements. Here again, the crucial logical rule is *modus tollens*, retransmission of falsity.

In giving an example, I shall assume as correct the doctrine that "ought" statements imply "can" statements in respect to persons.<sup>15</sup> Thus, in saying

<sup>14</sup>G. E. Moore, *Principia Ethica* (Cambridge: Cambridge University Press, 1903), p. 118; David Hume, *Treatise of Human Nature*, Selby-Bigge edition (Oxford: Oxford University Press, 1888), book 3, part 2, sec. 1.

<sup>15</sup>See the discussion in my *Morality and Religion* (London: Macmillan, 1971). It might be objected that "counsels of perfection" conflict with what I am saying here. Thus Hermann Hesse, in *The Journey to the East*, writes: "One paradox, however, must be accepted and this is that it is necessary to continually attempt the seemingly impossible." Or, to take the perfect example: "Be ye therefore perfect, even as your Father which is in heaven is perfect." But such injunctions do not really enjoin the impossible, as is seen in the implicit expectations that such action is unattainable. Rather, as in Hesse, what is enjoined is an *attempt* in a particular rigorous direction. See also George I. Mavrodes, "Is and Ought", in *Analysis*, December 1964, pp. 42–44; and Alan Gewirth, "On Deriving a Morally Significant 'Ought'", *Philosophy*, vol. 54, no. 208 (April 1979), pp. 231–32.



that a person ought to do something, it is assumed that it is possible for him to do that thing, that he can do it. Morality posts guides to possible action. On this assumption, the following argument is valid:

Premise: Jones ought to be a genius

Conclusion: Jones can be a genius.

Suppose we have evidence indicating that the conclusion is false. We might learn, say, that Jones is suffering from extensive organic brain damage, or that he has an I.Q. far below normal. While one might reasonably question the results of an I.Q. test, and their import for genius, one would probably accept sound evidence of massive brain damage to show that Jones cannot be a genius. Here we have used a factual consideration in evaluation and criticism of a moral claim.

Take a more topical example, the punishment of criminals, an issue both of morality and of public policy. Suppose that it is argued that one ought not to punish criminals but to treat them all psychologically in order to cure them of criminal tendencies. To this proposal it may be retorted that "ought" implies "can", and that there exist some criminals—for example, those with certain genetic defects—whom it is impossible to cure by psychological treatment. The example is not fanciful: the XYY chromosomal abnormality has been widely associated by researchers with criminal behavior and/or low intelligence in adult males; and recent studies suggest that one male in 300 may be born with just this abnormality.<sup>16</sup> This factual information, which bears logically on the original proposal for a different public policy, will if taken seriously lead to a modification of the proposal. Thus Dr. Park S. Gerald of the Harvard Medical School has urged that a large-scale study of XYY incidence should be done, because "a great deal of social planning could be related to this. These people [with XYY syndrome] might still get into trouble despite present welfare programs".<sup>17</sup>

Such arguments in which factual claims rebut prescriptive remarks are by no means unusual. On the contrary, they are rather common. Bishop Robinson provided an interesting illustration when he reported the response to his proposal, in a sermon, that capital punishment be abolished in favor of attempts to reform even the most hardened criminals. The response is reported by the *Observer* as follows:

Then came the letters; a week after the sermon they were piled on chairs and the floor in his study, a tide of sour disagreement. . . . "Well, you bloody

<sup>16</sup>JAMA, 205, no. 9 (August 26, 1968), p. 28.

<sup>17</sup>Since such arguments can easily be misused perhaps it is necessary to add here that a demonstration that one proposed alternative to punishment runs into difficulties in certain cases is in itself no argument on behalf of punishment. Whatever the facts concerning the XYY chromosomal abnormality may be, the problem of punishment remains to be dealt with.

fool", one began. A woman from Hampstead wrote briefly to say that "There *are* evil men who are unredeemable". "This is all rot," claimed an anonymous writer. "Just HANG 'em. I say dam the church and such talk".

Here again, an alleged fact, relating to possibility—"There are evil men who are unredeemable"—is used in rebuttal of a prescriptive policy.

In the *Observer* article from which these excerpts are taken, no mention of the XYY chromosomal abnormality is made. Outside an informed medical context, the claim that there just *are* "unredeemable men" might be dismissed as an admittedly factual but nonetheless untestable statement. The studies in genetics mentioned, however, indicate that such expressions may be given a quite hard and testable scientific interpretation, one harder to dismiss.

Moral claims are not, however, empirically testable. As we saw in the discussion of realism above, the notion of testability refers to refutability *by reports of sense observation*. And specific statements of impossibility—such as "Jones cannot be a genius"—although statements of fact, are not statements of observation. One cannot *observe* Jones's not being able to be a genius, although one may indeed so *infer* from certain observations one makes about him, in conjunction with laws of nature. Such statements are nonobservational inferences or conclusions of arguments which, themselves having nothing to do with morality, contend that certain kinds of facts and behavior are prohibited by natural law, given certain information (e.g., brain damage) relating to the party in question (e.g., Jones).

Nor is it claimed here that *all* moral statements may be rebutted in this way by factual information relating to possibility. Nonetheless, such factual criticism of moral injunctions plays a deeply pervasive role in the examination of morality. Almost all morality imposes some sort of obligation. Yet impossibility of performance generally releases one from obligation, or at the very least diminishes one's obligation. This is true in the law as well as in ordinary moral discussion. And it is also a matter of common reflection, as Undershaft indicates when, in *Major Barbara*, he says: "Well, you have made for yourself something that you call a morality or a religion or what not. It doesn't fit the facts. Well, scrap it. Scrap it and get one that does fit. That is what is wrong with the world at present." Information relating to impossibility also relates importantly to moral issues in connection with questions of freedom of action. Thus, if it can be shown that an action was forced, if it was impossible for one to resist it, then one may not be thought to have been obliged morally to have done otherwise, or to be morally culpable for having performed it. In this case, the argument that is constructed may be indirect: it may be argued that the impossibility to do otherwise renders the action unfree; and that the lack of freedom, in turn, defeats the obligation to do otherwise.

The connection between obligation and possibility is of course well

known. A philosopher who has written of it most interestingly is H.L.A. Hart, who shows that a contract in the law is rendered "defeasible" by impossibility of performance.<sup>18</sup> The bulk of Hart's discussion is non-justificational (although not self-consciously so). Yet many writers in ethics who are aware of Hart's discussion nonetheless repeat the old refrain about the lack of logical connection—indeed the impossibility of any such connection—between factual and moral statements.

### 10. Two Problems of Demarcation

What results from this discussion? Several examples have been presented of the treatment of classical problems through nonjustificational evaluation. These examples should illustrate whatever power this approach has to deal with problems hitherto regarded as insoluble. In these examples, the role of observation and other factual information is not to justify but to winnow. Facts about the world are the grim reapers of our speculations. They play this role most strongly in the sciences, but also in other areas, including morality.

Other sorts of considerations may also be brought to bear in the nonjustificational evaluation of ideas. Among these the most important—and the most neglected—is the question of what problem the idea under consideration is intended to solve, and whether it does so successfully. I have discussed this question elsewhere,<sup>19</sup> and mention it here only to emphasize that the present discussion hardly exhausts the problem of nonjustificational criticism. Quite the contrary, it does no more than suggest some of the very first moves in opening up the issues of nonjustificational criticism. Pursuing this question further amounts to developing a new kind of epistemology. For it is difficult to find any real examples in science, morality, or other areas where justification is of *any importance whatever*. The supposition that it is important is due entirely to philosophical tradition, not to actual need and practice. Consequently, all traditional and most contemporary epistemology and meta-ethics are obsolete to the extent to which they are accounts of, and theories of, justification.

The discussion in this appendix has depended on the asymmetry between verification and falsification. This idea, which is of far-reaching importance,

<sup>18</sup>H.L.A. Hart, "The Ascription of Responsibility and Rights", in A.G.N. Flew, ed. *Logic and Language*, 1st series (Oxford: Basil Blackwell, 1952), pp. 145–66.

<sup>19</sup>See chap. 5, sec 4, above. See also my "Goodman's Paradox: A Simple-Minded Solution", in *Philosophical Studies*, vol. 19, no. 6 (December 1968), pp. 85–88; my "Eine Lösung des Goodman-Paradoxons", in Gerard Radnitzky and Gunnar Andersson, eds., *Voraussetzungen und Grenzen der Wissenschaften* (Tübingen: J.C.B. Mohr Verlag, 1981), pp. 347–58; and my "Rationality, Criticism and Logic", sec. 16.

is, however, often misinterpreted. Identifying and eliminating some of these misinterpretations may bring our discussion to a close, and will return us to the problem of demarcation with which this appendix opened.

(1) There is a very important problem—*What is the relationship between evidence and what is evidenced?*—which must interest every empiricist and every scientifically oriented individual. Popper has answered—I believe correctly—a very specific version of this question: namely, *What is the relationship between observational evidence reports and theoretical statements about the world?* His answer, as we have seen, is that it is a falsifying relationship, not one of verification.

Ironically, Popper's own clarification of this relationship somewhat diminishes the *philosophical* significance of that relationship. The relationship between theory and observation has been most important historically because of the assumption that observation is the source and justification of all knowledge. Where this assumption is dropped, the problem's significance changes accordingly, and becomes part of what I have elsewhere (appendix 1) called the larger ecological problem of rationality.

I do not, however, wish these words to suggest that the role of observation is practically unimportant in science and critical discussion. Quite the contrary, in creating a critical environment, the control of observation is crucial. It is always important to chart how any particular theory relates to potential observational refutation; and if it does not so relate, it is important to know that, so that examination of the theory can be enhanced in some other way. Fields and domains that lack any such connection with observation and experimentation at the very least "lack an important social system feature supporting honesty", as the psychologist and evolutionary epistemologist Donald T. Campbell puts it.<sup>20</sup> Under a nonjustificational approach, observation remains the most important winnow of theory, and—as Campbell reports—the experience of laboratory researchers is that "experimentation is predominantly frustrating and disappointing". That is, experimental observation is an effective winnow.

(2) Popper himself happened to identify his answer to the question of the relationship between theory and observation with his answer to another question: namely, *What is the demarcation between science and nonscience?* Thus, on his account, a scientific theory would be one that is testable by an observational report (in the exact sense characterized by his theory of basic statements). And nonscientific theories—of which there are various kinds, including metaphysics and pseudo-science—would be observationally untestable.

This identification has, however, the effect of placing outside science some

<sup>20</sup>Donald T. Campbell, "A Tribal Model of the Social System Vehicle Carrying Scientific Knowledge", in *Knowledge: Creation, Diffusion, Utilization*, vol. 1, no. 2 (December 1979), pp. 181–201, esp. pp. 195 and 197–98.

theories and principles that have played a very important role within science both historically and at the present time. We have already mentioned, in our discussion of realism, some such principles which are compatible with all sense observation, and which nonetheless do conflict with testable (and well-tested) scientific theories, and thus are criticizable in terms of them. J.O. Wisdom has called such theories "theory-refutable" (as opposed to "observation-refutable" or testable).<sup>21</sup> Thus "Every substance has a solvent" is irrefutable in principle in the sense that no empirical refutation is possible. It is compatible, for instance, with "Gold has never been observed to dissolve". But it is incompatible with—and thus refutable by—the theory "Gold is insoluble". As another example, there is Schrödinger's discovery of the wave equation, involving as it does discontinuities as consequences, which conflicts with (and thus "theory-refutes") the (observation-irrefutable, or untestable) principle that energy occurs in all possible quantities: i.e., is continuous. Some additional examples of these important principles are: "For every event there is a cause", "To every observable physical change there exists a corresponding change in arrangement of invisible atoms", "There exists a perpetual motion machine", "All apparent regularities are in fact regulated by a system of natural laws", "Matter can only be moved by contiguous matter", "All mental changes are due to physiological causes", "All bodily changes are due to physical causes".<sup>22</sup>

Where such theories are brought into clash with scientific theories, and thus are criticizable in terms of these scientific theories, one must not assume too readily, however, that the observation-irrefutable but theory-refutable statement is wrong and the observation-refutable scientific hypothesis is right. Since no scientific theory can ever be fully verified by experience, it remains possible that any particular such hypothesis may be falsified by experience at some later date. Thus, in the case of a conflict between a scientific theory and an irrefutable statement, the latter could in principle be correct.

Such possible conflict between untestable and testable theories thus has a twofold effect. Not only does it enable the testable theory to exert a critical force against the untestable theory; by contrast, the untestable principle may take the lead, and exert a significant regulative effect, leading one to

<sup>21</sup>See the references in note 12 above. See also my "Reply to J. O. Wisdom", in *Problems in the Philosophy of Science*, pp. 108–9. I disagree with Wisdom's contention that "this kind of refutation is hypothetical in a way that refutation by observation is not, for the refuting theory, though tested and confirmed, may later be falsified; then the programme it had refuted becomes 'derefuted'". This is a misunderstanding of the situation that obtains with observation-refutation. Observation-refutations are and remain quite hypothetical; and theories refuted by observations may also be "derefuted" if the observation is revised in further testing.

<sup>22</sup>Watkins has written brilliantly about such statements. See the references in note 12 above. Watkins modifies his position in "Metaphysics and the Advancement of Science", *British Journal for the Philosophy of Science*, June 1975, pp. 91–121, and in "Minimal Presuppositions and Maximal Metaphysics", *Mind* (April 1978), pp. 195–209.

discount testable theories that conflict with it, and to encourage testable theories compatible with it.<sup>23</sup>

For such reasons, I prefer to treat the question of the relationship between theory and observation neutrally, without linking it necessarily to the question of demarcating science and nonscience. In any case, it is far more important to obtain a correct general characterization of the relationship between theory and observation than it is to define "science".

(3) In his early, but not later, writings, Popper goes a step further. He implicitly tends to identify the demarcation between science and nonscience with the demarcation between good and bad—the demarcation problem with which we opened this appendix. His most extreme statement, which appears both in *Die beiden Grundprobleme der Erkenntnistheorie* and in *The Logic of Scientific Discovery*, denies that untestable or unfalsifiable theories even speak about reality. Thus he writes (his italics): "In so far as a scientific statement speaks about reality, it must be falsifiable; and in so far as it is not falsifiable, it does not speak about reality."<sup>24</sup> Elsewhere he writes that theories that are untestable "are of no interest to empirical scientists", that "Irrefutability is not a virtue but a vice", and that the closer study of metaphysical statements is "not . . . the concern of empirical science".<sup>25</sup>

Whatever one may think of the identification between observationally testable and scientific theory, this further implicit identification between testable and good theory will not do, as Popper himself has long since recognized. As he reported in *Objective Knowledge* (1972) concerning his earlier work, and his change of mind: "In those days I identified wrongly the limits of science with those of arguability. I later changed my mind and argued that non-testable (i.e., irrefutable) metaphysical theories may be rationally arguable."<sup>26</sup> His own later work is, accordingly, a rich fusion of untestable interpretation and testable theory. This is so in his work in philosophical biology, in his defense of indeterminism against determinism in physics and in the social sciences, in his work with Sir John Eccles on the mind-body problem.

<sup>23</sup>See my "Commentary: Max Jammer on the Interaction between Science and Metaphysics", in *Proceedings of the 7th International Conference on the Unity of the Sciences*, New York, 1979.

<sup>24</sup>*The Logic of Scientific Discovery*, p. 314; *Die beiden Grundprobleme der Erkenntnistheorie* (Tübingen: J.C.B. Mohr Verlag, 1979), p. 10. See also *The Open Society*, vol. 2, p. 13.

<sup>25</sup>See *Conjectures and Refutations*, p. 257, and *Logic of Scientific Discovery*, p. 37. For discussion of the development of Popper's theory of demarcation, see the item listed in footnote 2 above.

<sup>26</sup>*Objective Knowledge*, p. 40n. See, for examples, K. R. Popper and J. C. Eccles, *The Self and Its Brain* (New York: Springer Verlag, 1977), and *The Open Universe*.

### 11. Evolution, Ecology, and Demarcation

What, then, is the criterion of demarcation between a good idea and a bad one?

There is none. There are, of course, certain qualities that are highly desirable in theories, and whose absence signals danger. These include testability and high empirical content. But these are not *criteria*: their presence is not required, and a theory lacking in them may turn out to be excellent. There are some objectionable characteristics in theories, and these include inconsistency and incoherency.<sup>27</sup> But their contraries are not criteria of goodness: consistency and coherency are desired, but they do not, in and of themselves, make a theory a good one.

How, then, does one get better ideas? How does one winnow out the bad from the good? The answer to this question is part of what the evolutionary epistemologist Donald T. Campbell calls "the general theory of fit".<sup>28</sup> The question is an evolutionary and ecological one; and its answer is related to the answer to the question of how animals and other organisms become better adapted to their environments. As it turns out, a nonjustificational theory of criticism is parallel to the neo-Darwinian account of evolution and adaptation, whereas a justificational theory of criticism is parallel to the discredited Lamarckian theory of evolution.<sup>29</sup> Which is not surprising, since the evolutionary adaptation of plants and animals is also a knowledge process.<sup>30</sup>

Darwinian evolution proceeds in three great steps or rhythms: (a) blind or unjustified variation; (b) systematic selection and elimination; and (c) retention and duplication.

Good and bad ideas demarcate from one another gradually, *in the setting of a critical, competitive, and creative environment, in accordance with these three steps.*

But what makes for such an environment? The epistemologist and methodologist who have set aside justificationism are freed of those powerful arguments on behalf of attachment and commitment which, so long as they were unanswered, served the interests of those who identify with, cling on to, and defend their positions and contexts, and thus

<sup>27</sup>See K. R. Popper, *Conjectures and Refutations*, chap. 10, and K. R. Popper, *The Open Society and Its Enemies*, 4th and subsequent editions, "Addendum: Facts, Standards and Truth: A Further Criticism of Relativism".

<sup>28</sup>See Donald T. Campbell, "Evolutionary Epistemology", William James Lectures, Harvard University, 1977. Preliminary mimeographed draft, October 1978.

<sup>29</sup>See Donald T. Campbell, "Unjustified Variation and Selective Retention in Scientific Discovery", in F. J. Ayala and T. Dobzhansky, eds., *Studies in the Philosophy of Biology* (London: Macmillan, 1974), pp. 144-46.

<sup>30</sup>See Donald T. Campbell, "Evolutionary Epistemology".

contribute to the maintenance of an uncritical environment hostile to the development of ideas.

What are the cultural ramifications of a change of metacontext in which justification is set aside? What must happen—intellectually, psychologically, socially, politically—for such a metacontext to be instituted? (For the idea of metacontext see appendix 1.) What would a culture lethal to positionality and attachment really be like? And would that be desirable?

The epistemologist who deals with such questions has as his goal the personal and institutional implementation of a transformed metacontext—one that involves the transformation of Western man away from the positionality and attachment that have marked his career. To reach such a goal, the epistemologist is faced with a charter for investigation whose ramifications extend far beyond traditional epistemology: how to create for our ideas the most lethal possible environment (systematic selection and elimination) in which the production of creative new ideas (variation) nonetheless thrives, and in which our intellectual heritage is preserved and transmitted (retention and duplication).

Put differently and more broadly, this question is: How can our intellectual life and institutions, our traditions, and even our etiquette, sensibility, manners and customs, and behavior patterns, be arranged so as to expose our beliefs, conjectures, ideologies, policies, positions, programs, sources of ideas, traditions, and the like, to optimum criticism, so as at once to counteract and eliminate as much intellectual error as possible, and also so as to contribute to and insure the fertility of the intellectual econiche: to create an environment in which not only negative criticism but also the positive creation of ideas, and the development of rationality, are truly inspired.

It is not easy to answer such questions, for existing traditions and even most institutions have evolved gradually; they are "complex phenomena": they enjoy a "spontaneously ordered" character and a usefulness that transcend anything that could have been produced by deliberate invention; they are the product of human action but not of human design.<sup>31</sup> Yet such spontaneous orders may also be fragile and difficult to maintain. Tampering with such traditions and institutions is hence fraught with the danger of unintended consequences, with the danger of making things far worse.

A first step in approaching such questions of reform and reconstruction of the intellectual econiche is to notice, to begin to identify, what existing traditions and institutions already contribute to goals of eliminating error and enhancing the advance of knowledge, and which ones work against those same goals. Some apparently trivial existing institutions—linguistic

<sup>31</sup>See Hayek, *Studies in Philosophy, Politics and Economics*, esp. chaps. 2, 4, and 6.

institutions, for instance—which of course were never developed for such purposes, in fact serve them rather subtly, economically, and effectively. There is, for instance, what I call “*marked knowledge*”, which is a kind of evolutionary precursor to falsified knowledge. We often use standard qualifiers, such as the phrase “so-called”, to *mark* concepts or theories or practices about which there is already some doubt or question, or which are, at the very least, out of fashion. There are many such markers: others are the use of the phrase “First Draft” to mark a manuscript that is being circulated for critical comments, or the phrase “trial balloon”, which one may use self-deprecatingly to offer a fresh but as yet unexamined idea. This sort of device should probably be used much more often: it could only do good if every published manuscript were prominently marked “Damaged Goods”. The use of these markers proclaims to others that we are savvy, critical, and aware of, or anticipate, the defects in question—or at least aware that there is some question about such ideas. We use such devices to get optimum use out of such ideas: for our purpose is not to delete them too fast, not to eliminate what might be called *defective knowledge* before we have got as much as we can from it, but *just to mark it as defective*. Such knowledge can be transmitted *so marked*; whereas in natural selection in nature, there is only deletion (extinction).

To begin to become aware of, and to face, such ecological questions is to begin artificially to construct and to probe possible environments for the advancement of science and learning. Paramount in such construction will be the ecological question of *balance*—for evolution puts its three steps or rhythms permanently at odds with one another in a matrix of essential tensions. Thus variations and retention are always opposed. Methodologists—even nonjustificational methodologists—nonetheless frequently give unbalanced advice. Thus Paul K. Feyerabend overemphasizes variation; justificationists generally overemphasize retention; and Popper overemphasizes elimination—an overemphasis that could readily be corrected through judicious marking of defective knowledge.

In using the language of evolutionary theory to confront and treat problems relating to the advancement of knowledge, one should not forget that the mechanisms of organic evolution and those of cultural and intellectual evolution are not identical, despite their close parallels. We have already mentioned that marked knowledge has no real organic counterpart. There is also no meta-aim governing the evolutionary development of organisms in accordance with which variation or lethal elimination need artificially to be encouraged. The evolutionary development of ideas, however, may be governed by just such a meta-aim, a culturally instituted “plastic control”, namely: the deliberate production of variation and the deliberate elimination of falsity and poor fit.

Such questions force the epistemologist out of the ivory tower into which

the dilemmas of justificationism have seduced him, and make of him a psychologist, a sociologist, a political theorist—even a social reformer. Since the advancement of science and learning is not the only desirable goal of social life, the epistemologist, like all social reformers, will meet with opposition and conflict, as well as with opportunities.