JOHN LAW & ANNEMARIE MOL, EDITORS

# COMPLEXITIES

SOCIAL STUDIES OF

KNOWLEDGE PRACTICES

#### COMPLEXITIES

# SCIENCE AND CULTURAL THEORY

A Series Edited by Barbara Herrnstein Smith and E. Roy Weintraub

# COMPLEXITIES

Social Studies of Knowledge Practices

JOHN LAW AND ANNEMARIE MOL, EDITORS

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## ANNEMARIE MOL AND JOHN LAW

### Complexities: An Introduction

Much recent work in the sociology of science, history of technology, anthropology of medicine, cultural studies, feminism, and political philosophy has been a revolt against simplification. The argument has been that the world is complex and that it shouldn't be tamed too much—and certainly not to the point where simplification becomes an impediment to understanding. But what *is* complexity? One way of starting is with a simple definition. There is complexity if things relate but don't add up, if events occur but not within the processes of linear time, and if phenomena share a space but cannot be mapped in terms of a single set of three-dimensional coordinates.

No one would deny that the world is complex, that it escapes simplicities. But what is complexity, and how might it be attended to? How might complexities be handled in knowledge practices, nonreductively, but without at the same time generating ever more complexities until we submerge in chaos? And then again, is the contrast between simplicity and complexity itself too simple a dichotomy? These are the questions explored in this book.

I

The arguments against reducing complexity by simplification have been well rehearsed. In *Modernity and the Holocaust* Zygmunt Bauman offers an elaborate (and by now classic) articulation of some of the most important of these arguments.<sup>1</sup> Bauman rejects the self-satisfied way of writing European history that treats this reductionism as if it were the revelation of a process of continuous improvement. "What is untenable is the concept of our—European—history as the rise of humanity over the animal in man, and as the triumph of rational organization over the cruelty of life that is nasty, brutish and short. What is also untenable is the concept of modern society as an unambiguously moralizing force, of its institutions as civilizing powers, of its coercive controls as a dam defending brittle humanity against the torrents of animal passions" (212–13). After all, as Bauman notes, the much-vaunted institutions of modern European societies did not prevent the Holocaust. On the contrary, they precisely proved to be perfectly adapted to the organized murder of millions of people and the pursuit of genocide.

The lesson that Bauman asks us to draw is that the rationality of the Enlightenment is an ambivalent endowment. If it is a blessing at all (and there are no doubt many achievements to which it might also point), then it is a thoroughly mixed blessing. His argument is that rational schemes are reductive because they order, divide, simplify, and exclude. To use one of Bauman's most haunting metaphors, they make weeds as well as flowers,<sup>2</sup> and they cut out the many shades of gray that lie between black and white. They are dangerous because they seem to be able to tell good from evil and to discern who is to blame and who is not. On occasions they simplify to death as they create the means of materializing their verdicts, means that include bureaucracy together with science and technology—and the very medicine that was designed to cure also turns out to invent tools for torturing and killing.

These arguments are well known, and indeed there are good reasons for worrying about simplification both in intellectual and political history. The list of Bauman's concerns has been extended within science and technology studies. To take one example, the process of scaling up poses many problems. Large-scale technologies usually grow out of laboratory experiments, but the process of translation is tricky because laboratory experiments are simplificatory devices: they seek to tame the many erratically changing variables that exist in the wild world, keeping some stable and simply excluding others from the argument. This often works well in the laboratory: if one does an experiment in a test tube, it is not unreasonable to assume that the air in the lab will absorb any heat that is produced. Calculation is greatly simplified by choosing to neglect a variable such as "heat." However, it works less well when what was confined to a test tube is scaled up to become a power plant. What happens now to

all the excess heat? Where does it go? And where do radioactive waste products go?<sup>3</sup>

So there is scaling, and then there are unpredictabilities, erratic forms of behavior. These do not fit the schemes of most sciences very well either because the latter prefer to treat with only a few variables, not too many. The problem is that what was not predictable tends to occur anyway. So how should this be handled?

The answer—one answer—is that such chaotic events are tamed by theories of chance. In being reduced to a probability and framed as a risk they are turned into something that, however erratic, is also calculable. The risk of an explosion in the factory on the edge of your town (an explosion that will take your town with it) is, say, 0.000000003 percent per annum. Now go and calculate whether this is a good enough reason to be anxious!

The modern world is full of technical and scientific simplifications like this, and they are used as a basis for action. For instance, in medicine the value of different forms of treatment is assessed in clinical trials. These are mostly carried out on populations of adult patients who are no older than sixty-five and who have only the disease in question. This is a simplification that generates methodologically sound results, but these results are not very useful when decisions are needed about patients who are older than sixty-five and have two, three, or four diseases.

The texts that carry academic stories tend to organize phenomena bewildering in their layered complexity into clean overviews. They make smooth schemes that are more or less linear, with a demonstrative or an argumentative logic in which each event follows the one that came before. What may originally have been surprising is explained and is therefore no longer surprising or disturbing. Academic texts may talk about strange things, but their tone is almost always calm.

This, then, is the first step. It is to say that simplifications that reduce a complex reality to whatever it is that fits into a simple scheme tend to "forget" about the complex, which may mean that the latter is surprising and disturbing when it reappears later on and, in extreme cases, is simply repressed.

To talk in this way is to denounce simplification. However, although it is important to be suspicious of simplification in the modern world (in the sciences, in technology, in medicine, in markets, in governing, or, as we call them here, in knowledge practices), it is equally important to be suspicious of the standard ways of reacting to these simplifications, the denunciations of simplicity. These denunciations tend to have a common intellectual shape. The trope that turns up in most of the criticisms of reductive simplification says that single orders are shaped to tame complex realities but that as they do so, they exert violence. Then the argument is that this is doubly wrong, for violence is bad in itself, but it also fails to capture the intricacies of the way the world really is.

One of the places where this trope first emerged was psychoanalysis, as it articulates the workings of the consciousness of the modern subject. This consciousness is seen as ordered, whereas unwelcome and disturbing events, thoughts, and feelings are repressed and delegated to the unconscious, where complexities gather, at the margins of the person. From there they may emerge, disruptively or otherwise, in the form of dreams or parapraxes.

The trope of repression and the productive ways it relates to what may be told have become a commonplace in much poststructuralist writing.<sup>4</sup> This trope is also found in endless other theories of society, economy, culture, and science.

In the work of Thomas Kuhn a scientific paradigm is a way of understanding, depicting, and handling scientific objects that presses these into a quite specific shape which holds despite the existence of anomalies that do not fit.<sup>5</sup> Kuhn describes the way such anomalies are displaced—often for many years. Sometimes they are simply not noticed, whereas on other occasions they are pushed to the margins, to a location that is the scientific analogy of the unconscious. From there they may emerge after a scientific revolution not as dreams but in the form of another paradigm, the next simplifying device, with its novel understandings and techniques.

Michel Foucault uses much the same trope.<sup>6</sup> He treats "rationality" and "madness" as a single historical invention. The one is a purification that was

only made possible by designating and expelling the other. Marginalizing madness, then, is not a form of repression. Instead it is productive, creating a social order cleansed of those designated as special, abnormal, or unruly. Foucault tries to avoid romanticizing this too much, yet even so the heterotopic and the marginalized somehow figure as holding promise, the possible kernel of a social and cultural revolution.

In Bruno Latour's Irreductions objects of knowledge are presented as always too complex for the sciences to catch and order. They never really fit within the schemes that are made for them, schemes that are inevitably simplifications.

Things-in-themselves? But they're fine, thank you very much. And how are you? You complain about things that have not been honored by your vision? You feel that these things are lacking the illumination of your consciousness? But if you missed the galloping freedom of the zebras in the savannah this morning, then so much the worse for you; the zebras will not be sorry that you were not there, and in any case you would have tamed them, killed, photographed, or studied them. Things in themselves lack nothing, just as Africa did not lack whites before their arrival. (Interlude IV, *Irreductions*, 193)

None of these traditions simply denounces the simplifications that occur in knowledge practices. Each sees these as productive, but so, too, is whatever escapes the paradigm, the episteme, consciousness. On the one hand there is an order that simplifies, and on the other there is an elusive and chaotic complexity expelled, produced, or suppressed by it. And this is what many of the debates concerning complexity are about: does order expel, produce, or suppress the complex, and if so how? Or is the chaotic forever elusive, however elaborate the attempts we make to catch and tame it?

#### III

Given the power of reductionism in the modern world, the complex is surely in need of some defenders. Yet celebrating complexity is not what we are out to do here. For we fear, ironically, that by now another critique of simplification is just too simple. The critique of simplification is so

well established that it has become a morally comfortable place to be. Denouncing violence is no doubt appropriate, but it is also disturbingly agreeable and self-satisfying, too simple. So our position—and that of the contributors to this book—is that the endless mobilization of this single trope, in which simplification figures as a reduction of complexity, leaves a great deal to discover and articulate. We need other ways of relating to complexity, other ways for complexity to be accepted, produced, or performed.

As you read this, where are you? Are you sitting at a desk or on a sofa, in an aircraft, perhaps, or on a train? Or perhaps you are lying in the bath? Another question: how many versions did this text go through? What was added and deleted along the way?

The answers to these questions are among the many complexities that don't concern us here. We leave them out not because they are irrelevant to intellectual work in general; no doubt they are relevant in various ways, but a single text cannot be everywhere at once. It cannot do everything all at the same time nor tell all.

The question is how a text might be where it is, while also acknowledging that it is not everywhere. How might a text make room within for whatever it also necessarily leaves out, for what is not there, not made explicit? How might a simple text respect complexities? These are questions about texts, but they might just as well be addressed to policies, to therapies, to technologies, to methods of representation, to objects, or to scientific formalisms.

What happens to complexity when simplifications are made? Answering this question requires a theoretical, but also an empirical and a methodological, inquiry. Thus the stories told by the contributors of this book are not narratives that use complexity theory. Instead they are stories about what happens to complexity in practice.<sup>7</sup> Or, to multiply, they are stories about what happens to complexit*ies* in practices.

ΙV

If complexity and simplicity are not necessarily opposites, then what are their relations? It is tempting to try to present an overview of how *simple* 

and *complex* might relate in ways that do not turn them into interdependent opposites, dualisms related by difference. This is a temptation reflected in one of the classic tasks of an introduction: to survey the contents of the book that follows. However, if we say that we *have* no overview and we cannot catch it all, this should not be misread as a confession of professional incompetence. Rather, it expresses a refusal to make an order, a single—simple—order that expels complexity. Instead, in what follows we offer a list.

Lists are not overviews. We will explore this more fully below, but the brief version of the argument is that they assemble elements that do not necessarily fit together into some larger scheme. In addition, they make no claims to inclusiveness. So the short list that follows does not claim to catch everything. Instead it is intended to suggest some ways of traveling through the chapters and the arguments that make up the book. It offers a key for thinking about the various dealings with complexity explored by the contributors. Our list does not present a history of the literatures, the field, or the problem, but instead it is spatial in character. It reflects a desire to make a space, define outlines, sketch contours—and then to walk through what has been laid out.

The list comes in three parts. These don't stand in a hierarchical relation to one another. Imagine, then, not a grid drawn in ever more detail, with ever more subdivisions; imagine, instead, turning the pages of a sketchbook. Imagine looking at different pictures, one after the other. Each orders and simplifies some part of the world, in one way or another, but what is drawn is always provisional and waits for the next picture, which draws things differently.

#### **Multiplicities**

The trope of the single order that reduces complexity (or that is bound to fail in its attempts to do so) starts to lose its power when *order* is multiplied, when *order* turns into *orders*. This is the first entry on our list: *multiplicity*. When investigators start to discover a variety of orders— modes of ordering, logics, frames, styles, repertoires, discourses—then the dichotomy between simple and complex starts to dissolve. This is because various "orderings" of similar objects, topics, fields, do not always reinforce the same simplicities or impose the same silences. Instead they may work—and relate—in different ways. This raises theoretical and

practical questions. In particular, the discovery of multiplicity suggests that we are no longer living in the modern world, located within a single *epistème*. Instead, we discover that we are living in different worlds. These are not worlds—that great trope of modernity—that belong on the one hand to the past and on the other to the present. Instead, we discover that we are living in two or more neighboring worlds, worlds that overlap and coexist.

Multiplicity is thus about coexistences at a single moment. To make sense of multiplicity, we need to think and write in topological ways, discovering methods for laying out a space, for laying out spaces, and for defining paths to walk through these.

One of the central concerns of political philosophy is the nature of the good. The most common approach to exploring this concern is indirect: it is to create procedures, which hang together coherently, for exploring what the good might be. Indeed the title of one of the most famous books written in this mode expresses this aspiration in an exemplary manner: A Theory of Justice. In this classic study John Rawls presents a single theory that produces a single version of how justice might be reached, a single justice.<sup>8</sup> The book attempts to tame complexity and, indeed, pushes it to the margins of what can be rationally handled.

This, then, is a singular solution, but there is another way of working. Spheres of Justice is the title of another crucial contribution to political philosophy. Written by Michael Walzer, it argues against the singularity of an encompassing theory of justice.<sup>9</sup> First, it shifts the activity of theorizing "justice" out of departments of philosophy and into a plethora of ordinary sites and situations. Second, it catalogues these sites and situations into a number of different social spheres. These are domains within society that each have their own way of separating good from bad, right from wrong, just from unjust, so that what is appropriate to the sphere of the market differs from what is appropriate to the sphere of education or health care or government.

There are other ways of multiplying "the just." For instance in Les Économies de la Grandeur Laurent Thévenot and Luc Boltanski distinguish among styles rather than spheres.<sup>10</sup> At first these styles seem to map onto social institutions (the "industrial" style sounds as if it fits with production, whereas the "domestic" style sounds as if it has to do with the way families

are run, and so on). But in their empirical investigations Thévenot, Boltanski, and their colleagues show that in every specific situation two, three, or even more styles are likely to be mobilized to justify actions.

Walzer uses his "spheres of justice" in a normative manner: once we have found how "the just" is established in each specific sphere, we are encouraged to stick with that mode of justification. Indeed crucial to his argument is the idea that it is a pollution to use arguments that belong elsewhere. By contrast Boltanski and Thévenot are more persistently empirical: they investigate the kinds of justifications that happen to be convincing for various people in a variety of specific situations. They are concerned with the mix as it occurs.

The differences between the two approaches are instructive and important, but we'll stop here, for the point is made. Instead of a single order separating the just from the unjust in a clear-cut way, both approaches suggest that there may be different orders and with those orders different gradients—gradients of right and wrong that establish different versions of the good.

Analogous moves have been made in other disciplines, fields, and traditions. For instance in *organization studies* the questions have often been asked: what *is* an organization? what is it to organize?

In his Images of Organization Gareth Morgan multiplied the picture of the single organization by elaborating on a variety of metaphors that are used in everyday and professional talk to frame and phrase the character of organizations. Organizations are talked about and handled as if they were machines, organisms, brains, cultures, political systems, psychic prisons, fluxes in transformation, or instruments of domination. Morgan argues that all these images are present, foregrounded here, backgrounded there, and he says that all catch something of organizational reality.<sup>11</sup>

John Law has made a similar argument.<sup>12</sup> He went to a single organization to investigate how different modes of ordering structure what goes on there. Organizing, he suggested, depends partly on ordering things—words, but also materials, desks, paperwork, computer systems—in an entrepreneurial manner, but vision or charisma are equally important, as is vocation and even administration. These various modes of ordering include, exclude, depend on, and combat one another.

There are ways out of singularity that generate a pluralism in which different parts of the world coexist within their own insulated spheres, but different modes of ordering or different styles of justification or different discourses may also overlap and interfere with one another. Attending to multiplicity, then, brings with it the need for new conceptualizations of what it might be to hold together.

Where various styles of justification each have their own way of differentiating the just from the unjust, the just becomes a complex phenomenon, more than one. But does this mean that there are many?

A question such as this has been explored by the other author of this introduction, Annemarie Mol, in relation to the body and its diseases. Various medical disciplines, with their different techniques—cutting here, questioning a patient there, observing X-ray images a little further along—have different knowledges. How do these relate? The traditional idea was that each of them reveals an aspect of a single, coherent body. On the other hand, it can also be argued that the different knowledges (clashing at some points, ignoring each other at others) all know their own "body." If this is the case, then it becomes important to understand how these different bodies hold together in hospital practice. It appears that this requires a lot of coordination work: files that go from one floor of the building to another, routines, conversations, memos, case conferences, operations. In practice, if a body hangs together, this is not because its coherence precedes the knowledge generated about it but because the various coordination strategies involved succeed in reassembling multiple versions of reality.

If this is right, then we are not dealing with a single body, but neither are there many different and unrelated bodies; for the various modes of ordering, logics, styles, practices, and the realities they perform do not exist in isolation from one another, as if in some ideal-typical liberal state of laissez-faire. They are not islands unto themselves, closed cultures, selfcontained paradigms, or bubbles. Instead, as Donna Haraway would say, they *interfere* with one another and reveal what Marilyn Strathern would call *partial connections*.<sup>13</sup> They meet—different ways of ordering the world, different worlds—just as (in Tzvetan Todorov's story about this) the Spaniards met with Malinche, who became Cortez's mistress as well as his translator. Malinche had been handed over as a present from some

men to some other men, and she betrayed those who had betrayed her, which is why the Spaniards were able to conquer Mexico. Thus she, woman between worlds, *mixture*, mestiza, came before any of the illusions that in meeting each party might stay pure.<sup>14</sup> Sensitivity to multiplicity suggests a number of questions about similarity and difference, about the embeddedness of orders in language and materiality, and about what it is to be neither one nor fragmented into many individuals. We need to think about what it is to be more than one and less than many.

Multiplicity, Point 1. If there are different modes of ordering that coexist, what is reduced or effaced in one may be crucial in another so that the question no longer is, Do we simplify or do we accept complexity? It becomes instead a matter of determining which simplification or simplifications we will attend to and create and, as we do this, of attending to what they foreground and draw our attention to, as well as what they relegate to the background.

Multiplicity, Point 2. Often it is not so much a matter of living in a single mode of ordering or of "choosing" between them. Rather it is that we find ourselves at places where these modes join together. Somewhere in the interferences something crucial happens, for although a single simplification reduces complexity, at the places where different simplifications meet, complexity is created, emerging where various modes of ordering (styles, logics) come together and add up comfortably or in tension, or both.

#### Flowing and Churning

Order, the single order, isn't simply reductionist because it occupies so much of the available space, pushing potentially disturbing chaos to the margins. Its pretensions and its apparent size also grow out of the linear history in which most "orders" are presented.

From the very beginning sociology sought to take social order out of timelessness and to insert it into time. Society, it argued, has a history; its current configurations came into being one way or another, and they may—or will fade away, collapse, or be overthrown. Questions about the creation and stability of social orders, about revolutions, upheavals, and qualitative changes, all these figure prominently in the concerns of the discipline. Things could have been otherwise, and in due course they will change, but right here and now they are overdetermined and cannot be wished away.

This, then, is also the time frame that was used when, in the social studies of science and technology, science and technology were drawn into "the social." They were redescribed as underdetermined by "nature" so that many other factors and actors were involved.<sup>15</sup> Without a microscope there are no slides. Without staining techniques there is no differentiation between cells. Without the discipline of pathology in the hospital there would have been no oncology, or it would have come out differently. Without clinical work there would have been no laboratory. Sciences and technology are not simply reflecting their object or doing what is most efficient, but at some point in the past they could have taken another course: things could have turned out differently.

A good image for this passage through time is the game of Go.<sup>16</sup> At first the stones on the board can be positioned anywhere, and no single pattern is privileged. However, every early move fixes the possibilities for later moves, so once there is a pattern, what follows comes to be inevitable.

So insofar as orders are put into time, the time that is mobilized is linear. It flows in one way only: on and on. It doesn't churn or slop from low to high tide and back again.

Fredric Jameson describes a house designed by architect Frank Gehry in Santa Monica.<sup>17</sup> This house juxtaposes two modes of building: a conventional, box-like, suburban, tract house and a "wrapper," composed of more or less junk materials (wire netting, corrugated metal) wrapped around the tract house to make all sorts of crazy shapes and volumes, inside and out. According to Jameson the tract house represents the affluent North, the wrapper the impoverished South, and—crucial this—the whole structure represents the contradictory unity of global capitalism, which (says Jameson) cannot be represented in two dimensions.

We might have presented this house as an example of multiplicity, of the interference, indeed, between two modes of building—but time also enters the story. The two-buildings-in-one, Jameson says, do not fit onto the two dimensions of a plan or photograph, which would show either one or the other, never both—for snapshots freeze time. By contrast, a visitor who walks through the house slides from wrapper into tract house and from tract house back into wrapper. The appreciation of each depends on the presence (and

absence) of the other. Neither is complete when one is there. Each waits for the necessary move back to the other. Back and forth, not linear time but tidal time.

Once we start to attend to times that come and go, what is reduced at one moment may resurface the next. Elements that come to the foreground now shift to the background a little later. In this way the possibility of recomplexification is included in what is momentarily simple and the nouns, simple and complex, give way to verbs, to talking of simplifying and complexifying.

Charis Cussins tells a story in which she makes time dance: a choreography.<sup>18</sup> Along the itinerary of women with problems of infertility, hope comes. This turns into success or disappointment—but then, later on, if they try again, the hope may come back again. The reality of infertility treatment doesn't stay the same. Now you assert your subjectivity while a little later you lie on your back, objectified, with your legs spread and some instrument inserted into your body, to come out proud and pregnant—or not.

What is said, what is allowed as an element in order, always depends on what is not said, on what is displaced and marginalized—this is the general trope. But in this time-sensitive version the expelled other has not gone away because while it is absent it is still present, too. It is deferred but will come back again, leaving traces, which is what Derrida calls différance.<sup>19</sup>

Time flies, but it flies like a swallow, up, down, off quickly and then coming slowly back again. Attending to such a time brings complexity into play, for simple orders may be made visible by snapshots of frozen moments. But they *are* only snapshots. What is visible in them may be hidden on the next image—and then become visible again a little later and even snapshots may show traces of what is but also isn't there, of complexities that surface earlier, later, at and in some other time.

#### Lists, Cases, and Walks

Orders do not simply expel the complex and chaotic. In addition, they insist that what belongs to them is drawn together and properly assembled. No element may hold back, and what is inside must be named, accorded a place. A proper order comes with the illusion that all relations can be specified and that it is possible to gain an all-inclusive overview. There are various ways of doing this.

One is a mode of representation that presupposes a single and conformable world. This is the *classificatory system*, which makes cages, big cages that are then subdivided into smaller ones, like the system that covers the animal kingdom: individuals go into species, species into families, and families come together into the genus. The system is materialized in classical museums: in this wing of the building you find the mammals, and the reptiles are over there. Rodents come with rodents. Walk around the corner, and you find the apes.

But this is not the only possibility. For instance, as we noted above, there is the list, which is not to say that there are no classificatory lists but that a list doesn't have to be classificatory. That lists may be other than classificatory is strikingly illustrated by the celebrated heteronomous list of animals Foucault borrows from Borges in the preface to The Order of Things, a list derived from "a certain Chinese encyclopaedia." "Animals," Borges wrote, are divided into "(a) belonging to the Emperor, (b) embalmed, (c) tame, (d) sucking pigs, (e) sirens, (f) fabulous, (g) stray dogs, (h) included in the present classification, (i) frenzied, (j) innumerable, (k) drawn with a very fine camelhair brush, (l) et cetera, (m) having just broken the water pitcher, (n) that from a long way off look like flies." This list, says Foucault, "shattered . . . all the familiar landmarks of my thought . . . breaking up all the ordered surfaces and all the planes with which we are accustomed to tame the wild profusion of existing things."<sup>20</sup> Not classifying, at least not in any way the reader was able to recognize, the list abstains from taming. It groups together, but it doesn't tame.

A list doesn't have to impose a single mode of ordering on what is included in it. Items in the list aren't necessarily responses to the same questions but may hang together in other ways, for instance socially, because a list may be the result of the work of different people who have each added something to it. Yet it remains open, for a list differs from a classification in that it recognizes its incompleteness. It doesn't even need to seek completeness. If someone comes along with something to add to the list, something that emerges as important, this may indeed be added to it.

A second way of representing that makes closed orders is to present examples as if they were representative of some larger law or point, as, for instance, in a physics textbook—or even more so in a school experiment in physics—in which some specificity, let us say an inclined plane, comes to exemplify or illustrate something larger, for instance Newton's laws of motion. Something similar happens in the social sciences when an event witnessed is presented as "the empirical instance" that is used to illustrate something general, larger, which may then be called "the theory." In situations like this there may be insistence on specificity, but if so, then this specificity is presented as a *detail* that illustrates and serves a larger whole.

There are other ways of mobilizing specificities that do not have to do with detail. One is to present cases as not being representative of something larger—into which they neatly fit. It is to take all cases as phenomena in their own right, each differing slightly in some (unexpected) way from all the others. Thus a case may still be instructive beyond its specific site and situation, and this tends to be why it is studied, but the lessons it holds always come with the condition that, elsewhere, in other cases, what is similar and different is not to be taken for granted. It remains to be seen, to be experienced, to be investigated.

Because they are not, so to speak, representative of something larger (a "theory"), cases are able to do all kinds of other work. For instance, they may sensitize the reader to events and situations elsewhere that have not been recognized so far and that may well be improbable. They may seduce the reader into continuing to read, to ask what is going to come next. They may suggest ways of thinking about and tackling other specificities, not because they are "generally applicable" but because they may be transferable, translatable. They may condense—anthropologists might want to say "symbolize"—a range of experiences, relations of a variety of different kinds. They may act as an irritant, destabilizing expectations. For instance, they may destabilize scale relations—undermining precisely the idea that details (or, better, specificities) are part of a larger whole. Or they may work allegorically, which means that they may tell not just about what they are manifestly telling but also about something else, something that may be hard to tell directly.

In contrast with the overview of the classificatory system, we suggest that *lists* are nonsystematic, alert, sensitizing but open to surprise. In contrast with the illustration that represents a larger theory, we suggest to treat *cases* as, again, sensitizing but also unique—as incitement to ask questions about difference and similarity, about what alters in moving from one place to another. A third way of making overviews we want to mention here is mapping. Maps draw surfaces that contain details (a set of sites or attributes of what is contained within these sites) that are related in an accountable manner. The accountancy involves measurable distance and proximity; it involves increase and decrease. Maps suggest transitive relations between entities that exceed or are subordinate to, but surely exclude, each other.

Imagine, as a contrast, walking through the little lanes that make up the inner city of Venice or walking through a jungle. In such places a map is unlikely to be the best tool for getting around. In Venice a local inhabitant who knows the place and can give directions is much better, and so are signposts that point in the right direction. In the jungle you might need something else to make your path a little simpler: a guide, for sure, but also a sharp machete and the skill to use it.

Here is the point: walking, as Michel de Certeau has noted, is a mode of covering space that gives no overview.<sup>21</sup> It immerses the walker in a land-scape or a townscape. As we walk, we may encounter a variety of comforting—or stunning—sights and situations, and then we can bring these to-gether instead or leave them separate, as they would be on a map, removed from one another. We may juxtapose them in the way we sometimes do after a journey, by telling stories or showing pictures. The picture of a large landscape is printed so that it has the same size as that of a plate filled with food, and the story about driving through the landscape is no bigger or smaller than the story about eating the meal. Other differences abound.

There are, then, modes of relating that allow the simple to coexist with the complex, of aligning elements without necessarily turning them into a comprehensive system or a complete overview. These are some of the ways of describing the world while keeping it open, ways of paying tribute to complexities, which are always there, somewhere, elsewhere, untamed: to list rather than classify; to tell about cases rather than present illustra-

tive representatives; to walk and tell stories about this rather than seek to make maps. Of course—this is the nature of our list, of any list—there are other possibilities too, told elsewhere or waiting to be discovered.

v

The chapters in this book examine highly diverse knowledge practices: markets, therapeutic interventions, the governing of supranational states, aerospace mathematics, ecology, road building, photography, the complex sciences, and dealings with childhood trauma. Their narratives come from Kenya, Belgium, Britain, Papua New Guinea, the Netherlands, France, and that nonnational state, the republic of science. They are written by anthropologists, economists, philosophers, psychologists, sociologists, and students of science, technology, and society. And they treat complexity as if it were more than one but less than many—as a set of possibilities, strategies that are partially connected.

This means that they also interfere with one another. Those interferences are complex, and if what we have said about overviews and orders is right, we cannot hope to catch these different versions and treatments of complexity in a classification or a map. We can, however, go for another walk, make another list, or turn the pages of a sketchbook and outline a set of partial connections.

For instance, it is obvious that many of the authors write about multiplicity. The chapter by Laurent Thévenot considers the compromises between a series of different regimes for connecting the good with the real—and therefore the world of normativities with material objects in the environment. Thus he writes about a road that is both a set of different roads when it is located within different pragmatic regimes (the market, industry) and in some sense "the same" road, at least if it is actually built. More than one and less than many, it embodies a series of compromises. Complexity, then, emerges where the multiple "road/s" that Thévenot writes about interfere with one another.

Multiplicity also appears in John Law's chapter on an aerodynamic formalism. Different elements—for instance the behavior of airfoils in air, the sickness of pilots, strategic considerations, and the supposed capacity of the Russians—all appear within this formalism. Or, more accurately, and this is his point, they both appear and do not appear in

what might be imagined as an endless oscillation between absence and presence. This, then, is Law's particular sense of complexity. Inferences between multiple configurations occur not in a linear sequence but as an oscillation between presence and deferral.

Oscillation is also important in the chapter by Nick Lee and Steve Brown, about the disposal of fear in childhood. These authors suggest that children are both beings and becomings, culturally located on a trajectory of normal development and the normalization that this trajectory implies. Viewed in this way there is a troubled relation—an oscillation—between the codependent cultural artifacts of the general (what children do as they develop "in general") and the particular (the actions of this particular child, in this case a three-year-old frightened by the characters in a dramatization of Barrie's *Peter Pan*). Complexity thus indexes a troubled and oscillatory relationship between general and particular, where generalized knowledges help to "dispose" fear onto the child, forcing him to bear the burden of disposing the general (childhood) and the specific (this child).

Marilyn Strathern, writing about the interpretation of pictures in anthropology, notes that anthropologists seek to describe events or pictures on the one hand and their preconditions on the other. We hear further echoes there, then, of the complexity of the link between general and particular touched on by Lee and Brown. Strathern introduces figure-ground reversals, the oscillation between appropriate and inappropriate interpretations and that between self-evidence (when what is depicted "speaks for itself") and the "excessive" interpretations of intertextuality. In her analysis complexity emerges as an oscillation, or at least mutual implication, between place (the particular) and space (its context, the general, understood as a set of coordinates). The general, Strathern suggests, is not beyond but already contained within the (particular) picture.

Complexity as tension between general and particular also appears in Michel Callon's essay, although he also mobilizes a further metaphor for imagining the relation among multiples, that of mediation. He describes service companies' methods for shaping their services, as well as the demands of customers. What methods do these companies use? The answer is that they deploy writing devices that both reflect and produce supply and demand and that mediate not only between the company and

its consumers but also between the customer in general and this particular customer, between the "macrosocial" and the "microsocial." Callon argues that the writing device is a material and performative mediator that produces objects or classes of objects that are usually held apart.

Performativity, then, is another crucial complexity-relevant trope. The argument is that knowing, the words of knowing, and texts do not describe a preexisting world. They are rather part of a practice of handling, intervening in, the world and thereby of enacting one of its versions—up to bringing it into being. This understanding informs most of the chapters. Callon explores it for the case of marketing, and the known world is central to his analysis. It is crucial, too, to Andrew Barry's essay, which considers how rhetorics of complexity are deployed in the European Union (EU). But the term *rhetoric* is less than satisfactory. For the words and the practices of complexity and nonreduction (Barry mentions process, network, actor-network, and nonlinear scale) are mobilized by the European Commission precisely in order to perform the EU into being in a way that will elude the attention (and so the resistance) of the sovereign states that make up Europe's most visible and entrenched political units.

In Annemarie Mol's essay various entities that have to do with atherosclerosis of the leg vessels are followed while they are being performed variably. Mol examines the specificities of the problems of the patients concerned, as well as the outline of two therapies, the actors who engage in treatment, as well as the treatment's aims. If all these, and more, configurations are locally performed, and variably delineated, how then to compare the improvements of "one" patient-condition that isn't one? How to compare two divergingly delineated interventions? In Mol's contribution complexities emerge as a result of a particular interference: that of comparison.

In Charis Thompson's essay comparison is equally crucial. Thomas describes a meeting where two modes of dealing with elephants in a Kenyan wildlife park were discussed. These modes appear to differ not just on a single point. Instead, they come with an entirely different framing of a list of things: what it is to engage in science, how elephants relate to humans and what is important about them, and even how to compare and engage in interaction. For this is important to the story: that differentiating incommensurabilities may help to clarify a discussion but

where tensions need to be handled in practice, it may be wiser to seek interferences, to increase complexity.

Multiplicity, oscillation, mediation, material heterogeneity, performativity, interference—and the list of metaphors for making and handling complexity in ways that escape the dualism between order and chaos could be extended further. Thus most of the authors are concerned with unfinished process: for there is no resting place in a multiple and partially connected world. Some refer to the necessary tensions in knowing and in being. Some—Strathern and Lee and Brown most clearly make explicit the essential reflexivity of the performativity of multiplicity and the production of knowing and known, for when subjects and objects are made together, there is no external resting place for those engaged in knowing and in writing.

There is not even a resting place for the one author in this book whose essay surveys models of complexity in the natural sciences: Chunglin Kwa. His description of the shift in models of complexity in ecology and meteorology is framed in terms of a distinction between romantic and baroque. Romanticism discovers complexity in emergent structures, whereas the baroque—a long-standing but recently popular understanding of the world that owes much to Leibniz—discovers complexity as a set of monads that know the world without being mechanically related to one another in the form of a system or an organism, that know the world, are conscious of it, but precisely resist being summed up. You may analyze to what extent his own writing has romantic or baroque characteristics.

There is room for many pictures on the pages of the sketchbook. And that is what this volume is: a book of sketches about complexities in knowledge practices; a book of sketches that seeks to imagine alternatives to the simplicity of the overview and its other, the forces of chaos; a book of sketches that, as this introduction suggests, makes any definition of complexity difficult if not self-defeating. For, recall, we started with a definition. We said if things relate but don't add up, then they are complex; if events occur but not within the processes of linear time, then they are complex; and if phenomena share a space but cannot be mapped in terms of a single set of three-dimensional coordinates, then they too are complex. This is not exactly wrong, but it is—too simple. It is too simple because it works with binaries. Addition, or not. Linearity, or not. A single space, or not. But in a complex world there are no simple binaries.

Things add up *and* they don't. They flow in linear time *and* they don't. And they exist within a single space *and* escape from it. That which is complex cannot be pinned down. To pin it down is to lose it.

NOTES

- 1. See Bauman (1989).
- 2. See Bauman (1987).
- 3. Radder (1988).

4. See, for instance, the distinction between "figure" and "discours" in the writing of Jean-François Lyotard (1984, 1985).

- 5. See Kuhn (1970).
- 6. See Foucault (1971).

7. The body of complexity theory that has emerged in the last twenty years is not explored in this volume, except in passing in the essay by Chunglin Kwa. The aim of this volume is not to contribute to a new theory of complexity but to ask how complexities, particularly elements that cannot be easily reduced to one another, are actually handled in instrumental, political, textual, medical, and economic practice.

- 8. See Rawls (1973).
- 9. See Walzer (1983).
- 10. See Boltanski and Thévenot (1987).
- 11. See Morgan (1986).
- 12. See Law (1994).
- 13. See Haraway (1991a, 1991b) and Strathern (1991).
- 14. Purity, Latour argues, is one of the great tropes of modernity. See Latour (1993).
- 15. See Bloor (1976) and Barnes (1997).
- 16. See Latour and Woolgar (1979).
- 17. For discussion see Jameson (1991, 97, 108-17).
- 18. See Cussins (1998).
- 19. See Derrida (1976).
- 20. Quoted from Foucault (1970, xv).
- 21. See de Certeau (1984).

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# CHUNGLIN KWA Romantic and Baroque Conceptions of Complex Wholes in the Sciences

In the 1990s *complexity* came to mean something different from what it predominantly meant in the 1950s. The newer complexity is not simply an extension of, or a development from, the old complexity. For complexity comes in kinds. In this essay I distinguish between "romantic" complexity and "baroque" complexity. They have, I will argue, quite different conceptions of the structure of reality.<sup>1</sup> I develop the argument in three stages. First, I characterize these two forms of complexity. Second, I explore the ways in which the term changed in the twentieth century by considering certain writings in meteorology and evolution and so-called chaos theory. And third, I return to the distinction between the romantic and the baroque and argue that both—together with other commitments, including those to reductionism—are long-standing metaphors, tropes, or indeed metaphysical positions within the natural sciences.

#### ROMANTIC AND BAROQUE

#### A Romantic Expectation

Models seek to bring conceptual unity to what otherwise would not easily be put together. And in a mathematical model several basic laws can be made to work together to "mimic" nature. The computer makes this possible. The enthusiasm inspired by the computer was nicely expressed by population dynamicist Crawford Holling in 1966: "If biology has told us anything, it is that complex systems are not just the sum of their parts. There is an emergent principle when fragments act and interact in a whole system. The speed and large memory of modern digital computers for the first time allows the ecologist, in principle, *to incorporate*  all the relevant actions and interactions of the fragments of complex ecological systems in an integrated manner."<sup>2</sup> The ideal of integrating all the workings of nature into one whole is called holism. And, indeed, for many years there was a special relationship between holism and the computer. If the assumption of holism is fed into a computer model, the computer faithfully reproduces it. But Holling was hoping for too much in 1966.

#### Holism

In the early twentieth century, organicists such as J. S. Haldane, Jan Smuts, and Paul Weiss reinvigorated romantic conceptions of nature through the notion of the complex unity of systems, in particular living systems.<sup>3</sup> Jan Smuts gave wide currency to the notion of "holism." "The whole as a real character is writ large on the face of Nature," he wrote in his Holism and Evolution.<sup>4</sup> So what is holism? Smuts's answer came in two parts. First, it is the idea that there are hierarchically different levels of organization in the natural world, each of which unites heterogeneous items of a lower level of integration into a functional whole. Second, holism is the suggestion that new levels of integration, or new wholes, have emerged at various times during the course of evolution on earth. Smuts's rather unsurprising paradigmatic example of the emergence of wholes is the organism. More controversially, he talks of higher levels of holism, the mind, and personality-where the latter is virtually in command of the universe. Although the latter, somewhat mystical, levels found few adherents in the scientific community, the word *holism* has stuck.

For many decades romantic holism and complexity were synonymous. If one took "complexity" seriously as a subject for science, one was a holist. If one objected to holism—usually on the grounds that it rests on unwarranted speculation—one was a reductionist. However, recently the word *holism* has disappeared more or less completely from discourse about complexity—which is, perhaps, an index of a different kind of complexity.

#### The Romantic Tradition: The Unity of the Whole

Romantic complexity sees an underlying unity in a world of heterogeneous objects and phenomena—ever since Rousseau wrote in the sev-

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