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the Reflective Practitioner

HOW PROFESSIONALS THINK IN ACTION

DONALD A SCHÖN

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Preface

This exploration of professional knowledge stems directly from my working life as an industrial consultant, technology manager, urban planner, policy analyst, and teacher in a professional school. Because of these experiences, the question of the relationship between the kinds of knowledge honored in academia and the kinds of competence valued in professional practice has emerged for me not only as an intellectual puzzle but as the object of a personal quest. I have become convinced that universities are not devoted to the production and distribution of fundamental knowledge in general. They are institutions committed, for the most part, to a *particular* epistemology, a view of knowledge that fosters selective inattention to practical competence and professional artistry.

This is not, of course, an unfamiliar point of view. Many people use the term "academic" in its pejorative sense. On the other hand, complaints about the elitism or obscurantism of the universities tend to be associated with a mystique of practical competence. When people use terms such as "art" and "intuition," they usually intend to terminate discussion rather than to open up inquiry. It is as though the practitioner says to his academic colleague, "While I do not accept *your* view of knowledge, I cannot describe my own." Sometimes, indeed, the practitioner appears to say, "My kind of knowledge is indescribable," or even, "I will not attempt to describe it lest I paralyze myself." These attitudes have contributed to a widening rift between the universities and the professions, research and practice, thought and action. They feed into the university's familiar dichotomy between the "hard" knowledge of science and scholarship and the "soft" knowledge of artistry and unvarnished opinion. There is nothing here to guide practitioners who wish to gain a better understanding of the practical uses and limits of research-based

knowledge, or to help scholars who wish to take a new view of professional action.

We are in need of inquiry into the epistemology of practice. What is the kind of knowing in which competent practitioners engage? How is professional knowing like and unlike the kinds of knowledge presented in academic textbooks, scientific papers, and learned journals? In what sense, if any, is there intellectual rigor in professional practice?

In this book I offer an approach to epistemology of practice based on a close examination of what some practitioners—architects, psychotherapists, engineers, planners, and managers—actually do. I have collected a sample of vignettes of practice, concentrating on episodes in which a senior practitioner tries to help a junior one learn to do something. In my analysis of these cases, I begin with the assumption that competent practitioners usually know more than they can say. They exhibit a kind of knowing-in-practice, most of which is tacit. Nevertheless, starting with protocols of actual performance, it is possible to construct and test models of knowing. Indeed, practitioners themselves often reveal a capacity for reflection on their intuitive knowing in the midst of action and sometimes use this capacity to cope with the unique, uncertain, and conflicted situations of practice.

The heart of this study is an analysis of the distinctive structure of reflection-in-action. I shall argue that it is susceptible to a kind of rigor that is both like and unlike the rigor of scholarly research and controlled experiment. I shall also consider the question of its limits, some of which derive from myths about the relation of thought to action, while others are grounded in powerful features of the interpersonal and institutional contexts that we create for ourselves.

Finally, I shall suggest implications of the idea of reflective practice—implications for the professional's relation to his clients, for the organizational settings of practice, for the future interaction of research and practice, and for the place of the

professions in the larger society, (The question of education for reflective practice, which I plan to treat more fully in a later book, I shall touch on very lightly here.)

The contributions I have found most helpful in this endeavor are those of people for whom research functions not as a distraction from practice but as a development of it. The late Raymond Hainer, for many years my closest friend and colleague, first made it possible for me to see the terrain I am now exploring. Chris Argyris, with whom I have worked closely for the last decade, has been a model of commitment to reflective practice. Jeanne Bamberger has introduced me to the joys and pains of close attention to the intuitive thinking revealed in the very particular phenomena of actual performance. And Martin Rein, with whom I taught several seminars on professional education, has shaped my ideas by giving me the benefit of criticisms derived from an inside view of my enterprise.

I am grateful to Yehudah Elkana, director of the Van Leer Institute in Jerusalem, who provided a hospitable environment for my writing in the spring of 1979. And I am especially indebted to the Massachusetts Institute of Technology's Division for Study and Research in Education where I have found a climate more conducive to this work than any I believe I could have found elsewhere.

Donald A. Schön
Cambridge, Massachusetts
1982

Part I
Professional Knowledge and Reflection-in-Action

1
The Crisis of Confidence in Professional Knowledge

The professions have become essential to the very functioning of our society. We conduct society's principal business through professionals specially trained to carry out that business, whether it be making war and defending the nation, educating our children, diagnosing and curing disease, judging and punishing those who violate the law, settling disputes, managing industry and business, designing and constructing buildings, helping those who for one reason or another are unable to fend for themselves. Our principal formal institutions—schools, hospitals, government agencies, courts of law, armies—are arenas for the exercise of professional activity. We look to professionals for the definition and solution of our problems, and it is through them that we strive for social progress. In all of these functions we honor what Everett Hughes has called "the professions' claim to extraordinary knowledge in matters of great social importance";[1] and in return, we grant professionals extraordinary rights and privileges. Hence, professional careers are among the most coveted and remunerative, and there are few occupations that have failed to seek out professional status. As one author asked, are we seeing the professionalization of nearly everyone?[2]

But although we are wholly dependent on them, there are increasing signs of a crisis of confidence in the professions. Not only have we witnessed well-publicized scandals in which highly esteemed professionals have misused their autonomy— where doctors and lawyers, for example, have used their positions illegitimately for private gain—but we are also encountering visible failures of professional action. Professionally designed

solutions to public problems have had unanticipated consequences, sometimes worse than the problems they were designed to solve. Newly invented technologies, professionally conceived and evaluated, have turned out to produce unintended side effects unacceptable to large segments of our society. A professionally conceived and managed war has been widely perceived as a national disaster. Professionals themselves have delivered widely disparate and conflicting recommendations concerning problems of national importance, including those to which professional activities have contributed.

As a result, there has been a disposition to blame the professions for their failures and a loss of faith in professional judgment. There have been strident public calls for external regulation of professional activity, efforts to create public organizations to protest and protect against professionally recommended policies, and appeals to the courts for recourse against professional incompetence. Even in the most hallowed professional schools of medicine and law, rebellious students have written popular exposés of the amoral, irrelevant, or coercive aspects of professional education.[3]

But the questioning of professionals' rights and freedoms—their license to determine who shall be allowed to practice, their mandate for social control, their autonomy—has been rooted in a deeper questioning of the professionals' claim to extraordinary knowledge in matters of human importance. This skepticism has taken several forms. In addition to the public loss of confidence noted above, there has been a virulent ideological attack on the professions, mostly from the Left. Some critics, like Ivan Illich, have engaged in a wholesale debunking of professional claims to special expertise.[4] Others have tried to show that professionals misappropriate specialized knowledge in their own interests and the interest of a power elite intent on preserving its dominance over the rest of the society.[5] Finally, and most significantly, professionals themselves have shown signs recently of a loss of confidence in their claims to extraordinary knowledge.

As short a time ago as 1963, *Daedalus,* the highly regarded journal of the American Academy of Arts and Sciences, published a volume on the professions that began, "Everywhere in American life, the professions are triumphant." The editors of *Daedalus* found evidence of triumph in the new visibility of the professions, the growing demand for their services, and their expansion in nearly all fields of practice:

> We already devote an impressive percentage of the gross national product to the training of professionals . . . and the day is coming when the "knowledge industry" will occupy the same key role in the American economy that the railroad industry did a hundred years ago ... At the midpoint of the fifteen year period (1955-1970) in which we are attempting to double the number of college professors—an awesome task which is made even more difficult by the simultaneous and equally grandiose expansion plans of all the other traditional professions, the spectacular proliferation of new professions and the increasing professionalization of business life—America has become more cognizant of the professions, and more dependent on their services, than at any previous time in our history. Thorsten Veblen's sixty-year-old dream of a professionally run society has never been closer to realization.[6]

The editors of *Daedalus* were by no means alone in their assessment of the situation. It was generally believed both that social needs for technical expertise were growing and that, as a cause and consequence of this growth, a professional knowledge industry had come into being. Richard Hofstadter wrote of the once self-sufficient "common man,"

> he cannot even make his breakfast without using devices, more or less mysterious to him, which expertise has put at his disposal; and when he sits down to breakfast and looks at his morning newspaper he reads about a whole range of vital and intricate issues and acknowledges, if he is candid with himself, that he has not acquired competence to judge most of them.[7]

In his commencement address at Yale in 1962, John Kennedy had

urged his young audience to "participate... in the solution of the problems that pour upon us, requiring the most sophisticated solutions to complex and obstinate issues."[8]

There were many references to a "second scientific revolution" which was producing a "knowledgeable society,"[9] an "active society," a "post-industrial society,"[10] organized around professional competence.

> The prodigious and increasing resources poured into research, the large and increasing numbers of trained people working on various natural and social "problems," and the expanding productivity resulting from this work is, at least in size, a new factor in social and ... in political life. This "second scientific revolution" . . . reflects both a new appreciation of the role of scientific knowledge and a new merger of western organization and scientific skills.[11]

Professionals in the labor force had risen from 4 percent in 1900, to 8 percent in 1950, to 13 percent in 1966.[12] Daniel Bell predicted that professional and technical workers would reach 15 percent of the labor force by 1975 and might well rise to 25 percent by the year 2000.[13] "The specialist in his field must be supreme," as one commentator noted, "for who, other than another similarly qualified specialist, can challenge him?"[14] Even the critics of the professions conceded that it had become impossible to conceive of a modern nation without professions.[15]

In the meantime, as the professions geared up to meet the escalating demand for their services, they suffered from overload. In the *Daedalus* volume, the essay on medicine spoke of the overtaxed physician and of the task of coordinating the proliferating specialties which had arisen out of successful medical research and practice. The essay on science complained of the dangers to scientific professionalism inherent in the bureaucracies which had grown up around scientific research. The distinguished representative of the law stressed the difficulties in maintaining the independence of the bar, the "real problem ... of making legal services available on a wider basis,"[16]

and the problem of managing the "burgeoning mass of data to be assimilated."[17] The teacher, the military professional, even the politician, expressed similar sentiments. As Kenneth Lynn observed,

> It is notable how many of the contributors to this symposium emphasize the multiplicity of demands that are made on the contemporary clergyman, teacher, doctor and scientists.[18]

In nearly all articles, the note most sharply sounded was the problem of a success attributed, in Bernard Barber's words, to the fact that:

> the generalized knowledge and the community orientation characteristic of professional behavior are indispensable in our society as we now know it and as we want it to be. Indeed, our kind of society can now maintain its fundamental character only by enlarging the scope for professional behavior.[19]

The success of the professionals was thought to be due, in short, to the explosion of the "knowledge industry" whose output it was the function of the professional to apply with rigor, probity, and "community orientation" to the goals and problems of American life.

The only jarring voices in this hymn of confident approbation came from the representatives of divinity and city planning. James Gustafson spoke of "the clergyman's dilemma." The clergy, he observed,

> retains a loyalty to ancient traditions in thought, in institutional life and practice. Yet it cannot simply rest its case for contemporary validity in its faithfulness to the ancient and honorable paths of the fathers. The overused phrase "the problem of relevance" points to the reality of its dilemma ... [20]

And William Alonso spoke of his profession's "lagging understanding":

> In the past half-century our cities have outgrown our concepts and our tools, and I have tried to show how the lagging understanding of the changes in kind that go with changes in size has led us to try remedies which are unsuited to the ills of our urban areas ... [21]

Yet in the period between 1963 and 1981, the expression of lagging understandings, unsuitable remedies, and professional dilemmas has become the norm, and the note of triumphant confidence in the knowledge industry is hardly to be heard at all. For in these years, both professional and layman have suffered through public events which have undermined belief in the competence of expertise and brought the legitimacy of the professions into serious question.

The nation had been enmeshed in a disastrous war which had caused it to seem at war with itself. The professional representatives of science, technology, and public policy had done very little to prevent or stop that war or to heal the rifts it produced. On the contrary, professionals seemed to have a vested interest in prolonging the conflict.

A series of announced national crises—the deteriorating cities, poverty, the pollution of the environment, the shortage of energy—seemed to have roots in the very practices of science, technology, and public policy that were being called upon to alleviate them.

Government-sponsored "wars" against such crises seemed not to produce the expected results; indeed, they often seemed to exacerbate the crises. The success of the space program seemed not to be replicable when the problems to be solved were the tangled sociotechno-politico-economic predicaments of public life. The concept of the "technological fix" came into bad odor. Indeed, some of the solutions advocated by professional experts were seen as having created problems as bad as or worse than those they had been designed to solve. Just as urban renewal had emerged in the early sixties as a destroyer of neighborhoods, its unexpected consequences attributed by critics like William Alonso to the weakness of its underlying theory, so in fields as

diverse as housing, criminal justice, social services, welfare, and transportation, the most promising solutions, painstakingly worked out and advocated by the experts, came to be seen as problematic.[22] They were ineffective, they created new problems, they were derived from theories which had been shown to be fragile and incomplete. To some critics, the public predicaments of the society began to seem less like problems to be solved through expertise than like dilemmas whose resolutions could come about only through moral and political choice.[23]

Advocates for peace and for the civil rights of minorities joined forces and turned against the experts whom they saw as instruments of an all-powerful establishment. Around such issues as environmental pollution, consumer exploitation, the inequity and high cost of medical care, the perpetuation of social injustice, scientists and scientifically trained professionals found themselves in the unfamiliar role of villain.

Shortages became gluts. The 1970 census revealed that we had grossly overestimated the demand for teachers, at all levels of our education system. The shortage of scientists and engineers, so visible in the late 1950s, had evaporated by the mid 1960s. Even the much-discussed shortage of physicians began to seem, by the early 1970s, to be less a shortage than an unwillingness on the part of physicians to serve where they were most needed.

With the scandals of Medicare and Medicaid, with Watergate and its aftermath, the public image of the professions was further tarnished. Apparently professionals could not be counted on to police themselves, to live up to standards of probity which set them above the ethical level of the general public. Like everyone else, they seemed ready to put their special status to private use.

Cumulatively, these events not only undermined particular social programs, creating doubts about their underlying strategies of intervention and models of the world, but generated a pervasive sense of the complexity of the phenomena with which scientists and professionals in general were attempting to deal. The events of the mid-1960s and early 1970s eroded the

confidence of the public, and of the professionals themselves, that there existed an armamentarium of theories and techniques sufficient to remove the troubles that beset society. Indeed, these troubles seemed, at least in part, attributable to the overweening pride of professional expertise.

In 1982, there is no profession which would celebrate itself in the triumphant tones of the 1963 *Daedalus* volume. In spite of the continuing eagerness of the young to embark on apparently secure and remunerative professional careers, the professions are in the midst of a crisis of confidence and legitimacy. In public outcry, in social criticism, and in the complaints of the professionals themselves, the long-standing professional claim to a monopoly of knowledge and social control is challenged—first, because professionals do not live up to the values and norms which they espouse, and second, because they are ineffective.

Professionals claim to contribute to social well-being, put their clients' needs ahead of their own, and hold themselves accountable to standards of competence and morality. But both popular and scholarly critics accuse the professions of serving themselves at the expense of their clients, ignoring their obligations to public service, and failing to police themselves effectively.[24] As one observer put it, "the more powerful the professions, the more serious the dangers of laxness in concern for public service and zealousness in promoting the practitioners' interests."[25] Surveys of client populations reveal a widespread belief that professionals overcharge for their services, discriminate against the poor and powerless in favor of the rich and powerful, and refuse to make themselves accountable to the public.[26] Among younger professionals and students, there are many who find the professions without real interest in the values they are supposed to promote: lawyers have no real interest in justice or compassion; physicians, in the equitable distribution of quality health care; scientists and engineers, in the beneficence and safety of their technologies.[27]

Evidence of professional ineffectiveness has been presented in

scholarly and journalistic exposés of professionally managed disasters—the Vietnam War, the Bay of Pigs, the nuclear accident at Three Mile Island, the near-bankruptcy of New York City, to name only a few examples of this genre.[28] Critics have called attention to the technical expert's disposition to deploy his techniques, whatever the consequences. Charles Reich, for example, describes the Bureau of Reclamation as "a dam building machine which will keep building dams as long as there is running water in a stream in the United States .. . [without reference to] the values that dams destroy." He concludes that

> professionals . . . can be counted on to do their job but not necessarily to define their job.[29]

And professionals have been loudly critical of their own failure to solve social problems, to keep from creating new problems, and to meet reasonable standards of competence in their service to their clients. In this vein, Warren Burger recently lashed out at the inadequate preparation and performance of trial lawyers in America, and David Rutstein was only among the first of many physicians to reflect publicly on the failure of the health-care system to keep pace with the enormous expansion of the nation's investment in medical research and technology.[30]

Some observers have also noted a trend toward deprofessionalization. Among such diverse professional groups as engineers, teachers, musicians, scientists, physicians, and statisticians, there has been a slackening of the labor market and a decline in economic status and working conditions, a pattern of institutional change which has been variously labelled "bureaucratization," "industrialization," or even "proletarianization" of the professions.[31] Professionals are unionizing in increasing numbers, apparently in recognition of their status as workers in a bureaucracy rather than as autonomous managers of their own careers.

The crisis of confidence in the professions, and perhaps also the decline in professional self-image, seems to be rooted in a

growing skepticism about professional effectiveness in the larger sense, a skeptical reassessment of the professions' actual contribution to society's well-being through the delivery of competent services based on special knowledge. Clearly, this skepticism is bound up with the questions of professional self-interest, bureaucratization, and subordination to the interests of business or government. But it also hinges centrally on the question of professional knowledge. Is professional knowledge adequate to fulfill the espoused purposes of the professions? Is it sufficient to meet the societal demands which the professions have helped to create?

The crisis of confidence in the professions may not depend solely on the question of professional knowledge. On the other hand, even the muckrakers and radical critics, who emphasize professional self-interest and subordination to class-interest, envisage a purification and restructuring of the professions so that society may gain a fuller, more justly distributed access to the benefits of their special knowledge.[32] There remains, even for these critics, the question of the adequacy of professional knowledge to the needs and problems of society.

Let us consider, then, how the crisis of confidence in the professions has been interpreted by professionals who have given serious thought in their own fields to the adequacy of professional knowledge. On the whole, their assessment is that professional knowledge is mismatched to the changing character of the situations of practice—the complexity, uncertainty, instability, uniqueness, and value conflicts which are increasingly perceived as central to the world of professional practice.

In such fields as medicine, management, and engineering, for example, leading professionals speak of a new awareness of a complexity which resists the skills and techniques of traditional expertise. As physicians have turned their attention from traditional images of medical practice to the predicament of the larger health care system, they have come to see the larger

system as a "tangled web" that traditional medical knowledge and skill cannot untangle. How can physicians influence a massively complex health care system which they do not understand and of which only a very small fraction is under their direct control?[33] The dean of a major school of management speaks of the inadequacy of established management theory and technique to deal with the increasingly critical task of "managing complexity."[34] The dean of a famous school of engineering observes that the nineteenth-century division of labor has become obsolete. Professionals are called upon to perform tasks for which they have not been educated, and "the niche no longer fits the education, or the education no longer fits the niche."[35]

Even if professional knowledge were to catch up with the new demands of professional practice, the improvement in professional performance would be transitory. The situations of practice are inherently unstable. Harvey Brooks, an eminent engineer and educator, argues that professions are now confronted with an "unprecedent requirement for adaptability":

> The dilemma of the professional today lies in the fact that both ends of the gap he is expected to bridge with his profession are changing so rapidly: the body of knowledge that he must use and the expectations of the society that he must serve. Both these changes have their origin in the same common factor— technological change ... The problem cannot be usefully phrased in terms of too much technology. Rather it is whether we can generate technological change fast enough to meet the expectations and demands that technology itself has generated. And the four professions—medicine, engineering, business management and education—must bear the brunt of responsibility for generating and managing this change. This places on the professional a requirement for adaptability that is unprecedented.[36]

The role of the physician will be continually reshaped, over the next decades, by the reorganization and rationalization of medical care; the proliferating roles of enterprise will call for a redefinition of the businessman's role; and architects will have to function in radically new ways as a consequence of the

introduction of new building technologies, new patterns of real estate and land development, and new techniques of information processing in design. As the tasks change, so will the demands for usable knowledge, and the patterns of task and knowledge are inherently unstable.[37]

The situations of practice are not problems to be solved but problematic situations characterized by uncertainty, disorder, and indeterminacy.[38] Russell Ackoff, one of the founders of the field of operations research, has recently announced to his colleagues that "the future of operations research is past"[39] because

> managers are not confronted with problems that are independent of each other, but with dynamic situations that consist of complex systems of changing problems that interact with each other. I call such situations *messes.* Problems are abstractions extracted from messes by analysis; they are to messes as atoms are to tables and charts . . . Managers do not solve problems: they manage messes.[40]

Ackoff argues that operations research has allowed itself to become identified with techniques, mathematical models, and algorithms, rather than with "the ability to formulate management problems, solve them, and implement and maintain their solutions in turbulent environments."[41] Problems are interconnected, environments are turbulent, and the future is indeterminate just in so far as managers can shape it by their actions. What is called for, under these conditions, is not only the analytic techniques which have been traditional in operations research, but the active, synthetic skill of "designing a desirable future and inventing ways of bringing it about."[42]

The situations of practice are characterized by unique events. Erik Erikson, the psychiatrist, has described each patient as "a universe of one,"[43] and an eminent physician has claimed that "85 percent of the problems a doctor sees in his office are not in the book."[44] Engineers encounter unique problems of design and are called upon to analyze failures of structures or materials under

conditions which make it impossible to apply standard tests and measurements.[45] The unique case calls for an art of practice which "might be taught, if it were constant and known, but it is not constant."[46]

Practitioners are frequently embroiled in conflicts of values, goals, purposes, and interests. Teachers are faced with pressures for increased efficiency in the context of contracting budgets, demands that they rigorously "teach the basics," exhortations to encourage creativity, build citizenship, help students to examine their values. Workers in the fields of social welfare are also torn between a professional code which advocates attention to persons and bureaucratic pressure for increased efficiency in processing cases. School superintendants, industrial managers, and public administrators are asked to respond to the conflicting demands of the many different groups which hold a stake in their enterprises. Professionals engaged in research and development are not infrequently torn between a "professional" concern for technological elegance, consumer safety, or social well-being, and an institutional demand for short-term return on investment.

In some professions, awareness of uncertainty, complexity, instability, uniqueness, and value conflict has led to the emergence of professional pluralism. Competing views of professional practice—competing images of the professional role, the central values of the profession, the relevant knowledge and skills—have come into good currency. Leston Havens has written about the "babble of voices" which confuses practitioners in the field of psychotherapy.[47] Social workers have produced multiple, shifting images of the nature of their practice, as have architects and town planners.[48] Each view of professional practice represents a way of functioning in situations of indeterminacy and value conflict, but the multiplicity of conflicting views poses a predicament for the practitioner who must choose among multiple approaches to practice or devise his own way of combining them.

In sum, when leading professionals write or speak about their own crisis of confidence, they tend to focus on the mismatch of traditional patterns of practice and knowledge to features of the practice situation—complexity, uncertainty, instability, uniqueness, and value conflict—of whose importance they are becoming increasingly aware.

Surely this is a laudable exercise in self-criticism. Nevertheless, there is something puzzling about the translation of wavering confidence in professional expertise into these particular accounts of the troubles of the professions. If it is true, for example, that social reality has shifted out from under the nineteenth-century division of labor, creating new zones of complexity and uncertainty, it is also true that practitioners in such fields as management and industrial technology do sometimes find ways to make sense of complexity and reduce uncertainty to manageable risk.

If it is true that there is an irreducible element of art in professional practice, it is also true that gifted engineers, teachers, scientists, architects, and managers sometimes display artistry in their day-to-day practice. If the art is not invariant, known, and teachable, it appears nonetheless, at least for some individuals, to be learnable.

If it is true that professional practice has at least as much to do with finding the problem as with solving the problem found, it is also true that problem setting is a recognized professional activity. Some physicians reveal skills in finding the problems of particular patients in ways that go beyond the conventional boundaries of medical diagnosis. Some engineers, policy analysts, and operations researchers have become skilled at reducing "messes" to manageable plans. For some administrators, the need to "find the right problem" has become a conscious principle of action.

And if it is true, finally, that there are conflicting views of professional practice, it is also true that some practitioners do manage to make a thoughtful choice, or even a partial synthesis,

from the babble of voices in their professions.

Why, then, should leading professionals and educators find these phenomena so disturbing? Surely they are not unaware of the artful ways in which some practitioners deal competently with the indeterminacies and value conflicts of practice. It seems, rather, that they are disturbed because they have no satisfactory way of describing or accounting for the artful competence which practitioners sometimes reveal in what they do. They find it unsettling to be unable to make sense of these processes in terms of the model of professional knowledge which they have largely taken for granted. Complexity, instability, and uncertainty are not removed or resolved by applying specialized knowledge to well-defined tasks. If anything, the effective use of specialized knowledge depends on a prior restructuring of situations that are complex and uncertain. An artful practice of the unique case appears anomalous when professional competence is modelled in terms of application of established techniques to recurrent events. Problem setting has no place in a body of professional knowledge concerned exclusively with problem solving. The task of choosing among competing paradigms of practice is not amenable to professional expertise.

The events which led from the "triumphant professions" of the early 1960s to the skepticism and unease of the 1970s and early 1980s have been at least as apparent to the professionals as to the general public. But the sense of confusion and unease which is discernable among leading professionals has an additional source. Professionals have been disturbed to find that they cannot account for processes they have come to see as central to professional competence. It is difficult for them to imagine how to describe and teach what might be meant by making sense of uncertainty, performing artistically, setting problems, and choosing among competing professional paradigms, when these processes seem mysterious in the light of the prevailing model of professional knowledge.

We are bound to an epistemology of practice which leaves us

at a loss to explain, or even to describe, the competences to which we now give overriding importance.

2
From Technical Rationality to Reflection-in-Action

The Dominant Epistemology of Practice

According to the model of Technical Rationality—the view of professional knowledge which has most powerfully shaped both our thinking about the professions and the institutional relations of research, education, and practice—professional activity consists in instrumental problem solving made rigorous by the application of scientific theory and technique. Although all occupations are concerned, on this view, with the instrumental adjustment of means to ends, only the professions practice rigorously technical problem solving based on specialized scientific knowledge.

The model of Technical Rationality has exerted as great an influence on scholarly writing about the professions as on critical exposes of the role of the professions in the larger society. In the 1930s, for example, one of the earliest students of the professions asserted that

> it is not difficult to account in general for the emergence of the new professions. Large-scale organization has favored specialization. Specialized occupations have arisen around the new scientific knowledge.[1]

In a major book on the professions, published in 1970, Wilbert Moore embraced Alfred North Whitehead's distinction between a profession and an avocation. An avocation is "the antithesis to a

profession" because it is "based upon customary activities and modified by the trial and error of individual prac-tice."[2] In contrast, Moore said, a profession

> involves the application of general principles to specific problems, and it is a feature of modern societies that such general principles are abundant and growing.[3]

The same author argues further that professions are highly specialized occupations, and that

> the two primary bases for specialization within a profession are (1) the substantive field of knowledge that the specialist professes to command and (2) the technique of production or application of knowledge over which the specialist claims mastery.[4]

Finally, a recent critic of professional expertise sees the professional's claim to uniqueness as a " . . . preoccupation with a specialized skill premised on an underlying theory."[5]

The prototypes of professional expertise in this sense are the "learned professions" of medicine and law and, close behind these, business and engineering. These are, in Nathan Glazer's terms, the "major" or "near-major" professions.[6] They are distinct from such "minor" professions as social work, librarianship, education, divinity, and town planning. In the essay from which these terms are drawn, Glazer argues that the schools of the minor professions are hopelessly nonrigorous, dependent on representatives of academic disciplines, such as economics or political science, who are superior in status to the professions themselves. But what is of greatest interest from our point of view, Glazer's distinction between major and minor professions rests on a particularly well-articulated version of the model of Technical Rationality. The major professions are "disciplined by an unambiguous end—health, success in litigation, profit— which settles men's minds,"[7] and they operate in stable institutional contexts. Hence they are grounded in systematic, fundamental knowledge, of which scientific knowledge is the proto type,[8] or

else they have "a high component of strictly technological knowledge based on science in the education which they provide."[9] In contrast, the minor professions suffer from shifting, ambiguous ends and from unstable institutional contexts of practice, and are *therefore* unable to develop a base of systematic, scientific professional knowledge. For Glazer, the development of a scientific knowledge base depends on fixed, unambiguous ends because professional practice is an instrumental activity. If applied science consists in cumulative, empirical knowledge about the means best suited to chosen ends, how can a profession ground itself in science when its ends are confused or unstable?

The systematic knowledge base of a profession is thought to have four essential properties. It is specialized, firmly bounded, scientific, and standardized. This last point is particularly important, because it bears on the paradigmatic relationship which holds, according to Technical Rationality, between a profession's knowledge base and its practice. In Wilbert Moore's words,

> If every professional problem were in all respects unique, solutions would be at best accidental, and therefore have nothing to do with expert knowledge. What we are suggesting, on the contrary, is that there are sufficient uniformities in problems and in devices for solving them to qualify the solvers as professionals . . . professionals apply very general principles, *standardized* knowledge, to concrete problems ... [10]

This concept of "application" leads to a view of professional knowledge as a hierarchy in which "general principles" occupy the highest level and "concrete problem solving" the lowest. As Edgar Schein has put it,[11] there are three components to professional knowledge:

1. An *underlying discipline* or *basic science* component upon which the practice rests or from which it is developed.

2. An *applied science* or *"engineering"* component from which many of the day-to-day diagnostic procedures and problem-solutions are derived.
3. A *skills and attitudinal* component that concerns the actual performance of services to the client, using the underlying basic and applied knowledge.[12]

The application of basic science yields applied science. Applied science yields diagnostic and problem-solving techniques which are applied in turn to the actual delivery of services. The order of application is also an order of derivation and dependence. Applied science is said to "rest on" the foundation of basic science. And the more basic and general the knowledge, the higher the status of its producer.

When the representatives of aspiring professions consider the problem of rising to full professional status, they often ask whether their knowledge base has the requisite properties and whether it is regularly applied to the everyday problems of practice. Thus, in an article entitled "The Librarian: From Occupation to Profession,"[13] the author states that

> the central gap is of course the failure to develop a general body of scientific knowledge bearing precisely on this problem, in the way that the medical profession with its auxiliary scientific fields has developed an immense body of knowledge with which to cure human diseases.

The sciences in which he proposes to ground his profession are "communications theory, the sociology or psychology of mass communications, or the psychology of learning as it applies to reading."[14] Unfortunately, however, he finds that

> most day-to-day professional work utilizes rather concrete rule-of-thumb local regulations and rules and major catalog systems . . . The problems of selection and organization are dealt with on a highly empiricist basis, concretely, with little reference to general scientific principles.[15]

And a social worker, considering the same sort of question, concludes that "social work is already a profession" because it has a basis in

> theory construction via systematic research. To generate valid theory that will provide a solid base for professional techniques requires the application of the scientific method to the service related problems of the profession. Continued employment of the scientific method is nurtured by and in turn reinforces the element of *rationality* ...[16]

It is by progressing along this route that social work seeks to "rise within the professional hierarchy so that it, too, might enjoy maximum prestige, authority, and monopoly which presently belong to a few top professions."[17]

If the model of Technical Rationality appeared only in such statements of intent, or in programmatic descriptions of professional knowledge, we might have some doubts about its dominance. But the model is also embedded in the institutional context of professional life. It is implicit in the institutionalized relations of research and practice, and in the normative curricula of professional education. Even when practitioners, educators, and researchers question the model of technical rationality, they are party to institutions that perpetuate it.

As one would expect from the hierarchical model of professional knowledge, research is institutionally separate from practice, connected to it by carefully defined relationships of exchange. Researchers are supposed to provide the basic and applied science from which to derive techniques for diagnosing and solving the problems of practice. Practitioners are supposed to furnish researchers with problems for study and with tests of the utility of research results. The researcher's role is distinct from, and usually considered superior to, the role of the practitioner.

> In the evolution of every profession there emerges the researcher-theoretician whose role is that of scientific investigation and theoretical systematization. In technological professions, a division of

> labor thereby evolves between the theory-oriented and the practice-oriented person. Witness the physician who prefers to attach himself to a medical research center rather than to enter private practice ... [18]

In a similar vein, Nathan Glazer speaks of the sociologist, political scientist, or economist who, when he is invited to bring his discipline to the school of a minor profession, manifests a level of status disturbingly superior to that of the resident practitioners. And in schools of engineering, which have been transformed into schools of engineering science, the engineering scientist tends to place his superior status in the service of values different from those of the engineering profession.[19]

The hierarchical separation of research and practice is also reflected in the normative curriculum of the professional school. Here the order of the curriculum parallels the order in which the components of professional knowledge are "applied." The rule is: first, the relevant basic and applied science; then, the skills of application to real-world problems of practice. Edgar Schein's study of professional education led him to describe the dominant curricular pattern as follows:

> Most professional school curricula can be analyzed in terms of the form and timing of these three elements [of professional knowledge]. Usually the professional curriculum starts with a common science core followed by the applied science elements. The attitudinal and skill components are usually labelled "practicum" or ' clinical work" and may be provided simultaneously with the applied science components or they may occur even later in the professional education, depending upon the availability of clients or the ease of simulating the realities that the professional will have to face.[20]

Schein's use of the term "skill" is of more than passing interest. From the point of view of the model of Technical Rationality institutionalized in the professional curriculum, real knowledge lies in the theories and techniques of basic and applied science. Hence, these disciplines should come first. "Skills" in the use of theory and technique to solve concrete problems should come

later on, when the student has learned the relevant sci-ence—first, because he cannot learn skills of application until he has learned applicable knowledge; and secondly, because skills are an ambiguous, secondary kind of knowledge. There is something disturbing about calling them "knowledge" at all.

Again, medicine is the prototypical example. Ever since the Flexner Report, which revolutionized medical education in the early decades of this century, medical schools have devoted the first two years of study to the basic sciences—chemistry, physiology, pathology—as "the appropriate foundation for later clinical training."[21] Even the physical arrangement of the curriculum reflects the basic division among the elements of professional knowledge:

> The separation of the medical school curriculum into two disjunctive stages, the preclinical and the clinical, reflects the division between theory and practice. The division also appears in the location of training and in medical school facilities. The sciences of biochemistry, physiology, pathology and pharmacology are learned from classrooms and laboratories, that is, in formal academic settings. More practical training, in clinical arts such as internal medicine, obstetrics and pediatrics, takes place in hospital clinics, within actual institutions of delivery.[22]

And teaching roles tend to reflect the same division:

> Medical school faculties tend to be divided between the PhD's and MD's, between teachers of basic science and those in clinical programs.[23]

Even though the law might be thought to have a dubious basis in science, the introduction of the still-dominant pattern of legal education—by Christopher Columbus Langdell at Harvard University in the 1880s and 1890s—followed the normative curricular model. In his address before the Harvard Law School in 1886, Langdell argued that "first, law is a science, and secondly ... all available materials of that science are contained in printed

books."[24] Langdell claimed that legal education is better conducted in a law school than in a lawyer's office because legal study is based upon broad, scientifically determined principles which cut across state lines.

> For Langdell claimed law was a science . . . this meant that its principles could be developed from analysis of prior court decisions and could be used to predict subsequent ones. Just as Charles William Eliot was introducing the experimental laboratory into the study of natural sciences at Harvard, so it was Langdell's claim, with the study of previously decided cases.[25]

Even the famous "case method" was originally grounded in the belief that the teaching of scientific principles should precede the development of skills in their application.

In his recent review of the Harvard School of Business Administration, the school which first adapted Langdell's method to management education, Derek Bok, the current president of Harvard University, argues against case method. His argument reveals both his implicit belief in the normative curriculum of professional education and his adherence to the model of technical rationality.

Bok begins by noting that case teaching has certainly helped to keep professors "closely involved with the activities of real corporations" and has "forced them to work continuously at their teaching."[26] But he worries that

> although the case is an excellent device for teaching students to *apply* theory and technique, it does not provide an ideal way of communicating concepts and analytic methods in the first in-stance.[27]

Exclusive concentration on cases leaves students little time to "master analytic technique and conceptual material"—a limitation that has become more critical as "the corporate world grows more complex"—and it prevents faculty from engaging in "intensive work to develop better generalizations, theories and methods that can eventually be used to attack corporate

problems in more effective ways."[28] What is especially interesting in this argument is its misreading of what many business case teachers would consider the heart of their teaching: carefully guided analysis of innumerable cases drawn from real world business contexts in order to help students develop the generic problem-solving skills essential to effective management. Although some of the strongest advocates of case teaching admit that they cannot define these skills or relate them to general theory, they believe that the case method stands on its own unique merits.[29] President Bok has made a contrary assumption. He assumes that the business school faculty accepts both the mission to develop "better generalizations, theories and methods" and the normative idea of a curriculum which places general principles and methods before the skills of application. To faculty members who think they are engaged in a very different sort of educational enterprise, he argues from an unquestioned belief in a normative curriculum which derives from the model of Technical Rationality.

The Origins of Technical Rationality

It is striking that the dominant model of professional knowledge seems to its proponents to require very little justification. How comes it that in the second half of the twentieth century we find in our universities, embedded not only in men's minds but in the institutions themselves, a dominant view of professional knowledge as the application of scientific theory and technique to the instrumental problems of practice?

The answer to this question lies in the last three hundred years of the history of Western ideas and institutions. Technical Rationality is the heritage of Positivism, the powerful philosophical doctrine that grew up in the nineteenth century as an account of the rise of science and technology and as a social

movement aimed at applying the achievements of science and technology to the well-being of mankind. Technical Rationality is the Positivist epistemology of practice. It became institutionalized in the modern university, founded in the late nineteenth century when Positivism was at its height, and in the professional schools which secured their place in the university in the early decades of the twentieth century.

Because excellent accounts of this story exist elsewhere,[30] I shall only touch on its main points here.

Since the Reformation, the history of the West has been shaped by the rise of science and technology and by the industrial movement which was both cause and consequence of the increasingly powerful scientific world-view. As the scientific world-view gained dominance, so did the idea that human progress would be achieved by harnessing science to create technology for the achievement of human ends. This Technological Program,[31] which was first vividly expressed in the writings of Bacon and Hobbes, became a major theme for the philosophers of the Enlightenment in the eighteenth century, and by the late nineteenth century had been firmly established as a pillar of conventional wisdom. By this time, too, the professions had come to be seen as vehicles for the application of the new sciences to the achievement of human progress. The engineers, closely tied to the development of industrial technology, became a model of technical practice for the other professions. Medicine, a learned profession with origins in the medieval universities, was refashioned in the new image of a science-based technique for the preservation of health. And statecraft came to be seen as a kind of social engineering. As the professions evolved and proliferated, they became, increasingly, the principal agents of the Technological Program.

As the scientific movement, industrialism, and the Technological Program became dominant in Western society, a philosophy emerged which sought both to give an account of the triumphs of science and technology and to purge mankind of the

residues of religion, mysticism, and metaphysics which still prevented scientific thought and technological practice from wholly ruling over the affairs of men. It was in this spirit that, in the first half of the nineteenth century, Auguste Comte first expressed the three principal doctrines of Positivism. First, there was the conviction that empirical science was not just a form of knowledge but the only source of positive knowledge of the world. Second, there was the intention to cleanse men's minds of mysticism, superstition, and other forms of pseudo-knowledge. And finally, there was the program of extending scientific knowledge and technical control to human society, to make technology, as Comte said, "no longer exclusively geometrical, mechanical or chemical, but also and primarily political and moral."[32]

By late nineteenth century, Positivism had become a dominant philosophy. And in the early twentieth century, in the theories of the Vienna Circle, its epistemological program took on a beguiling clarity. Meaningful propositions were held to be of two kinds, either the analytic and essentially tautological propositions of logic and mathematics, or the empirical propositions which express knowledge of the world. The truth of the former was to be grounded in the fact that their negation implies a self-contradiction; the truth of the latter, in some relevant empirical observation. The only significant statements about the world were those based on empirical observation, and all disagreements about the world could be resolved, in principle, by reference to observable facts. Propositions which were neither analytically nor empirically testable were held to have no meaning at all. They were dismissed as emotive utterance, poetry, or mere nonsense.

As Positivists became increasingly sophisticated in their efforts to explain and justify the exclusivity of scientific knowledge, they recognized to what extent observational statements were theory-laden, and found it necessary to ground empirical knowledge in irreducible elements of sensory experience. They

began to see laws of nature not as facts inherent in nature but as constructs created to explain observed phenomena, and science became for them a hypothetico-deductive system. In order to account for his observations, the scientist constructed hypotheses, abstract models of an unseen world which could be tested only indirectly through deductions susceptible to confirmation or disconfirmation by experiment. The heart of scientific inquiry consisted in the use of crucial experiments to choose among competing theories of explanation.

In the light of such Positivist doctrines as these, practice appeared as a puzzling anomaly. Practical knowledge exists, but it does not fit neatly into Positivist categories. We cannot readily treat it as a form of descriptive knowledge of the world, nor can we reduce it to the analytic schemas of logic and mathematics. Positivism solved the puzzle of practical knowledge in a way that had been foreshadowed by the Technological Program and by Comte's program for applying science to morality and politics. Practical knowledge was to be construed as knowledge of the relationship of means to ends. Given agreement about ends,[33] the question, "How ought I to act?" could be reduced to a merely instrumental question about the means best suited to achieve one's ends. Disagreement about means could be resolved by reference to facts concerning the possible means, their relevant consequences, and the methods for comparing them with respect to the chosen ends of action. Ultimately, the instrumental question could be resolved by recourse to experiment. And as men built up scientific understandings of cause and effect, causal relationships could be mapped onto instrumental ones. It would be possible to select the means appropriate to one's ends by applying the relevant scientific theory. The question, "How ought I to act?" could become a scientific one, and the best means could be selected by the use of science-based technique.

In the late nineteenth and early twentieth centuries, the professions of engineering and medicine achieved dramatic successes in reliably adjusting means to ends and became models

of instrumental practice. The engineer's design and analysis of materials and artifacts, the physician's diagnosis and treatment of disease, became prototypes of the science-based, technical practice which was destined to supplant craft and artistry. For according to the Positivist epistemology of practice, craft and artistry had no lasting place in rigorous practical knowledge.

Universities came of age in the United States, assumed their now familiar structure and styles of operation, in the late nineteenth and early twentieth centuries when science and technology were on the rise and the intellectual hegemony of Positivism was beginning to be established. Although other traditions of thought were never wholly extinguished in American univer-sities—indeed, in some places managed to preserve a kind of local dominance—nevertheless, in the United States more than in any other nation except Germany, the very heart of the university was given over to the scientific enterprise, to the ethos of the Technological Program, and to Positivism.

Indeed, it was from the Germanic tradition, carried to the United States after the Civil War by young American graduates of the German universities, that the new concept of the university as a multidisciplinary research institution took root in the United States, first in Johns Hopkins University, the founding of which was "perhaps the most decisive single event in the history of learning in the Western hemisphere."[34] And it was from the model of Johns Hopkins that other universities began to mold themselves around the German ideal and to manifest, as Edward Shils has written,

> a drift of opinion [toward] . .. the appreciation of knowledge, particularly knowledge of a scientific character. There was general agreement that knowledge could be accepted as knowledge only if it rested on empirical evidence, rigorously criticized and rationally analyzed ... The knowledge which was appreciated was secular knowledge which continued the mission of sacred knowledge, complemented it, led to it, or replaced it; fundamental, systematically acquired knowledge was thought in some way to be a step toward

> redemption. This kind of knowledge held out the prospect of the transfiguration of life by improving man's control over the resources of nature and over the powers that weaken his body; it offered the prospect of better understanding of society which it was thought would lead to the improvement of society.[35]

With the coming of the new model of the university, the Positivist epistemology found expression in normative ideas about the proper division of labor between the university and the professions. As Thorsten Veblen argued in *The Higher Learning in America,* "The difference between the modern university and the lower and professional schools is broad and simple; not so much a difference of degree as of kind."[36] The universities have a higher mission to "fit men for a life of science and scholarship; and [they are] accordingly concerned with such discipline only as they will give efficiency in the pursuit of knowledge"; whereas the lower schools are occupied with "instilling such knowledge and habits as will make their pupils fit citizens of the world in whatever position in the fabric of workday life they may fall."[37] The proper relation between the higher and lower schools is one of separation and exchange. Quite simply, the professions are to give their practical problems to the university, and the university, the unique source of research, is to give back to the professions the new scientific knowledge which it will be their business to apply and test. Under no conditions are the technical men of the lower schools to be allowed into the university, for this would put them in a false position

> which unavoidably leads them to court a specious appearance of scholarship and so to invest their technological discipline with a degree of pedantry and sophistication; whereby it is hoped to give these schools and their work some scientific and scholarly pres-tige.[38]

Veblen's battle was, of course, quixotic. The evils against which he railed at the University of Chicago in 1916 were harbingers of a general trend. The survival-oriented interests of the professions reinforced the interest of university boards of governors in

appropriating schools of useful knowledge. The professions did enter the new universities, in increasing numbers, until by 1965 Bernard Barber could write in *Daedalus* that "nearly all the well-established professions are located in the universities."[39]

But for this, the professionalizing occupations paid a price. They had to accept the Positivist epistemology of practice which was now built into the very tissue of the universities. And they had also to accept the fundamental division of labor on which Veblen had placed so great an emphasis. It was to be the business of university-based scientists and scholars to create the fundamental theory which professionals and technicians would apply to practice. The function of the professional school would be

> the transmission to its students of the generalized and systematic knowledge that is the basis of professional performance.[40]

But this division of labor reflected a hierarchy of kinds of knowledge which was also a ladder of status. Those who create new theory were thought to be higher in status than those who apply it, and the schools of "higher learning" were thought to be superior to the "lower."

Thus were planted the seeds of the Positivist curriculum, typical of professional schools in American universities, and the roots of the now-familiar split between research and practice.

Emerging Awareness of the Limits of Technical Rationality

Although it was in the early decades of the twentieth century that occupations professionalized and professional schools sought their places in the universities, it was World War II that gave a major new impetus both to the Technological Program and to the

Positivist epistemology of practice.

In World War II, technologists drew upon scientific research as never before. Vannevar Bush created the first large scale national research and development institute, the National Research and Development Corporation. The new discipline of operations research grew out of the American and British efforts to use applied mathematics for bomb tracking and submarine search. And the Manhattan project became the very symbol of the successful use of science-based technology for national ends. Its lesson seemed to be this: If a great social objective could be clearly defined, if a national commitment to it could be mustered, if unlimited resources could be poured into the necessary research and development, then any such objective could be achieved. The greatest beneficiary of this lesson was the institution of research and development itself. But as a side effect, there was also a reinforcement of the idea of scientific research as a basis for professional practice.

Following World War II, the United States government began an unparalleled increase in the rate of spending for research. As government spending for research increased, research institutions proliferated. Some were associated with the universities, others stood outside them. All were organized around the production of new scientific knowledge and were largely promoted on the basis of the proposition that the production of new scientific knowledge could be used to create wealth, achieve national goals, improve human life, and solve social problems. Nowhere was the rate of increase in research spending more dramatic, and nowhere were the results of that spending more visible, than in the field of medicine. The great centers of medical research and teaching were expanded, and new ones were created. The medical research center, with its medical school and its teaching hospital, became the institutional model to which other professions aspired. Here was a solid base of fundamental science, an equally solid body of applied clinical science, and a profession which had geared itself to implement

the ever-changing products of research. Other professions, hoping to achieve some of medicine's effectiveness and prestige, sought to emulate its linkage of research and teaching institutions, its hierarchy of research and clinical roles, and its system for connecting basic and applied research to practice.

The prestige and apparent success of the medical and engineering models exerted a great attraction for the social sciences. In such fields as education, social work, planning, and policy making, social scientists attempted to do research, to apply it, and to educate practitioners, all according to their perceptions of the models of medicine and engineering. Indeed, the very language of social scientists, rich in references to measurement, controlled experiment, applied science, laboratories, and clinics, was striking in its reverence for these models.

In the mid-1950s, the Soviet launching of Sputnik gave a further impetus to national investment in science and technology. Sputnik shocked America into increased support for science, especially basic science, and created a new sense of urgency about the building of a society based on science. Suddenly we became acutely aware of a national shortage of professionals—scientists and engineers, but also physicians and teachers—who were seen as necessary to the development and application of scientific knowledge. It was the cumulative impact of these national responses to World War II and Sputnik which set the stage for the triumph of professionalism, the triumph celebrated in the *Daedalus* issue of 1963.

Between 1963 and 1982, however, both the general public and the professionals have become increasingly aware of the flaws and limitations of the professions. As I have pointed out in chapter 1, the professions have suffered a crisis of legitimacy rooted both in their perceived failure to live up to their own norms and in their perceived incapacity to help society achieve its objectives and solve its problems. Increasingly we have become aware of the importance to actual practice of phenomena—complexity, uncertainty, instability, uniqueness, and

value-conflict—which do not fit the model of Technical Rationality. Now, in the light of the Positivist origins of Technical Rationality, we can more readily see why these phenomena are so troublesome.

From the perspective of Technical Rationality, professional practice is a process of problem *solving.* Problems of choice or decision are solved through the selection, from available means, of the one best suited to established ends. But with this emphasis on problem solving, we ignore problem *setting,* the process by which we define the decision to be made, the ends to be achieved, the means which may be chosen. In real-world practice, problems do not present themselves to the practitioner as givens. They must be constructed from the materials of problematic situations which are puzzling, troubling, and uncertain. In order to convert a problematic situation to a problem, a practitioner must do a certain kind of work. He must make sense of an uncertain situation that initially makes no sense. When professionals consider what road to build, for example, they deal usually with a complex and ill-defined situation in which geographic, topological, financial, economic, and political issues are all mixed up together. Once they have somehow decided what road to build and go on to consider how best to build it, they may have a problem they can solve by the application of available techniques; but when the road they have built leads unexpectedly to the destruction of a neighborhood, they may find themselves again in a situation of uncertainty.

It is this sort of situation that professionals are coming increasingly to see as central to their practice. They are coming to recognize that although problem setting is a necessary condition for technical problem solving, it is not itself a technical problem. 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.

Even when a problem has been constructed, it may escape the categories of applied science because it presents itself as unique or unstable. In order to solve a problem by the application of existing theory or technique, a practitioner must be able to map those categories onto features of the practice situation. When a nutritionist finds a diet deficient in lysine, for example, dietary supplements known to contain lysine can be recommended. A physician who recognizes a case of measles can map it onto a system of techniques for diagnosis, treatment, and prognosis. But a unique case falls outside the categories of applied theory; an unstable situation slips out from under them. A physician cannot apply standard techniques to a case that is not in the books. And a nutritionist attempting a planned nutritional intervention in a rural Central American community may discover that the intervention fails because the situation has become something other than the one planned for.

Technical Rationality depends on agreement about ends. When ends are fixed and clear, then the decision to act can present itself as an instrumental problem. But when ends are confused and conflicting, there is as yet no "problem" to solve. A conflict of ends cannot be resolved by the use of techniques derived from applied research. It is rather through the nontechnical process of framing the problematic situation that we may organize and clarify both the ends to be achieved and the possible means of achieving them.

Similarly, when there are conflicting paradigms of professional practice, such as we find in the pluralism of psychiatry, social work, or town planning, there is no clearly established context for the use of technique. There is contention over multiple ways of framing the practice role, each of which entrains a distinctive approach to problem setting and solving. And when practitioners do resolve conflicting role frames, it is through a kind of inquiry which falls outside the model of Technical Rationality. Again, it

is the work of naming and framing that creates the conditions necessary to the exercise of technical expertise.

We can readily understand, therefore, not only why uncertainty, uniqueness, instability, and value conflict are so troublesome to the Positivist epistemology of practice, but also why practitioners bound by this epistemology find themselves caught in a dilemma. Their definition of rigorous professional knowledge excludes phenomena they have learned to see as central to their practice. And artistic ways of coping with these phenomena do not qualify, for them, as rigorous professional knowledge.

This dilemma of "rigor or relevance" arises more acutely in some areas of practice than in others. In the varied topography of professional practice, there is a high, hard ground where practitioners can make effective use of research-based theory and technique, and there is a swampy lowland where situations are confusing "messes" incapable of technical solution. The difficulty is that the problems of the high ground, however great their technical interest, are often relatively unimportant to clients or to the larger society, while in the swamp are the problems of greatest human concern. Shall the practitioner stay on the high, hard ground where he can practice rigorously, as he understands rigor, but where he is constrained to deal with problems of relatively little social importance? Or shall he descend to the swamp where he can engage the most important and challenging problems if he is willing to forsake technical rigor?

In such "major" professions as medicine, engineering, or agronomy there are zones where practitioners can function as technical experts. But there are also zones where the major professions resemble the minor ones. Medical technologies such as kidney dialysis generate demands in excess of the nation's willingness to invest in medical care. Engineering that seems powerful and elegant when judged from a narrowly technical perspective may also carry unacceptable risks to environmental quality or human safety. Large-scale, industrialized agriculture

situations of uncertainty, instability, uniqueness, and value conflict.

Knowing-in-action. Once we put aside the model of Technical Rationality, which leads us to think of intelligent practice as an *application* of knowledge to instrumental decisions, there is nothing strange about the idea that a kind of knowing is inherent in intelligent action. Common sense admits the category of know-how, and it does not stretch common sense very much to say that the know-how is *in* the action—that a tightrope walker's know-how, for example, lies in, and is revealed by, the way he takes his trip across the wire, or that a big-league pitcher's know-how is in his way of pitching to a batter's weakness, changing his pace, or distributing his energies over the course of a game. There is nothing in common sense to make us say that know-how consists in rules or plans which we entertain in the mind prior to action. Although we sometimes think before acting, it is also true that in much of the spontaneous behavior of skillful practice we reveal a kind of knowing which does not stem from a prior intellectual operation.

As Gilbert Ryle has put it,

> What distinguishes sensible from silly operations is not their parentage but their procedure, and this holds no less for intellectual than for practical performances. "Intelligent" cannot be defined in terms of "intellectual" or "knowing *how*" in terms of "knowing *that*"; "thinking what I am doing" does not connote "both thinking what to do and doing it." When I do something intelligently . . . I am doing one thing and not two. My performance has a special procedure or manner, not special antecedents.[50]

And Andrew Harrison has recently put the same thought in this pithy phrase: when someone acts intelligently, he "acts his mind."[51]

Over the years, several writers on the epistemology of practice have been struck by the fact that skillful action often reveals a "knowing more than we can say." They have invented various