9 Thin Simplifications and Practical Knowledge: Mētis

No battle—Tarutino, Borodino, or Austerlitz—takes place as those who planned it anticipated. That is an essential condition.
—Tolstoy, *War and Peace*

We have repeatedly observed the natural and social failures of thin, formulaic simplifications imposed through the agency of state power. The utilitarian commercial and fiscal logic that led to geometric, monocropped, same-age forests also led to severe ecological damage. Where the formula had been applied with the greatest rigor, it eventually became necessary to attempt to restore much of the forest's original diversity and complexity—or rather, to create a "virtual" forest that would mimic the robustness and durability of the "prescientific" forest.

The planned "scientific city," laid out according to a small number of rational principles, was experienced as a social failure by most of its inhabitants. Paradoxically, the failure of the designed city was often averted, as was the case in Brasília, by practical improvisations and illegal acts that were entirely outside the plan. Just as the stripped-down logic behind the scientific forest was an inadequate recipe for a healthy, "successful" forest, so were the thin urban-planning schemata of Le Corbusier an inadequate recipe for a satisfactory human community.

Any large social process or event will inevitably be far more complex than the schemata we can devise, prospectively or retrospectively, to map it. Lenin had every reason, as a would-be head of the vanguard party, to emphasize military discipline and hierarchy in the revolutionary project. After the October Revolution, the Bolshevik state authorities had every reason, once again, to exaggerate the central, all-seeing role of the party in bringing the revolution about. And yet we know—and Lenin and Luxemburg knew—that the revolution had been a close call, relying more on the improvisations, missteps, and

strokes of luck that Tolstoy described in *War and Peace* than on the precision of a parade-ground drill.

The thin simplifications of agricultural collectivization and centrally planned production have met a comparable fate, whether on the collective farms of the former Soviet Union or in the ujamaa villages of Nyerere's Tanzania. Here again, the schemes that did not collapse altogether managed to survive thanks largely to desperate measures either not envisaged or else expressly prohibited by the plan. Thus an informal economy developed in Russian agriculture, operating on tiny private plots and and the "theft" of time, equipment, and commodities from the state sector and supplying most of the dairy products, fruit, vegetables, and meat in the Russian diet.[1] Thus the forcibly resettled Tanzanians successfully resisted collective production and drifted back to sites more suitable for grazing and cultivation. At times, the price of an unyielding imposition of state simplifications on agrarian life and production—Stalin's forced collectivization or China's Great Leap Forward—was famine. As often as not, however, state officials recoiled before the abyss and came to tolerate, if not condone, a host of informal practices that in fact underwrote the survival of the official scheme.

These rather extreme instances of massive, state-imposed social engineering illustrate, I think, a larger point about formally organized social action. In each case, the necessarily thin, schematic model of social organization and production animating the planning was inadequate as a set of instructions for creating a successful social order. By themselves, the simplified rules can never generate a functioning community, city, or economy. Formal order, to be more explicit, is always and to some considerable degree parasitic on informal processes, which the formal scheme does not recognize, without which it could not exist, and which it alone cannot create or maintain.

This homely insight has long been of great tactical value to generations of trade unionists who have used it as the basis of the work-to-rule strike. In a work-to rule action (the French call it *grève du zèle*), employees begin doing their jobs by meticulously observing every one of the rules and regulations and performing only the duties stated in their job descriptions. The result, fully intended in this case, is that the work grinds to a halt, or at least to a snail's pace. The workers achieve the practical effect of a walkout while remaining on the job and following their instructions to the letter. Their action also illustrates pointedly how actual work processes depend more heavily on informal understandings and improvisations than upon formal work rules. In the long work-to-rule action against Caterpillar, the large equipment manufacturer, for example, workers reverted to following the inefficient procedures specified by the engineers, knowing they would cost the company valuable time and quality, rather than continuing the more expeditious practices they had long ago devised on the job.[2] They were relying on the tested assumption that working strictly by the book is necessarily less productive than working with initiative.

This perspective on social order is less an analytical insight than a sociological truism. It does offer, however, a valuable point of departure for understanding why authoritarian, high-modernist schemes are potentially so destructive. What they ignore—and often suppress—are precisely the practical skills that underwrite any complex activity. My aim in this chapter is to conceptualize these practical skills, variously called know-how (*savoir faire* or *arts de faire*),[3] common sense, experience, a knack, or *mētis*. What are these skills? How are they created, developed, and maintained? What is their relation to formal epistemic knowledge? I hope to show that many forms of high modernism have replaced a valuable collaboration between these two dialects of knowledge with an "imperial" scientific view, which dismisses practical know-how as insignificant at best and as dangerous superstitions at worst. The relation between scientific knowledge and practical knowledge is, as we shall see, part of a political struggle for institutional hegemony by experts and their institutions. Taylorism and scientific agriculture are, on this reading, not just strategies of production, but also strategies of control and appropriation.

Mētis: The Contours of Practical Knowledge

Following the illuminating studies of Marcel Detienne and Jean-Pierre Vernant, we can find in the Greek concept of mētis a means of comparing the forms of knowledge embedded in local experience with the more general, abstract knowledge deployed by the state and its technical agencies.[4] Before elaborating the concept and its use, we will turn to a brief example in order to illustrate the vernacular character of local knowledge and ground the discussion that follows.

When the first European settlers in North America were wondering when and how to plant New World cultivars, such as maize, they turned to the local knowledge of their Native American neighbors for help. They were told by Squanto, according to one legend (Chief Massasoit, according to another), to plant corn when the oak leaves were the size of a squirrel's ear.[5] Embedded in this advice, however folkloric its ring today, is a finely observed knowledge of the succession of natural events in the New England spring. For Native Americans it was this *orderly* succession of, say, the skunk cabbage appearing, the willows be-

ginning to leaf, the red-wing blackbird returning, and the first hatch of the mayfly that provided a readily observable calendar of spring. While the timing of these events might be earlier or later in a given year and while the pace of their succession might be more drawn out or accelerated, the *sequence* of the events was almost never violated. As a rule of thumb, it was a nearly foolproof formula for avoiding a frost. We almost certainly distort Squanto's advice, as the colonists perhaps did, by reducing it to a single observation. Everything we know about indigenous technical knowledge suggests that it relies on an accumulation of many partly redundant signals. If other indications did not confirm the oak-leaf formula, a prudent planter might delay further.

Compare this advice to that based on more universalistic units of measurement. A typical local edition of *The Farmer's Almanac* is a case in point. It may suggest planting corn after the first full moon in May or after a specified date, such as May 20. In New England, at any rate, this advice would require considerable adjustment by latitude and altitude. A date that would serve for southern Connecticut would not suit Vermont; a date that worked in the valleys would not be right for the hills (especially the north-facing slopes); a date that worked near the coast would not work inland. And the almanac's date is almost certainly a fail-safe date, since the worst thing that could happen to an almanac publisher would be to have his or her advice lead to a crop failure. As a result of this commercial caution, some valuable growing time may have been lost in the interest of certainty.[6]

The Native American maxim, by contrast, is vernacular and local, keyed to common features of the local ecosystem; it inquires about oak leaves *in this place*, and not oak leaves in general. Despite its specificity, it travels remarkably well. It can be deployed successfully anywhere in temperate North America where there are oak trees and squirrels. The precision provided by the observed sequence almost certainly gains a few days of growing time while not appreciably raising the risk of planting before a hard frost.

Practical knowledge like Squanto's can, of course, be translated into more universalistic scientific terms. A botanist might observe that the first growth of oak leaves is made possible by rising ground and ambient temperatures, which also assure that maize will grow and that the probability of a killing frost is negligible. The mean soil temperature at a given depth might do just as well. Along these lines, the early nineteenth-century mathematician, Adolph Quetelet, turned his scientific eye to the mundane problem of when the lilacs would bloom in Brussels. He concluded, after much rigorous observation, that the lilacs burst into bloom "when the sum of the squares of the mean daily

temperature since the last frost added up to (4264C) squared."[7] Knowledge this certainly is! Given the techniques for making the required observations, it is probably quite accurate. But it is hardly practical. Quetelet's playful formula alerts us to a hallmark of most practical, local knowledge: it is as economical and accurate as it needs to be, no more and no less, for addressing the problem at hand.

One hesitates before introducing yet another unfamiliar term, such as "mētis," into this discussion. In this case, however, "mētis" seems to better convey the sorts of practical skills that I have in mind than do such plausible alternatives as "indigenous technical knowledge," "folk wisdom," "practical skills," techne, and so on.[8]

The concept comes to us from the ancient Greeks. Odysseus was frequently praised for having mētis in abundance and for using it to outwit his enemies and make his way home. Mētis is typically translated into English as "cunning" or "cunning intelligence." While not wrong, this translation fails to do justice to the range of knowledge and skills represented by mētis. Broadly understood, mētis represents a wide array of practical skills and acquired intelligence in responding to a constantly changing natural and human environment. Odysseus's mētis was in evidence, not only in his deceiving of Circe, the Cyclops, and Polyphemus and in binding himself to the mast to avoid the Sirens, but also in holding his men together, in repairing his ship, and in improvising tactics to get his men out of one tight spot after another. The emphasis is both on Odysseus's ability to adapt successfully to a constantly shifting situation *and* on his capacity to understand, and hence outwit, his human and divine adversaries.

All human activities require a considerable degree of mētis, but some activities require far more. To begin with skills that require adapting to a capricious physical environment, the acquired knowledge of how to sail, fly a kite, fish, shear sheep, drive a car, or ride a bicycle relies on the capacity for mētis. Each of these skills requires hand-eye coordination that comes with practice and a capacity to "read" the waves, the wind, or the road and to make the appropriate adjustments. One powerful indication that they all require mētis is that they are exceptionally difficult to teach apart from engaging in the activity itself. One might imagine trying to write down explicit instructions on how to ride a bicycle, but one can scarcely imagine that such instructions would enable a novice to ride a bicycle on the first try. The maxim "Practice makes perfect" was devised for such activities as this, inasmuch as the continual, nearly imperceptible adjustments necessary for riding a bicycle are best learned by having to make them. Only through an acquired "feel" for balanced motion do the required adjustments become

automatic.[9] No wonder that most crafts and trades requiring a touch or feel for implements and materials have traditionally been taught by long apprenticeships to master craftsmen.

There is no doubt that some individuals seem to get the hang of a particular skill and master it more quickly than most other people. But beyond this ineffable difference (which often spells the difference between competence and genius), riding a bike, sailing, fishing, shearing sheep, and so on can be learned through practice. Since every road, wind, stream, and sheep is different and continually changing, the best practitioner, like Odysseus, will have had experience under many different conditions. If your life depended on your ship coming through rough weather, you would surely prefer a successful captain with long experience to, say, a brilliant physicist who had analyzed the natural laws of sailing but who had never actually sailed a vessel.

Those specialists who deal with emergencies and disasters are also exemplary of mētis. Firefighters, rescue squads, paramedics, mine-disaster teams, doctors in hospital emergency rooms, crews that repair downed electrical lines, teams that extinguish fires in oil fields, and, as we shall see, farmers and pastoralists in precarious environments must respond quickly and decisively to limit damage and save lives. Although there are rules of thumb that can be and are taught, each fire or accident is unique, and half the battle is knowing which rules of thumb to apply in which order and when to throw the book away and improvise.

Red Adair's team, which has been hired worldwide to cap wellhead fires, was a striking and diagnostic case. Before the Gulf War of 1990, his was the only team with any appreciable "clinical" experience, and he could set his own price. Each fire presented new problems and required an inspired mixture of experience and improvisation. We can imagine, at almost opposite ends of a spectrum, Adair on one hand and a minor clerk performing highly repetitive steps on the other. Adair's job cannot, by definition, be reduced to a routine. He must *begin* with the unpredictable—an accident, a fire—and then devise the techniques and equipment (from an existing repertoire, to be sure, but one invented largely by him) required to extinguish that fire and cap that well.[10] The clerk, by contrast, deals with a predictable, routinized environment that can often be ordered in advance and down to the smallest detail. Adair cannot simplify his environment in order to apply a cookie-cutter solution.

The examples thus far introduced have been mostly concerned with the relation between people and their physical environment. But mētis equally applies to human interaction. Think of the complex physical activities that require constant adjustment to the movement, values,

desires, or gestures of others. Boxing, wrestling, and fencing require instant, quasi-automatic responses to an opponent's moves, which can be learned only through long practice of the activity itself. Here the element of deception enters as well. The successful boxer will learn to feint a move in order to provoke a response of which he can then take advantage. If we move from physical contests to such cooperative activities as dancing, music, or lovemaking, a similar practiced responsiveness born of experience is essential. Many sports combine both the cooperative and the competitive aspects of mētis. A soccer player must learn not only the moves of his or her teammates but also which *team* moves and fakes will deceive their opponents. Such skills, it is important to note, are both generic and particular; while each player may be more or less skilled at different facets of the game, each team has its particular combination of skills, its "chemistry," and each contest with an opposing team represents a challenge that is in some ways unique.[11]

On a much bigger, higher-stakes canvas, war diplomacy and politics more generally are mētis-laden skills. The successful practitioner, in each case, tries to shape the behavior of partners and opponents to his own ends. Unlike the sailor, who can adjust to the wind and the waves but not influence them directly, the general and the politician are in constant interaction with their counterparts, each of whom is trying to outfox the other. Adapting quickly and well to unpredictable events—both natural events, such as the weather, and human events, such as the enemy's move—and making the best out of limited resources are the kinds of skills that are hard to teach as cut-and-dried disciplines.

The necessarily implicit, experiential nature of mētis seems central. A simple experiment in implicit learning conducted by the philosopher Charles Peirce may help to convey something of the process. Peirce had people lift two weights and judge which of the two was heavier. At first, their discrimination was rather crude. But as they practiced for long periods, they became able to distinguish accurately quite minute differences in weight. They could not pinpoint what it was that they sensed or felt, but their actual capacity to discriminate grew enormously. Peirce took the results as evidence for a kind of subliminal communication via "faint sensations" between people. For our purposes, however, it illustrates a rudimentary kind of knowledge that can be acquired only by practice and that all but defies being communicated in written or oral form apart from actual practice.[12]

Surveying the range of examples that we have touched on, we can venture some preliminary generalizations about the nature of mētis and about where it is relevant. Mētis is most applicable to broadly sim-

ilar but never precisely identical situations requiring a quick and practiced adaptation that becomes almost second nature to the practitioner. The skills of mētis may well involve rules of thumb, but such rules are largely acquired through practice (often in formal apprenticeship) and a developed feel or knack for strategy. Mētis resists simplification into deductive principles which can successfully be transmitted through book learning, because the environments in which it is exercised are so complex and nonrepeatable that formal procedures of rational decision making are impossible to apply. In a sense, mētis lies in that large space between the realm of genius, to which no formula can apply, and the realm of codified knowledge, which can be learned by rote.

The Art of the Locality

Why are the rules of thumb that can be derived from any skilled craft still woefully inadequate to its practice? Artists or cooks, Michael Oakeshott has noted, may in fact write about their art and try to boil it down to technical knowledge, but what they write represents not much of what they know but rather only that small part of their knowledge that can be reduced to exposition. Knowing a craft's shorthand rules is a very long way from its accomplished performance: "These rules and principles are mere abridgements of the activity itself; they do not exist in advance of the activity, they cannot properly be said to govern it and they cannot provide the impetus of the activity. A complete mastery of the principles may exist alongside a complete inability to pursue the activity to which they refer, for the pursuit of the activity does not consist in the application of these principles; and even if it did, the knowledge of how to apply them (the knowledge of actually pursuing the activity) is not given in a knowledge of them."[13]

Knowing how and when to apply the rules of thumb *in a concrete situation* is the essence of mētis. The subtleties of application are important precisely because mētis is most valuable in settings that are mutable, indeterminant (some facts are unknown), and particular.[14] Although we shall return to the question of indeterminacy and change, here I want to explore further the localness and particularity of mētis.

In seamanship, the difference between the more general knowledge of navigation and the more particular knowledge of piloting is instructive. When a large freighter or passenger liner approaches a major port, the captain typically turns the control of his vessel over to a local pilot, who brings it into the harbor and to its berth. The same procedure is followed when the ship leaves its berth until it is safely out into the sealanes. This sensible procedure, designed to avoid accidents, reflects

the fact that navigation on the open sea (a more "abstract" space) is the more general skill, while piloting a ship through traffic in a particular port is a highly contextual skill. We might call the art of piloting a "local and situated knowledge." What the pilot knows are local tides and currents along the coast and estuaries, the unique features of local wind and wave patterns, shifting sandbars, unmarked reefs, seasonal changes in microcurrents, local traffic conditions, the daily vagaries of wind patterns off headlands and along straits, how to pilot in these waters at night, not to mention how to bring many different ships safely to berth under variable conditions.[15] Such knowledge is particular, by definition; it can be acquired only by local practice and experience. Like a bird or an insect that has adapted brilliantly to a narrow ecological niche, the pilot knows *one* harbor. Much of his knowledge would be irrelevant if he were suddenly transposed to a different port.[16] Despite the rather narrow context of this knowledge, it is agreed by captains, harbormasters, and, not least, those who insure maritime commerce against losses that the pilot's knowledge of a particular port must prevail. The pilot's experience is *locally superior* to the general rules of navigation.

Mark Twain's classic *Life on the Mississippi* reflects at great length on the knowledge acquired by riverboat pilots. Part of that knowledge consists of rules of thumb about surface features that may signal shallows, currents, or other navigational hazards. Much of it, however, consists of a quite specific familiarity with their particular stretch of the Mississippi at different seasons and water levels—knowledge that could have been gained in that particular place only through experience. Although there is something that might properly be called a knowledge of rivers in general, it is a quite thin and unsatisfactory knowledge when it comes to making a particular trip on a particular river. A native pilot is no less necessary on a given river than a native tracker for a given jungle or a local guide in Bruges or in the medina of an ancient Arab city.

The practice and experience reflected in mētis is almost always *local*. Thus a guide on mountain climbing may be best at Zermatt, which she has scaled often; an airplane pilot best on Boeing 747s, on which he was trained; and the orthopedic surgeon best at knees, where her surgical experience has given her a certain expertise. It is not entirely clear how much of these experts' mētis would be transferable if they were suddenly shifted to Mont Blanc, DC3s, and hands.

Every instance of the application of a given skill will require specific adjustments for local conditions. For a weaver, each new supply of yarn or thread handles differently. For a potter, a new supply of

clay "works" differently. Long experience with different materials will have the effect of making such adjustments quasi-automatic. The specificity of knowledge goes even deeper, in the sense that each loom or potter's wheel has its own distinctive qualities, which an artisan comes to know and appreciate (or work around). Every general knowledge that is actually applied, then, requires some imaginative translation. A consummate knowledge of looms in general does not translate directly into the successful operation of this particular loom with its peculiarities of design, use, woods, and repairs. To speak of the art of one loom, the art of one river, the art of one tractor, or the art of one automobile is not preposterous; it is to point to the size and importance of the gap between general knowledge and situated knowledge.

We might reasonably think of situated, local knowledge as being *partisan* knowledge as opposed to generic knowledge. That is, the holder of such knowledge typically has a passionate interest in a particular outcome. An insurer of commercial shipping for a large, highly capitalized maritime firm can afford to rely on probability distributions for accidents. But for a sailor or captain hoping for a safe voyage, it is the outcome of the single event, a single trip, that matters. Mētis is the ability and experience necessary to influence the outcome—to improve the odds—in a particular instance.

The state simplifications and utopian schemes we have examined in earlier chapters all concern activities that are carried out in spatially and temporally unique settings. While something can indeed be said about forestry, revolution, urban planning, agriculture, and rural settlement in general, this will take us only so far in understanding *this* forest, *this* revolution, *this* farm. All farming takes place in a unique space (fields, soil, crops) and at a unique time (weather pattern, season, cycle in pest populations) and for unique ends (this family with its needs and tastes). A mechanical application of generic rules that ignores these particularities is an invitation to practical failure, social disillusionment, or most likely both. The generic formula does not and cannot supply the local knowledge that will allow a successful translation of the necessarily crude general understandings to successful, nuanced, local applications. The more general the rules, the more they require in the way of translation if they are to be locally successful. Nor is it simply a matter of the captain or navigator realizing at what point his rules of thumb are inferior to the intimate local knowledge of the pilot. Rather, it is a matter of recognizing that the rules of thumb themselves are largely a codification derived from the actual practices of sailing and piloting.

One last analogy may help to clarify the relationship between general rules of thumb and mētis. Mētis is not merely the specification of local values (such as the local mean temperature and rainfall) made in order to successfully apply a generic formula to a local case. Taking language as a parallel, I believe that the rule of thumb is akin to formal grammar, whereas mētis is more like actual speech. Mētis is no more derivative of general rules than speech is derivative of grammar. Speech develops from the cradle by imitation, use, trial and error. Learning a mother tongue is a stochastic process—a process of successive, self-correcting approximations. We do not begin by learning the alphabet, individual words, parts of speech, and rules of grammar and then trying to use them all in order to produce a grammatically correct sentence. Moreover, as Oakeshott indicates, a knowledge of the rules of speech by themselves is compatible with a complete inability to speak intelligible sentences. The assertion that the rules of grammar are derivative of the practice of actual speech is nearer to the truth. Modern language training that aims at competence in speaking recognizes this and begins with simple speech and rote repetition in order to imprint pattern and accent while leaving the rules of grammar implicit, or else introducing them later as a way of codifying and summarizing practical mastery.

Like language, the mētis or local knowledge necessary to the successful practice of farming or pastoralism is probably best learned by daily practice and experience. Like serving a long apprenticeship, growing up in a household where that craft is continually practiced often represents the most satisfactory preparation for its exercise. This kind of socialization to a trade may favor the conservation of skills rather than daring innovation. But any formula that excludes or suppresses the experience, knowledge, and adaptability of mētis risks incoherence and failure; learning to speak coherent sentences involves far more than merely learning the rules of grammar.

The Relation with Episteme and Techne

For the Greeks and particularly for Plato, episteme and techne represented knowledge of an order completely different from mētis.[17] Technical knowledge, or techne, could be expressed precisely and comprehensively in the form of hard-and-fast rules (*not* rules of thumb), principles, and propositions. At its most rigorous, techne is based on logical deduction from self-evident first principles. As an ideal type, it radically differs from mētis in terms of how it is organized, how it is codified and taught, how it is modified, and the analytical precision it exhibits.

Where mētis is contextual and particular, techne is universal. In the logic of mathematics, ten multiplied by ten equals one hundred everywhere and forever; in Euclidean geometry, a right angle represents ninety degrees of a circle; in the conventions of physics, the freezing point of water is always zero degrees centigrade.[18] Techne is settled knowledge; Aristotle wrote that techne "came into being when from many notions gained from experience, a universal judgement about a group of similar things arises."[19] The universality of techne arises from the fact that it is organized analytically into small, explicit, logical steps and is both decomposable and verifiable. This universality means that knowledge in the form of techne can be taught more or less completely as a formal discipline. The rules of techne provide for theoretical knowledge that may or may not have practical applications. Finally, techne is characterized by impersonal, often quantitative precision and a concern with explanation and verification, whereas mētis is concerned with personal skill, or "touch," and practical results.

If the description of techne as an ideal or typical system of knowledge resembles the self-image of modern science, that is no accident. The actual *practice* of science, however, is something else again.[20] The rules of techne are the specification of how knowledge is to be codified, expressed, and verified, *once* it has been discovered. No rules of techne or episteme can explain scientific invention and insight. Discovering a mathematical theorem requires genius and perhaps mētis; the proof of the theorem, however, must follow the tenets of techne.[21] Thus the systematic and impersonal rules of techne facilitate the production of knowledge that can be readily assembled, comprehensively documented, and formally taught, but they cannot by themselves add to that knowledge or explain how it came into being.[22]

Techne is characteristic, above all, of self-contained systems of reasoning in which the findings may be logically derived from the initial assumptions. To the degree that the form of knowledge satisfies these conditions, to that degree is it impersonal, universal, and completely impervious to context. But the context of mētis, as Detienne and Vernant emphasize, is characteristically "situations which are transient, shifting, disconcerting and ambiguous, situations which do not lend themselves to precise measurement, exact calculation, or rigorous logic."[23] Nussbaum shows convincingly how Plato attempted, especially in the *Republic*, to transform the realm of love—a realm that almost by definition is one of contingency, desire, and impulse—into a realm of techne or episteme.[24] Plato regarded mundane love as subject to the lower appetites, and he hoped to purge it of these base instincts so that it could more closely resemble the philosopher's pure search for truth.

The superiority of pure reasoning, especially scientific and mathematical logic, lay in the fact that it was "pure of pain, maximally stable, and directed at the truth." The objects of such reasoning "are eternally what they are regardless of what human beings do and say."[25] What one loved, or *should* love, Plato claimed, was not the beloved himself but rather the pure forms of unalloyed beauty reflected in the beloved.[26] Only in this way could love remain straight and rational, free of the appetites.

The spheres of human endeavor that are freest of contingency, guesswork, context, desire, and personal experience—and thus free of mētis—hence came to be perceived as man's highest pursuits. They are the philosopher's work. One can see why, on the strength of such criteria, Euclidean geometry, mathematics, some self-contained forms of analytical philosophy, and perhaps music are considered to be among the purest of pursuits.[27] Unlike the natural sciences and concrete experiments, these disciplines exist as realms of pure thought, untouched by the contingencies of the material world. They begin in the mind or on a blank sheet of paper. The Pythagorean theorem, $a^2 + b^2 = c^2$, is true for all right triangles everywhere and forever.

A recurrent theme of Western philosophy and science, including social science, has been the attempt to reformulate systems of knowledge in order to bracket uncertainty and thereby permit the kind of logical deductive rigor possessed by Euclidean geometry.[28] In the natural sciences, the results have been revolutionary. Where philosophy and the human sciences are concerned, the efforts have been just as persistent but the results far more ambiguous. Descartes's famous episteme "I think, therefore I am" mimicked the first step in a mathematical proof and was an "answer to the disorder that threatened to undo society."[29] The aim of Jeremy Bentham and the utilitarians was, through their calculus of pleasure and pain (hedonism), to reduce the study of ethics to a pure natural science, to an examination of "every circumstance by which an individual can be influenced, being remarked and inventoried, nothing . . . left to chance, caprice, or unguided discretion, everything being surveyed and set down in dimension, number, weight, and measure."[30]

Even chance (*tuche*) itself, which techne was designed to master, was eventually, thanks to statistics and probability theory, transformed into a singular fact that might enter the formulas of techne. Risk, providing it could be assigned a known probability, became a fact like any other, whereas uncertainty (where the underlying probabilities are not known) still lay outside techne's reach.[31] The intellectual "career" of risk and uncertainty is indicative of many fields of inquiry in which the

realm of analysis was reformulated and narrowed to exclude elements that could not be quantified and measured but could only be judged. Better put, techniques were devised to isolate and domesticate those aspects of key variables that might be expressed in numbers (a nation's wealth by gross national product, public opinion by poll numbers, values by psychological inventories). Neoclassical economics, for example, has undergone a transformation along these lines. Consumer preferences are first taken as a given and then counted, in order to bracket taste as a major source of uncertainty. Invention and entrepreneurial activity are treated as exogenous and cast outside the perimeter of the discipline as too intractable to submit to measurement and prediction.[32] The discipline has incorporated calculable risk while exiling those topics where genuine uncertainty prevails (ecological dangers, shifts in taste).[33] As Stephen Marglin shows, "the emphasis on self-interest, calculation, and maximization in economics" are classical examples of "self-evident postulates" and reflect "more an ideological commitment to the superiority of episteme than a serious attempt to unravel the complexities and mysteries of human motivation and behavior."[34]

The logic of such reformulations is analogous to the experimental practice and self-imposed boundaries of modern scientific agriculture. By constricting its field of inquiry, it gained enormously in precision and scientific power at the possible expense of irrelevance or unpleasant surprises from beyond its artificial perimeters.[35] Techne is most suitable to activities "that have a singular end or goal, an end that is specifiable apart from the activity itself, and one susceptible to quantitative measurement."[36] Thus the problem most successfully addressed by scientific agriculture is how to grow the largest number of bushels of a crop at the least cost per acre, as revealed through one-variable-at-a-time trials conducted on experimental plots. Issues of farming life and community, family needs, long-term soil structure, ecological diversity, and sustainability are either difficult to incorporate or excluded altogether. Formulas of efficiency, production functions, and rational action are specifiable only when the ends sought are simple, sharply defined, and hence measurable.

The problem, as Aristotle recognized, is that certain practical choices cannot, "even in principle, be adequately and completely captured in a system of universal rules."[37] He singled out navigation and medicine as two activities in which the practical wisdom of long experience is indispensable to superior performance. They were mētis-laden activities in which responsiveness, improvisation, and skillful, successive approximations were required. If Plato can be credited, Socrates deliberately refrained from writing down his teachings, because he believed that the

activity of philosophy belonged more to mētis than to episteme or techne. A written text, even if it takes the form of a philosophical dialogue, is a cut-and-dried set of codified rules. An oral dialogue, by contrast, is alive and responsive to the mutuality of the participants, reaching a destination that cannot be specified in advance. Socrates evidently believed that the interaction between teacher and students that we now call the Socratic method, and not the resulting text, *is* philosophy.[38]

Practical Knowledge Versus Scientific Explanation

Only by grasping the potential achievement and range of mētis is it possible to appreciate the valuable knowledge that high-modernist schemes deprive themselves of when they simply impose their plans. One major reason why mētis is denigrated, particularly in the hegemonic imperium of scientific knowledge, is that its "findings" are practical, opportune, and contextual rather than integrated into the general conventions of scientific discourse.

We have seen the idiosyncracies of mētis at work in the historical vernaculars of measurement of area, weight, and volume. The aim was always to achieve a local purpose or to express an important local feature (such as "a farm of two cows") rather than to accommodate some universal unit of measurement. Like Squanto's maxim, such vernacular measures apparently often conveyed more information than an abstract measure could. They certainly conveyed information that was more *locally* relevant. It was just this local, practical index, which varied from place to place, that ensured that mētis would be confusing, incoherent, and unassimilable for purposes of statecraft.

The classification of flora follows much the same logic among indigenous people. What matters is local use and value. Thus the categories into which various plants are sorted follow a logic of practical use: good for making soup, good for making twine, helpful in healing cuts, effective for settling an upset stomach, poisonous for cattle, useful for weaving our cloth, favored by rabbits as food, good for making fences, and so on. This knowledge is never static, however; it is constantly being expanded through practical experimentation. And the categories into which floral reality is divided are clearly not the occasionally invisible Linnaean botanical categories favored by scientific researchers.[39]

The litmus test for mētis is practical success. Did the navigator make the trip safely? Did Odysseus's stratagems outwit the Cyclops? Did the poultice cure the boil? Was the farmer's harvest abundant? If a technique works effectively and repeatedly for the purpose intended, the

practitioners of mētis do not pause long to ask why and how it worked, to define the precise mechanism of cause and effect. Their intent is not to contribute to a wider body of knowledge but to solve the concrete problems they face. This does not mean that the practitioners of mētis do not invent new solutions. They most decidedly do. Until quite recently virtually all the improvements in agriculture have come from the field rather than from industry or science. What it does mean, however, is that the innovations of mētis will typically represent a recombination (*bricolage*, to use Lévi-Strauss's term)[40] of existing elements; farmers did not invent the tractor to solve their problems of traction power.[41] By the same token, the bricolage of practical knowledge has often produced complex techniques—such as polycropping and soil-building strategies—that work admirably but that science has not (yet?) understood.

The power of practical knowledge depends on an exceptionally close and astute observation of the environment. It should by now be rather obvious why traditional cultivators like Squanto are such consummate observers of their environment, but the reasons bear repeating in the context of a comparison with scientific knowledge. First, these cultivators have a vital, direct stake in the results of close observation. Unlike the research scientist or extension agent who does not have to take her own advice, the peasant is the immediate consumer of his own conclusions. Unlike the typical modern-day farmer, the peasant has no outside experts to rely on beyond his experienced neighbors; he must make decisions based on what he knows.

Second, the poverty or marginal economic status of many of these cultivators is itself, I would argue, a powerful impetus to careful observation and experimentation. Consider the hypothetical case of two fishermen, both of whom must make their living from a river. One fisherman lives by a river where the catch is stable and abundant. The other lives by a river where the catch is variable and sparse, affording only a bare and precarious subsistence. The poorer of the two will clearly have an immediate, life-and-death interest in devising new fishing techniques, in observing closely the habits of fish, in the careful siting of traps and weirs, in the timing and signs of seasonal runs of different species, and so forth.

Nor should we forget that the peasant cultivator or pastoralist lives year in and year out in the field of observation. He or she will likely know things that neither an absentee cultivator nor a research scientist would ever notice.[42] Finally, as mentioned in the previous chapter, such a cultivator is always a member of a community that serves as a living, oral reference library for observations, practices, and experiments—a body of knowledge that an individual could never amass alone.

The experimental temper of "prescientific" peoples, often impelled by mortal threats, resulted in many important, efficacious discoveries. South American Indians discovered that chewing the bark of the cinchona tree was an effective remedy for malaria, without knowing that its active ingredient was quinine or why it worked. Westerners knew that certain foods consumed in the early spring, such as rhubarb, could relieve the symptoms of wintertime scurvy, without knowing anything about Vitamin C. The mold from certain breads was used to stem infections long before the isolation of penicillin.[43] According to Anil Gupta, roughly three-quarters of the modern pharmacopoeia are derivatives of traditionally known medicines.[44] Even in the absence of remedies, people often knew what measures would lessen their chances of contracting a dreaded contagious disease. The Londoners in Daniel Defoe's *Journal of the Plague Year* knew that moving to the country or, failing that, sealing oneself up in one's rooms vastly improved one's chances of surviving the bubonic plague of 1665.[45] Knowing, as we now do, that the vectors of the plague were the fleas carried by rats, we can appreciate why these strategies often worked, but Defoe's contemporaries hit on these effective solutions even though they thought that the plague was caused by vapors.

A most striking illustration of practice preceding science is the widespread use of variolation to check the spread of smallpox long before Sir William Jenner's heralded development of vaccination in 1798. The story, which Frédérique Apffel Marglin analyzes in impressive detail, is valuable because it demonstrates how purely mētis skills led to a form of inoculation that mimicked or presaged what is justifiably seen as a great milestone in scientific medicine.[46] Let me make it clear that the last thing I intend here is a defense of traditional medicine vis-à-vis modern medical research and experimental method.[47] What this account does highlight, however, is how frequently local knowledge, trial and error, or what we might more generously call the stochastic method have produced practical solutions without benefit of scientific method.

By at least the sixteenth century, the technique of variolation was widely practiced in India, the Middle East, Europe, and China. The practice consisted of using human smallpox matter, scratched into the skin or inhaled, which gave the recipient a mild, rarely fatal case of smallpox. "Fresh" smallpox matter—from the pustules or scabs of someone with an active infection contracted in the usual way—was never used. The inoculation was typically made with attenuated matter saved from those who had had mild cases during last year's epidemic or with matter taken from the pustules of those who had been inocu-

lated the previous year. Dosage could be regulated according to the size and age of the patient.

The principle behind variolation, the same principle that forms the basis of homeopathy, reflected a much older practice. Inoculation in one form or another was widely practiced well before the rise of modern medicine. In India, variolation was carried out by ritual specialists and was thoroughly integrated with the worship of the goddess Sithala.[48] In other societies, its cultural setting was no doubt different, although the actual procedures were remarkably parallel.

Jenner's discovery of vaccination using cowpox matter was therefore not entirely novel. A young girl had told him that she was protected against smallpox because she had already had cowpox. Jenner, following this lead, inoculated his own children with cowpox matter and observed that they showed no reaction to a subsequent smallpox vaccination. Vaccination was, of course, a great advance over variolation. Because it used live smallpox matter, variolation induced a mild but active case that was contagious, and 1 to 3 percent of those so treated died from the treatment, a ratio that nonetheless compared favorably with the one or two in six who perished in an epidemic. Jenner's technique used killed virus, thus avoiding contagion, and his vaccination had a remarkably low iatrogenic rate: only one in a thousand died of the vaccination itself. His achievement is rightly celebrated, but it is important to recognize that "Jennerian vaccination was not an abrupt break with the past, but the direct descendant and heir of inoculation."[49]

Variolation, though hardly to be preferred to vaccination, was an impressive accomplishment of practical prescientific medicine. The principle of inoculation had long been grasped, and, one imagines, a great many practitioners in affected communities were trying to develop a successful technique. Once the efficacy of a new treatment was established, the news must have traveled faster than any epidemic and quickly displaced less successful preventative measures. There is no magic here. The ingredients of such practical knowledge are simple: a pressing need (in this case, a matter literally of life and death), a few promising leads that worked in analogous contexts (inoculation), a vast army of freelance experimenters willing to try almost anything,[50] time to "simmer" (as the experimenters and their clients observed the results of various stratagems through successive epidemics), and the sharing (through chains of communication) of the experimental results. As long as it didn't require an electron microscope, it would in fact be surprising if such a combination of passionate interest, close observation, large numbers of amateur specialists trying different possibilities, and the time necessary for trial and error did not produce many novel solutions to practical problems. The variolators before Jenner were not unlike the polycropping cultivators described by Paul Richards. They had devised, not just stumbled upon, something that worked, without quite knowing exactly why it worked. While this increased their risk of drawing false inferences from what they saw, it did not diminish the practical achievements of their bricolage.

Mētis, with the premium it places on practical knowledge, experience, and stochastic reasoning, is of course not merely the now-superseded precursor of scientific knowledge. It is the mode of reasoning most appropriate to complex material and social tasks where the uncertainties are so daunting that we must trust our (experienced) intuition and feel our way. Albert Howard's description of water management in Japan offers an instructive example: "Erosion control in Japan is like a game of chess. The forest engineer, after studying his eroding valley, makes his first move, locating and building one or more check dams. He waits to see what Nature's response is. This determines the forest engineer's next move, which may be another dam or two, an increase in the former dam, or the construction of side retaining walls. Another pause for observation, the next move is made, and so on, until erosion is checkmated. The operations of natural forces, such as sedimentation and re-vegetation, are guided and used to the best advantage to keep down costs and to obtain practical results. *No more is attempted than Nature has already done in the region.*"[51] The engineer in Howard's account recognizes implicitly that he is dealing with "an art of one valley." Each prudent, small step, based on prior experience, yields new and not completely predictable effects that become the point of departure for the next step. Virtually any complex task involving many variables whose values and interactions cannot be accurately forecast belongs to this genre: building a house, repairing a car, perfecting a new jet engine, surgically repairing a knee, or farming a plot of land.[52] Where the interactions involve not just the material environment but social interaction as well—building and peopling new villages or cities, organizing a revolutionary seizure of power, or collectivizing agriculture—the mind boggles at the multitude of interactions and uncertainties (as distinct from calculable risks).

More than thirty-five years ago, in recognition of the refractory complexity of ambitious social policy, Charles Lindblom coined the memorable expression "the science of muddling through."[53] The phrase was meant to capture the spirit of a practical approach to large-scale policy problems that could not be completely understood, let alone comprehensively addressed. Models of public administration, Lind-

blom complained, implicitly assumed a synoptic mastery of a policy initiative, when in practice, knowledge was both limited and fragmentary, and means could never be neatly separated from goals. His characterization of actual policy practice emphasized a piecemeal approach of limited comparisons, a sequence of trials and errors followed by revised trials, reliance on past experience, and "disjointed incrementalism."[54] Albert Hirschman has made the same point, rather more metaphorically, by comparing social policy to house building: "The architect of social change can never have a reliable blueprint. Not only is each house he builds different from any other that was built before, but it necessarily uses new construction materials and even experiments with untested principles of stress and structure. Therefore what can be most usefully conveyed by the builders of one house is an understanding of the experience that made it at all possible to build under these trying circumstances."[55]

Taken together, Lindblom's and Hirschman's positions amount to a well-reasoned strategic retreat from the ambition to comprehensive, rational planning. If we can make allowances for the social-science jargon, the concepts behind such terms as "bounded rationality" (rather than "synoptic mastery") and "satisficing" (rather than "maximizing"), terms invented to describe a world working by educated guesswork and rules of thumb, sound very much like mētis.

Learning Beyond the Book

A step-by-step "muddling through" approach would seem to be the only prudent course in a field like erosion management or public policy implementation, where surprises are all but guaranteed. The fact that in these cases the level of uncertainty and hence of potential disaster can be reduced by breaking down the process into more manageable steps does *not* imply that any novice could then take charge. On the contrary, only someone with wide experience will be able to interpret the results of and reactions to an initial step in order to determine the next step. One would want hydrologists and policy managers who had been surprised many times and have had many successes behind them. Their repertoire of responses would be larger, their judgment in reading the environment surer, their sense of what surprises might await them more accurate. Once again, some of their competence could be interpreted and taught, but much of it would remain implicit—a sixth sense that comes with long practice. At the risk of trying to pinpoint the ineffable, I want to suggest how important such knowledge is and how difficult it is to translate it into codified form.[56]

Mētis knowledge is often so implicit and automatic that its bearer is at a loss to explain it.[57] A staple of early medical training, I have been told, is the story of a physician who, at the turn of the century, had a spectacularly high success rate in diagnosing syphilis in its early stages. Laboratory tests confirmed his diagnoses, but he himself did not know precisely what it was that he detected in the physical exams that led him to his conclusions. Intrigued by his success, hospital administrators asked two other doctors to closely observe his examination of patients over several weeks and to see if they could spot what he was picking up. At long last, they and the doctor realized that he was unconsciously registering the patients' slight eye tremor. The eye tremor then became a universally recognized symptom of syphilis. Although this insight could be codified, what is instructive here is that it could have been achieved only through close observation and long clinical experience and that, even before then, it could have been known subliminally.

Any experienced practitioner of a skill or craft will develop a large repertoire of moves, visual judgments, a sense of touch, or a discriminating gestalt for assessing the work as well as a range of accurate intuitions born of experience that defy being communicated apart from practice. A few brief examples will help to convey the subtlety and nuance of this knowledge. In Indonesia, older Bugis sea captains, sound asleep below decks, will awaken the moment there is a change in direction, weather, current, or some combination of the three. As the ocean's waves change amplitude or begin striking the ship from a different direction, a captain immediately senses the change through the resulting slight alterations in the roll and pitch of the ship.

In the days when a case of diphtheria in town was still an occasion for quarantining the patient at home, a doctor was taking a young medical student along with him on his rounds. When they had been admitted to the front hall of a quarantined house but before they had seen the patient, the older man paused and said, "Stop. Smell the odor! Never forget this smell; this is the smell of a house with diphtheria."[58] Another doctor once told me that, after seeing thousands of infants at a busy clinic, he believed that he could tell with a high degree of accuracy, just by looking, whether an infant was seriously ill and needed immediate attention. He couldn't quite put his finger on the exact visual cue that informed his judgment, but he supposed that it was some combination of complexion, the expression of the eyes, body tone, and animation. Albert Howard once again makes a persuasive case for the "practiced eye": "An experienced farmer can tell the health of the soil and the quality of the humus by the plants—their vigor, their growth, the profuse roots, the 'glow' of health. . . . The same is true for the

health of animals on good land." Indeed, he continues, "it is not necessary to weigh or measure them. A glance on the part of the successful grazier, or a butcher accustomed to deal with high class animals, is sufficient to tell him whether all is well or whether there is something wrong with the soil or the management of the animals, or both."[59]

What is the status of such insight or intuition? We might call these skills the "tricks of the trade" (in the nondeceptive sense) that most "crafty" practitioners acquire.[60] Notice that virtually all the experienced judgments described in these anecdotes could be verified by tests and measurements. Diphtheria can be detected in the laboratory, a child's anemia can be verified by blood tests, and the Bugis sea captain can go on deck to confirm the shift in the wind. It is doubtless reassuring to those who have both the intuition and access to formal measurement to know that their judgment can be checked. But the epistemic alternative to mētis is far slower, more laborious, more capital intensive, and not always decisive. When rapid judgments of high (not perfect) accuracy are called for, when it is important to interpret early signs that things are going well or poorly, then there is no substitute for mētis. In the case of the experienced doctor, in fact, it is mētis that informs a decision about whether tests are needed and, if so, which tests.

Even the part of mētis that can be conveyed by rules of thumb is the codification of practical experience. The boiling down of maple sap into syrup is a tricky business. If one goes too far, the sap will boil over. The stopping point can be determined by a thermometer or by a hydrometer (which indicates specific gravity). But those with experience look for the mass of small bubbles that forms on the surface of the sap just before it begins to boil over—a visual rule of thumb that is far easier to use. Achieving the insight, however, *requires* that, at least once, the syrup maker make a mistake and go too far. Chinese recipes, it has always amused me, often contain the following instruction: "Heat the oil until it is *almost* smoking." The recipes assume that the cook has made enough mistakes to know what oil looks like just before it begins smoking. The rule of thumb for maple syrup and for oil are, by definition, the rules of experience.

Those who do not have access to scientific methods and laboratory verification have often relied on mētis to develop rich knowledge systems that are remarkably accurate. Traditional navigation skills before the eras of sextants, magnetic compasses, charts, and sonar are a case in point. I refer again to the Bugis in this context, because their skills have been so brilliantly documented by Gene Ammarell.[61] In the absence of formal tide tables, the Bugis have elaborated a thoroughly reliable scheme for forecasting rising and falling tides, the direction of currents, and the relative strength of tides—all of which are vitally important to their sailing plans and safety.[62] Calculating on the basis of time of day, the number of days into the lunar cycle, and the monsoon season, the Bugis captain holds in his head a system that provides all the accurate information he needs about tides. From an astronomer's perspective, it seems odd that the scheme makes no reference to the angle of declination of the moon. But since the monsoon is directly related to the declination of the moon, it serves effectively as a proxy. The cognitive map of the Bugis captain can be reconstructed in written form, as Ammarell has done, for illustrative purposes, but it was learned orally and by informal apprenticeship among the Bugis. Given the complexity of the phenomena it is meant to address, the system for evaluating and predicting tides is elegantly simple and eminently effective.

The Dynamism and Plasticity of Mētis

The term "traditional," as in "traditional knowledge"—a term that I have carefully avoided—is a misnomer, sending all the wrong signals.[63] In the mid–nineteenth century, explorers in West Africa stumbled upon groups growing maize, a New World grain, as their main staple. Although it was unlikely that the West Africans had been growing maize for longer than two generations, its cultivation was already surrounded by elaborate rituals and myths about a maize goddess or spirit who had given them the first kernels. What was striking was both the alacrity with which they had adopted maize and the speed with which they had integrated it into their traditions.[64] The apparent spread of variolation across four continents is a further instance of how widely and how rapidly "traditional peoples" will embrace techniques that solve vital problems. Examples could be multiplied. Sewing machines, matches, flashlights, kerosene, plastic bowls, and antibiotics are only a tiny sample of the products that solved vital problems or eliminated great drudgery and were thus readily accepted.[65] Practical efficacy is, as we have noted, the key test of mētis knowledge, and all these products passed with flying colors.

The point that I am making would hardly need emphasis or elaborate illustration except for the fact that a certain understanding of science, modernity, and development has so successfully structured the dominant discourse that all other kinds of knowledge are regarded as backward, static traditions, as old wives' tales and superstitions. High modernism has needed this "other," this dark twin, in order to rhetorically present itself as the antidote to backwardness.[66] The binary oppo-

sition also comes from a history of competition between the institutions and personnel that sprang up around these two forms of knowledge. Modern research institutions, agricultural experiment stations, sellers of fertilizer and machinery, high-modernist city planners, Third World developers, and World Bank officials have, to a considerable degree, made their successful institutional way in the world by the systematic denigration of the practical knowledge that we have called mētis.

Their characterization could not, in this context, be further from the truth. Mētis, far from being rigid and monolithic, is plastic, local, and divergent.[67] It is in fact the idiosyncracies of mētis, its contextualness, and its fragmentation that make it so permeable, so open to new ideas. Mētis has no doctrine or centralized training; each practitioner has his or her own angle. In economic terms, the market for mētis is often one of nearly perfect competition, and local monopolies are likely to be broken by innovation from below and outside. If a new technique works, it is likely to find a clientele.

In his defense of traditionalism against rationalism, Michael Oakeshott emphasizes the pragmatism of real, existing traditions: "The big mistake of the rationalist—though it is not inherent in the method—is to assume that 'tradition,' or what is better called 'practical knowledge,' is rigid, fixed and unchanging—in fact it is 'preeminently fluid.'"[68] Tradition, in part because of its local variation, is pliable and dynamic. "No traditional way of behavior, no traditional skill ever remains fixed," he says elsewhere. "Its history is one of continual change."[69] The changes are likely to be small and gradual (incrementalism) rather than sudden and discontinuous.

It is worth emphasizing the degree to which oral cultures, as opposed to written cultures, may avoid the rigidity of orthodoxy. Because an oral culture has no textual reference point for marking deviations, its religious myths, rituals, and folklore are likely to drift. The tales and traditions currently in circulation vary with the speaker, the audience, and local needs. Having no yardstick like a sacred text to measure the degree of drift from its Ur-tradition, such a culture can change greatly over time and simultaneously think of itself as remaining faithful to tradition.[70]

Perhaps the best analogy for a society's stock of mētis is its language. Yes, there are rules of thumb for expression: clichés, formulas of politeness, customs for swearing, and conventional conversations. But unless there is a central committee of grammarians with draconian police powers, the language is always being added to as new expressions and novel combinations are invented and puns and irony undermine old formulas. Under great pressure and rapid change, the language may change rather dramatically and new hybrids arise, but for the people who speak it, it remains recognizably their language. Influence over the direction of a language is never equally distributed, but innovation comes from far and wide, and if others find a particular innovation useful or apposite, they will adopt it as part of *their* language. In language as in mētis, seldom is the name of an innovator remembered, and this, too, helps to make the result a joint, mutual product.

The Social Context of Mētis and Its Destruction

While doing fieldwork in a small village in Malaysia, I was constantly struck by the breadth of my neighbors' skills and their casual knowledge of local ecology. One particular anecdote is representative. Growing in the compound of the house in which I lived was a locally famous mango tree. Relatives and acquaintances would visit when the fruit was ripe in the hope of being given a few fruits and, more important, the chance to save and plant the seeds next to their own house. Shortly before my arrival, however, the tree had become infested with large red ants, which destroyed most of the fruit before it could ripen. It seemed nothing could be done short of bagging each fruit. Several times I noticed the elderly head of household, Mat Isa, bringing dried nipah palm fronds to the base of the mango tree and checking them. When I finally got around to asking what he was up to, he explained it to me, albeit reluctantly, as for him this was pretty humdrum stuff compared to our usual gossip. He knew that small black ants, which had a number of colonies at the rear of the compound, were the enemies of large red ants. He also knew that the thin, lancelike leaves of the nipah palm curled into long, tight tubes when they fell from the tree and died. (In fact, the local people used the tubes to roll their cigarettes.) Such tubes would also, he knew, be ideal places for the queens of the black ant colonies to lay their eggs. Over several weeks he placed dried nipah fronds in strategic places until he had masses of black-ant eggs beginning to hatch. He then placed the egg-infested fronds against the mango tree and observed the ensuing week-long Armageddon. Several neighbors, many of them skeptical, and their children followed the fortunes of the ant war closely. Although smaller by half or more, the black ants finally had the weight of numbers to prevail against the red ants and gain possession of the ground at the base of the mango tree. As the black ants were not interested in the mango leaves or fruits while the fruits were still on the tree, the crop was saved.

This successful field experiment in biological controls presupposes

several kinds of knowledge: the habitat and diet of black ants, their egg-laying habits, a guess about what local material would substitute as movable egg chambers, and experience with the fighting proclivities of red and black ants. Mat Isa made it clear that such skill in practical entomology was quite widespread, at least among his older neighbors, and that people remembered something like this strategy having worked once or twice in the past. What is clear to me is that no agricultural extension official would have known the first thing about ants, let alone biological controls; most extension agents were raised in town and in any case were concerned entirely with rice, fertilizer, and loans. Nor would most of them think to ask; they were, after all, the experts, trained to instruct the peasant. It is hard to imagine this knowledge being created and maintained except in the context of lifelong observation and a relatively stable, multigenerational community that routinely exchanges and preserves knowledge of this kind.

One purpose of this illustration is to alert us to the social conditions necessary for the reproduction of comparable practical knowledge. These social conditions, at a minimum, would seem to require a community of interest, accumulated information, and ongoing experimentation. Occasionally there are formal institutions that seem almost perfectly tailored to the collection and exchange of practical information, such as the *veillées* of nineteenth-century France. The veillée, as its name implies, was a traditional pattern of gathering practiced by farm families during winter evenings, often in barns to take advantage of the warmth generated by the livestock and thus save on fuel. With no agenda save sociability and economy, the gatherings amounted to local assemblies where opinions, stories, agricultural news, advice, gossip, and religious or folk tales were exchanged while the participants shelled nuts or embroidered. Given the fact that each member there possessed a lifetime of interested observation and practice in which every family paid for the consequences of its agricultural decisions, the veillée was an unheralded daily seminar on practical knowledge.

This brings us squarely to two of the great ironies of mētis. The first is that mētis is not democratically distributed. Not only does it depend on a touch or a knack that may not be common, but access to the experience and practice necessary for its acquisition may be restricted. Artisan guilds, gifted craftsmen, certain classes, religious fraternities, entire communities, and men in general often treat some forms of knowledge as a monopoly they are reluctant to share. Better stated, the availability of such knowledge to others depends greatly on the social structure of the society and the advantages that a monopoly in some forms of knowledge can confer.[71] In this respect mētis is not unitary,

and we should perhaps speak of metises, recognizing its nonhomogeneity. The second irony is that, however plastic and receptive mētis is, some forms of it seem to depend on key elements of preindustrial life for their elaboration and transmission. Communities that are marginal to markets and to the state are likely to retain a high degree of mētis; they have no choice, as they have to rely disproportionately on the knowledge and materials at hand. If, while shopping at the local store or visiting at the farmers' association, Mat Isa had found a cheap pesticide that would have finished off the red ants, I don't doubt that he would have used it.

Some forms of mētis are disappearing every day.[72] As physical mobility, commodity markets, formal education, professional specialization, and mass media spread to even the most remote communities, the social conditions for the elaboration of mētis are undermined. One could, with great justice, welcome a great many of these extinctions of local knowledge. Once matches become widely available, why would anyone want to know, except as a matter of idle curiosity, how to make fire with flint and tinder? Knowing how to scrub clothes on a washboard or on a stone in the river is undoubtedly an art, but one gladly abandoned by those who can afford a washing machine. Darning skills were similarly lost, without much nostalgia, when cheap, machine-made stockings came on the market. As the older Bugis seamen say, "These days, with charts and compasses, *anyone* can steer."[73] And why not? The production of standardized knowledge has made certain skills more broadly—more democratically—available, as they are no longer the preserve of a guild that may refuse admission or insist on a long apprenticeship.[74] Much of the world of mētis that we have lost is the all but inevitable result of industrialization and the division of labor. And much of this loss was experienced as a liberation from toil and drudgery.

But it would be a serious error to believe that the destruction of mētis was merely the inadvertent and necessary by-product of economic progress. The destruction of mētis and its replacement by standardized formulas legible only from the center is virtually inscribed in the activities of both the state and large-scale bureaucratic capitalism. As a "project," it is the object of constant initiatives which are never entirely successful, for no forms of production or social life can be made to work by formulas alone—that is, without mētis. The logic animating the project, however, is one of control and appropriation. Local knowledge, because it is dispersed and relatively autonomous, is all but unappropriable. The reduction or, more utopian still, the elimination of mētis and the local control it entails are preconditions, in the case of

the state, of administrative order and fiscal appropriation and, in the case of the large capitalist firm, of worker discipline and profit.

The subordination of mētis is fairly obvious in the development of mass production in the factory. A comparable de-skilling process is, I believe, more compelling and, given the intractable obstacles to complete standardization, ultimately less successful in agricultural production.

As Stephen Marglin's early work has convincingly shown, capitalist profit requires not only efficiency but the *combination* of efficiency and control.[75] The crucial innovations of the division of labor at the subproduct level and the concentration of production in the factory represent the key steps in bringing the labor process under unitary control. Efficiency and control might coincide, as in the case of the mechanized spinning and weaving of cotton. At times, however, they might be unrelated or even contradictory. "Efficiency at best creates a *potential* profit," notes Marglin. "Without control the capitalist cannot realize that profit. Thus organizational forms which enhance capitalist control may increase profits and find favor with capitalists even if they affect productivity and efficiency adversely. Conversely, more efficient ways of organizing production which reduce capitalist control may end up reducing profits and being rejected by capitalists."[76] The typical structure of artisanal production was often an impediment to efficiency. But it was nearly *always* an obstacle to capitalist profits. In the "putting-out" system in textiles that prevailed before factory organization, cottage workers had control over the raw material, could set the pace of the work, and could increase their return by various stratagems that were difficult to monitor. The crucial advantage of the factory, from the boss's point of view, was that he could more directly fix the hours and the intensity of the work and control the raw materials.[77] To the degree that efficient production could still be organized on an artisanal basis (such as early woolen manufacturing and silk ribbon weaving, according to Marglin), to that degree was it difficult for the capitalist to appropriate the profits of a dispersed craft population.

The genius of modern mass-production methods, Frederick Taylor, saw the issue of destroying mētis and turning a resistant, quasi-autonomous, artisan population into more suitable units, or "factory hands," with great clarity. "Under scientific management . . . the managers assume . . . the burden of gathering together all of the traditional knowledge which in the past has been possessed by the workmen and then of classifying, tabulating, and reducing this knowledge to rules, laws, formulae. . . . Thus all of the planning which under the old system was done by the workmen, must of necessity under the new system be done by management in accordance with the law of science."[78]

In the Taylorized factory, only the factory manager had the knowledge and command of the whole process, and the worker was reduced to the execution of a small, often minute, part of the overall process. The result was often remarkably efficient, as in the early Ford plants; it was always, however, a great boon to control and profit.[79]

The utopian dream of Taylorization—a factory in which every pair of hands was more or less reduced to automatic movements, on the model of programmed robots—was unrealizable. Not that it wasn't tried. David Noble has described the well-funded attempt to make machine tools through numerical controls because it promised "emancipation from the human worker."[80] Its ultimate failure came precisely because the system had designed out mētis—the practical adjustments that an experienced worker would make to compensate for slight changes in material, temperatures, the wear on or irregularities in the machine, mechanical malfunction, and so forth. As one operator said, "Numerical controls are supposed to be like magic, but all you can do automatically is produce scrap."[81] This conclusion could be generalized. In a brilliant ethnography of the work routines of machine operators whose jobs appeared to have been thoroughly de-skilled, Ken Kusterer has shown how the workers nevertheless had to develop individual skills that were absolutely necessary to successful production but that could never be reduced to formulas a novice could immediately use. One machine operator, whose job was classified as "unskilled," drew an analogy between performing his job and driving a car: "Cars are basically the same but every car is different. . . . At first when you're learning, you just learn rules about driving. But as you get to know how to drive, you get a feel for the car you're driving—you know, things like how it feels at different speeds, how well the brakes work, when it's going to overheat, how to start it when it's cold. . . . Then if you think about old cars like these machines, been running three shifts for twenty years, some of them, like maybe you've got a car with no horn, that wants to turn right when you hit the brake, that don't start right unless you pump the gas in a certain way—then maybe you see what it's like trying to run these old machines they've got down here."[82]

Taylorization has its analogue in agricultural production as well, an analogue with a far longer and more variegated history. In agriculture, as in manufacturing, the mere efficiency of a form of production is not sufficient to ensure the appropriation of taxes or profits. Independent smallholder agriculture may, as we have noted, be the most efficient way to grow many crops. But such forms of agriculture, although they may present possibilities for taxation and profit when their products are bulked, processed, and sold, are relatively illegible and hard to

control. As is the case with autonomous artisans and petit-bourgeois shopkeepers, monitoring the commercial fortunes of small-fry farms is an administrative nightmare. The possibilities for evasion and resistance are numerous, and the cost of procuring accurate, annual data is high, if not prohibitive.[83]

A state mainly concerned with appropriation and control will find sedentary agriculture preferable to pastoralism or shifting agriculture. For the same reasons, such a state would generally prefer largeholding to smallholding and, in turn, plantation or collective agriculture to both. Where control and appropriation are the overriding considerations, only the last two forms offer direct control over the workforce and its income, the opportunity to select cropping patterns and techniques, and, finally, direct control over the production and profit of the enterprise. Although collectivization and plantation agriculture are seldom very efficient, they represent, as we have seen, the most legible and hence appropriable forms of agriculture.

The large capitalist agricultural producer faces the same problem as the factory owner: how to transform the essentially artisanal or mētis knowledge of farmers into a standardized system that will allow him greater control over the work and its intensity. The plantation was one solution. In colonial countries, where able-bodied men were pressed into service as gang labor, the plantation represented a kind of private collectivization, inasmuch as it relied on the state for the extramarket sanctions necessary to control its labor force. More than one plantation sector has made up what it lacked in efficiency by using its political clout to secure subsidies, price supports, and monopoly privileges.

The control made possible by the plantation, not to mention the collective farm, has proved, with few exceptions, to entail such high costs in supervision, rigidity, and overhead as to be inefficient. Now that plantation agriculture has been discredited, some of the newer alternatives devised to replicate its control and standardization are instructive, as they indicate the functional similarity that may lie behind different forms.[84] The invention of contract farming worldwide is just one noteworthy example.[85] When chicken farmers realized that huge, centralized operations for raising fryers not only were inefficient but posed serious disease and environmental problems, they devised a kind of high-tech putting-out system.[86] The large firm contracts with a farmer to supply him with chicks and then to buy back (after six weeks or so) a certain number of chickens meeting their standards. The farmer, for his part, is obliged to construct and pay for a building that meets corporate specifications and to feed, water, and medicate the chickens

with rations supplied by the corporation and according to their precise timetable. An inspector frequently verifies compliance. For the corporation, the advantages are enormous: it risks no capital except what is invested in the birds; it needs no land of its own; its management expenses are small; it achieves uniform product standards; and, not least, it can fail to renew a contract or change the price paid after each round at no cost to itself.

The logic, although not the form, is the same as on the plantation. Given its national or international market, what the corporation requires is absolute, guaranteed uniformity of product and a stable supply.[87] The need to administer the production of uniform fryers in many different localities requires an optic of standardization and aggregation. As we saw in the case of scientific forestry, this is not merely a question of inventing measures that accurately reflect the facts on the ground and that can be conveyed to administrators. It is, above all, a question of changing the environment so that it is more standardized to begin with. Only the standardized breeding, the building constructed to specifications, the fixed formula for feed, and the mandatory feeding schedule—all disciplined by the contract—make it possible for a single specialist to inspect one hundred poultry farms raising fryers for, say, Kentucky Fried Chicken, and to ensure that the variation is minimal. One can visualize his handy checklist. The purpose of contract farming is not to understand farms and adapt to them; rather, it is to transform farms and farm labor at the outset so that they fit the grid of the contract.

For farmers who sign up, as long as the contracts are rolled over, there are profits to be made, although at considerable risk. The contracts are short term, the work schedules detailed, and the set-up and supplies mandatory. The contract farmers are in theory small-business entrepreneurs, but aside from the fact that they risk their land and buildings, they have not much more control over their working day than do assembly-line workers.

The Case Against Imperial Knowledge

> They said . . . that he was so devoted to Pure Science . . . that he would rather have people die by the right therapy than be cured by the wrong.
> —Sinclair Lewis, *Arrowsmith*

The argument that I have been venturing is not a case against high modernism or state simplifications per se or, to be sure, against epistemic knowledge per se. Our ideas about citizenship, public-health pro-

grams, social security, transportation, communication, universal public education, and equality before the law are all powerfully influenced by state-created, high-modernist simplifications. I will go further and say that the *initial* land reforms in Bolshevik Russia and in postrevolutionary China were state-abetted simplifications that effectively enfranchised millions who had lived in virtual serfdom. Epistemic knowledge, though never separate in its practice from mētis, has provided us with a knowledge of the world that, for all its darker aspects, few of us would want to surrender.

What has proved to be truly dangerous to us and to our environment, I think, is the *combination* of the universalist pretensions of epistemic knowledge and authoritarian social engineering. Such a combination has been at work in city planning, in Lenin's view of revolution (but not his practice), in collectivization in the Soviet Union, and in villagization in Tanzania. The combination is implicit in the logic of scientific agriculture and explicit in its colonial practice. When schemes like these come close to achieving their impossible dreams of ignoring or suppressing mētis and local variation, they all but guarantee their own practical failure.

Universalist claims seem inherent in the way in which rationalist knowledge is pursued. Although I am no philosopher of knowledge, there seems to be no door in this epistemic edifice through which mētis or practical knowledge could enter on its own terms. It is this *imperialism* that is troubling. As Pascal wrote, the great failure of rationalism is "not its recognition of technical knowledge, but its *failure* to recognize any other."[88] By contrast, mētis does not put all its eggs in one basket; it makes no claim to universality and in this sense is pluralistic. Of course, certain structural conditions can thwart this imperialism of epistemic claims. Democratic and commercial pressures sometimes oblige agricultural scientists to premise their work on practical problems as defined by farmers. During the Meiji Restoration, three-person technical teams began by investigating farmers' innovations and then taking them back to the laboratory to perfect them. The construction workers who refused to leave Brasília as planned or the disillusioned ujamaa villagers who fled from their settlements to some degree undid the plans made for them. Such resistance, however, comes from outside the paradigm of epistemic knowledge itself. When someone like Albert Howard, himself a meticulous scientist, recognizes the "art" of farming and the nonquantifiable ways of knowing, he steps outside the realm of codified, scientific knowledge.

Authoritarian high-modernist states in the grip of a self-evident (and usually half-baked) social theory have done irreparable damage

to human communities and individual livelihoods. The danger was compounded when leaders came to believe, as Mao said, that the people were a "blank piece of paper" on which the new regime could write. The utopian industrialist Robert Owen had the same vision for the factory town New Lanark, although on a civic rather than national level: "Each generation, indeed each administration, shall see unrolled before it the blank sheet of infinite possibility, and if by chance this tabula rasa had been defaced by the irrational scribblings of tradition-ridden ancestors, then the first task of the rationalist must be to scrub it clean."[89]

What conservatives like Oakeshott miss, I think, is that high modernism has a natural appeal for an intelligentsia and a people who may have ample reason to hold the past in contempt.[90] Late colonial modernizers sometimes wielded their power ruthlessly in transforming a population that they took to be backward and greatly in need of instruction. Revolutionaries have had every reason to despise the feudal, poverty-stricken, inegalitarian past that they hoped to banish forever, and sometimes they have also had a reason to suspect that immediate democracy would simply bring back the old order. Postindependence leaders in the nonindustrial world (occasionally revolutionary leaders themselves) could not be faulted for hating their past of colonial domination and economic stagnation, nor could they be faulted for wasting no time or democratic sentimentality on creating a people that they could be proud of. Understanding the history and logic of their commitment to high-modernist goals, however, does not permit us to overlook the enormous damage that their convictions entailed when combined with authoritarian state power.

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For Louise, again, always