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Action Science: Promoting Learning for Action and Change

In action science we seek knowledge that will serve action. The action scientist is an interventionist who seeks both to promote learning in the client system and to contribute to general knowledge. This is done by creating conditions for valid inquiry in the context of practical deliberation by members of client systems. This is what we mean when we speak of enacting communities of inquiry in communities of social practice. In this chapter we will discuss the implications of the action science orientation toward knowledge. At this point we may note three such implications:

1. Knowledge must be designed with the human mind in view. We must take account of the limited information-seeking and -processing capabilities of human beings in the action context. We must be concerned with the problem of selecting from the infinite complexity of the world that which is relevant to action.
2. Knowledge should be relevant to the forming of purposes as well as to the achieving of purposes already formed. It will not do to assume that intentions and goals are givens.

3. Knowledge must take account of the normative dimension. Indeed, a concern with value questions is implicit in the injunction to attend to the forming of purposes. In answering the practical question, "What shall I do?" the actor forms purposes that, expressed in action, provide the best evidence for what that actor values. Knowledge that helps the actor to form purposes thereby leads to the enacting of values. If these values differ from the old, we have generated knowledge that can contribute to changing the world. If they do not differ, we have generated knowledge that helps keep the world as it is. In either case, in generating knowledge in the service of action, we cannot avoid responsibility for its normative implications.

We may note also that action science is reflexive to an unusual degree. The action scientist is a practitioner, an interventionist seeking to help client systems. This help takes the form of creating conditions in the behavioral world of the client system that are conducive to inquiry and learning. Lasting improvement requires that the action scientist help clients to change themselves so that their interactions will create these conditions for inquiry and learning. Hence the practice of action science involves teaching others the skills needed to practice action science.

The knowledge needed to practice action science is itself an appropriate domain of study for the action scientist, both because it is itself practical knowledge and because it will be helpful for clients to learn and to use it. An interventionist requires knowledge that can be used by human beings in the action context, including knowledge relevant to the forming of purposes. As an agent who seeks to bring about some states of affairs rather than others, the action scientist will be advocating a normative position. A challenge that action science seeks to meet is that of making these kinds of practical knowledge explicit and testable.

Pragmatic Explanation and Practical Knowledge

We can clarify the differences between knowledge in the service of action and knowledge for its own sake by examining

what mainstream philosophers of science have to say about pragmatic explanation and the covering-law model. Pragmatic explanations are those that we offer and accept in everyday life. Several kinds of explanation may be distinguished: We may clarify the meaning of a term or obscure passage from a text; we may offer reasons that justify our behavior; we may state the rules of a game; and we may identify the antecedent factors or causes that led to an event. The covering-law model is intended to provide an ideal for the last of these kinds of explanations (Scheffler, 1981, p. 19; Hempel, 1965a, pp. 412-415). The covering-law model, as an ideal for scientific explanation, provides answers to "explanation-seeking why-questions" such as, "Why is it the case that *p*?" (Hempel, 1965a, pp. 334-335, 421). Hempel explicitly excludes explanations of rules and meanings from the domain of scientific explanations (pp. 412-414). This exclusion raises the issues of hermeneutics and the sciences of action that we discussed earlier and that we do not want to repeat here. Rather, we want to discuss the covering-law model on its own ground, that of causal explanation.

Mainstream philosophers of science claim that all causal explanations conform to the covering-law model (Hempel, 1965a). This should be understood as potential or ideal conformity, for everyone agrees that we accept many causal explanations in everyday life that do not appear to invoke covering laws. To illustrate, let us use Hempel's example of explaining the cracking of a car radiator on a cold night (1965b, p. 232). The covering-law explanation includes general laws pertaining to the freezing temperature of water and the increase in water pressure for a given drop in temperature, along with initial conditions such as the fact that the car was outside all night, the temperature fell from 39° F to 25° F, the radiator was full of water, and so on. All these statements are necessary so that the event to be explained, the cracking of the radiator, can be deduced by logical reasoning.

In everyday life, if someone asks, "Why did the radiator crack?" it would seem odd to reply by stating all the laws and initial conditions given in the covering-law explanation. Rather we might say, "The temperature fell into the 20s last night." In

some circumstances this would be accepted as an adequate explanation. In other circumstances—for example, if the event occurred in Boston in February—the fact that the temperature fell into the 20s would not be news. In this case, an appropriate explanation might be, "I drove up from Florida yesterday, and there was no antifreeze in the radiator."

Each of these everyday explanations can be considered a sketch or an incomplete version of a covering-law explanation. In stating them, we take for granted that the other person knows that water freezes at 32° F, that water expands as it freezes, and so forth. We select only those features that we believe necessary to make the event intelligible to the other person. Such explanations are called "pragmatic" because they are tailored to achieving the purposes at hand in particular contexts. For example, in the context of Boston in February, it would probably not be sufficient to say that the temperature had dropped; the other might think, "But it's been in the 20s every night this week." Similarly, stating that there was no antifreeze in the radiator would not be sufficient, because the other would wonder why it cracked last night rather than the night before. The additional information, "I drove up from Florida yesterday," anticipates the doubts that can be expected to arise in the questioner's mind (who might yet be expected to wonder, "How could you have forgotten to add antifreeze?"). Hence the ability to give satisfactory pragmatic explanations depends on differentiating what others can be assumed to know from what will satisfy their puzzlement (see Hempel, 1965a, pp. 425-428).

We may distinguish a second aspect of pragmatic explanation, one that deals with the concept of cause. Strictly speaking, neither the drop in temperature nor the lack of antifreeze "caused" the crack in the radiator; rather, the constellation of factors stated in the full covering-law explanation, taken jointly, caused this result. This is one reason why philosophers of science speak of causal explanation rather than of cause; as John Stuart Mill argued in *A System of Logic,* there is no scientific basis for singling out one factor as the cause. We make such judgments according to the purpose at hand. Scheffler points

out, "We may single out for causal status just that condition presumed subject to human control and thus capable of providing a basis for determining legal or moral responsibility" (1981, p. 24). Hence pragmatic explanations, concerned with practical issues of control and responsibility in particular contexts, select some conditions and regard them as causes according to the purposes at hand.

We now wish to extend the concept of pragmatic explanation from cases in which someone verbalizes an explanation to cases of action more generally. We conceive of action as informed by (tacit) pragmatic explanations. Any action that intends to bring about or prevent certain consequences rests on causal beliefs, assumptions, or hunches. Thus when I put antifreeze in my car, I do so to prevent a cracked radiator. In identifying causal factors that can be manipulated to bring about intended consequences, agents focus on particular factors within a constellation of circumstances. Von Wright speaks of such factors as "relative" sufficient conditions, because their sufficiency to bring about intended consequences is relative to a given constellation of background factors (1971, p. 56). We may also note that the idea that causal explanations are embedded in action fits the pragmatist conception of testing beliefs by acting on them. On the analogy with experimentation, the pragmatic explanation embedded in action is the hypothesis being tested. If the intended consequences occur, then the hypothesis is confirmed; if they do not, then it (or the auxiliary hypotheses represented by assumed background conditions) is disconfirmed.

We may now ask, What is the kind of knowledge by which actors construct pragmatic explanations (including the tacit explanations embedded in action)? At this point let us simply label it practical knowledge, and note that it is knowledge in the service of action. Covering-law explanations, by abstracting from contextually bound pragmatics, systematically omit such knowledge. For example, simply knowing the covering-law explanation for the cracked radiator would give an agent little guidance in designing explanations appropriate to a particular context. It could be claimed that knowledge of the

covering-law variety is necessary to designing pragmatic explanations, in the sense that it provides a knowledge base on which to draw. But quite rudimentary knowledge of this sort, when combined with practical knowledge for constructing appropriate explanations in context and revising them as the situation develops, would be adequate for everyday affairs; whereas detailed and sophisticated covering-law knowledge in the absence of practical knowledge would leave one helpless.

We do not mean to suggest that mainstream sciences cannot construct theories of practical knowledge. On the contrary, a popular research area in contemporary social psychology has been the reasoning strategies of human beings in everyday life (Nisbett and Ross, 1980). But these explanations of practical reasoning themselves conform to the covering-law model. For example, an explanation of why a particular actor uttered the pragmatic explanation, "the temperature fell into the 20s last night," would include laws and conditions from which, ideally, that utterance (or a category of which it is an example) could be deduced. To be sure, it is unlikely that social psychologists today could state all the laws and conditions that would be necessary for the deduction. But to the degree they fell short, their explanation would be incomplete. It could be justly criticized for its incompleteness, and it would also be regarded as pointing toward the additional research that would be required to fill the gaps (Scheffler, 1981, p. 77). Thus, in the mainstream account, scientific explanations of practical reasoning are themselves to be judged by reference to the ideal of nonpragmatic explanation represented by the covering-law model.

The critical standards we are discussing are illustrative of the normative thrust of mainstream science. It holds that the better explanation specifies with greater precision the conditions that jointly determine the phenomenon being explained. Stated differently, the better explanation is that which permits the deduction of a statement that more specifically describes the phenomenon. For example, a theory that predicts an eclipse to the nearest millisecond is better or stronger than one that predicts it to the nearest second. In Popper's words: "Theories are nets cast to catch what we call 'the world': to rationalize,

to explain, and to master it. We endeavour to make the mesh ever finer and finer" (1959, p. 59).

But we wish to suggest that, from the perspective of knowledge in the service of action, increasing precision is but one value among several and that, taken to an extreme, it becomes destructive of other values, hence counterproductive. Some of these other values fall under the heading of usability. Usable knowledge, in the context of social interaction, must be suited to the cognitive limits of human beings acting in real time. This means, among other things, that the actor grasp what Lewin called the "wholeness" of the problem. Yet mainstream scientists, who focus on increasing precision, have tended to isolate fragments of social reality in order to study them more closely. Another set of relevant values pertains to the kind of world created by using the knowledge being generated. If the knowledge desired is highly precise, it is generally necessary for the actor to exert a high degree of unilateral control over the setting, and that includes other people. This is because precise knowledge is generated under conditions of unilateral control, as, for example, in the experimental situation. Argyris (1980) discusses these arguments in detail.

In arguing that precision is but one of several values and that there are trade-offs among them, we are not saying that action science is never interested in increasing precision. For example, when a personnel manager says that "it is important to help people express their feelings," an action scientist might question under what conditions that advice does and does not hold. Increasingly differentiated theories are important to the extent that they help people act more competently and more justly. In using terms like *competence* and *justice,* we are, of course, raising normative issues, which we will discuss in more detail later in this chapter. At this point we wish only to note that increasing precision is also a normative consideration. If it is true, as we claim, that in the action context this goal may conflict with the goals of competence and justice, then mainstream social scientists can view issues of competence and justice as tangential to their work only by ignoring the implications of their work for action. Such ignorance is rationalized

by relegating issues of use to the domain of applied science. In this model it is the responsibility of the scientist to generate the best (most precise) knowledge possible, and the applied scientist then selects the level of precision appropriate to practitioners. One consequence of this division of labor is that those responsible for generating knowledge can ignore important considerations for knowledge in the service of action. Another consequence is that those concerned with practice may not feel responsible for meeting the standards of rigor demanded in science. Indeed it is not unusual for the same individual to sharply separate his or her research activities from clinical practice or consulting activities, using high standards of rigor for research but not for practice.

In action science we propose high standards of rigor for practical knowledge. The standards appropriate to knowledge in the service of action will, however, differ in some respects from those recognized in mainstream science. As we have already noted, one such difference is that action science tempers the mainstream value of precision with values pertaining to usability and to the kind of world created by using knowledge. We may say that in action science we seek explanations that are optimally incomplete. These will be explanations that, like Lewin's early conceptual models, identify relationships among a few factors that are important for action but ignore other factors. Another feature of these explanations is that they should be capable of elaboration as necessary. In other words, knowledge in the service of action should on the one hand include explanations that have gaps, and on the other hand should include ways of filling in the gaps in accordance with the purposes at hand. We are arguing against the mainstream strategy of first developing explanations that are as precise as possible and leaving consideration of the requirements of action to applied scientists and practitioners. This approach, in our view, inhibits understanding of knowledge for action by separating science and practice.

We may note another respect, however, in which explanations in action science resemble the covering-law model: Both explain particular events by reference to recurring patterns. In

the mainstream account these regularities are conceived as general laws, following Hume's analysis of lawfulness. In action science these regularities arise from the intended and unintended consequences of action by purposive agents. Philosophers of the counterview argue that regularities of human action cannot be assimilated to the covering-law model (von Wright, 1971; Harré and Secord, 1972; Manicas and Secord, 1983). Without trying to settle this issue, we simply wish to note the common reliance on recurrent patterns. The point would seem too obvious to mention were it not for the suggestions of some advocates of the counterview that social reality is so changeable that there are no dependable empirical regularities for social science to identify (for example, Gergen, 1982). However poor may be the prospects for finding "general laws of history" or laws of social behavior that remain unchanged through the ages, it is clear that agents in everyday life presume many regularities. Embedded in every action that intends to bring about or prevent certain consequences is a causal theory. These causal theories, or tacit pragmatic explanations, presume regularities of the sort, "If I do *a,* then *b* will occur." Any particular theory may, of course, be wrong. But if theories were not often correct, or correctable, which is to say if underlying regularities did not in fact exist, then practical action would be inconceivable.

An important difference between the recurring pattern explained in the sciences of action and those explained in the natural sciences is captured in the concept of the behavioral world. This is the notion that the more or less stable patterns of interaction that are the facts to be explained by the social sciences are artifacts of the actions of human agents (see Argyris and Schön, 1974; Schön, Drake, and Miller, 1984). That is, the underlying regularities that characterize human action are created and maintained by human beings as members of communities of social practice. Yet those underlying regularities are social facts, independent of the individual, that constrain and channel action. In this view human beings are seen in their dual aspect as causal agents and as "pawns" acted upon by outside forces. For example, we are socialized by the culture into which we are born, and this culture is created and recreated by human

agents who might act otherwise (Berger and Luckmann, 1966; Pearce and Cronen, 1980, p. 88).

Toward an Epistemology of Practice

We have said that the goal of action science is to generate knowledge in the service of action. Such inquiry requires an epistemology of practice, that is, a theory about the kinds of knowledge relevant to action. Recall the question we posed earlier: What kind of knowledge do human beings use to construct pragmatic explanations? At that point we simply labeled it practical knowledge. Here we will begin to unpack that bundle of concepts.

Let us begin with the notion of purposiveness, which as we saw earlier is central to the concept of action. It is in light of an agent's purposes that the environment takes on meaning. For example, as Lewin noted early in his career, a battlefield has directions, a front and a back, because of the purposes of the human beings for whom it is a battlefield. We may note two ways in which purposiveness enters into the agent's selection of relevant features of the environment. First, objects may be described under many categories. As James pointed out, the skill of reasoning is in selecting as the essential quality of a thing "that one of its properties which is so important for my interests that in comparison with it I may neglect the rest" (1890, p. 335). Thus, the relevant feature of objects on a battlefield may be their capacity to give shelter. Second, the several conditions that jointly cause an event may be divided into "cause" and background conditions, as is characteristic of pragmatic explanation. Again, as noted by Mill, such discriminations are made according to the purposes at hand. Barnard's analysis of the process of decision emphasized that it is when we approach a set of circumstances with a view to accomplishing some purpose that we can distinguish "strategic factors," those which if changed would accomplish the purpose (1968, pp. 202-203).

The importance of purpose to the designing of action will be readily acknowledged. But at this point we can distinguish the mainstream epistemology of practice from that of action

science. In the mainstream model, as Schön notes, practical knowledge is construed as knowledge of the relationship of means to ends (1983, p. 33). Purposes or ends are taken as givens, inputs to the decision process. Scientific knowledge is then applied to the technical problem of choosing the best means to achieve those ends. This construal is consistent with the positivist separation of fact and value, according to which rationality and knowledge pertain to the realm of facts. The choice of purposes involves value judgments, and therefore is not in the realm of scientific knowledge. This position was expressed in an early and respected text in applied psychology, which declared that "psychology may be able to tell how to sell an order of goods to a purchaser who does not want the goods, but whether this would be ethical or not psychology need not decide" (Hollingworth and Poffenberger, 1917, p. 20).

The reference to ethics should not be taken as limiting the generality of the present argument. Moral reasoning is an aspect of practical reasoning, which deals with questions about how to act. Positivist doubts about one's ability to reason in moral matters extend to all varieties of practical reasoning (Raz, 1978, p. 1). Hence the mainstream equation of practical knowledge, insofar as it is knowledge, with knowledge of the relationship of means to ends. This is taken to be the domain of applied science. It may help to note the ambiguous meaning of the term *practical.* In modern usage it commonly means useful or utilitarian, as in the sense that a table saw is a practical means of cutting wood. This is consistent with the means-ends construal of the mainstream. But a more ancient meaning of practical goes back to Aristotle's notion of *praxis,* which referred to "the disciplines and activities predominant in man's ethical and political life" (Bernstein, 1971, p. x). Practical reasoning, in this second sense of "practical," is concerned with choices about what to do. It is concerned with ends as well as means, and has a valuational or moral component. This is the sense in which Kant spoke of practical reason as distinguished from pure reason. We might add that no amount of technical knowledge, in the absence of intelligently chosen ends, is "practical" even in the first sense of the word.

Problem Setting. We can introduce our alternative to the mainstream account of practical knowledge with the help of Schön's distinction between problem solving and problem setting. Problem solving can be understood as a matter of means-ends deliberation. This is because the statement of a well-formed problem includes specification of the purposes to be achieved. But before a problem can be solved, it must be set. Real life does not present us with well-defined problems such as those at the end of the chapters of a textbook. Rather, human beings confronted with complex, ambiguous, and puzzling circumstances must pose the problems they will endeavor to solve. Schön writes: "When we set the problem, we select what we will treat as the 'things' of the situation, we set the boundaries of our attention to it, and we impose upon it a coherence which allows us to say what is wrong and in what directions the situation needs to be changed. Problem setting is a process in which, interactively, we *name* the things to which we will attend and *frame* the context in which we will attend to them" (1983, p. 40).

In accordance with this usage, we will speak of the way an actor frames a problem or a situation. The framing of a problem defines what is to count as a solution. Means-ends deliberation occurs within the context of a given frame.

It may seem that, in drawing attention to the actor's framing of the situation, we have simply pushed a reliance on a priori purposiveness back one step. For if we ask what leads the actor to frame the situation in a certain way, must we not answer that the purposes that the actor brings to the situation are key elements? It appears there is an interdependence between purposes and frames. On the one hand, an actor's purposes flow from the framing of the situation—for example, when members of a management committee frame the situation as a contest in which each tries to win for his or her department. On the other hand, we might attribute the contest frame to predispositions of members to seek to unilaterally control the task and to win, or perhaps to their career goals and their beliefs about the relation of departmental and individual success. An analytical notion that may be helpful here is that of "nested" frames and

purposes. Just as means-ends analyses take on a nested quality, with the means for achieving broader purposes becoming the ends of more narrowly focused activities, so ways of framing one's work role may generate purposes that guide the framing of particular tasks.

We may also draw from what philosophers have had to say about practical reason. Practical reasoning is concerned with questions of the type, "What shall I do?" whereas theoretical reasoning is concerned with questions of the type, "What is the case?" Since Anscombe (1957), philosophers of action have rediscovered Aristotle's notion of the practical syllogism, which is to practical reasoning what the familiar demonstrative syllogism ("all men are mortal; Socrates is a man; therefore Socrates is mortal") is to theoretical reasoning. The major premise of a practical syllogism is an intention, moral imperative, or goal. The minor premise states means-ends reasoning relevant to achieving the goal, and the conclusion is an action. For example, if the major premise is "I want to get to New York today," and the minor premise is "the only way to get to New York today is by train," then the conclusion is "catch the train!"

Now, the form of the practical syllogism would seem to lend support to the notion that the intention or purpose comes first and is followed by means-ends reasoning to determine how to achieve the purpose. Certainly examples can be cited that conform to this model. But some philosophers have argued that this is far from the normal situation. Human beings must choose what to do in particular situations, and only rarely do they enter the situation with a specific intention already formed. Rather, the agent must appreciate the possibilities presented in the situation and see to what objectives these possibilities pertain. As Wiggins (1978) argues, an agent has many interests and concerns that make competing claims. The more difficult problem is not the means-ends deliberation for achieving a given interest, but rather that of seeing "what really qualifies as an adequate and practically determinate specification of that which is here to be heeded or realized or safeguarded" (p. 145). This requires a high degree of situational appreciation "to prompt the imagination to play upon the question and let it

activate in reflection and thought-experiment whatever concerns and passions it should activate" (p. 144). Wiggins argues that the minor premise of a practical syllogism arises from the process of situational appreciation and that the minor premise "activates a corresponding major premise which spells out the general import of the concern which makes this feature the salient feature in the situation" (p. 147). In other words, specification of the purpose or goal to be achieved *follows* a process of "situational appreciation," which would seem to be analogous to what we have called "framing."

Tacit Knowing. We have suggested that a key step in the designing of action is that of framing the situation, because framing defines purposes in the light of which the actor can distinguish strategic factors. We must now add a set of concepts that will be familiar to cognitive psychologists and social psychologists—concepts that pertain to the knowledge by which actors frame situations and design action within frames. Like other cognitively oriented behavioral scientists, we think of human beings as having vocabularies or repertoires of theories, categories, schemas, scripts, patterns, and other forms of knowledge (see Nisbett and Ross, 1980, p. 28, for their list of "knowledge structures"). This knowledge can be thought of as in the form of rules, as is being done by researchers in artificial intelligence who are seeking to program computers to perform as experts in solving real-world problems (for example, Davis, Buchanan and Shortliffe, 1977). The notions of vocabularies, categories, and rules also point to the similarities between intentional action and language use that we have mentioned earlier. As we will discuss later in this book, mainstream research on the cognitive bases of expertise is relevant to the action science concern with competent action.

It is characteristic of action that most of the knowledge informing it remains tacit. Polanyi, the first to use the phrase *tacit knowing,* cites as an example our ability to recognize one face among thousands despite the fact that we cannot tell how we recognize the face we know (1967, p. 4). Polanyi suggests that this kind of knowledge is characteristic of our ability to recognize many kinds of "physiognomies," whether those of

human beings, rock specimens, or cases of disease. We might extend the example to the ability to recognize situations, with the important difference that to recognize a situation is at the same time to frame it—an observation that points to the fact that other framings are conceivable. When we recognize Aunt Mary, we make the only correct identification; but when we recognize or frame a situation, we construct one of several possible interpretations. Typically, however, the actor is unaware of alternative possibilities.

Another common illustration of our unawareness of the knowledge that informs our actions is found in language use. Native speakers of English know that they can say, "I picked the book up," "I picked up the book," or "I picked it up." But there is no danger they might inadvertently say, "I picked up it." (The example is from Labov and Fanshel, 1977, p. 75.) Yet few native speakers would be able to state the rules that disallow the latter alternative. In an extension of this example, approaches to social inquiry that focus on rules for generating and understanding interaction recognize that human beings usually cannot state the rules they are said to follow.

The kinds of knowledge to which we refer must be inferred from skillful performances. Tacit knowing is, in effect, an hypothesis to explain the fact that human beings frequently perform skillfully. The features of skillful action are that it is effective, it appears to be effortless, and the actor need not think about how to do it. Indeed, thinking about how to perform the action may inhibit skillful performance. Classic examples of this are typewriting, driving a car, and playing tennis. We can add the examples of recognizing a face, speaking one's native tongue, and smoothing over a potentially embarrassing moment at a party. In each of these cases we may speak of skillful performance, tacit knowing, and rule following because it is possible to recognize mistakes and to distinguish more and less competent performances.

Reflecting and Acting. Schön speaks of the tacit knowledge embedded in recognitions, judgments, and skillful actions as knowing-in-action, and argues that it is the characteristic mode of ordinary practical knowledge (1983, pp. 50–54). But

he also notes that people sometimes reflect on what they are doing, especially when they are puzzled or don't get the results they expect. This reflecting-in-action is a way of making explicit some of the tacit knowledge embedded in action so that the agent can figure out what to do differently.

Returning to our earlier analogy between action and experimentation, we can say that the agent is stimulated to reflect when the tacit hypotheses or pragmatic explanations embedded in action are disconfirmed. Schön suggests a more differentiated view of hypothesis testing in action by noting that the same action that tests an hypothesis is also both a probe by which the agent explores the situation and a move intended to change the situation (1983, p. 151).

Drawing on these ideas, we can now sketch a more comprehensive and dynamic model of the epistemology of practice. The agent, confronted with a complex, puzzling, and ambiguous set of circumstances, draws on tacit knowledge to frame the situation and act. The consequences of this action generate information about the situation and about the suitability of the framing and action of the agent. The agent interprets this information, again drawing on tacit knowledge. If the action-as-probe generates information inconsistent with the original framing, if the action-as-move does not achieve intended consequences or leads to unintended consequences, or if the action-as-hypothesis is disconfirmed, the agent may be led to reflect on the tacit understandings that informed the original framing and action. This reflection may or may not lead to a reframing of the situation and a new sequence of moves.

We must also keep in mind that practice is social action. When the situation that the actor frames involves other people, then the framing will include the agent's beliefs about the intentions and beliefs of other people. The consequences of action include the reactions of those others, which themselves depend on how they frame the situation and on their beliefs about the intentions and beliefs of the original actor. As we noted in our discussion of the counterview, interaction presumes intersubjective understandings in the community of practice. Action also creates shared understandings, which then enter into future

action. Our account of the epistemology of practice must include the rules and norms of inquiry of the relevant community, as they are created and maintained by the actions of individuals. Thus if one actor is critical of another but withholds the criticism for fear the other will become defensive, and if the other suspects this is the case but does not say so for fear the first will become defensive, then the two of them have begun to establish the shared rule that threatening information is not discussable.

The concepts of tacit knowing and reflection suggest a different model of the relation between knowing and action than is customary. The customary model may be summed up in the statement, "Think before you act." This is what people generally mean by conscious deliberation. It is also the model that is formalized in decision theory: The actor is to anticipate the consequences of possible courses of action, assign a utility to each, and choose that course with the highest expected utility. We can agree that this model captures some aspects of reality. But our preceding discussion suggests that a more appropriate model may often be, "Act and reflect on your action." This is almost a reversal of the conventional model, and might be caricatured as, "Act before you think." The point is, of course, that intelligent action is informed by highly skillful and complex reasoning, most of which is tacit. It is necessary to act and then reflect in order to discover what reasoning informed the action. A second and more generally recognized reason for acting "first" is that action serves as a means of exploring a situation. Action produces information that can be used for the design of future action. Both of these considerations point to the importance of the dynamic aspects of the epistemology of practice. We must consider the stream of action, from acting to reflecting with a view to future action to acting again. Schön (1983, p. 163) refers to this dynamic process as "reflective conversation with the situation." The practitioner imposes a frame on the situation, and modifies it in light of the "back talk" of the situation.

We may now contrast the implications of the mainstream account and the action science account for ways of dealing with failure to achieve intended consequences. The mainstream epis-

temology of practice focuses on means-ends rationality. Failure to achieve the intended ends leads to a reexamination of means and a search for more effective means. The action science epistemology of practice focuses on framing or problem setting, as well as on means-ends reasoning or problem solving. Failure to achieve intended consequences may, given this model, lead to reflection on the original frame and the setting of a different problem. We will refer to the first approach as *single-loop learning* and to the second as *double-loop learning.*

There is an instructive parallel between the notion of reframing and Kuhn's discussion of choice between competing paradigms. Rorty suggests this parallel when, extending Kuhn's ideas to philosophy, he argues his view that "new philosophical paradigms [nudge] old problems aside, rather than [provide] new ways of stating or solving them" (1979, p. 264). Just as Kuhn proposes that the growth of scientific knowledge occurs as new paradigms replace the old, so improvements in practice may occur as new frames replace old ones. The cutting edge of this analogy is related to Kuhn's claim that paradigms are incommensurable. Purely technical criteria (what Kuhn [1970b, p. 200] calls an "algorithm for theory choice") apply to competing alternatives within a given paradigm or within a given frame. If the ends are given, determination of the best means is a technical question. This is the kind of problem that the mainstream account of science claims as its own. But if the choice is between different frames, as it is whenever agents reflect on their frames with a view toward possible reframing, purely technical criteria are inadequate.

This does not mean there are no rational criteria for choosing between frames. As Schön (1983) suggests, frame experiments may be evaluated according to their fruitfulness in keeping inquiry moving, in creating consequences that are favored by the "appreciation systems" of the practitioner, and so forth. Such criteria may be compared to Kuhn's suggestion that accuracy, scope, and simplicity function as values that guide theory choice, but not as rules. These criteria remain vague. We hope that future inquiry can clarify them. Our point here is that reframing means that agents and practitioners must face the

challenge of rationally reflecting on value-laden, messy issues. The injunction to be "scientific," in the narrow sense in which science is equated with technical rationality, is equivalent to restricting attention to single-loop learning. Action science proposes a broader construal of scientific inquiry, one that asserts the possibility of rational inquiry into double-loop issues.

Empirical Testing in Action Science

In the mainstream account, as we have seen, what is distinctive about science is its critical testing of knowledge claims in the context of justification. Scientific theories must have empirical content, in the sense that the results of observation must have some bearing on the acceptance or rejection of the theory. Competent members of the scientific community should be able to agree at the level of observation, even if they disagree at the level of theory. The logic that connects theory and observation should be explicit, so that different scientists can agree whether a particular set of observations confirm or disconfirm a theory. These are the conditions of objective knowledge: falsifiable theory, intersubjective agreement on observation, explicit inferences, and a community of inquiry in which public testing occurs.

Action science shares with the mainstream an emphasis on these principles. As we will explain in this section, however, their implementation differs in action science and in mainstream science. In part this is because the domain of action science is action and interpretive understanding, with the implications identified by the counterview: The rich layers of meaning constructed by social actors, in addition to the meanings imposed by scientists, are relevant to description and explanation. Still more important is the fact that in action science, empirical testing occurs in the action context. This feature distinguishes action science from both the mainstream and the counterview. It is this feature, we suggest, that makes it possible to rigorously test interpretive knowledge and thus to bridge mainstream and counterview. At the same time, testing in the action context requires distinctive ways of implementing the mainstream principles of empirical testing.

Claims in Action Science. We will begin by describing two kinds of claims that may be tested in action science: dispositional attributions and theories of causal responsibility. These are not the only kinds of claims that may be of interest. Inquiry in action science, as in practical deliberation and science more generally, is a moving spotlight that may focus on different aspects of belief or on the rules and norms of inquiry itself. But these two kinds of claims will serve for illustrative purposes, because it should be clear that agents do sometimes make, criticize, and evaluate such claims and that this is an important practical activity.

Dispositional attributions include a broad class of statements of the form, "Agent *a* has disposition *d*." Dispositional explanation has received much philosophical attention, and it raises many issues that we will not discuss here (Ryle, 1949; Hempel, 1965a, pp. 457-477; Davidson, 1980). Dispositions, understood as tendencies to behave in certain ways in certain situations, include desires, beliefs, attitudes, abilities, and psychological traits. Examples of dispositional attributions in ordinary speech include: "He is defensive," "she is abrasive," "he fears failure," "she thinks I am foolish," and so on. Notice that dispositions, as we use the term here, include, but are not limited to, so-called personality traits.

To assert that an actor is following a rule or tacit theory is to make a special kind of dispositional attribution. An example we will use is, "John follows the rule [or what we will later call a theory-in-use proposition], 'If I am about to deprecate someone, first deprecate myself.' "

The second kind of claims, theories of causal responsibility, are of the form: "Action (or pattern of actions) *a* will lead to (be causally responsible for) consequences *c*." To extend our example, someone could argue, "The impact of enacting the 'deprecate self' rule will be to decrease the likelihood that the other person will challenge the validity of the actor's view." Notice that such causal hypotheses might describe either the intended consequences of the action, in which case they are the reasons for which the actor follows the rule, or the unintended consequences.

Dispositional attributions and theories of causal responsi-

bility are complexly related. To say that someone is "insensitive," for example, seems to involve both kinds of claim: that the agent acts in certain ways and that these actions tend to create certain impacts on others. Our contribution to clarifying the relationship of dispositional and causal attributions depends on the "theory-in-use proposition," which we will discuss in the following chapter and in Part Three of this book.

Both dispositional attributions and theories of causal responsibility may be oriented to supraindividual levels of analysis. For example, a group may be said to engage in "groupthink" (Janis, 1972), with the consequence that poor decisions are made. An organization may be said to engage in defensive routines, to camouflage them, and to camouflage the camouflage, with the consequence that it becomes less able to adapt to changing conditions. As we will describe later in this book, the action scientist often creates a "map" or model of behavioral patterns in the client system that describes feedback loops that contribute both to success and to escalating error. Patterns at supraindividual levels, of course, depend on the patterned behaviors of individuals, although none of the individuals in the client system may be aware of the ways their actions serve to reinforce the actions of others. Having created such a model, the action scientist must then create conditions in which clients can test its validity for themselves. Since the model describes causal relationships, it suggests what clients could do differently that would alter the consequences described in the model. If clients choose to learn to act in these new ways, the consequences of their altered behavior provide a strong test of the causal theories embedded in the model.

Intersubjective Agreement on Data. The data of action science are the actions of individuals as members of communities of practice. The most important form of action is talk. While we by no means exclude nonverbal aspects of action, they too are like language in the sense that they are meaningful within particular communities of practice; hence talk can serve as our exemplar. Under suitable conditions, different observers can come to a high degree of agreement that a particular agent did or did not make a particular utterance. Talk can be recorded on

audiotapes, and with some loss of information it can be transcribed. Thus talk is a good candidate for meeting mainstream requirements for intersubjective agreement at the level of data. At the same time, talk is meaningful. Using talk as data for the empirical testing of theory forces us to deal with the issues raised by interpretation.

The first point to note is that talk *is* action. As Austin (1962) and Searle (1969) have made clear, when people talk they are performing such actions as promising, justifying, ordering, conceding, and so forth. This relation may be obscured by commonsense expressions such as "all talk and no action." But if we think of the situations in which such a comment might be made, we can see that the talk referred to is action, namely, the action of delaying or avoiding some positive step. The separation of talk and action has also been a research strategy in linguistics, which has found it useful for some purposes to abstract language from the pragmatics of speech (Habermas, 1979, pp. 5–6). In recent decades, however, there has been much interest in the study of talk as action. This orientation has stimulated much research by social scientists who see natural conversation as "a strategic research site for studying the ways in which members of a society organize their social interactions" (Labov and Fanshel, 1977, p. 24; see also Gronn, 1983).

The problem of interpretation arises as soon as we consider that, like all action, talk is meaningful. Different hearers may interpret the same utterance differently. The possibility of interpretive ambiguity threatens the intersubjective agreement among observers so necessary to testing in the mainstream account of science. In action science we deal with this issue with the help of a conceptual device, namely, the ladder of inference. This is a schematic representation of the steps by which human beings select from and read into interaction as they make sense of everyday life. The first rung of the ladder of inference includes relatively observable data—for example, a sentence uttered by someone. This kind of data could be checked against an audiotape recording. The second rung of the ladder of inference is the cultural meaning of that utterance. This is the meaning that would be understood by anyone who was a

member of the relevant language community. For example, if the utterance is "X, your performance is not up to standard" and is spoken by a superior to a subordinate, the cultural meaning is "X, the quality of your work is unacceptable." The third rung of the ladder of inference is the meaning imposed by the hearer. For example, someone might conclude that the superior's utterance was "blunt" or "insensitive."

It should be clear that the likelihood of differences in the interpretations of different observers increases the higher one goes on the ladder of inference. Hence some cardinal rules of action science are: Begin at the lowest rung of the ladder of inference, state the meanings at the next higher rung and check for agreement, and continue to the next higher rung only if there is agreement at lower rungs. These rules are meant not only for action scientists but also for agents in everyday life whenever they are dealing with important and threatening issues. Hence the criterion of intersubjective agreement is built into the rules. If cultural meanings have been checked and there is general agreement, those meanings can be treated as hard data. They become the premises for further inferences.

A second way in which ambiguities arise concerns the selection of particular utterances from a stream of conversation. For example, if we ask a member of a group, "What is going on here?" the answer might be that "the boss is chewing out Joe." Notice that this is a meaning at the third rung of the ladder of inference. It is an interpretation of the salient meaning that makes sense of a stream of conversation. If we then ask, "What has the boss said that you see as chewing out Joe?" we may be told some of the sentences that the boss has uttered. This would be data at the first rung of the ladder of inference. But we will not be told everything that the boss and Joe have said; we will be told only a few sentences, those that our respondent thinks are most important. This is characteristic of the way that human beings make sense of the situations in which they find themselves. It is related to our discussion of framing, in that the way an actor frames the situation determines what features of it are salient for him or her. Now suppose that the boss is present and she thinks we have not been told the whole story. She may

say, "Yes, I did say this and that; but I also said, 'Joe, I'm concerned about how you may be feeling.' I don't see that as 'chewing out.' " This illustrates how agents' interpretations of episodes may be checked by a procedure in which an agent states both his interpretation and some utterances at the first rung of the ladder of inference on which that interpretation is based, and other agents then add other rung-one data that, in their view, confirm or disconfirm the first interpretation. The procedure may or may not lead to general agreement on a single interpretation. But it can clarify how far up the ladder of inference agreement extends and where differences arise. It both tests and displays the interpretations of agents in social settings.

Talk as a Window on Practical Reasoning. If we conceive of talk (action) as generated according to rules or tacit theories, then we can seek to infer those rules and theories from displays of talk. This is common research practice in several fields of inquiry that focus on presumed tacit knowledge, including such fields as linguistics, ethnomethodology, and sociolinguistics. In contrast to the mainstream social science objection that talk is merely "anecdotal" data, in this view talk is systematically designed according to a theory. In inferring a rule from a sample of talk, we propose a hypothesis that may be disconfirmed. This hypothesis asserts that in similar situations the actor will create similar meanings.

Agents frequently talk about what they are doing, have done, or intend to do, and they may give their reasons for so acting. This reflective talk provides another window into practical reasoning. Such accounts raise important problems, however, because we cannot assume that they are accurate. Indeed, the idea that action is informed by tacit knowledge presumes that agents cannot state many of the rules they are following. Still, agents' accounts can provide much data that is helpful in inferring rules of which they may not be aware. They may report thoughts and concerns that they did not state at the time of action, such as "I thought she was getting defensive." Such reports help clarify how the actor construes the situation. We need not assume that self-reports are accurate; they may be tested for interpretive consistency with other data. Such proce-

dures are continuous with those we use in ordinary life to make sense of what people are doing. The difference is that in action science they become more explicit and subject to public discussion, and they are guided by rules such as those embedded in the ladder of inference (for example, "Illustrate attributions with relatively directly observable data, and ask others for their reactions").

We said earlier that agents sometimes reflect on their action, especially when unexpected results occur, and thereby discover some of the tacit reasoning that lay behind their action, as they try to figure out what they might do differently. This reflection may of course be private, and agents may report on their private reflections. But reflection may also be public—for example, when a management group discusses an organizational problem or when an individual talks with a therapist. Talk is the vehicle of public reflection. Such talk provides the best data we are likely to find for inferring the cognitive processes by which human beings reflect on action. But public reflection is also a key process by which human beings learn to act more effectively. It is by helping members of client systems to engage in public reflection that action science can both contribute to general knowledge and help clients improve their practice.

Ricoeur has argued that the human sciences depend on the "inscription" of action, the "fixing" of momentary traces so that they can be reflected upon and critically interpreted, as in the model of a text (Ricoeur, 1977). In action science we may select passages from a transcript and ask clients to reflect on them. We may ask clients to write cases that include bits of remembered or anticipated dialogue. Or the same function may be accomplished by recollecting particular sentences at the first rung of the ladder of inference and treating them as a "case" on which actors reflect. Whatever technique is used, the point is to slow down the action so that actors can reflect on the tacit understandings embedded in action.

Threats to Validity in the Action Context. The methodology of any science must be adapted to the most important threats to validity facing that science. Mainstream social science has focused on threats arising from uncontrolled variables, non-

random assignment of subjects to conditions, learning effects from multiple testing, and so forth (Campbell and Stanley, 1963). Argyris (1980) has described how the rigorous controls used to counter such threats themselves may introduce additional threats to validity. For example, subjects may distort their responses. This is not to say that the concerns of mainstream scientists are not legitimate, but that the cure may, for some purposes, be worse than the disease.

The most important threats to validity in action science are those arising from the action context. Some of these problems may have occurred to the reader during our discussion of talk as data. For example, we described how agents' interpretations may be checked by stating the utterances on which they are based and encouraging others to cite data that may disconfirm the interpretation. Such a procedure depends on the willingness of members of social settings to discuss their disagreements. But it is common for people to withhold discordant views for fear that others will become upset or embarrassed. Similarly, we have described how agents may report thoughts that they did not state at the time of action. But people may make such disclosures strategically. They may report only what they believe will support their position or increase their status in the eyes of others. In short, the validity of inquiry in the action context is threatened by a variety of defensive routines, including self-censorship and face saving.

Our research indicates that human beings, when dealing with threatening issues, typically act in ways that inhibit the generation of valid information and that create self-sealing patterns of escalating error. For example, people automatically withhold thoughts and feelings, or state them in ways that makes it difficult for others to challenge. They speak at high levels of inference, assume that what they say is concrete and obvious, and avoid creating conditions that might disconfirm their views. They attribute defensiveness and nasty motives to others, do not state these attributions publicly, and act in ways that elicit behavior that they interpret as confirming their attributions. They are predisposed to attribute responsibility for error to others or to situational factors rather than to them-

selves. Patterns that maintain this situation are treated as undiscussable and are covered with a layer of camouflage. Many of these features are protected by layers of genuine unawareness and by defenses to maintain the unawareness. While this description is cast in the language of our research, its general features, and their negative implications for valid inquiry in the action context, are congruent with the descriptions of researchers of many theoretical perspectives (Nisbett and Ross, 1980; Goffman, 1959, 1967; Cyert and March, 1963).

In the following chapter we will describe our model of the master program that leads individuals to design such action, which we call Model I, and our model of the behavioral world that is created by and reinforces Model I, which we call Model O-I ("O" for "organizational"). These models are central to the theory by which we explain the features described in the preceding paragraph, in that those features may be derived from the theory. Models I and O-I may be considered a descriptive epistemology of the action context, one that specifies the causal factors that reduce the probability that valid knowledge will be generated and that errors will be detected and corrected. In the following chapter we will also describe Models II and O-II, which constitute a normative epistemology for the action context. The action scientist seeks to deal with the threats to validity posed by Model I by creating conditions that approximate Model II. Movement toward Model II is hypothesized to be helpful to the client system. To act congruently with Model II, in the face of automatic Model I action by members of the client community, requires of the action scientist a set of behavioral or clinical skills. The action scientist intends also to help clients learn these skills, so that they may create conditions approximating Model II when the action scientist is not present.

Implicit in the forgoing discussion is the professional-client relation that is characteristic of action science. Some readers may wonder how the action scientist is able to create conditions in which actors in social settings take the time to state the data on which their interpretations are based and to report reasoning that they usually keep private. The social psychologists Nisbett and Wilson acknowledge that such procedures

would generate useful data but regard them as "ecologically meaningless" (1977, p. 246). Gronn, an organizational ethnographer, rejects the notion of checking meanings with his subjects as "impractical and impolite" and fears that he might offend them (1981, pp. 26-27). Nisbett and Wilson represent mainstream social science, and Gronn represents the counterview. Neither combines their research with intervention.

It is because the action scientist is an interventionist seeking to help clients learn that it is possible to create the kinds of data we have been discussing. Clients are willing to reflect publicly and to discuss touchy issues because they expect to learn. It is essential, of course, that the action scientist indeed be able to help. Clients will not long tolerate an uncomfortable and time-consuming process if they do not see that it is helping them. The decision to continue the research is one that clients and action scientist must monitor in an ongoing way. If it does continue, it will be because both parties are internally committed to it and believe that important learning is at stake. Such commitment implies further research advantages. First, clients will be dealing with issues about which they feel strongly, in contrast to the typical laboratory situation in which a concept such as "learned helplessness" is operationalized as a low score on a puzzle-solving task. Second, clients will themselves be committed to monitoring the validity of the information that is generated. In mainstream research the subject may just be "doing his job." In action science the client intends to use the information generated to help make difficult changes in her life.

Yet another advantage to combining research and intervention is that causal theories are tested repeatedly as clients seek to implement them. This advantage involves a comparison of testing in action science with experimentation in mainstream science, a subject to which we turn in the next section.

Experimentation and Action Science. We have pointed out that in mainstream science there are several levels of testing, of which experimentation is the most rigorous. There are also several levels of testing in action science. In ascending order of rigor, we can ask individuals what led them to act as they did; we can observe their action in the future to see if it confirms

previously developed hypotheses; and we can intervene to change previously identified patterns. Intervention is the action science analogue of experimentation. When clients involve themselves in change experiments, they engage in nontrivial learning, and they think and reflect seriously on what they are doing and what prevents them from changing. Thus in the process of intervention, better data are generated at the levels of asking and observation. Also, the kinds of learning we are interested in do not occur immediately. Many iterations are required, thus providing an action science analogue to multiple trials or replications. Each intervention, as an action intended to bring about certain consequences, is based on causal theories; and the theories are tested by seeing if the consequences that actually occur are consistent with what the theory would predict.

As we have noted in our discussion of action and causality, there is strong support for the analogy between intervention and experimentation. Experimentation is a powerful test of causal hypotheses precisely because it is an intervention into the course of nature. Still, there are important differences between the methodology of controlled experimentation and intervention in action science. We may say that experimentation is a subset or a refinement of action, one in which practical interests are bracketed for the sake of precise explanation. For example, the experimenter is frequently enjoined to control all relevant variables and to vary but one at a time. Practical action occurs in a field of multiple and interacting variables, and the agent usually does not have unilateral control over them. The methodology of experimentation allows the experimenter to determine whether situations confronting subjects are the same. In the action context, it is the interpretations of actors that are critical to determining if two situations are the same. An experiment occurs, in a sense, outside of history. But in action science, perhaps the most important consequences of any inquiry are their impact on the rules and norms that will guide future inquiry in that same community of practice.

Another important difference between intervention and experimentation is identified by Schön's observation that "the

practitioner makes his hypothesis come true. He acts as though his hypothesis were in the imperative mood" (1983, p. 149). Recall Schön's notion that the action by which the practitioner tests an hypothesis is also a means of exploring the situation and a move intended to change the situation. Experimentation in mainstream science, while oriented primarily to testing, may also be oriented to probing or discovery (Hempel, 1966, pp. 20-21). But the third aspect of practice, that of action as an attempt to change the situation, is related to those pragmatic interests that are bracketed in controlled experimentation. To be sure, the scientist often does have an interest in designing experiments that confirm the hypotheses being tested, because only then (in many cases) are the results publishable. But such considerations are in a sense illegitimate, in that other scientists may justly criticize procedures that lead to confirmation at the expense of a genuine test. In practical action, in contrast, achieving the intended result is often the primary consideration.

Another way of stating this difference between action and experimentation is to say that experimentation is valid only if there is a genuine risk of disconfirmation. There is a sense, however, in which self-fulfilling prophecies are the essence of effective action. Consider, for example, the entrepreneur who is convinced that a particular location is just right for her business. The explanatory reasoning underlying this belief may be, in some objective sense, wrong; but believing it is right may lead the entreprencur to work very hard, thus making it true. At the same time, we should note that situations are not wholly manipulable. While we may think of the explanations embedded in action as projections onto the situation that the agent seeks to make true, no one who grapples with practical action can be so solipsistic as to think that projection always makes it so. Entrepreneurs often fail, despite their positive thinking. Moves have consequences, many of which are unforeseen and unintended. The explanations embedded in action may be in error in ways that cannot be rectified by enacting self-fulfilling prophecies. We may distinguish, then, cases in which the tendency to create self-fulfilling prophecies is productive and those in which it is counterproductive. If an agent acts in

ways that ensure blindness to sources of error, there is high risk of continuing ineffectiveness.

Some of the hypotheses embedded in intervention are of the kind that Schön (1983) describes, that is, moves intended to change the situation. This is the case, for example, with the hypothesis that action consistent with Model II will tend to evoke the kind of defenses that are facilitative of learning. Other hypotheses characteristic of action science, however, are of a kind that some members of the behavioral setting will wish to disconfirm. For example, the action scientist may attribute that all members of the client system are programmed with Model I theory-in-use. Clients will not like this attribution and will seek to generate data that will disconfirm it. Similarly, the action scientist may create a map of the behavioral world of the client system that, if true, calls for some wrenching changes. Clients will be motivated to look for errors in the map before acting on it. Thus an important class of the hypotheses or explanations proposed by action scientists can be expected to be subjected to critical tests by members of the relevant community of practice who have an interest in disconfirmation.

We might suggest that the principle of falsification functions in action science as a heuristic to guide criticism. While falsification is not always a prime consideration in the action context, there are many situations in which it is relevant. For example, an agent who believes that a second agent is defensive may unknowingly act in ways that evoke defensiveness, and may take the evoked defensiveness as evidence for the original attribution. This is a self-fulfilling prophecy that is also self-sealing; the result is a vicious circle. Criticism guided by the principle of falsification may then take the form, "If you act in ways that may be responsible for creating the defensiveness you see, how would you ever discover if you were wrong about the person already being defensive?" This is often a compelling criticism. Such criticism is also in order when an agent says, in effect, "The reason I know that what I say is true is that I feel it deeply." It is not that such feelings are not often right; the problem with such arguments is that there is no way for the agent or others to discover when they may be wrong. The principle of falsification thus serves to support norms of public test-

ing by providing a way to remind agents that they might, in principle, be wrong.

Testing and Rule-Governed Interaction. Our discussion of intervention and experimentation has focused on the similarities between the logic of action and the logic of experimentation. If someone asserts that doing x will bring about y, then it should be possible to test the assertion by doing x (and refraining from doing x) and seeing if y occurs. This is the logic by which causal hypotheses are tested in the natural sciences, and we have discussed ways in which it is also relevant to practical deliberation. But there is another aspect of testing in the action context, one that pertains to actors' (mostly tacit) understandings of the rules that govern interaction.

Consider our earlier example and the assertion that "the impact of enacting the 'deprecate self' rule will be to decrease the likelihood that the other person will challenge the validity of the actor's view." How might we justify this assertion? We might reason that, if an actor deprecates himself before deprecating someone else, the impact is likely to be one of saying, "I'm no better than you, I do this too." Also, we might reason that such a move makes tacit appeal to a norm of reciprocity and equality: "I've just admitted a weakness; it would be impolite of you to now deny a weakness." Such considerations may be compelling to agents who share mastery of a system of rules for social interaction.

A related argument appeals to the agent's intentions in enacting the "deprecate self" rule. If asked to reflect on his reasoning, the agent might say, "I didn't want to make him defensive" or "I didn't want to come on as judgmental and threatening." It should be clear that these reasons logically entail the causal assertion we are discussing, that is, that the recipient will be less likely to challenge the actor's view if the latter employs the "deprecate self" rule. This argument from internal consistency with the agent's reasoning does not "prove" that the causal assertion is valid; but it does imply that, if the actor's reasoning was valid, then the causal assertion is valid.

One kind of experiment in action science is role playing, in which two or more agents talk as if they were in a particular situation. Such a procedure has more validity than simply talk-

ing about what might happen in abstract terms. The concreteness of role playing evokes the tacit understandings that constitute mastery of the system of rules of interaction. That is, human beings have tacit theories that explain and predict how other human beings are likely to react in various situations. Although far from infallible, these tacit theories have a high degree of validity when situations are enacted or are described in concrete terms. But agents can respond to abstract descriptions only by drawing on that portion of their tacit understandings that they have made explicit; and their explicit theories, or what we call their espoused theories, may be inaccurate formulations of their tacit understandings.

Discovery and Justification in Action Science. Recall that the mainstream account of science makes much of the distinction between the context of discovery and the context of justification. There are several reasons why this distinction cannot be carried through in action science. The actor in practical life has no choice but to act (even if to forebear), and actions once taken construct future constraints. This means that in the action context there is a premium on facility in creating good guesses and on the construction of fast, reliable tests. The action scientist, like the actor in everyday life, must be concerned with effective discovery lest, for example, he or she waste client time or actually harm the client system.

The importance of discovery can be clarified by reference to the cognitive limits of human beings as worked out in the pioneer work of Simon and his colleagues. March and Simon (1958) and Cyert and March (1963) explain that when individuals or organizations face situations for which routines have not been developed, they engage in search. Search is an activity that consumes resources, and it is suspended when a satisfactory alternative has been found. That is, given our cognitive limits as human beings, we do not exhaustively search out all possible alternatives; rather we search until we discover some alternative that is good enough. But this means that the order in which we generate alternatives (that is, more discoveries) is critical. The heuristics that guide the generation of alternatives will largely determine the chosen course of action. Hence practitioners who seek to improve their practice through public reflection should

be interested in reflecting on how they discover problems and possible alternatives. Action science must be concerned with such issues. Indeed, to add a level of reflexivity, the action scientist must be concerned with how best to help practitioners discover problematic features in the practitioner's patterns of discovery.

It is sometimes argued, in the spirit of Kuhn, that discovery cannot be separated from justification because the paradigm (or "framing") that structures the context of discovery also determines the criteria of justification. There is some validity to this view; the way in which a problem is set identifies what is to count as a solution. But not all criteria of justification are thus determined. The very notion of discovering problematic features in practitioners' patterns of discovery implies independent criteria of justification. For example, the contrasting heuristics of discovery—"look first for the other person's responsibility" and "look first for one's own personal responsibility"—may be evaluated with respect to their consequences for creating a behavioral world conducive to generating valid information. This latter consideration, or "value," is second order with respect to the former heuristics.

The interpenetration of discovery and justification in the action context is perhaps better shown by the following argument: An actor may frame a situation in such a way that he creates self-sealing processes of escalating error. For example, if the marketing people in a corporation frame an upcoming budget meeting as a win-lose battle with research and development for scarce funds, they may act in ways that ensure that a win-lose battle will occur. Under such conditions it is unlikely they will discover if their framing was ill advised. Stated more generally, some "discoveries" may create conditions in which valid inquiry for purposes of justification cannot occur.

Action Science as Critical Theory

At several points in the preceding discussion we have mentioned the normative dimension of action science. We have noted that action has a moral aspect, as suggested by the concern of practical reasoning with questions of the type, "What

shall I (we) do?" We have distinguished the epistemology of practice embedded in action science from the mainstream view by noting that practical knowledge refers not only to knowledge of the relationship of means to ends but also to the intelligent choice of ends. We have pointed out that the action scientist is an interventionist seeking to bring about some states of affairs rather than others, in our case guided by the normative theory we call Model II. And we have stated that action science seeks alternatives to the status quo that will both illuminate what exists and inform fundamental change.

The normative dimension of action science requires special comment because both the mainstream view and many versions of the counterview suggest that it is not appropriate for a scientist to advocate a normative position. The mainstream view has been heavily influenced by the positivist separation of fact and value. Only statements of fact were, on this account, held to be cognitively meaningful; value judgments were branded "emotive utterances." Accordingly scientists were to limit themselves to matters of fact. Advocates of the counterview—Schutz (1962) is one example—have rejected the positivist account, but they have thought it necessary for the social scientist to adapt a disinterested stance, a position of value neutrality.

There is, however, an influential contemporary view that argues that the theorist should adopt a normative position that offers a basis for criticism of the status quo. This position has been developed by theorists of the Frankfurt School, whose most influential member in recent years has been Jürgen Habermas. The Frankfurt School has championed "critical theory," an approach to social inquiry that seeks to unite knowledge and action, theory and practice. The critical theorist, it is said, takes a practical interest in improving human existence.

Writers of the Frankfurt School discuss two exemplars of critical theory. The first is Marxism, although the Marxism they discuss is not orthodox Marxism because their emphasis is on the critique of ideology or on the false consciousness that blinds human beings to their true interests and not on the supposed inevitability of a proletarian revolution. The second exemplar is

Freudian psychotherapy. What Marxism and Freudianism have in common is that they seek to transform the self-awareness of the subjects to whom they are addressed, in the interests of emancipation. It appears to us that action science is a third exemplar of critical theory. Action science is as unlike Marxism and psychoanalysis as they are unlike each other. But it, too, seeks to stimulate critical self-reflection among human agents so that they may more freely choose whether and how to transform their world.

In this section we will describe some features of critical theory in order to clarify the normative dimension of action science. Our discussion will rely heavily on Geuss (1981) and Bernstein (1976), each of whom has based his thoughtful treatments of critical theory largely on the writings of Habermas.

Habermas has proposed that there are three types of sciences (Bernstein, 1976, p. 191). First, the "empirical-analytic sciences" fit the description of the mainstream account. They seek hypothetical-deductive theories that describe regularities between dependent and independent variables. They serve "technical" interests in the sense that they enable human beings to extend their control over nature. Second, the "historical-hermeneutic sciences" fit the descriptions of science held by the counterview. They are concerned with communicative action, and their methodologies are those appropriate to the interpretation of texts and the understanding of meaning. They serve "practical" interests that are guided by consensual norms. And, finally, "critical social science" goes beyond the description of empirical regularities and the interpretation of meanings. It serves "emancipatory" interests by offering a critique of what is from the perspective of what might be. The methodological framework is that of self-reflection, by which human subjects can transform their self-awareness and can act to change the world. Bernstein describes the relation among the three kinds of sciences and their guiding interests: "A consistent, adequate understanding of the empirical-analytic sciences demands the existence—as Peirce and so many who have followed him have argued—of an open, self-critical community of inquirers. And

the practical interest that governs the historical-hermeneutic disciplines seeks to promote such open, nondistortive communication. Implicit in the knowledge guided by the technical and practical interests is the demand for the ideal state of affairs in which nonalienating work and free interaction can be manifested" (1976, p. 198).

The three kinds of sciences should not be viewed as mutually exclusive. The natural sciences, perhaps, can be understood as purely empirical-analytic disciplines, although such an understanding does not account for the intersubjective practices of the scientific community. The sciences of social action are both empirical analytic and historical hermeneutic, although, as the polarization between mainstream and counterview indicates, the relationships between these distinctive aspects are not well understood. Critical social science includes empirical-analytic and historical-hermeneutic aspects yet goes beyond them.

Geuss (1981, p. 76) proposes that a critical theory is composed of three main constituent parts, which we summarize here:

A. A part which shows that a transition from the present state of society . . . to some proposed final state is . . . possible . . .
B. A part which shows that the transition . . . is "practically necessary," i.e. that
   1. . . . the present social arrangements cause pain, suffering, and frustration . . . agents . . . only accept the present arrangements . . . because they hold a particular world-picture . . . one they acquired only because they were in conditions of coercion;
   2. the proposed final state will be one which will lack the illusions and unnecessary coercion and frustration . . . which . . . will be easier for the agents to realize their true interests;
C. A part which asserts that the transition from the present state to the proposed final state can come about only if the agents adopt the

> critical theory as their "self-consciousness" and act on it.

This description of the features of a critical theory still appears to fit Marxism better than it does either psychoanalysis or action science. But at this point it is adequate to identify what is distinctive about critical theory. It should be clear that in order to satisfy the several claims Geuss describes, a critical theory must make many empirical assertions. On the one hand, for example, it must identify the causal links between present social arrangements and their negative consequences, and show that alternative arrangements would not create these same consequences. On the other hand, it is not clear that the claim that agents would reject their current world view if they were in a position to know better is empirical. Assuming this claim is not simply a tautology (if they had different wants, they would want different things), what is its status? And related to this, what are we to make of the reference to agents' "true interests"? Assuming agents do not now "know better" and are unaware of their "true interests," how are these to be determined? Geuss identifies the point at issue when he observes that a critical theory "doesn't merely give information about how it would be rational for agents to act *if* they had certain interests; it claims to inform them about what interests it is rational for them to have" (1981, p. 58). This claim points to the radical difference between critical theory and mainstream science.

Critical theory justifies advocacy of a normative position by adhering to the principle of internal criticism. That is, the critical theorist claims that the normative views in question are implicit in the beliefs and practices of the agents to whom the critical theory is addressed. As Geuss points out: "Human agents don't merely have and acquire beliefs, they also have ways of criticizing and evaluating their own beliefs. Every agent will have a set of epistemic principles, i.e. an at least rudimentary set of second-order beliefs about such things as what kinds of beliefs are acceptable or unacceptable, and how beliefs can be shown to be acceptable or unacceptable" (1981, p. 61).

Critical theory proceeds by making explicit the epistemic

principles that agents already use but of which they are unaware and by showing that the agents' world view is false by the criteria of these epistemic principles. The question remains, What are the criteria for determining if the critical theory has validly carried through this critique? Geuss argues that it is the agents to whom the critical theory is addressed who are the final judges of its validity. That is, the critical theory is confirmed if those agents agree that their world view is "reflectively unacceptable" to them. "Reflective unacceptability" means that agents will give up the belief in question when they reflect on it in light of valid information in free discussion. This does not mean, of course, that agents will abandon their beliefs as soon as they are challenged. The very point of critical theory is that agents can be wrong about these matters. Marxist theorists speak of "false consciousness," and psychoanalytic theorists speak of the unconscious, repression, and so on. But the ultimate criterion of validity is free assent in a discussion very like Peirce's community of inquiry, in which the test of truth is that investigators who begin with different views converge on one opinion in the course of inquiry.

The relation to Peirce is especially clear in Habermas's version of critical theory. Habermas argues that human interaction presumes what he calls an ideal speech situation. That is, he argues that all linguistic communication involves four kinds of validity claims: that what is uttered is comprehensible, that the content of what is said is true, that the speaker is being truthful (the utterance is congruent with the speaker's intentions), and that the speech acts being performed are legitimate (Habermas, 1979, pp. 2, 28; Bernstein, 1976, p. 211). Now, if any of these validity claims are questioned, speakers resort to what Habermas calls a discourse in which the claims are examined and tested. The criteria for good discourse, that is, for the rationality of the consensus that may be achieved through discourse, are that it approximate the ideal speech situation. That is, "What it means for a statement to be true is that it would be the one on which all agents would agree if they were to discuss all of human experience in absolutely free and uncoerced cir-

cumstances for an indefinite period of time" (Geuss, 1981, p. 65). This is the same definition Peirce gives of truth in scientific inquiry. Habermas argues that the ideal speech situation is the grounding for the ideas of rationality, freedom, and justice, as well as the idea of truth.

Habermas has argued that acceptability in the ideal speech situation is a "transcendental" criterion of truth, by which he means that all human beings everywhere at all times are committed to recognizing it by virtue of the nature of linguistic communication. Geuss questions this universality, pointing out that there may be some exotic cultures in which it does not hold. He agrees, however, that modern societies do accept the notion that "our real interests are the ones we would form in conditions of complete freedom of discussion" (1981, p. 67). If the criteria of the ideal speech situation are fundamental to the epistemic principles of agents in everyday life (as of course they are for scientists), then critical theory can show that a certain set of beliefs is false by showing that agents would not have adopted those beliefs had they been in ideal speech situations (that is, those beliefs could have been formed only under conditions of coercion). The setting in which such a demonstration can be recognized as valid is one that itself approximates ideal speech. Thus, on this analysis, it would be inconsistent and "false" for an advocate of critical theory to coerce (psychologically or otherwise) others to adopt the critical theory. The only form of coercion that is legitimate is the force of the better argument, as judged in free and open discussion.

As we have seen, embedded in the scientific enterprise is an ethic of responsible belief (Scheffler, 1982, p. 7). Action science extends this ethic to the realm of responsible action. In this section we describe a set of action science values that we claim are conceptually and empirically interrelated. That is, action that creates a behavioral world in which some of these values are realized tends to be guided by others of these values. We also claim that these values are embedded in the epistemic principles of client systems; and to the extent that this is not true, we would not expect the system to engage in action sci-

ence. The practice of action science, especially in the early stages of an engagement, involves carrying through an internal critique so that clients can become aware and can confirm or disconfirm for themselves the degree to which they enact patterns that are inconsistent with the values they affirm.

We begin with the values of competence and justice. When we view human beings as agents, we see designing and taking actions to achieve intended consequences as basic life activities. To say that agents seek to bring about intended consequences is to say that they seek to be competent. Justice becomes crucial as soon as we consider human agents as social beings. The core of the concept of justice is the principle of universality, which Edgley observes is generally regarded as the most important principle in the area of practical reason: "If a particular person ought to do a certain thing in a particular situation, he and anyone else in a situation of the same relevant kind ought to do the same kind of thing" (1978, p. 28).

Competence and justice are closely related, and both involve the notion of rationality. The principle of universality is a rational principle; to assert both that "everyone should do x" and that "I need not do x" is to be inconsistent, to act unjustly, and to act contrary to good reasons. Agents who act in this way can be seen as incompetent, in part because they create defensive reactions in others. Competence requires that the agent not create counterproductive consequences, another illustration of the principle of rationality.

Competence requires that action be informed by valid information. The popular metaphor of human agent as intuitive scientist (Kelly, 1955; Schutz, 1967; Heider, 1958; Kelley, 1971; Nisbett and Ross, 1980) points to the importance of theories that explain the world, revised in light of evidence so that they may be accurate. Generating valid information requires something like a community of inquiry guided by such norms as intersubjectively verifiable data, explicit inferences, and public falsifiability. To assert and act on theories that are held exempt from such criteria is unjust. That is, to assert a theory is to make a validity claim; validity depends on susceptibility to public test; hence to claim exemption from public testing is to vio-

late the principle of universality and to say in effect that "all validity claims must be subject to test, except mine."

Creating and maintaining behavioral worlds conducive to generating valid information require conditions in which agents can make free and informed choices and feel internally committed to their choices. The requirement of free and informed choice is a necessary warrant of the validity of beliefs accepted in a community of inquiry. This is evident in Habermas's analysis of the ideal speech situation and also in the long-recognized congruence between the values of science and those of democracy. If choice is not free and informed, then we have no reason to believe that the community of inquiry will tend toward true opinions. Internal commitment is an empirical consequence of free and informed choice. In the realm of action it is also an indispensable condition for valid information over time. When human beings feel internally committed to a course of action, they more intelligently monitor its implementation. Implementation will be more competent, and it becomes more likely that information important to success will be recognized and acted upon. For example, workers who feel internally committed to producing a good product will be less likely to knowingly allow design errors to go uncorrected.

Each of the values that we have just discussed may be related to the notion of personal causal responsibility. Agents who focus on their personal responsibility are likely to act more competently and more justly than those who do not. Those who distance themselves from their personal responsibility are likely to create behavioral worlds in which valid information is not generated, choices are not recognized, and agents feel little internal commitment. While it is obvious that human beings often do blame others and do not recognize their own responsibility, they do this in the belief that they have good reasons for holding others responsible. If the action scientist, guided by the norm that people should be personally responsible, sees that people seem to be distancing themselves, and if this criticism can be made in the context of public reflection and is recognized as valid by the people involved, then it becomes possible for them to learn and to change. Action science makes this pos-

sible by creating conditions in which members of client systems can consider for themselves empirical, interpretive, and normative claims in free and open inquiry.

We can briefly summarize the aspects of action science discussed in this chapter as follows:

1. Action science intends to enact communities of inquiry in communities of social practice. Just as scientific inquiry proceeds according to rules and norms of responsible belief, so action science extends this ethic to practical deliberation.

2. Whereas mainstream science is directed primarily toward knowledge for its own sake and only secondarily toward its technical application, action science is directed toward knowledge in the service of action. It builds on an epistemology of practice that sees practical knowledge as a realm of tacit knowing that can be made explicit through reflective inquiry.

3. Whereas mainstream science emphasizes empirical claims and the counterview emphasizes interpretive claims, the domain of action science is characterized by the interpenetration of empirical, interpretive, and normative claims.

4. The covering-law model captures part of the logic of knowledge in action science. For example, the defensive routines characteristic of social systems can be derived from, and thus are explained by, the theory of Models I and O-I. But action science intends to produce knowledge that is optimally incomplete and that can be filled in as the situation requires. Theoretical constructs should be simple enough to be usable, while enabling the actor to grasp all relevant features of the situation. They should be suited to dealing with concrete situations and to making scientific generalizations. Action science focuses on the meanings and logic of action more than on regularities among contingent events.

5. The testing of knowledge claims in action science, as in mainstream science, is guided by the norms of public testing, falsifiability, intersubjective agreement on data, and explicit inferences. However, in action science these norms are used to structure and refine the practices for coming to agreement common to ordinary speech, and are extended to interpretive and normative, as well as empirical, claims. As the ground of knowl-

edge claims in mainstream science is the community of inquiry insofar as it follows appropriate rules and norms, so the ground of knowledge claims in action science is the community of practice insofar as it enacts norms for valid information, free and informed choice, and internal commitment.

6. Whereas the mainstream account of science distinguishes sharply between the context of discovery and the context of justification, in action science the two cannot be sharply distinguished.

7. Action science intends to create alternatives to the status quo and to promote learning at the level of norms and values. Inquiry focuses on double-loop learning and frame breaking, or what Rorty (1979) calls abnormal discourse. Like critical theory (Geuss, 1981), action science advocates and justifies its normative position through internal critique of the epistemic principles of the client system, which remains the ultimate judge of the validity of the critique.