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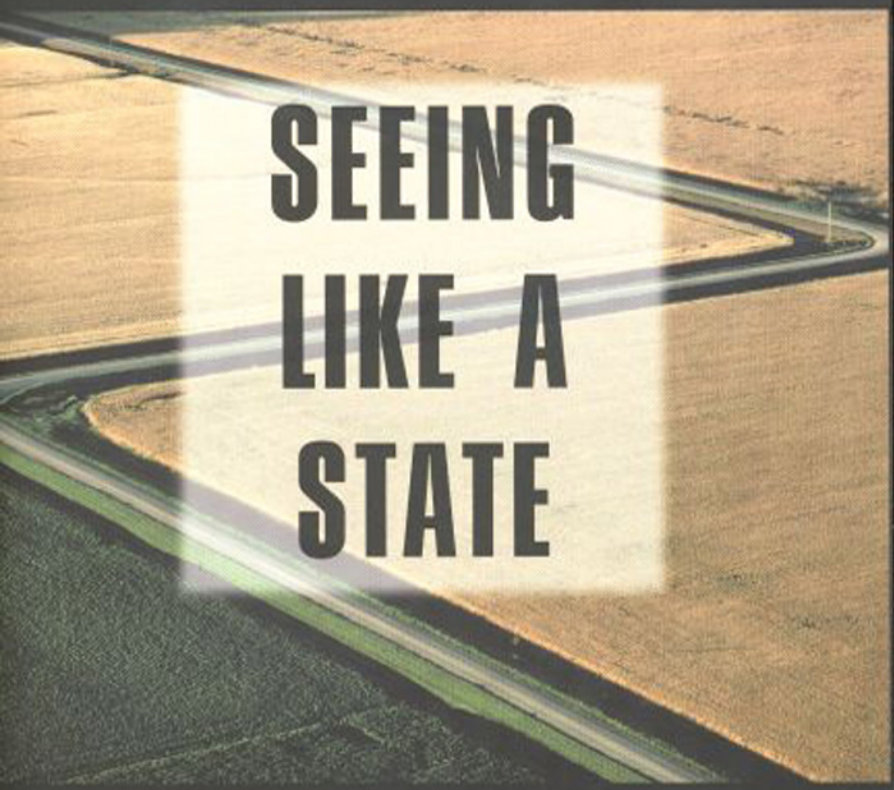


SEEING LIKE A STATE

How Certain Schemes to Improve the Human Condition Have Failed

1 Nature and Space

> Would it not be a great satisfaction to the king to know at a designated moment every year the number of his subjects, in total and by region, with all the resources, wealth & poverty of each place; [the number] of his nobility and ecclesiastics of all kinds, of men of the robe, of Catholics and of those of the other religion, all separated according to the place of their residence? . . . [Would it not be] a useful and necessary pleasure for him to be able, in his own office, to review in an hour's time the present and past condition of a great realm of which he is the head, and be able himself to know with certitude in what consists his grandeur, his wealth, and his strengths?
> —Marquis de Vauban, *proposing an annual census to Louis XIV in 1686*

Certain forms of knowledge and control require a narrowing of vision. The great advantage of such tunnel vision is that it brings into sharp focus certain limited aspects of an otherwise far more complex and unwieldy reality. This very simplification, in turn, makes the phenomenon at the center of the field of vision more legible and hence more susceptible to careful measurement and calculation. Combined with similar observations, an overall, aggregate, synoptic view of a selective reality is achieved, making possible a high degree of schematic knowledge, control, and manipulation.

The invention of scientific forestry in late eighteenth-century Prussia and Saxony serves as something of a model of this process.[1] Although the history of scientific forestry is important in its own right, it is used here as a metaphor for the forms of knowledge and manipulation characteristic of powerful institutions with sharply defined interests, of which state bureaucracies and large commercial firms are perhaps the outstanding examples. Once we have seen how simplification, legibility, and manipulation operate in forest management, we can then explore how the modern state applies a similar lens to urban planning, rural settlement, land administration, and agriculture.

The State and Scientific Forestry: A Parable

> I [Gilgamesh] would conquer in the Cedar Forest. . . . I will set my hand to it and will chop down the Cedar.
> —*Epic of Gilgamesh*

The early modern European state, even before the development of scientific forestry, viewed its forests primarily through the fiscal lens of

revenue needs. To be sure, other concerns—such as timber for shipbuilding, state construction, and fuel for the economic security of its subjects—were not entirely absent from official management. These concerns also had heavy implications for state revenue and security.[2] Exaggerating only slightly, one might say that the crown's interest in forests was resolved through its fiscal lens into a single number: the revenue yield of the timber that might be extracted annually.

The best way to appreciate how heroic was this constriction of vision is to notice what fell outside its field of vision. Lurking behind the number indicating revenue yield were not so much forests as commercial wood, representing so many thousands of board feet of saleable timber and so many cords of firewood fetching a certain price. Missing, of course, were all those trees, bushes, and plants holding little or no potential for state revenue. Missing as well were all those parts of trees, even revenue-bearing trees, which might have been useful to the population but whose value could not be converted into fiscal receipts. Here I have in mind foliage and its uses as fodder and thatch; fruits, as food for people and domestic animals; twigs and branches, as bedding, fencing, hop poles, and kindling; bark and roots, for making medicines and for tanning; sap, for making resins; and so forth. Each species of tree—indeed, each part or growth stage of each species—had its unique properties and uses. A fragment of the entry under "elm" in a popular seventeenth-century encyclopedia on aboriculture conveys something of the vast range of practical uses to which the tree could be put.

> Elm is a timber of most singular use, especially whereby it may be continually dry, or wet, in extremes; therefore proper for water works, mills, the ladles and soles of the wheel, pumps, aqueducts, ship planks below the water line, . . . also for wheelwrights, handles for the single handsaw, rails and gates. Elm is not so apt to rive [split] . . . and is used for chopping blocks, blocks for the hat maker, trunks and boxes to be covered with leather, coffins and dressers and shovelboard tables of great length; also for the carver and those curious workers of fruitage, foliage, shields, statues and most of the ornaments appertaining to the orders of architecture. . . . And finally . . . the use of the very leaves of this tree, especially the female, is not to be despised, . . . for they will prove of great relief to cattle in the winter and scorching summers when hay and fodder is dear. . . . The green leaf of the elms contused heals a green wound or cut, and boiled with the bark, consolidates bone fractures.[3]

In state "fiscal forestry," however, the actual tree with its vast number of possible uses was replaced by an abstract tree representing a volume of lumber or firewood. If the princely conception of the forest was still utilitarian, it was surely a utilitarianism confined to the direct needs of the state.

From a naturalist's perspective, nearly everything was missing from

the state's narrow frame of reference. Gone was the vast majority of flora: grasses, flowers, lichens, ferns, mosses, shrubs, and vines. Gone, too, were reptiles, birds, amphibians, and innumerable species of insects. Gone were most species of fauna, except those that interested the crown's gamekeepers.

From an anthropologist's perspective, nearly everything touching on human interaction with the forest was also missing from the state's tunnel vision. The state did pay attention to poaching, which impinged on its claim to revenue in wood or its claim to royal game, but otherwise it typically ignored the vast, complex, and negotiated social uses of the forest for hunting and gathering, pasturage, fishing, charcoal making, trapping, and collecting food and valuable minerals as well as the forest's significance for magic, worship, refuge, and so on.[4]

If the utilitarian state could not see the real, existing forest for the (commercial) trees, if its view of its forests was abstract and partial, it was hardly unique in this respect. Some level of abstraction is necessary for virtually all forms of analysis, and it is not at all surprising that the abstractions of state officials should have reflected the paramount fiscal interests of their employer. The entry under "forest" in Diderot's *Encyclopédie* is almost exclusively concerned with the *utilité publique* of forest products and the taxes, revenues, and profits that they can be made to yield. The forest as a habitat disappears and is replaced by the forest as an economic resource to be managed efficiently and profitably.[5] Here, fiscal and commercial logics coincide; they are both resolutely fixed on the bottom line.

The vocabulary used to organize nature typically betrays the overriding interests of its human users. In fact, utilitarian discourse replaces the term "nature" with the term "natural resources," focusing on those aspects of nature that can be appropriated for human use. A comparable logic extracts from a more generalized natural world those flora or fauna that are of utilitarian value (usually marketable commodities) and, in turn, reclassifies those species that compete with, prey on, or otherwise diminish the yields of the valued species. Thus, plants that are valued become "crops," the species that compete with them are stigmatized as "weeds," and the insects that ingest them are stigmatized as "pests." Thus, trees that are valued become "timber," while species that compete with them become "trash" trees or "underbrush." The same logic applies to fauna. Highly valued animals become "game" or "livestock," while those animals that compete with or prey upon them become "predators" or "varmints."

The kind of abstracting, utilitarian logic that the state, through its officials, applied to the forest is thus not entirely distinctive. What is distinctive about this logic, however, is the narrowness of its field of vision, the degree of elaboration to which it can be subjected, and above

all, as we shall see, the degree to which it allowed the state to impose that logic on the very reality that was observed.[6]

Scientific forestry was originally developed from about 1765 to 1800, largely in Prussia and Saxony. Eventually, it would become the basis of forest management techniques in France, England, and the United States and throughout the Third World. Its emergence cannot be understood outside the larger context of the centralized state-making initiatives of the period. In fact, the new forestry science was a subdiscipline of what was called cameral science, an effort to reduce the fiscal management of a kingdom to scientific principles that would allow systematic planning.[7] Traditional domainal forestry had hitherto simply divided the forest into roughly equal plots, with the number of plots coinciding with the number of years in the assumed growth cycle.[8] One plot was cut each year on the assumption of equal yields (and value) from plots of equal size. Because of poor maps, the uneven distribution of the most valuable large trees (*Hochwald*), and very approximate cordwood (*Bruststaerke*) measures, the results were unsatisfactory for fiscal planning.

Careful exploitation of domainal forests was all the more imperative in the late eighteenth century, when fiscal officials became aware of a growing shortage of wood. Many of the old-growth forests of oak, beech, hornbeam, and linden had been severely degraded by planned and unplanned felling, while the regrowth was not as robust as hoped. The prospect of declining yields was alarming, not merely because it threatened revenue flows but also because it might provoke massive poaching by a peasantry in search of firewood. One sign of this concern were the numerous state-sponsored competitions for designs of more efficient woodstoves.

The first attempt at more precise measurements of forests was made by Johann Gottlieb Beckmann on a carefully surveyed sample plot. Walking abreast, several assistants carried compartmentalized boxes with color-coded nails corresponding to five categories of tree sizes, which they had been trained to identify. Each tree was tagged with the appropriate nail until the sample plot had been covered. Because each assistant had begun with a certain number of nails, it was a simple matter to subtract the remaining nails from the initial total and arrive at an inventory of trees by class for the entire plot. The sample plot had been carefully chosen for its representativeness, allowing the foresters to then calculate the timber and, given certain price assumptions, the revenue yield of the whole forest. For the forest scientists (*Forstwissenschaftler*) the goal was always to "deliver the greatest possible *constant* volume of wood."[9]

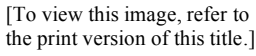
The effort at precision was pushed further as mathematicians worked from the cone-volume principle to specify the volume of saleable wood contained by a standardized tree (*Normalbaum*) of a given

size-class. Their calculations were checked empirically against the actual volume of wood in sample trees.[10] The final result of such calculations was the development of elaborate tables with data organized by tree size and age under specified conditions of normal growth and maturation. By radically narrowing his vision to commercial wood, the state forester had, with his tables, paradoxically achieved a synoptic view of the entire forest.[11] This restriction of focus reflected in the tables was in fact the only way in which the whole forest could be taken in by a single optic. Reference to these tables coupled with field tests allowed the forester to estimate closely the inventory, growth, and yield of a given forest. In the regulated, abstract forest of the forstwissenschaftler, calculation and measurement prevailed, and the three watchwords, in modern parlance, were "minimum diversity," the "balance sheet," and "sustained yield." The logic of the state-managed forest science was virtually identical with the logic of commercial exploitation.[12]

The achievement of German forestry science in standardizing techniques for calculating the sustainable yield of commercial timber and hence revenue was impressive enough. What is decisive for our purposes, however, was the next logical step in forest management. That step was to attempt to create, through careful seeding, planting, and cutting, a forest that was easier for state foresters to count, manipulate, measure, and assess. The fact is that forest science and geometry, backed by state power, had the capacity to transform the real, diverse, and chaotic old-growth forest into a new, more uniform forest that closely resembled the administrative grid of its techniques. To this end, the underbrush was cleared, the number of species was reduced (often to monoculture), and plantings were done simultaneously and in straight rows on large tracts. These management practices, as Henry Lowood observes, "produced the monocultural, even-age forests that eventually transformed the Normalbaum from abstraction to reality. The German forest became the archetype for imposing on disorderly nature the neatly arranged constructs of science. Practical goals had encouraged mathematical utilitarianism, which seemed, in turn, to promote geometric perfection as the outward sign of the well-managed forest; in turn the rationally ordered arrangements of trees offered new possibilities for controlling nature."[13]

The tendency was toward regimentation, in the strict sense of the word. The forest trees were drawn up into serried, uniform ranks, as it were, to be measured, counted off, felled, and replaced by a new rank and file of lookalike conscripts. As an army, it was also designed hierarchically from above to fulfill a unique purpose and to be at the disposition of a single commander. At the limit, the forest itself would not even have to be seen; it could be "read" accurately from the tables and maps in the forester's office.

1. Mixed temperate forest, part managed, part natural regeneration



2. One aisle of a managed poplar forest in Tuscany

How much easier it was to manage the new, stripped-down forest. With stands of same-age trees arranged in linear alleys, clearing the underbrush, felling, extraction, and new planting became a far more routine process. Increasing order in the forest made it possible for forest workers to use written training protocols that could be widely applied. A relatively unskilled and inexperienced labor crew could adequately carry out its tasks by following a few standard rules in the new forest environment. Harvesting logs of relatively uniform width and length not only made it possible to forecast yields successfully but also to market homogeneous product units to logging contractors and timber merchants.[14] Commercial logic and bureaucratic logic were, in this instance, synonymous; it was a system that promised to maximize the return of a single commodity over the long haul and at the same time lent itself to a centralized scheme of management.

The new legible forest was also easier to manipulate experimentally. Now that the more complex old-growth forest had been replaced by a forest in which many variables were held constant, it was a far simpler matter to examine the effects of such variables as fertilizer applications, rainfall, and weeding, on same-age, single-species stands. It was the closest thing to a forest laboratory one could imagine at the time.[15] The very simplicity of the forest made it possible, for the first time, to assess novel regimens of forest management under nearly experimental conditions.

Although the geometric, uniform forest was intended to facilitate management and extraction, it quickly became a powerful aesthetic as well. The visual sign of the well-managed forest, in Germany and in the many settings where German scientific forestry took hold, came to be the regularity and neatness of its appearance. Forests might be inspected in much the same way as a commanding officer might review his troops on parade, and woe to the forest guard whose "beat" was not sufficiently trim or "dressed." This aboveground order required that underbrush be removed and that fallen trees and branches be gathered and hauled off. Unauthorized disturbances—whether by fire or by local populations—were seen as implicit threats to management routines. The more uniform the forest, the greater the possibilities for centralized management; the routines that could be applied minimized the need for the discretion necessary in the management of diverse old-growth forests.

The controlled environment of the redesigned, scientific forest promised many striking advantages.[16] It could be synoptically surveyed by the chief forester; it could be more easily supervised and harvested according to centralized, long-range plans; it provided a steady, uniform commodity, thereby eliminating one major source of revenue fluctuation; and it created a legible natural terrain that facilitated manipulation and experimentation.

This utopian dream of scientific forestry was, of course, only the *immanent* logic of its techniques. It was not and could not ever be realized in practice. Both nature and the human factor intervened. The existing topography of the landscape and the vagaries of fire, storms, blights, climatic changes, insect populations, and disease conspired to thwart foresters and to shape the actual forest. Also, given the insurmountable difficulties of policing large forests, people living nearby typically continued to graze animals, poach firewood and kindling, make charcoal, and use the forest in other ways that prevented the foresters' management plan from being fully realized.[17] Although, like all utopian schemes, it fell well short of attaining its goal, the critical fact is that it did partly succeed in stamping the actual forest with the imprint of its designs.

The principles of scientific forestry were applied as rigorously as was practicable to most large German forests throughout much of the nineteenth century. The Norway spruce, known for its hardiness, rapid growth, and valuable wood, became the bread-and-butter tree of commercial forestry. Originally, the Norway spruce was seen as a restoration crop that might revive overexploited mixed forests, but the commercial profits from the first rotation were so stunning that there was little effort to return to mixed forests. The monocropped forest was a disaster for peasants who were now deprived of all the grazing, food, raw materials, and medicines that the earlier forest ecology had afforded. Diverse old-growth forests, about three-fourths of which were broadleaf (deciduous) species, were replaced by largely coniferous forests in which Norway spruce or Scotch pine were the dominant or often only species.

In the short run, this experiment in the radical simplification of the forest to a single commodity was a resounding success. It was a rather long short run, in the sense that a single crop rotation of trees might take eighty years to mature. The productivity of the new forests reversed the decline in the domestic wood supply, provided more uniform stands and more usable wood fiber, raised the economic return of forest land, and appreciably shortened rotation times (the time it took to harvest a stand and plant another).[18] Like row crops in a field, the new softwood forests were prodigious producers of a single commodity. Little wonder that the German model of intensive commercial forestry became standard throughout the world.[19] Gifford Pinchot, the second chief forester of the United States, was trained at the French forestry school at Nancy, which followed a German-style curriculum, as did most U.S. and European forestry schools.[20] The first forester hired by the British to assess and manage the great forest resources of India and Burma was Dietrich Brandes, a German.[21] By the end of the nineteenth century, German forestry science was hegemonic.

The great simplification of the forest into a "one-commodity ma-

chine" was precisely the step that allowed German forestry science to become a rigorous technical and commercial discipline that could be codified and taught. A condition of its rigor was that it severely bracketed, or assumed to be constant, all variables except those bearing directly on the yield of the selected species and on the cost of growing and extracting them. As we shall see with urban planning, revolutionary theory, collectivization, and rural resettlement, a whole world lying "outside the brackets" returned to haunt this technical vision.

In the German case, the negative biological and ultimately commercial consequences of the stripped-down forest became painfully obvious only after the *second* rotation of conifers had been planted. "It took about one century for them [the negative consequences] to show up clearly. Many of the pure stands grew excellently in the first generation but already showed an amazing retrogression in the second generation. The reason for this is a very complex one and only a simplified explanation can be given. . . . Then the whole nutrient cycle got out of order and eventually was nearly stopped. . . . Anyway, the drop of one or two site classes [used for grading the quality of timber] during two or three generations of pure spruce is a well known and frequently observed fact. This represents a production loss of 20 to 30 percent."[22]

A new term, *Waldsterben* (forest death), entered the German vocabulary to describe the worst cases. An exceptionally complex process involving soil building, nutrient uptake, and symbiotic relations among fungi, insects, mammals, and flora—which were, and still are, not entirely understood—was apparently disrupted, with serious consequences. Most of these consequences can be traced to the radical simplicity of the scientific forest.

Only an elaborate treatise in ecology could do justice to the subject of what went wrong, but mentioning a few of the major effects of simplification will illustrate how vital many of the factors bracketed by scientific forestry turned out to be. German forestry's attention to formal order and ease of access for management and extraction led to the clearing of underbrush, deadfalls, and snags (standing dead trees), greatly reducing the diversity of insect, mammal, and bird populations so essential to soil-building processes.[23] The absence of litter and woody biomass on the new forest floor is now seen as a major factor leading to thinner and less nutritious soils.[24] Same-age, same-species forests not only created a far less diverse habitat but were also more vulnerable to massive storm-felling. The very uniformity of species and age among, say, Norway spruce also provided a favorable habitat to all the "pests" which were specialized to that species. Populations of these pests built up to epidemic proportions, inflicting losses in yields and large outlays for fertilizers, insecticides, fungicides, or rodenticides.[25] Apparently the first rotation of Norway spruce had grown exceptionally well in large part because it was living off (or mining) the long-accumulated

soil capital of the diverse old-growth forest that it had replaced. Once that capital was depleted, the steep decline in growth rates began.

As pioneers in scientific forestry, the Germans also became pioneers in recognizing and attempting to remedy many of its undesirable consequences. To this end, they invented the science of what they called "forest hygiene." In place of hollow trees that had been home to woodpeckers, owls, and other tree-nesting birds, the foresters provided specially designed boxes. Ant colonies were artificially raised and implanted in the forest, their nests tended by local schoolchildren. Several species of spiders, which had disappeared from the monocropped forest, were reintroduced.[26] What is striking about these endeavors is that they are attempts to work around an impoverished habitat still planted with a single species of conifers for production purposes.[27] In this case, "restoration forestry" attempted with mixed results to create a *virtual* ecology, while denying its chief sustaining condition: diversity.

The metaphorical value of this brief account of scientific production forestry is that it illustrates the dangers of dismembering an exceptionally complex and poorly understood set of relations and processes in order to isolate a single element of instrumental value. The instrument, the knife, that carved out the new, rudimentary forest was the razor-sharp interest in the production of a single commodity. Everything that interfered with the efficient production of the key commodity was implacably eliminated. Everything that seemed unrelated to efficient production was ignored. Having come to see the forest as a commodity, scientific forestry set about refashioning it as a commodity machine.[28] Utilitarian simplification in the forest was an effective way of maximizing wood production in the short and intermediate term. Ultimately, however, its emphasis on yield and paper profits, its relatively short time horizon, and, above all, the vast array of consequences it had resolutely bracketed came back to haunt it.[29]

Even in the realm of greatest interest—namely, the production of wood fiber—the consequences of not seeing the forest for the trees sooner or later became glaring. Many were directly traceable to the basic simplification imposed in the interest of ease of management and economic return: monoculture. Monocultures are, as a rule, more fragile and hence more vulnerable to the stress of disease and weather than polycultures are. As Richard Plochmann expresses it, "One further drawback, which is typical of all pure plantations, is that the ecology of the natural plant associations became unbalanced. Outside of the natural habitat, and when planted in pure stands, the physical condition of the single tree weakens and resistance against enemies decreases."[30] Any unmanaged forest may experience stress from storms, disease, drought, fragile soil, or severe cold. A diverse, complex forest, however, with its many species of trees, its full complement of birds, insects, and

mammals, is far more resilient—far more able to withstand and recover from such injuries—than pure stands. Its very diversity and complexity help to inoculate it against devastation: a windstorm that fells large, old trees of one species will typically spare large trees of other species as well as small trees of the same species; a blight or insect attack that threatens, say, oaks may leave lindens and hornbeams unscathed. Just as a merchant who, not knowing what conditions her ships will face at sea, sends out scores of vessels with different designs, weights, sails, and navigational aids stands a better chance of having much of her fleet make it to port, while a merchant who stakes everything on a single ship design and size runs a higher risk of losing everything, forest biodiversity acts like an insurance policy. Like the enterprise run by the second merchant, the simplified forest is a more vulnerable system, especially over the long haul, as its effects on soil, water, and "pest" populations become manifest. Such dangers can only partly be checked by the use of artificial fertilizers, insecticides, and fungicides. Given the fragility of the simplified production forest, the massive outside intervention that was required to establish it—we might call it the administrators' forest—is increasingly necessary in order to sustain it as well.[31]

Social Facts, Raw and Cooked

> Society must be remade before it can be the object of quantification. Categories of people and things must be defined, measures must be interchangeable; land and commodities must be conceived as represented by an equivalent in money. There is much of what Weber called rationalization in this, and also a good deal of centralization.
> —Theodore M. Porter, *"Objectivity as Standardization"*

The administrators' forest cannot be the naturalists' forest. Even if the ecological interactions at play in the forest were known, they would constitute a reality so complex and variegated as to defy easy shorthand description. The intellectual filter necessary to reduce the complexity to manageable dimensions was provided by the state's interest in commercial timber and revenue.

If the natural world, however shaped by human use, is too unwieldy in its "raw" form for administrative manipulation, so too are the actual social patterns of human interaction with nature bureaucratically indigestible in their raw form. No administrative system is capable of representing *any* existing social community except through a heroic and greatly schematized process of abstraction and simplification. It is not simply a question of capacity, although, like a forest, a human community is surely far too complicated and variable to easily yield its secrets to bureaucratic formulae. It is also a question of purpose. State agents have no interest—nor should they—in describ-

ing an entire social reality, any more than the scientific forester has an interest in describing the ecology of a forest in detail. Their abstractions and simplifications are disciplined by a small number of objectives, and until the nineteenth century the most prominent of these were typically taxation, political control, and conscription. They needed only the techniques and understanding that were adequate to these tasks. As we shall see, here are some instructive parallels between the development of modern "fiscal forestry" and modern forms of taxable property in land. Premodern states were no less concerned with tax receipts than are modern states. But, as with premodern state forestry, the taxation techniques and reach of the premodern state left much to be desired.

Absolutist France in the seventeenth century is a case in point.[32] Indirect taxes—excise levies on salt and tobacco, tolls, license fees, and the sale of offices and titles—were favored forms of taxation; they were easy to administer and required little or nothing in the way of information about landholding and income. The tax-exempt status of the nobility and clergy meant that a good deal of the landed property was not taxed at all, transferring much of the burden to wealthy commoner farmers and the peasantry. Common land, although it was a vitally important subsistence resource for the rural poor, yielded no revenue either. In the eighteenth century, the physiocrats would condemn all common property on two presumptive grounds: it was inefficiently exploited, and it was fiscally barren.[33]

What must strike any observer of absolutist taxation is how wildly variable and unsystematic it was. James Collins has found that the main direct land tax, the *taille*, was frequently not paid at all and that no community paid more than one-third of what they were assessed.[34] The result was that the state routinely relied on exceptional measures to overcome shortfalls in revenue or to pay for new expenses, particularly military campaigns. The crown exacted "forced loans" (*rentes, droits aliénés*) in return for annuities that it might or might not honor; it sold offices and titles (*vénalités d'offices*); it levied exceptional hearth taxes (*fouages extraordinaires*); and, worst of all, it billeted troops directly in communities, often ruining the towns in the process.[35]

The billeting of troops, a common form of fiscal punishment, is to modern forms of systematic taxation as the drawing and quartering of would-be regicides (so strikingly described by Michel Foucault at the beginning of *Discipline and Punish*) is to modern forms of systematic incarceration of criminals. Not that there was a great deal of choice involved. The state simply lacked both the information and the administrative grid that would have allowed it to exact from its subjects a reliable revenue that was more closely tied to their actual capacity to pay. As with forest revenue, there was no alternative to rough-and-ready calculations and their corresponding fluctuations in yields. Fiscally,

the premodern state was, to use Charles Lindblom's felicitous phrase, "all thumbs and no fingers"; it was incapable of fine tuning.

Here is where the rough analogy between forest management and taxation begins to break down. In the absence of reliable information about sustainable timber yield, the state might either inadvertently overexploit its resources and threaten future supply or else fail to realize the level of proceeds the forest might sustain.[36] The trees themselves, however, were not political actors, whereas the taxable subjects of the crown most certainly were. They signaled their dissatisfaction by flight, by various forms of quiet resistance and evasion, and, in extremis, by outright revolt. A reliable format for taxation of subjects thus depended not just on discovering what their economic conditions were but also on trying to judge what exactions they would vigorously resist.

How were the agents of the state to begin measuring and codifying, throughout each region of an entire kingdom, its population, their landholdings, their harvests, their wealth, the volume of commerce, and so on? The obstacles in the path of even the most rudimentary knowledge of these matters were enormous. The struggle to establish uniform weights and measures and to carry out a cadastral mapping of landholdings can serve as diagnostic examples. Each required a large, costly, long-term campaign against determined resistance. Resistance came not only from the general population but also from local power-holders; they were frequently able to take advantage of the administrative incoherence produced by differing interests and missions within the ranks of officialdom. But in spite of the ebbs and flows of the various campaigns and their national peculiarities, a pattern of adopting uniform measurements and charting cadastral maps ultimately prevailed.

Each undertaking also exemplified a pattern of relations between local knowledge and practices on one hand and state administrative routines on the other, a pattern that will find echoes throughout this book. In each case, local practices of measurement and landholding were "illegible" to the state in their raw form. They exhibited a diversity and intricacy that reflected a great variety of purely local, not state, interests. That is to say, they could not be assimilated into an administrative grid without being either transformed or reduced to a convenient, if partly fictional, shorthand. The logic behind the required shorthand was provided, as in scientific forestry, by the pressing material interests of rulers: fiscal receipts, military manpower, and state security. In turn, this shorthand functioned, as did Beckmann's Normalbäume, as not just a description, however inadequate. Backed by state power through records, courts, and ultimately coercion, these state fictions transformed the reality they presumed to observe, although never so thoroughly as to precisely fit the grid.

Forging the Tools of Legibility: Popular Measures, State Measures

Nonstate forms of measurement grew from the logic of local practice. As such, they shared some generic features despite their bewildering variety—features that made them an impediment to administrative uniformity. Thanks to the synthesis of the medievalist Witold Kula, the reasoning that animated local practices of measurement may be set out fairly succinctly.[37]

Most early measures were human in scale. One sees this logic at work in such surviving expressions as a "stone's throw" or "within earshot" for distances and a "cartload," a "basketful," or a "handful" for volume. Given that the size of a cart or basket might vary from place to place and that a stone's throw might not be precisely uniform from person to person, these units of measurement varied geographically and temporally. Even measures that were apparently fixed might be deceptive. The *pinte* in eighteenth-century Paris, for example, was equivalent to .93 liters, whereas in Seine-en-Montagne it was 1.99 liters and in Precy-sous-Thil, an astounding 3.33 liters. The *aune*, a measure of length used for cloth, varied depending on the material (the unit for silk, for instance, was smaller than that for linen), and across France there were at least seventeen different aunes.[38]

Local measures were also relational or "commensurable."[39] Virtually any request for a judgment of measure allows a range of responses depending on the context of the request. In the part of Malaysia with which I am most familiar, if one were to ask "How far is it to the next village?" a likely response would be "Three rice-cookings." The answer assumes that the questioner is interested in how much time it will take to get there, not how many miles away it is. In varied terrain, of course, distance in miles is an utterly unreliable guide to travel time, especially when the traveler is on foot or riding a bicycle. The answer also expresses time not in minutes—until recently, wristwatches were rare—but in units that are locally meaningful. Everyone knows how long it takes to cook the local rice. Thus an Ethiopian response to a query about how much salt is required for a dish might be "Half as much as to cook a chicken." The reply refers back to a standard that everyone is expected to know. Such measurement practices are irreducibly local, inasmuch as regional differences in, say, the type of rice eaten or the preferred way of cooking chicken will give different results.

Many local units of measurement are tied practically to particular activities. Marathi peasants, as Arjun Appadurai notes, express the desired distance between the onion sets they plant in terms of handbreadths. When one is moving along a field row, the hand is, well, the most handy gauge. In similar fashion, a common measure for twine or rope is the distance between the thumb and elbow because this corresponds with how it is wrapped and stored. As with setting onions, the

process of measuring is embedded in the activity itself and requires no separate operation. Such measurements, moreover, are often approximate; they are only as exact as the task at hand requires.[40] Rainfall may be said to be abundant or inadequate if the context of the query implies an interest in a particular crop. And a reply in terms of inches of rainfall, however accurate, would also fail to convey the desired information; it ignores such vital matters as the timing of the rain. For many purposes, an apparently vague measurement may communicate more valuable information than a statistically exact figure. The cultivator who reports that his rice yield from a plot is anywhere between four and seven baskets is conveying more accurate information, when the focus of attention is on the variability of the yield, than if he reported a ten-year statistical average of 5.6 baskets.

There is, then, no single, all-purpose, correct answer to a question implying measurement unless we specify the relevant local concerns that give rise to the question. Particular customs of measurement are thus situationally, temporally, and geographically bound.

Nowhere is the particularity of customary measurement more evident than with cultivated land. Modern abstract measures of land by surface area—so many hectares or acres—are singularly uninformative figures to a family that proposes to make its living from these acres. Telling a farmer only that he is leasing twenty acres of land is about as helpful as telling a scholar that he has bought six kilograms of books. Customary measures of land have therefore taken a variety of forms corresponding to those aspects of the land that are of greatest practical interest. Where land was abundant and manpower or draftpower scarce, the most meaningful gauge of land was often the number of days required to plow or to weed it. A plot of land in nineteenth-century France, for example, would be described as representing so many *morgen* or *journals* (days of work) and as requiring a specific kind of work (*homée, bechée, fauchée*). How many morgen were represented by a field of, say, ten acres could vary greatly; if the land were rocky and steeply pitched, it might require twice as much labor to work than if it were rich bottomland. The morgen would also differ from place to place depending on the strength of local draftpower and the crops sown, and it would differ from time to time as technology (plow tips, yokes, harnesses) affected the work a man could accomplish in a day.

Land might also be evaluated according to the amount of seed required to sow it. If the soil were very good, a field would be densely sown, whereas poor land would be more lightly seeded. The amount of seed sown to a field is in fact a relatively good proxy for average yield, as the sowing is done in anticipation of average growing conditions, while the actual seasonal yield would be more variable. Given a particular crop regimen, the amount of seed sown would indicate roughly

how productive a field had been, although it would reveal little about how arduous the land was to cultivate or how variable the harvests were. But the average yield from a plot of land is itself a rather abstract figure. What most farmers near the subsistence margin want to know above all is whether a particular farm will meet their basic needs reliably. Thus small farms in Ireland were described as a "farm of one cow" or a "farm of two cows" to indicate their grazing capacity to those who lived largely by milk products and potatoes. The physical area a farm might comprise was of little interest compared to whether it would feed a particular family.[41]

To grasp the prodigious variety of customary ways of measuring land, we would have to imagine literally scores of "maps" constructed along very different lines than mere surface area. I have in mind the sorts of maps devised to capture our attention with a kind of fun-house effect in which, say, the size of a country is made proportional to its population rather than its geographical size, with China and India looming menacingly over Russia, Brazil, and the United States, while Libya, Australia, and Greenland virtually disappear. These types of customary maps (for there would be a great many) would construct the landscape according to units of work and yield, type of soil, accessibility, and ability to provide subsistence, none of which would necessarily accord with surface area. The measurements are decidedly *local, interested, contextual,* and *historically specific*. What meets the subsistence needs of one family may not meet the subsistence needs of another. Factors such as local crop regimens, labor supply, agricultural technology, and weather ensure that the standards of evaluation vary from place to place and over time. Directly apprehended by the state, so many maps would represent a hopelessly bewildering welter of local standards. They definitely would not lend themselves to aggregation into a single statistical series that would allow state officials to make meaningful comparisons.

The Politics of Measurement

Thus far, this account of local measurement practices risks giving the impression that, although local conceptions of distance, area, volume, and so on were different from and more varied than the unitary abstract standards a state might favor, they were nevertheless aiming at objective accuracy. That impression would be false. Every act of measurement was an act marked by the play of power relations. To understand measurement practices in early modern Europe, as Kula demonstrates, one must relate them to the contending interests of the major estates: aristocrats, clergy, merchants, artisans, and serfs.

A good part of the politics of measurement sprang from what a contemporary economist might call the "stickiness" of feudal rents. Noble

and clerical claimants often found it difficult to increase feudal dues directly; the levels set for various charges were the result of long struggle, and even a small increase above the customary level was viewed as a threatening breach of tradition.[42] Adjusting the measure, however, represented a roundabout way of achieving the same end. The local lord might, for example, lend grain to peasants in smaller baskets and insist on repayment in larger baskets. He might surreptitiously or even boldly enlarge the size of the grain sacks accepted for milling (a monopoly of the domain lord) and reduce the size of the sacks used for measuring out flour; he might also collect feudal dues in larger baskets and pay wages in kind in smaller baskets. While the formal custom governing feudal dues and wages would thus remain intact (requiring, for example, the same number of sacks of wheat from the harvest of a given holding), the actual transaction might increasingly favor the lord.[43] The results of such fiddling were far from trivial. Kula estimates that the size of the bushel (*boisseau*) used to collect the main feudal rent (taille) increased by one-third between 1674 and 1716 as part of what was called the *réaction féodale*.[44]

Even when the unit of measurement—say, the bushel—was apparently agreed upon by all, the fun had just begun. Virtually everywhere in early modern Europe were endless micropolitics about how baskets might be adjusted through wear, bulging, tricks of weaving, moisture, the thickness of the rim, and so on. In some areas the local standards for the bushel and other units of measurement were kept in metallic form and placed in the care of a trusted official or else literally carved into the stone of a church or the town hall.[45] Nor did it end there. How the grain was to be poured (from shoulder height, which packed it somewhat, or from waist height?), how damp it could be, whether the container could be shaken down, and, finally, if and how it was to be leveled off when full were subjects of long and bitter controversy. Some arrangements called for the grain to be heaped, some for a "half-heap," and still others for it to be leveled or "striked" (*ras*). These were not trivial matters. A feudal lord could increase his rents by 25 percent by insisting on receiving wheat and rye in heaped bushels.[46] If, by custom, the bushel of grain was to be striked, then a further micropolitics erupted over the strickle. Was it to be round, thereby packing in grain as it was rolled across the rim, or was it to be sharp-edged? Who would apply the strickle? Who could be trusted to keep it?

A comparable micropolitics, as one might expect, swirled around the unit of land measurement. A common measure of length, the ell, was used to mark off the area to be plowed or weeded as a part of feudal labor dues. Once again, the lengths and widths in ells were "sticky," having been established through long struggle. It was tempting for a lord or overseer to try raising labor dues indirectly by increasing the length of the ell. If the attempt were successful, the formal rules of

corvée labor would not be violated, but the amount of work extracted would increase. Perhaps the stickiest of all measures before the nineteenth century was the price of bread. As the most vital subsistence good of premodern times, it served as a kind of cost-of-living index, and its cost was the subject of deeply held popular customs about its relationship to the typical urban wage. Kula shows in remarkable detail how bakers, afraid to provoke a riot by directly violating the "just price," managed nevertheless to manipulate the size and weight of the loaf to compensate to some degree for changes in the price of wheat and rye flour.[47]

Statecraft and the Hieroglyphics of Measurement

Because local standards of measurement were tied to practical needs, because they reflected particular cropping patterns and agricultural technology, because they varied with climate and ecology, because they were "an attribute of power and an instrument of asserting class privilege," and because they were "at the center of bitter class struggle," they represented a mind-boggling problem for statecraft.[48] Efforts to simplify or standardize measures recur like a leitmotif throughout French history—their reappearance a sure sign of previous failure. More modest attempts to simply codify local practices and create conversion tables were quickly overtaken and rendered obsolete by changes on the ground. The king's ministers were confronted, in effect, with a patchwork of local measurement codes, each of which had to be cracked. It was as if each district spoke its own dialect, one that was unintelligible to outsiders and at the same time liable to change without notice. Either the state risked making large and potentially damaging miscalculations about local conditions, or it relied heavily on the advice of local trackers—the nobles and clergy in the Crown's confidence—who, in turn, were not slow to take full advantage of their power.

The illegibility of local measurement practices was more than an administrative headache for the monarchy. It compromised the most vital and sensitive aspects of state security. Food supply was the Achilles heel of the early modern state; short of religious war, nothing so menaced the state as food shortages and the resulting social upheavals. Without comparable units of measurement, it was difficult if not impossible to monitor markets, to compare regional prices for basic commodities, or to regulate food supplies effectively.[49] Obliged to grope its way on the basis of sketchy information, rumor, and self-interested local reports, the state often responded belatedly and inappropriately. Equity in taxation, another sensitive political issue, was beyond the reach of a state that found it difficult to know the basic comparative facts about harvests and prices. A vigorous effort to collect taxes, to requisition for mil-

itary garrisons, to relieve urban shortages, or any number of other measures might, given the crudeness of state intelligence, actually provoke a political crisis. Even when it did not jeopardize state security, the Babel of measurement produced gross inefficiencies and a pattern of either undershooting or overshooting fiscal targets.[50] No effective central monitoring or controlled comparisons were possible without standard, fixed units of measurement.

Simplification and Standardization of Measurement

> The conquerors of our days, peoples or princes, want their empire to possess a unified surface over which the superb eye of power can wander without encountering any inequality which hurts or limits its view. The same code of law, the same measures, the same rules, and if we could gradually get there, the same language; that is what is proclaimed as the perfection of the social organization. . . . The great slogan of the day is *uniformity*.
> —Benjamin Constant, *De l'esprit de conquête*

If scientific forestry's project of creating a simplified and legible forest encountered opposition from villagers whose usage rights were being challenged, the political opposition to standard and legible units of measurement was even more refractory. The power to establish and impose local measures was an important feudal prerogative with material consequences which the aristocracy and clergy would not willingly surrender. Testimony to their capacity to thwart standardization is evident in the long series of abortive initiatives by absolutist rulers who tried to insist on some degree of uniformity. The very particularity of local feudal practices and their impenetrability to would-be centralizers helped to underwrite the autonomy of local spheres of power.

Three factors, in the end, conspired to make what Kula calls the "metrical revolution" possible. First, the growth of market exchange encouraged uniformity in measures. Second, both popular sentiment and Enlightenment philosophy favored a single standard throughout France. Finally, the Revolution and especially Napoleonic state building actually enforced the metric system in France and the empire.

Large-scale commercial exchange and long-distance trade tend to promote common standards of measurement. For relatively small-scale trade, grain dealers could transact with several suppliers as long as they knew the measure each was using. They might actually profit from their superior grasp of the profusion of units, much as smugglers take advantage of small differences in taxes and tariffs. Beyond a certain point, however, much of commerce is composed of long chains of transactions, often over great distances, between anonymous buyers and sellers. Such trade is greatly simplified and made legible by standard weights and measures. Whereas artisanal products were typically made by a single producer according to the desires of a particular cus-

tomer and carried a price specific to that object, the mass-produced commodity is made by no one in particular and is intended for any purchaser at all. In a sense, the virtue of the mass commodity is its reliable uniformity. In proportion, then, as the volume of commerce grew and the goods exchanged became increasingly standardized (a ton of wheat, a dozen plow tips, twenty cart wheels), there was a growing tendency to accept widely agreed upon units of measurement. Officials and physiocrats alike were convinced that uniform measures were the precondition for creating a national market and promoting rational economic action.[51]

The perennial state project of unifying measures throughout the kingdom received a large degree of popular support in the eighteenth century, thanks to the réaction féodale. Aiming to maximize the return on their estates, owners of feudal domains, many of them arrivistes, achieved their goal in part by manipulating units of measurement. This sense of victimization was evident in the *cahiers* of grievances prepared for the meeting of the Estates General just before the Revolution. The cahiers of the members of the Third Estate consistently called for equal measures (although this was hardly their main grievance), whereas the cahiers of the clergy and nobility were silent, presumably indicating their satisfaction with the status quo on this issue. The following petition from Brittany is typical of the way in which an appeal for unitary measures could be assimilated to devotion to the Crown: "We beg them [the king, his family, and his chief minister] to join with us in checking the abuses being perpetrated by tyrants against that class of citizens which is kind and considerate and which, until this day has been unable to present its very grievances to the very foot of the throne, and now we call on the King to mete out justice, and *we express our most sincere desire for but one king, one law, one weight, and one measure.*"[52]

For centralizing elites, the universal meter was to older, particularistic measurement practices as a national language was to the existing welter of dialects. Such quaint idioms would be replaced by a new universal gold standard, just as the central banking of absolutism had swept away the local currencies of feudalism. The metric system was at once a means of administrative centralization, commercial reform, and cultural progress. The academicians of the revolutionary republic, like the royal academicians before them, saw the meter as one of the intellectual instruments that would make France "revenue-rich, militarily potent, and *easily administered.*"[53] Common measures, it was supposed, would spur the grain trade, make land more productive (by permitting easier comparisons of price and productivity), and, not incidentally, lay the groundwork for a national tax code.[54] But the reformers also had in mind a genuine cultural revolution. "As mathematics was the language of science, so would the metric system be the

language of commerce and industry," serving to unify and transform French society.[55] A rational unit of measurement would promote a rational citizenry.

The simplification of measures, however, depended on that other revolutionary political simplification of the modern era: the concept of a uniform, homogeneous citizenship. As long as each estate operated within a separate legal sphere, as long as different categories of people were unequal in law, it followed that they might also have unequal rights with respect to measures.[56] The idea of equal citizenship, the abstraction of the "unmarked" citizen, can be traced to the Enlightenment and is evident in the writings of the Encyclopedists.[57] For the Encyclopedists, the cacophony among measurements, institutions, inheritance laws, taxation, and market regulations was the great obstacle to the French becoming a single people. They envisioned a series of centralizing and rationalizing reforms that would transform France into a national community where the same codified laws, measures, customs, and beliefs would everywhere prevail. It is worth noting that this project promotes the concept of *national* citizenship—a national French citizen perambulating the kingdom and encountering exactly the same fair, equal conditions as the rest of his compatriots. In place of a welter of incommensurable small communities, familiar to their inhabitants but mystifying to outsiders, there would rise a single national society perfectly legible from the center. The proponents of this vision well understood that what was at stake was not merely administrative convenience but also the transformation of a people: "The uniformity of customs, viewpoints, and principles of action will, inevitably, lead to a greater community of habits and predispositions."[58] The abstract grid of equal citizenship would create a new reality: the French citizen.

The homogenization of measures, then, was part of a larger, emancipatory simplification. At one stroke the equality of all French people before the law was guaranteed by the state; they were no longer mere subjects of their lords and sovereign but bearers of inalienable rights as citizens.[59] All the previous "natural" distinctions were now "denaturalized" and nullified, at least in law.[60] In an unprecedented revolutionary context where an entirely new political system was being created from first principles, it was surely no great matter to legislate uniform weights and measures. As the revolutionary decree read: "The centuries old dream of the masses of only one just measure has come true! The Revolution has given the people the meter."[61]

Proclaiming the universal meter was far simpler than ensuring that it became the daily practice of French citizens. The state could insist on the exclusive use of its units in the courts, in the state school system, and in such documents as property deeds, legal contracts, and tax codes. Outside these official spheres, the metric system made its way only very slowly. In spite of a decree for confiscating *toise* sticks in

shops and replacing them with meter sticks, the populace continued to use the older system, often marking their meter sticks with the old measures. Even as late as 1828 the new measures were more a part of *le pays légal* than of *le pays réel*. As Chateaubriand remarked, "Whenever you meet a fellow who, instead of talking *arpents*, *toises*, and *pieds*, refers to hectares, meters, and centimeters, rest assured, the man is a prefect."[62]

Land Tenure: Local Practice and Fiscal Shorthand

The revenue of the early modern state came mainly from levies on commerce and land, the major sources of wealth. For commerce, this implied an array of excise taxes, tolls and market duties, licensing fees, and tariffs. For landed wealth, this meant somehow attaching every parcel of taxable property to an individual or an institution responsible for paying the tax on it. As straightforward as this procedure seems in the context of the modern state, its achievement was enormously difficult for at least two reasons. First, the actual practices of customary land tenure were frequently so varied and intricate as to defy any one-to-one equation of taxpayer and taxable property. And second, as was the case with standardizing measurement, there were social forces whose interests could only be damaged by the unified and transparent set of property relations desired by the state's fiscal agents. In the end, the centralizing state succeeded in imposing a novel and (from the center) legible property system, which, as had the work of the scientific foresters, not only radically abridged the practices that the system described but at the same time transformed those practices to align more closely with their shorthand, schematic reading.

An Illustration

> *Negara mawi tata, desa mawi cara* (The capital has its order, the village its customs).
> —*Javanese proverb*

A hypothetical case of customary land tenure practices may help demonstrate how difficult it is to assimilate such practices to the bare-bones schema of a modern cadastral map. The patterns I will describe are an amalgam of practices I have encountered in the literature of or in the course of fieldwork in Southeast Asia, and although the case is hypothetical, it is not unrealistic.

Let us imagine a community in which families have usufruct rights to parcels of cropland during the main growing season. Only certain crops, however, may be planted, and every seven years the usufruct

land is redistributed among resident families according to each family's size and its number of able-bodied adults. After the harvest of the main-season crop, all cropland reverts to common land where any family may glean, graze their fowl and livestock, and even plant quickly maturing, dry-season crops. Rights to graze fowl and livestock on pasture-land held in common by the village is extended to all local families, but the number of animals that can be grazed is restricted according to family size, especially in dry years when forage is scarce. Families not using their grazing rights can give them to other villagers but not to outsiders. Everyone has the right to gather firewood for normal family needs, and the village blacksmith and baker are given larger allotments. No commercial sale from village woodlands is permitted.

Trees that have been planted and any fruit they may bear are the property of the family who planted them, no matter where they are now growing. Fruit fallen from such trees, however, is the property of anyone who gathers it. When a family fells one of its trees or a tree is felled by a storm, the trunk belongs to the family, the branches to the immediate neighbors, and the "tops" (leaves and twigs) to any poorer villager who carries them off. Land is set aside for use or leasing out by widows with children and dependents of conscripted males. Usufruct rights to land and trees may be let to anyone in the village; the only time they may be let to someone outside the village is if no one in the community wishes to claim them.

After a crop failure leading to a food shortage, many of these arrangements are readjusted. Better-off villagers are expected to assume some responsibility for poorer relatives—by sharing their land, by hiring them, or by simply feeding them. Should the shortage persist, a council composed of heads of families may inventory food supplies and begin daily rationing. In cases of severe shortages or famine, the women who have married into the village but have not yet borne children will not be fed and are expected to return to their native village. This last practice alerts us to the inequalities that often prevail in local customary tenure; single women, junior males, and anyone defined as falling outside the core of the community are clearly disadvantaged.

This description could be further elaborated. It is itself a simplification, but it does convey some of the actual complexity of property relations in contexts where local customs have tended to prevail. To describe the usual practices in this fashion, as if they were laws, is itself a distortion. Customs are better understood as a living, negotiated tissue of practices which are continually being adapted to new ecological and social circumstances—including, of course, power relations. Customary systems of tenure should not be romanticized; they are usually riven with inequalities based on gender, status, and lineage. But because they are strongly local, particular, and adaptable, their plas-

ticity can be the source of microadjustments that lead to shifts in prevailing practice.

Imagine a lawgiver whose only concern was to respect land practices. Imagine, in other words, a written system of positive law that attempted to represent this complex skein of property relations and land tenure. The mind fairly boggles at the clauses, sub-clauses, and sub-sub-clauses that would be required to reduce these practices to a set of regulations that an administrator might understand, never mind enforce. And even if the practices could be codified, the resulting code would necessarily sacrifice much of their plasticity and subtle adaptability. The circumstances that might provoke a new adaptation are too numerous to foresee, let alone specify, in a regulatory code. That code would in effect freeze a living process. Changes in the positive code designed to reflect evolving practice would represent at best a jerky and mechanical adaptation.

And what of the *next* village, and the village after that? Our hypothetical code-giver, however devilishly clever and conscientious, would find that the code devised to fit one set of local practices would not travel well. Each village, with its own particular history, ecology, cropping patterns, kinship alignments, and economic activity, would require a substantially new set of regulations. At the limit, there would be at least as many legal codes as there were communities.

Administratively, of course, such a cacophony of local property regulations would be a nightmare. The nightmare is experienced not by those whose particular practices are being represented but by those state officials who aspire to a uniform, homogeneous, national administrative code. Like the "exotic" units of weights and measures, local land tenure practice is perfectly legible to all who live within it from day to day. Its details may often be contested and far from satisfactory to all its practitioners, but it is completely familiar; local residents have no difficulty in grasping its subtleties and using its flexible provisions for their own purposes. State officials, on the other hand, cannot be expected to decipher and then apply a new set of property hieroglyphs for each jurisdiction. Indeed, the very concept of the modern state presupposes a vastly simplified and uniform property regime that is legible and hence manipulable from the center.

My use of the term "simple" to describe modern property law, whose intricacies provide employment to armies of legal professionals, will seem grossly misplaced. It is surely the case that property law has in many respects become an impenetrable thicket for ordinary citizens. The use of the term "simple" in this context is thus both relative and perspectival. Modern freehold tenure is tenure that is mediated through the state and therefore readily decipherable only to those who have sufficient training and a grasp of the state statutes.[63] Its relative simplicity is lost on those who cannot break the code, just

as the relative clarity of customary tenure is lost on those who live outside the village.

The fiscal or administrative goal toward which all modern states aspire is to measure, codify, and simplify land tenure in much the same way as scientific forestry reconceived the forest. Accommodating the luxuriant variety of customary land tenure was simply inconceivable. The historical solution, at least for the liberal state, has typically been the heroic simplification of individual freehold tenure. Land is owned by a legal individual who possesses wide powers of use, inheritance, or sale and whose ownership is represented by a uniform deed of title enforced through the judicial and police institutions of the state. Just as the flora of the forest were reduced to Normalbäume, so the complex tenure arrangements of customary practice are reduced to freehold, transferrable title. In an agrarian setting, the administrative landscape is blanketed with a uniform grid of homogeneous land, each parcel of which has a legal person as owner and hence taxpayer. How much easier it then becomes to assess such property and its owner on the basis of its acreage, its soil class, the crops it normally bears, and its assumed yield than to untangle the thicket of common property and mixed forms of tenure.

The crowning artifact of this mighty simplification is the cadastral map. Created by trained surveyors and mapped to a given scale, the cadastral map is a more or less complete and accurate survey of all landholdings. Since the driving logic behind the map is to create a manageable and reliable format for taxation, the map is associated with a property register in which each specified (usually numbered) lot on the map is linked to an owner who is responsible for paying its taxes. The cadastral map and property register are to the taxation of land as the maps and tables of the scientific forester were to the fiscal exploitation of the forest.

The Code Rural *That Almost Was*

The rulers of postrevolutionary France confronted a rural society that was a nearly impenetrable web of feudal *and* revolutionary practices. It was inconceivable that they could catalogue its complexities, let alone effectively eliminate them, in the short run. Ideologically, for example, their commitment to equality and liberty was contradicted by customary rural contracts like those used by craft guilds, which still employed the terms "master" (*maître*) and "servant" (*serviteur*). As rulers of a new nation—not a kingdom—they were likewise offended by the absence of an overall legal framework for social relations. For some, a new civil code covering all Frenchmen seemed as if it would be sufficient.[64] But for bourgeois owners of rural property who, along with their noble neighbors, had been threatened by the local uprisings

of the Revolution and La Grand Peur and, more generally, by the aggressiveness of an emboldened and autonomous peasantry, an explicit *code rural* seemed necessary to underwrite their security.

In the end, no postrevolutionary rural code attracted a winning coalition, even amid a flurry of Napoleonic codes in nearly all other realms. For our purposes, the history of the stalemate is instructive. The first proposal for a code, which was drafted between 1803 and 1807, would have swept away most traditional rights (such as common pasturage and free passage through others' property) and essentially recast rural property relations in the light of bourgeois property rights and freedom of contract.[65] Although the proposed code prefigured certain modern French practices, many revolutionaries blocked it because they feared that its hands-off liberalism would allow large landholders to recreate the subordination of feudalism in a new guise.[66]

A reexamination of the issue was then ordered by Napoleon and presided over by Joseph Verneilh Puyrasseau. Concurrently, Deputé Lalouette proposed to do precisely what I supposed, in the hypothetical example, was impossible. That is, he undertook to systematically gather information about all local practices, to classify and codify them, and then to sanction them by decree. The decree in question would become the code rural. Two problems undid this charming scheme to present the rural populace with a rural code that simply reflected its own practices. The first difficulty was in deciding which aspects of the literally "infinite diversity" of rural production relations were to be represented and codified.[67] Even in a particular locality, practices varied greatly from farm to farm and over time; any codification would be partly arbitrary and artificially static. To codify local practices was thus a profoundly political act. Local notables would be able to sanction their preferences with the mantle of law, whereas others would lose customary rights that they depended on. The second difficulty was that Lalouette's plan was a mortal threat to all the state centralizers and economic modernizers for whom a legible, national property regime was the precondition of progress. As Serge Aberdam notes, "The Lalouette project would have brought about exactly what Merlin de Douai and the bourgeois, revolutionary jurists always sought to avoid."[68] Neither Lalouette's nor Verneilh's proposed code was ever passed, because they, like their predecessor in 1807, seemed to be designed to strengthen the hand of the landowners.

The Illegibility of Communal Tenure

The premodern and early modern state, as we have noted, dealt more with communities than with individuals when it came to taxes. Some apparently individual taxes, such as the notorious Russian "soul tax," which was collected from all subjects, were actually paid directly

by the communities or indirectly through the nobles whose subjects they were. Failure to deliver the required sum usually led to collective punishment.[69] The only agents of taxation who regularly reached to the level of the household and its cultivated fields were the local nobility and clergy in the course of collecting feudal dues and the religious tithe. For its part, the state had neither the administrative tools nor the information to penetrate to this level.

The limitations on state knowledge were partly due to the complexity and variability of local production. This was not the most important reason, however. The collective form of taxation meant that it was generally in the interest of local officials to misrepresent their situation in order to minimize the local tax and conscription burden. To this end, they might minimize the local population, systematically understate the acreage under cultivation, hide new commercial profits, exaggerate crop losses after storms and droughts, and so on.[70] The point of the cadastral map and land register was precisely to eliminate this fiscal feudalism and rationalize the fiscal take of the state. Just as the scientific forester needed an inventory of trees to realize the commercial potential of the forest, so the fiscal reformer needed a detailed inventory of landownership to realize the maximum, sustainable revenue yield.[71]

Assuming that the state had the will to challenge the resistance of the local nobles and elites and the financial resources to undertake a full cadastral survey (which was both time-consuming and expensive), it faced other obstacles as well. In particular, some communal forms of tenure simply could not be adequately represented in cadastral form. Rural living in seventeenth- and early eighteenth-century Denmark, for example, was organized by *ejerlav*, whose members had certain rights for using local arable, waste, and forest land. It would have been impossible in such a community to associate a household or individual with a particular holding on a cadastral map. The Norwegian large farm (*gard*) posed similar problems. Each household held rights to a given proportion of the value (*skyld*) of the farm, not to the plot of land; none of the joint owners could call a specific part of the farm his own.[72] Although it was possible to estimate the arable land of each community and, making some assumptions about crop yields and subsistence needs, arrive at a plausible tax burden, these villagers derived a substantial part of their livelihood from the commons by fishing, forestry, collecting resin, hunting, and making charcoal. Monitoring this kind of income was almost impossible. Nor would crude estimates of the value of the commons solve the problem, for the inhabitants of nearby villages often shared one another's commons (even though the practice was outlawed). The mode of production in such communities was simply incompatible with the assumption of individual freehold tenure implicit in a cadastral map. It was claimed, although the evi-

dence is not convincing, that common property was less productive than freehold property.[73] The state's case against communal forms of land tenure, however, was based on the correct observation that it was fiscally illegible and hence fiscally less productive. Rather than trying, like the hapless Lalouette, to bring the map into line with reality, the historical resolution has generally been for the state to impose a property system in line with its fiscal grid.

As long as common property was abundant and had essentially no fiscal value, the illegibility of its tenure was no problem. But the moment it became scarce (when "nature" became "natural resources"), it became the subject of property rights in law, whether of the state or of the citizens. The history of property in this sense has meant the inexorable incorporation of what were once thought of as free gifts of nature: forests, game, wasteland, prairie, subsurface minerals, water and watercourses, air rights (rights to the air above buildings or surface area), breathable air, and even genetic sequences, into a property regime. In the case of common-property farmland, the imposition of freehold property was clarifying not so much for the local inhabitants—the customary structure of rights had always been clear enough to them—as it was for the tax official and the land speculator. The cadastral map added documentary intelligence to state power and thus provided the basis for the synoptic view of the state and a supralocal market in land.[74]

An example may help to clarify the process of installing a new, more legible property regime. The case of two prerevolutionary Russian villages provides a nearly textbook example of state attempts to create individual tenure in keeping with its convictions about agricultural growth and administrative order. Most of rural Russia, even after the emancipation of 1861, was a model of fiscal illegibility. Communal forms of tenure prevailed, and the state had little or no knowledge of who cultivated which strips of land or what their yields and income were.

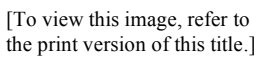
Novoselok village had a varied economy of cultivation, grazing, and forestry, whereas Khotynitsa village was limited to cultivation and some grazing (figures 3 and 4). The complex welter of strips was designed to ensure that each village household received a strip of land in every ecological zone. An individual household might have as many as ten to fifteen different plots constituting something of a representative sample of the village's ecological zones and microclimates. The distribution spread a family's risks prudently, and from time to time the land was reshuffled as families grew or shrunk.[75]

It was enough to make the head of a cadastral surveyor swim. At first glance it seems as if the village itself would need a staff of professional surveyors to get things right. But in practice the system, called interstripping, was quite simple to those who lived it. The strips of land

[To view this image, refer to the print version of this title.]

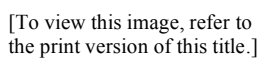
3. Novoselok village before the Stolypin Reform

were generally straight and parallel so that a readjustment could be made by moving small stakes along just one side of a field, without having to think of areal dimensions. Where the other end of the field was not parallel, the stakes could be shifted to compensate for the fact that the strip lay toward the narrower or wider end of the field. Irregular fields were divided, not according to area, but according to yield. To the eye—and certainly to those involved in cadastral mapping—the pattern seemed convoluted and irrational. But to those familiar with it, it was simple enough and worked admirably for their purposes.



4. Khotynitsa village before the Stolypin Reform

The dream of state officials and agrarian reformers, at least since emancipation, was to transform the open-field system into a series of consolidated, independent farmsteads on what they took to be the western European model. They were driven by the desire to break the hold of the community over the individual household and to move from collective taxation of the whole community to a tax on individual landholders. As in France, fiscal goals were very much connected to reigning ideas of agricultural progress. Under Count Sergei Witte and Petr Stolypin, as George Yaney notes, plans for reform shared a common vision of how things were and how they needed to be: "First tableau: poor peasants, crowded together in villages, suffering from hunger, running into each other with their plows on their tiny strips. Second tableau: agriculture specialist agent leads a few progressive



5. Novoselok village after the Stolypin Reform

peasants off to new lands, leaving those remaining more room. Third tableau: departing peasants, freed from restraints of strips, set up khutor [integral farmsteads with dwellings] on new fields and adapt latest methods. Those who remain, freed of village and family restraints, plunge into a demand economy—all are richer, more productive, the cities get fed, and the peasants are not proletarianized."[76] It was abundantly clear that the prejudicial attitude toward interstripping was based as much on the autonomy of the Russian village, its illegibility to outsiders, and prevailing dogma about scientific agriculture as it was

[To view this image, refer to the print version of this title.]

6. Khotynitsa village after the Stolypin Reform

on hard evidence.[77] The state officials and agrarian reformers reasoned that, once given a consolidated, private plot, the peasant would suddenly want to get rich and would organize his household into an efficient workforce and take up scientific agriculture. The Stolypin Reform therefore went forward, and cadastral order was brought to both villages in the wake of the reform (figures 5 and 6).

In Novoselok village, seventeen independent farmsteads (*khutor*) were created in a way that aimed to give each household a share of meadow, arable, and forest. In Khotynitsa village, ten khutor were created as well as seventy-eight farms (*otrub*), whose owners continued to dwell in the village center. As a cadastral matter, the new farms were mappable, easily legible from above and outside, and, since each was owned by an identifiable person, assessable.

Taken alone, the maps shown in figures 5 and 6 are misleading. Such model villages suggest efficient cadastral teams working their way diligently through the countryside and turning open-field chaos into tidy lit-

tle farms. Reality was something else. In fact, the dream of orderly, rectangular fields was approximated only on newly settled land, where the surveyor faced little geographical or social resistance.[78] Elsewhere, the reformers were generally thwarted, despite tremendous pressure to produce integral farms. There were unauthorized consolidations, although they were forbidden; there were also "paper consolidations," in which the new farmers continued to farm their strips as before.[79] The best evidence that the agricultural property system had in fact not become legible to central tax officials was the immensely damaging procurement policies pursued by the czarist government during World War I. No one knew what a reasonable levy on grain or draft animals might be; as a result, some farmers were ruined, while others managed to hoard grain and livestock.[80] The same experience of forced procurement without adequate knowledge of landholdings and wealth was repeated again after the October Revolution during the period of War Communism.[81]

The Cadastral Map as Objective Information for Outsiders

The value of the cadastral map to the state lies in its abstraction and universality. In principle, at least, the same objective standard can be applied throughout the nation, regardless of local context, to produce a complete and unambiguous map of all landed property. The completeness of the cadastral map depends, in a curious way, on its abstract sketchiness, its lack of detail—its thinness. Taken alone, it is essentially a geometric representation of the borders or frontiers between parcels of land. What lies inside the parcel is left blank—unspecified—since it is not germane to the map plotting itself.

Surely many things about a parcel of land are far more important than its surface area and the location of its boundaries. What kind of soil it has, what crops can be grown on it, how hard it is to work, and how close it is to a market are the first questions a potential buyer might ask. These are questions a tax assessor would also want to ask. From a capitalist perspective, the physical dimensions of land are beside the point. But these other qualities can become relevant (especially to the state) only after the terrain to which they apply has been located and measured. And unlike identifying location and dimension, identifying these qualities involves judgments that are complex, susceptible to fraud, and easily overtaken by events. Crop rotations and yields may change, new tools or machines may transform cultivation, and markets may shift. The cadastral survey, by contrast, is precise, schematic, general, and uniform. Whatever its other defects, it is the precondition of a tax regimen that comprehensively links every patch of land with its owner—the taxpayer.[82] In this spirit, the survey for a 1807 Dutch land tax (inspired by Napoleonic France) stressed that all

surveyors were to use the same measurements, surveyors' instruments were to be periodically inspected to ensure conformity, and all maps were to be drawn up on a uniform scale of 1:2,880.[83]

Land maps in general and cadastral maps in particular are designed to make the local situation legible to an outsider. For purely local purposes, a cadastral map was redundant. Everyone knew who held, say, the meadow by the river, the value of the fodder it yielded, and the feudal dues it carried; there was no need to know its precise dimensions. A substantial domain might have the kind of prose map, or *terrier,* that one finds in old deeds ("from the large oak tree, north 120 feet to the river bank, thence . . ."), with a notation about the holder's obligations to the domain. One imagines such a document proving valuable to a young heir, new to the management of a domain. But a proper map seems to have come into use especially when a brisk market in land developed. The Netherlands was thus a leader in land mapping because of its early commercialization and because each speculator who invested in the draining of land by windmill wanted to know in advance precisely what plot of the newly opened land he would be entitled to. The map was especially crucial to the new bourgeois owners of landed estates, for it allowed them to survey a large territory at a glance. Its miniaturization helped it to serve as an aide-mémoire when the property consisted of many small parcels or the owner was not intimately familiar with the terrain.

As early as 1607, an English surveyor, John Norden, sold his services to the aristocracy on the premise that the map was a substitute for the tour of inspection: "A plot rightly drawne by true information, discribeth so the lively image of a manor, and every branch and member of the same, as the lord sitting in his chayre, may see what he hath, and where and how he lyeth, and in whole use and occupation of every particular is upon suddaine view."[84] A national tax administration requires the same logic: a legible, bureaucratic formula which a new official can quickly grasp and administer from the documents in his office.

What Is Missing in This Picture?

> Administrative man recognizes that the world he perceives is a drastically simplified model of the buzzing, blooming confusion that constitutes the real world. He is content with the gross simplification because he believes that the real world is mostly empty—that most of the facts of the real world have no great relevance to any particular situation he is facing and that most significant chains of causes and consequences are short and simple.
> —Herbert Simon

Isaiah Berlin, in his study of Tolstoy, compared the hedgehog, who knew "one big thing," to the fox, who knew many things. The scientific

forester and the cadastral official are like the hedgehog. The sharply focused interest of the scientific foresters in commercial lumber and that of the cadastral officials in land revenue constrain them to finding clear-cut answers to one question. The naturalist and the farmer, on the other hand, are like the fox. They know a great many things about forests and cultivable land. Although the forester's and cadastral official's range of knowledge is far narrower, we should not forget that their knowledge is systematic and synoptic, allowing them to see and understand things a fox would not grasp.[85] What I want to emphasize here, however, is how this knowledge is gained at the expense of a rather static and myopic view of land tenure.

The cadastral map is very much like a still photograph of the current in a river. It represents the parcels of land as they were arranged and owned at the moment the survey was conducted. But the current is always moving, and in periods of major social upheaval and growth, a cadastral survey may freeze a scene of great turbulence.[86] Changes are taking place on field boundaries; land is being subdivided or consolidated by inheritance or purchase; new canals, roads, and railways are being cut; land use is changing; and so forth. Inasmuch as these particular changes directly affect tax assessments, there are provisions for recording them on the map or in a title register. The accumulation of annotations and marginalia at some point render the map illegible, whereupon a more up-to-date but still static map must be drawn and the process repeated.

No operating land-revenue system can stop at the mere identification of parcel and ownership. Other schematic facts, themselves static, must be created to arrive at some judgment of a sustainable tax burden. Land may be graded by soil class, how well it is watered, what crops are grown on it, and its presumed average yield, which is often checked by sample crop-cuttings. These facts are themselves changing, or they are averages that may mask great variation. Like the still photo of the cadastral map, they grow more unrealistic with time and must be reexamined.

These state simplifications, like all state simplifications, are always far more static and schematic than the actual social phenomena they presume to typify. The farmer rarely experiences an average crop, an average rainfall, or an average price for his crops. Much of the long history of rural tax revolts in early modern Europe and elsewhere can be illuminated by the lack of fit between an unyielding fiscal claim, on one hand, and an often wildly fluctuating capacity of the rural population to meet that claim, on the other.[87] And yet, even the most equitable, well-intentioned cadastral system cannot be uniformly administered except on the basis of stable units of measurement and calculation. It can no more reflect the actual complexity of a farmer's experience than the

scientific forester's schemes can reflect the complexity of the naturalist's forest.[88]

Governed by a practical, concrete objective, the cadastral lens also ignored anything lying outside its sharply defined field of vision. This was reflected in a loss of detail in the survey itself. Surveyors, one recent Swedish study found, made the fields more geometrically regular than they in fact were. Ignoring small jogs and squiggles made their job easier and did not materially affect the outcome.[89] Just as the commercial forester found it convenient to overlook minor forest products, so the cadastral official tended to ignore all but the main commercial use of a field. The fact that a field designated as growing wheat or hay might also be a significant source of bedding straw, gleanings, rabbits, birds, frogs, and mushrooms was not so much unknown as ignored lest it needlessly complicate a straightforward administrative formula.[90] The most significant instance of myopia, of course, was that the cadastral map and assessment system considered only the dimensions of the land and its value as a productive asset or as a commodity for sale. Any value that the land might have for subsistence purposes or for the local ecology was bracketed as aesthetic, ritual, or sentimental values.

Transformation and Resistance

> The cadastral map is an instrument of control which both reflects and consolidates the power of those who commission it. . . . The cadastral map is partisan: where knowledge is power, it provides comprehensive information to be used to the advantage of some and the detriment of others, as rulers and ruled were well aware in the tax struggles of the 18th and 19th centuries. Finally, the cadastral map is active: in portraying one reality, as in the settlement of the new world or in India, it helps obliterate the old.
> —Roger J. P. Kain and Elizabeth Baigent, *The Cadastral Map*

The shorthand formulas through which tax officials must apprehend reality are not mere tools of observation. By a kind of fiscal Heisenberg principle, they frequently have the power to transform the facts they take note of.

The door-and-window tax established in France under the Directory and abolished only in 1917 is a striking case in point.[91] Its originator must have reasoned that the number of windows and doors in a dwelling was proportional to the dwelling's size. Thus a tax assessor need not enter the house or measure it but merely count the doors and windows. As a simple, workable formula, it was a brilliant stroke, but it was not without consequences. Peasant dwellings were subsequently designed or renovated with the formula in mind so as to have as few openings as possible. While the fiscal losses could be recouped by rais-

ing the tax per opening, the long-term effects on the health of the rural population lasted for more than a century.

The novel state-imposed form of land tenure was far more revolutionary than a door-and-window tax. It established a whole new institutional nexus. However simple and uniform the new tenure system was to an administrator, it flung villagers willy-nilly into a world of title deeds, land offices, fees, assessments, and applications. They faced powerful new specialists in the form of land clerks, surveyors, judges, and lawyers whose rules of procedure and decisions were unfamiliar.

Where the new tenure system was a colonial imposition—that is, where it was totally unfamiliar, where it was imposed by alien conquerors using an unintelligible language and institutional context, and where local practices bore no resemblance to freehold tenure—the consequences were far-reaching. The permanent settlement in India, for example, created a new class who, because they paid the taxes on the land, became full owners with rights of inheritance and sale where none had existed earlier.[92] At the same time, literally millions of cultivators, tenants, and laborers lost their customary rights of access to the land and its products. Those in the colonies who first plumbed the mysteries of the new tenure administration enjoyed unique opportunities. Thus the Vietnamese *secrétaires* and *interprètes* who served as intermediaries between the French officials in the Mekong Delta and their Vietnamese subjects were in a position to make great fortunes. By concentrating on the legal paperwork, such as title deeds, and the appropriate fees, they occasionally became landlords to whole villages of cultivators who had imagined they had opened common land free for the taking. The new intermediaries, of course, might occasionally use their knowledge to see their compatriots safely through the new legal thicket. Whatever their conduct, their fluency in a language of tenure specifically designed to be legible and transparent to administrators, coupled with the illiteracy of the rural population to whom the new tenure was indecipherable, brought about a momentous shift in power relations.[93] What was simplifying to an official was mystifying to most cultivators.

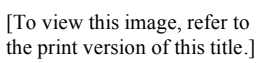
Freehold title and standard land measurement were to central taxation and the real-estate market what central bank currency was to the marketplace.[94] By the same token, they threatened to destroy a great deal of local power and autonomy. It is no wonder, then, that they should have been so vigorously resisted. In the eighteenth-century European context, any general cadastral survey was by definition a gambit of centralization; the local clergy and nobility were bound to see both their own taxing powers and the exemptions they enjoyed menaced. Commoners were likely to see it as a pretext for an additional local tax. Jean-Baptiste Colbert, the great "centralizer" of absolutism, proposed to conduct a national cadastral survey of France, but he was

thwarted in 1679 by the combined opposition of the aristocracy and clergy. After the Revolution more than a century later, the radical François-Noël Babeuf, in his "Projet de cadastre perpetuel," dreamed of a perfectly egalitarian land reform in which everyone would get an equal parcel.[95] He too was thwarted.

We must keep in mind not only the capacity of state simplifications to transform the world but also the capacity of the society to modify, subvert, block, and even overturn the categories imposed upon it. Here it is useful to distinguish what might be called facts on paper from facts on the ground. As Sally Falk Moore and many others have emphasized, the land-office records may serve as the basis for taxation, but they may have little to do with the actual rights to the land. Paper owners may not be the effective owners.[96] Russian peasants, as we saw, might register a "paper" consolidation while continuing to interstrip. Land invasions, squatting, and poaching, if successful, represent the exercise of de facto property rights which are not represented on paper. Certain land taxes and tithes have been evaded or defied to the point where they have become dead letters.[97] The gulf between land tenure facts on paper and facts on the ground is probably greatest at moments of social turmoil and revolt. But even in more tranquil times, there will always be a shadow land-tenure system lurking beside and beneath the official account in the land-records office. We must never assume that local practice conforms with state theory.

All centralizing states recognized the value of a uniform, comprehensive cadastral map. Carrying out the mapmaking, however, was another matter. As a rule of thumb, cadastral mapping was earlier and more comprehensive where a powerful central state could impose itself on a relatively weak civil society. Where, by contrast, civil society was well organized and the state relatively weak, cadastral mapping was late, often voluntary, and fragmentary. Thus Napoleonic France was mapped much earlier than England, where the legal profession managed for a long time to stymie this threat to its local, income-earning function. It followed from the same logic that conquered colonies ruled by fiat would often be cadastrally mapped before the metropolitan nation that ordered it. Ireland may have been the first. After Cromwell's conquest, as Ian Hacking notes, "Ireland was completely surveyed for land, buildings, people, and cattle under the directorship of William Petty, in order to facilitate the rape of that nation by the English in 1679."[98]

Where the colony was a thinly populated settler-colony, as in North America or Australia, the obstacles to a thorough, uniform cadastral grid were minimal. There it was a question less of mapping preexisting patterns of land use than of surveying parcels of land that would be given or sold to new arrivals from Europe and of ignoring indigenous peoples and their common-property regimes.[99] Thomas Jefferson, with



7. The survey landscape, Castleton, North Dakota

an eye trained by Enlightenment rationalism, imagined dividing the United States west of the Ohio River into "hundreds"—squares measuring ten miles by ten miles—and requiring settlers to take the parcels of land as so designated.

The geometrical clarity of Jefferson's proposal was not merely an aesthetic choice; he claimed that irregular lots facilitated fraud. To reinforce his case, he cited the experience of Massachusetts, where actual landholdings were 10 percent to 100 percent greater than what had

been granted by deed.[100] Not only did the regularity of the grid create legibility for the taxing authority, but it was a convenient and cheap way to package land and market it in homogeneous units. The grid facilitated the commoditization of land as much as the calculation of taxes and boundaries. Administratively, it was also disarmingly simple. Land could be registered and titled from a distance by someone who possessed virtually no local knowledge.[101] Once it was in place, the scheme had some of the impersonal, mechanical logic of the foresters' tables. But in practice, land titling in Jefferson's plan (which was modified by Congress to provide for rectangular lots and townships that were thirty-six square miles) did not always follow the prescribed pattern.

The Torrens system of land titling, developed in Australia and New Zealand in the 1860s, provided a lithographed, presurveyed grid representing allotments that were registered to settlers on a first-come, first-served basis. It was the quickest and most economical means yet devised to sell land, and it was later adopted in many British colonies. The more homogeneous and rigid the geometric grid, however, the more likely it was to run afoul of the natural features of the nonconforming landscape. The possibilities for surprises was nicely captured in this satirical verse from New Zealand.

> Now the road through Michael's section
> though it looked well on the map
> For the use it was intended
> wasn't really worth a rap
> And at night was not unlikely
> to occasion some mishap.
>
> It was nicely planned on paper
> and was ruled without remorse
> Over cliffs, and spurs and gullies
> with a straight and even course
> Which precluded locomotion
> on part of man or horse.[102]

The cadastral survey was but one technique in the growing armory of the utilitarian modern state.[103] Where the premodern state was content with a level of intelligence sufficient to allow it to keep order, extract taxes, and raise armies, the modern state increasingly aspired to "take in charge" the physical and human resources of the nation and make them more productive. These more positive ends of statecraft required a much greater knowledge of the society. And an inventory of land, people, incomes, occupations, resources, and deviance was the logical place to begin. "The need for the increasingly bureaucratic state to organize itself and control its resources gave an impulse to the collection

of vital and other statistics; to forestry and rational agriculture; to surveying and exact cartography; and to public hygiene and climatology."[104]

Although the purposes of the state were broadening, what the state wanted to know was still directly related to those purposes. The nineteenth-century Prussian state, for example, was very much interested in the ages and sexes of immigrants and emigrants but not in their religions or races; what mattered to the state was keeping track of possible draft dodgers and maintaining a supply of men of military age.[105] The state's increasing concern with productivity, health, sanitation, education, transportation, mineral resources, grain production, and investment was less an abandonment of the older objectives of statecraft than a broadening and deepening of what those objectives entailed in the modern world.