# Pragmatogonies

## A Mythical Account of How Humans
## and Nonhumans Swap Properties

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The study of science and technology has been deeply modified in the last 20 years through the use of what has been called a *principle of symmetry* (Bloor, 1991). Truth and falsity, efficiency and irrationality, profitability and waste have been treated in the same terms instead of being partitioned in two incompatible realms. Instead of extracting the three sisters—truth, efficiency, and profitability—from the messy social world, they became mixed into social practice as intimately as possible. Very quickly, however, it appeared that the social theory that had been used to study rationality as well as irrationality in a symmetrical fashion was deeply flawed because it had been devised in contraposition to the world of objects. This birth defect made very difficult the use of the resources of the social sciences to study the natural world.

To get out of this difficulty, it has been necessary to define a generalized principle of symmetry, not between rational and irrational behavior, but between humans and nonhumans (Latour, 1987). The apparent difficulty of this new principle—which is nothing but an extension of the first one—is that it seems to blur the boundaries between the human subject and the nonhuman object. It appears to succumb either to the sin of anthropomorphism (Schaffer, 1991) or to the mechanization of sacred human subjectivity (Collins & Yearley, 1992).

There is no way to answer these critiques as long as we take for granted that we *know* what object and subject, human and nonhuman, mean. In this article, I have no intention of defending or illustrating the principle of symmetry.[1] I simply want to offer an alternative myth to help us suspend our knowledge of what constitutes the human subject and the nonhuman object. Only a myth, at

this point, may help move the discussion further and point at the common locus from which is produced a certain type of linkage between certain types of humanity and certain types of nonhumanity.

## LOOKING FOR THE ENTRY POINT
## OF OBJECTS INTO THE COLLECTIVE

11:00 a.m.: Clairborne sits near Niva, looking around vigilantly. Before Clairborne can make a move, Crook arrives, both nervous and brazen. Both Clairborne and Crook want Niva's favors, but Clairborne is her old friend. Crook has just arrived and no one trusts him, he is so unpredictable. Clairborne moves closer to Niva, but this does not stop Crook, who continues to close in. Tension mounts. Niva is caught between two conflicting emotions, wanting to flee and yet worried to be on her own so near Crook. She opts to stay near Clairborne, which seems like the safest bet. Everyone is watching closely to see what will happen. Sharman pays special attention since the outcome could affect him. Crook lunges at Clairborne, but instead of running away, Clairborne grabs Niva's infant. The infant clings trustingly to its big friend. Suddenly, the action shifts, as if Clairborne had erected a protective shield between himself and Niva. Frustrated, but not daring to make a further move toward them, Crook turns elsewhere to vent his frustration. As he suspected he would, Sharman becomes the target of Crook's aggression. As the two run off exhanging threats, the small group around Niva relaxes. Clairborne huddles closer to Niva; the infant snuggles in her lap. Sharman now is the one with the problem. It is 11:05 a.m. (Shirley Strum, personal communication, 1994)

This bit of soap opera does not come from *Dallas* or any of those sitcoms with which you Americans conquer our TV sets all around the world, but from primatologists' accounts of baboon life.[2] Such a group of baboons offers the best baseline, the best benchmark, to register how objects enter the collective, because, although baboons are complex in their social and political maneuvering, they are, unlike chimpanzees for instance, devoid of any tools and artifacts, at least in the wild.

To understand the linkages between humans and nonhumans, we have to define techniques in a different way.

First, let me define technical action as the form of *delegation* that allows us to mobilize in an interaction movements which have been executed earlier, farther away, and by other actants, as though they are still present and available to us now. Without the presence of the past, the presence of the far away, the presence of nonhuman characters, we would be limited, precisely, to interactions, to what we can manage to do, right now, with our own social skills, like the Machiavellian baboons I have just introduced.

Second, this definition of technical action does not imply any *Homo faber* mythology as if we had through techniques some sort of privileged, unmediated, unsocialized access to objective matter and natural forces. Objects, matter, force, and nature are latecomers and cannot be used as our starting point. The traditional definition of techniques as the imposition of a form consciously planned in advance onto some shapeless matter should be replaced by a much more

oblique, although more accurate, definition as the socialization of non-humans (Latour & Lemonnier, 1994).

Third, the most important consequence of criticizing the *Homo faber* myth, is that when we exchange properties with nonhumans through technical delegation, we enter into a complex transaction, which is visible in contemporary collectives as well as in traditonal ones. If anything, as I have shown elsewhere (Latour, 1993b), what we call *modern* collectives are not the ones in which society and technology are finally divorced from each other, but those in which relations are so intimate, transactions so many, and mediations so convoluted, that there is no longer any plausible way to differentiate for good a collective body, an artifact and a subject.

Fourth, to absorb this symmetry between humans and nonhumans on the one hand, and this continuity between traditional and contemporary collectives on the other, social theory has to be somewhat modified. It is nowadays commonplace to say that techniques are social because they have been socially constructed.[3] But this pronouncement remains vacuous if the meanings of *mediation* and of *social* are not made more precise. If we intend to say that social relations are inscribed in technology so that when we are confronted with an artifact, we are confronted, in effect, with social relations, then we say nothing more than a tautology, a very implausible one at that.[4] If artifacts are social relations, then why on earth has society to pass through them to inscribe itself onto something else? Why not inscribe itself directly? After all, the artifacts count for nothing; they are just there to transport domination, exclusion, and power, conducting them like electricity along a wire. I know the answer critical theory will give. By going through the medium of artifacts, power and domination hide themselves under the guise of natural and objective forces. They appear naturalized or objectified or reified. Do you see how critical theory functions? First it uses a tautology: Technology is nothing but social relations. Then it adds a conspiracy theory: Society is hiding itself behind the fetish of techniques.

But techniques are not fetishes, they do something more, something unpredictable; they are not means, but mediators, that is, means and ends at the same time, and this is precisely why they are brought to bear on the social fabric. So, in addition to all its other defects, critical theory is also politically weak because it is unable to explain why artifacts enter the stream of our relations through the constant recruitment of socialized nonhumans. This does not happen to mirror, reflect, inscribe, or hide social relations but to remake them anew through fresh and unexpected sources of power. Society is not stable enough to inscribe itself onto anything. On the contrary, most of the features of social order—scale, asymmetry, durability, power, division of labor, role distribution, and hierarchy—are impossible even to define without bringing in socialized nonhumans. Yes, society is constructed, but not just *socially* constructed. Only Shirley Strum's baboons, we could say, construct their society socially (Strum & Latour, 1987). Humans for a few millions of years now have extended their social relations to other actants with which, with whom, they have swapped many properties, and with which, with whom, they form a *collective*.[5] There is no sense

in which the notion of a *human* can be disentangled from the nonhumans into whose fate it has woven more and more intimately over the ages.

Such an argument could trigger the objection that symmetry between humans and nonhumans is impossible because the humans seem always to have the initiative. This commonsense objection is not so commonly sensible, however, because in most of our activities we do not attribute the causative role to humans (see Fuller, 1994, this issue). Scientists, for instance, commonly say that they do not speak but that nature speaks—or more exactly, writes—through the medium of the instruments and the laboratory. So who does the speaking? The scientists? Yes, to be sure, but they insist that when they talk they are authorized by the real enunciator of their speech, reality itself, so that in the end reality does most of the talking. You will find the same conundrum in the question of political representation: Hobbes' sovereign, after all, is the *actor* of whom we are the *authors*. And similarly in fiction: Novelists claim that they are forced to write either by the muse or by the sheer impulse of the characters themselves, and, amusingly enough, the literary critics often make fun of this fetishistic belief by appealing to still another collective force for which the novelists play the expressive role of medium, that of society or that of the Zeitgeist. So every activity suspends the easy commonsense idea that humans speak and act. Every activity implies a generalized principle of symmetry or, at the least, offers an ambiguous mythology that disputes the unique position of humans. We find exactly the same uncertainty with techniques, where we have a human action ending up in the action of a nonhuman. So who eventually is responsible for the action? Both. The responsibility has to be shared, symmetry restored, and the role of humanity shifted sideways from being the sole transcendant cause to that of *mediating mediators*.

## AN UNREASONABLE PRAGMATOGONY

After having quickly summarized what has been learned about techniques by using the principle of symmetry, I could take two different paths, one reasonable, the other unreasonable. The first path would be to describe with as many details as I could some modern sociotechnical imbroglios and to show you in what sense machines and machinations participate in the same deeply renewed Machiavellian politics (Latour, 1992, 1993a; Latour & Lemonnier, 1994; MacKenzie, 1990).

Unfortunately, I am going to take a totally unreasonable and speculative path. Instead of describing sociotechnical networks, I am going to attempt a genealogy of the swapping of properties between humans and nonhumans. Because it will be as unreasonable, implausible, and unempirical as the cosmogonies of the past, and because it will retrace the metamorphosis of the object, I will call it, after Serres (1987), a *pragmatogony*.

The reason I am going to do this is that, no matter how many excellent case studies I and my colleagues are able to produce, they are understood by readers in many instances as a social construction of technology! In other words, readers

account for such studies in terms of the dualist paradigm I have criticized so much. The reason for this obstinacy seems to reside in the impossibility of disentangling the various meanings of the catchword *sociotechnical* (Callon, 1986, 1989). What I want to do now is to peel away, one by one, the various layers of meaning that are sedimented in the present packages that we label *society* and *techniques*. Because every time we use the word social, we implicate many types of nonhumans, and every time we speak of techniques, we also bring in definitions of society, the only way out, if we do not want to throw up our hands in despair, is to attempt a genealogy of these associations.

I have another reason to attempt a genealogy. After having disputed the dualist paradigm for years, I now realize that no one is ready to abandon an arbitrary but useful dichotomy, such as that between society and technology, if it is not replaced by analytical categories which have at least the same discriminating power as those just jettisoned (Lee & Brown, 1994, this issue). We can toss around the phrase sociotechnical networks for ages without ever moving beyond the dualist paradigm we wish to overcome. To move on, I need to convince you that I can differentiate *much finer* details with the new paradigm than with the former one. (I am assuming you do not need to be persuaded that there is nothing intrinsically wrong in blurring the distinction between social actors and objects.) To do so, I will traverse all the meanings of sociotechnical I have been able to devise, from the most contemporary to the most primitive. The advantage of this maneuver is that we will be able (in the future) to qualify with some precision which sort of properties are swapped or invented for each of those meanings.

In my present story I have isolated 11 different layers. Of course, I do not claim any plausibility for these definitions, nor for their sequence. I simply want to show that the tyranny of the dichotomy between humans and nonhumans is not inevitable because it is possible to give at least one other myth in which it plays no role. If I succeed in giving some space for the imagination, this would mean that we are not forever stuck with the boring alternation of humans to nonhumans and back. It would be possible to imagine a space, that will later be studied empirically, in which we could observe the swapping of properties without always having to start from a priori definitions of humanity.

## PRAGMATOGONIES

I am now going to sketch, in a telegraphic style, the various stages of my myth without even trying to be plausible. I will simply stick to the same principle all along, starting with the latest meaning of sociotechnical and proceeding all the way to the earliest, most primitive layer.

### 11. POLITICAL ECOLOGY

The eleventh and most recent interpretation of the sociotechnical crossover[6] is, paradoxically, the easiest to define because it is the most literal. Lawyers,

## 11th meaning of "sociotechnical"

State of social
relations

State of nonhuman
relations

*Technologies*

Crossover

Nonhumans have rights
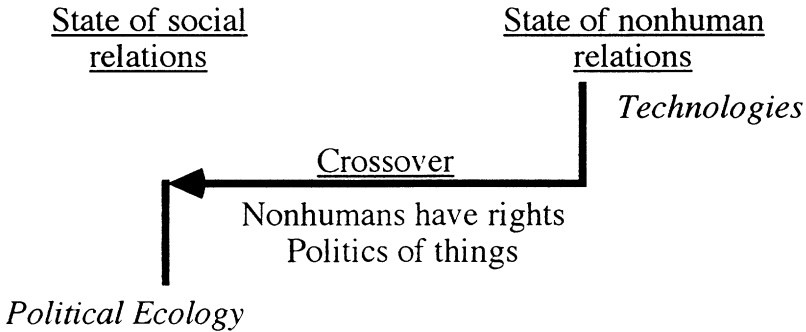Politics of things

*Political Ecology*

**Figure 1:**   The pragmatogony is told by taking properties learned in social relations and bringing them to bear on the state of nonhuman relations and vice-versa.

activists, ecologists, businessmen, and political philosophers are now seriously talking, because of the ecological crisis, of granting to nonhumans some sorts of rights and some sort of standing in court (see Figure 1).

Not many years ago when we were contemplating the sky above our heads, we thought of nothing but matter and nature. Nowadays, when we look above our heads, we watch a sociopolitical imbroglio, because, for instance, the depletion of the ozone layer brings together a scientific controversy, a political dispute between North and South, and gigantic strategic moves inside industry. The idea of a political representation of nonhumans seems not only plausible but necessary, although it would have seemed ludicrous or even indecent a few years ago. We used to deride primitive people who thought that some disorder in their society, some pollution, could threaten the natural order to the point of letting the sky fall on their heads. We do not laugh anymore when we abstain from pressing the button of an aerosol for precisely the same reason. We too are now afraid that the sky could fall on our heads because of our pollution, our negligence. We have become much more primitive, that is, much more cautious—or, should I say, much more civilized?

How can this crossover between rights and science be defined? Like all crossovers it mixes elements of both sides, those of the political, and those of the scientific or technological orders. But this mixing is not just any haphazard rearrangement. *Technologies* (see below for the definition) have taught us how to manage vast assemblies of nonhumans on a large scale. But this form of management was still conceived as efficient, profitable, rational, and objective, and as a mastery over matter. In the new crossover we bring the property learned through this prior experiment in large-scale management of the planet to bear on the political system. The new hybrid remains a nonhuman, but not only does

it lose its material, objective, and rational character, it also takes up some of the properties of citizenship. It has rights, it should be protected, it cannot be enslaved. To use Michel Serres's (1990) phrase, we should replace the social contract by the "natural contract." I will call this first layer of meaning—last in chronological order—*political ecology*. We now understand that we must literally and not just symbolically manage the planet and practice the politics of things.

## 10. TECHNOLOGIES

Do not believe, however, that when I talk of a crossover of technology and politics, I am referring to pure forms, as if techniques were on the material side and politics on the social one. No, I am only defining the eleventh layer of what is packed into the definition of society and techniques. Turning toward the tenth layer, we realize that our definition of technology is itself due to the crossover between a previous definition of society and a particular version of what a nonhuman can be.

To give you an example of what I have in mind, when I met a scientist, a few months ago, he introduced himself by saying, "Hi, I am the coordinator of the chromosome 11 of yeast." What an extraordinary hybrid! Here is a person—"I am"—a corporate body—"the coordinator"—and a truly natural phenomenon—"yeast," whose genome (that is, the complete DNA sequence) this scientist is elucidating! If you were cutting in the middle of this sentence with the dualist paradigm, putting on the one side the social aspect of his organization and on the other the natural truth of yeast DNA, you would not only bungle the data but would also lose any chance of understanding how the yeast genome can become known to an organization and how an organization could become naturalized as a DNA sequence inside a Macintosh hard disk.

We again encounter a crossover here, but it is of a different sort and goes in a different direction, although it can also be called sociotechnical. For the scientist I interviewed, there was no question of granting any sort of rights of citizenship to the yeast. For him, the yeast is a strictly material entity. The industrial laboratory, where new modes of organization of labor elicit completely new features of the nonhumans, would be a good definition of what a technology is in the English sense of the word: that is, a fusion of science, organization, and industry. In technology, the forms of coordination learned through *networks of power* (see below) are extended to disarticulate entities not only on a much larger scale but also in a much more intimate way. Although yeast had, for millenia, already been put to work by the old brewing industry, the yeast now distributed through the networks of 30 European laboratories to have its genome mapped is humanized and socialized in the much more literal sense of becoming a code, a book, a program of action, compatible with our ways of coding, counting, and reading, and no longer retaining any of its material quality, its outsiderness. It has been swallowed within the collective. Through technology, socialness is shared with nonhumans in an almost promiscuous way,

automatons being endowed with some sort of primitive speech, intelligence, foresight, self-control, discipline. They have no rights, to be sure, as in the eleventh meaning, but they are much more than material entities: They are complicated organizations.

## 9. NETWORKS OF POWER

This is not to say that what I call organizations and networks are purely social, because they are themselves recapitulating nine former crossovers of humans and nonhumans. Alfred Chandler and Thomas Hughes have each shown the simultaneous extension of what the former calls the *global corporation* (Chandler, 1990) and the latter calls *networks of power* (Hughes, 1983). Here again, I could talk of a sociotechnical imbroglio and replace the dualist paradigm by the seamless web of technical and social factors so beautifully deployed by Hughes. But the point of my little genealogy is to be able to identify inside the seamless web the properties which are borrowed from the social world to socialize the nonhumans, and, vice versa, from the nonhumans to naturalize and expand the social realm. For each layer of meaning, everything happens as if we were learning, through our contact with one side, *ontological properties*, which are then reimported to the other side, generating new, completely unexpected effects.

The extension of networks of power in the electrical industry, in telecommunications, in transportation, are impossible to imagine without the massive mobilization of material entities. The reason why Tom Hughes' (1983) book is so exemplary for the field of science studies lies in his ability to show how a technical invention—that of electric lighting—is brought to bear by Edison on a mode of organization, of management, of law, that creates a corporation without much precedent because its scope and scale, to use Chandler's title, are directly related to the physical properties of the electrical networks. Not that Hughes in any way talks of a material infrastructure triggering changes in the social superstructure. On the contrary, his networks of power are complete hybrids, but hybrids of a peculiar sort: They lend their nonhuman qualities to what were until then weak, local, and scattered corporate bodies. Management of large masses of electrons, clients, power stations, subsidiaries, meters, and dispatching rooms takes on the formal and universal character of scientific law.

Notice that this layer of meaning resembles the eleventh, with which I started, because in both cases the crossover comes preferentially from the nonhumans and is then brought to bear on the corporate bodies. What can be done with the electrons, can also be done with the electors. But the intimacy is weaker in networks of power than in political ecology because the entities which Edison, Bell, or Ford mobilized still look like matter, still seem nonsocial before *industry* (see below) forges them into shape. Political ecology, however, is concerned with the fate of nonhumans which are so socialized and so closely related to us that they have to be protected by rights as if they were our brethren, as if we were primitive again.

## 8. INDUSTRY

In the philosophy and sociology of techniques, we often imagine that there is no difficulty in defining material entities because they are objective, they just stand there, unproblematically composed of forces, of atoms, of elements. Only the social, the human side, would be difficult to interpret, we believe, because it is so complex, hermeneutic, and historical. The principle of my genealogy, however, is that whenever we talk of matter as a given, we are in fact considering a package of multiple layers of former crossovers between social and natural elements so that what we take as primitive and pure terms are belated and mixed ones. Just by retracing the most recent three steps, we can already see that matter is vastly different depending on the different layers I have called political ecology, technology, or networks of power. Far from being a primitive term, always immutable in contrast to a fast changing society, matter has a genealogy too, and nonhumans can in no way be limited to their material definition, which, on the contrary, we should be able to retrace.

The extraordinary feat that I will call *industry* is to grant nonhumans the possibility of being related to one another in an assembly of actants that we call a machine or an automaton, which is endowed with some sort of autonomy and which is submitted to regular laws that can be measured through instruments and accounting procedures. From tools held in the hands of human workers, we shift to an assembly of machines where tools are related *to one another*, creating a massive array of labor and material relations in the new factories that Marx has forcefully described as so many circles of Dante's *Inferno*.

The paradox of this stage of the relations between humans and nonhumans is that it is seen as alienation, dehumanization, as if this was the first time that poor and exploited human weakness was confronted with an all-powerful objective force. However, to relate nonhumans together in an assembly of machines, ruled by laws, and accounted for by instruments, is still to grant them some sort of social life. Indeed, the whole modernist project consists of creating that peculiar hybrid: A fabricated nonhuman that has nothing of the character of society and politics, but that builds the body politic all the more effectively because it seems completely estranged from humanity (Latour, 1993b). This famous shapeless matter, celebrated so fervently throughout the 18th and 19th centuries, which is there for man's—but not woman's—ingenuity to mold and fashion, is only one of the many ways to socialize nonhumans. They are socialized so much that they are granted the possibility of creating an assembly of their own, an automaton, checking and surveying, pushing and triggering one another, as if they had full autonomy. It is the *megamachine* (see below) extended to nonhumans.

It is only because we do not do our own anthropology, the anthropology of our modern world, that we can overlook the strange and hybrid quality of matter as it is seized on and implemented by industry. We treat it as mechanistic, forgetting that mechanism is one half of the modern definition of society. Fancy that, a society of machines! Yes, the eighth meaning of the word sociotechnical,

although it seems to designate an unproblematic industry dominating matter through machines, is the strangest sort of sociotechnical imbroglio. The matter of an outside world is not a given, but a recent historical creation.

## 7. THE MEGAMACHINE

From where does industry come? If it is not a given that it is the sudden discovery of the objective laws of matter by capitalism, then how can we imagine its genealogy? Through which earlier and more primitive meanings of sociotechnical does it emerge? Lewis Mumford has made, in a series of beautiful books, the intriguing suggestion that megamachines are the templates on which machines were then constructed (Mumford, 1966, 1986). First comes the megamachine, that is, the organization of large numbers of humans through chains of command, deliberate planning, and accounting procedures. This change of scale through the imperial machinery of legal commands is what has first to be invented. The local interactions of humans are now extended through the large, stratified, externalized body politic, which can keep track of many nested subprograms of action through the invention of such intellectual techniques as writing, counting, and accounting. According to Mumford, before having any notion of wheels, gears, works, and movements, you first need to have set up the very possibility of a large-scale organization. Large-scale management is the template for large-scale technologies. Then and only then, by substituting some but not all of its subprograms by nonhumans, may you generate machinery and factories, industries and automatons. The nonhumans, in this view, enter the organization and take up the role of obedient servant which has already been rehearsed for centuries by humans enrolled in the imperial megamachine. Nonhumans are the understudies of human servants.

In this seventh episode, the mass of nonhumans assembled into cities by *internalized ecology* (see below) has been brought to bear on empire building. No matter how debatable this hypothesis may be in the history of technology, it fits my little pragmatogony nicely. Before being able to delegate action to nonhumans, and before being able to relate nonhumans to one another in an automaton, you first need to be able to nest many subprograms of action into one another without losing track of them. Management, in a way, always precedes the expansion of material techniques. Or rather, if we want to keep with the logic of my story, every time we learn something about the management of humans, we shift this new knowledge to the nonhumans, endowing them with more and more organizational properties.

This is how we could interpret the even-numbered episodes I have recounted so far: Industry transfers to nonhumans the management of people learned in the imperial megamachine, just as technologies do for the large-scale management learned through networks of power. And if we recapitulate the odd-numbered episodes, we see the opposite process at work: What has been learned from the nonhumans is then reimported to reconfigure people, as that which happens in networks of power and political ecology.

From the vantage point of my mythical pragmatogony, it is easy to understand, I hope, why philosophers, sociologists, and historians of techniques have so much difficulty in defining the terms society, human, technology, and material world that they use with such profusion: Every meaning of these words recapitulates a whole pile of significations borrowed, by crossover, either from the humans or from the nonhumans. They look for pure terms and always find mixed ones. Humans pop up in their definitions of matter, and nonhumans are distributed throughout their definitions of human subjects.

### 6. INTERNALIZED ECOLOGY

Do not believe that the story stops here, or that we have finally stumbled over pure forms as if the megamachine was made of social relations through and through. No, we have only reached the sixth layer of meaning, and if we turn our attention to what the megamachine itself implies, we discover that an earlier extension of social relations to nonhumans has to be postulated. How can we define domestication and agriculture better than by considering it as the granting of socialness and intimacy to nonhuman actants? I will call this process *internalized ecology*; where so many animals, plants, and materials are submitted to such an intense socialization, re-education, and reconfiguration, that they change shapes, functions, and even genetic makeup (Kent, 1989).

Again, as for the other even-numbered episodes, there is no way to describe domestication as a decisive break from *society* (see below) or as the sudden access to a reserve of fresh proteins, existing out there on an objective and material basis. To enroll—so to speak—those proteins in the emerging collective, one first needs to grant them, through another crossover, some of the social attributes necessary to integrate them. The result of this shift of characters is a human-made landscape (gardens, villages, and cities); a development so radical that it completely changed what is meant by social and material life. To speak of material infrastuctures and of symbolic representations, as in the dualist paradigm I have criticized, is obviously not the best way to talk about domestication, urban life, and gardens.

So profound is this break that we touch here the limits of history and enter the darkness of prehistory. But let us not be afraid. If we want to pursue this genealogy of our relation with nonhumans, we must go on, although the firm grounding, the primitive terms, the Origin we seek is beyond all reason. So! Into the mists of pragmatogony we go one step further.

### 5. SOCIETY

What is a society, this beginning of all social explanations that so many social scientists take as a given? If my genealogy is even vaguely suggestive, it cannot be a primitive term, because it has itself to be made, to be constructed through the mediation of many *techniques* (see below).

In the Durkheimian interpretation, a society is what precedes individual action, what lasts much longer than any interaction, what dominates us, the reality *in which* we are born, live, and die. Society is this corporate body that is so overarching that it socializes us, the humans, giving us a role, a shape, and a function; yes, it domesticates us by teaching us how to behave and to conform. It is externalized, it is reified, it is more real than ourselves. The origin of all religions and sacred rituals, for Durkheim, are nothing but the return, through figures and myths, of what is transcendant over any individual interaction: society.

And yet we build our society solely through interactions. No matter how many roles and functions we have been disciplined into, we still repair the social fabric out of our own knowledge and ethnomethods. Durkheim may be right, but so is Garfinkel.

According to the reproductive principle of my genealogy, we know that the way to proceed is to look for the nonhumans when we cannot understand the emergence of a social feature, and to look for the state of social relations whenever we cannot understand how a new type of object enters the collective.

Where did we get this idea of a long-lasting society that dominates our interactions and forces us into the roles that we then occupy? Certainly not from society, because that would be falling into the trap of tautology Durkheim set for himself. He claimed that society was sui generis, thus transforming it from a strange animal into a completely mysterious one, more opaque indeed than the religion he tried to explain. Instead, the solution may simply be found in yet another incarnation of the word sociotechnical. We are not alone in our interactions. We also bring the long-lasting influence of all the actions which we, or others, have taken in the past through technical mediation. What Durkheim mistook for the effect of a sui generis social order is simply the effect of having brought so many techniques to bear on our social relations. From them, we learned what it was to last longer, to be spread over space and time, to occupy a role, to be dispatched into a function. By reimporting this competence into the definition of society, we learned how to reify it, to make it stand independently of fast-moving interactions. And indeed, we learned how to delegate to this externalized body even the task of delegating us into roles and functions. Yes, society exists for real, but no, it is not socially constructed. Even in this, the most primitive concept of all social theory, nonhumans proliferate rendering it impossible to recognize a "pure" society.

## 4. TECHNIQUES

Is it possible to retrace our genealogy still further, even beyond what Durkheim took as his starting point? I want to see how far I can go by maintaining the same principle of alternation: To modify the social we are allowed only to use the nonhumans; and to modify those in turn, we are allowed only to re-employ the competences which have been learned through the commerce of humans. But you see how far back I am in my genealogy, so far

indeed that we can no longer talk of humans, of anatomically modern humans, but of highly social *prehumans*. Still, I have to go on because a speculative attempt such as this only has any worth if it is pursued to its extreme consequences.

I am now in a position to define techniques with some precision. A technique is far from being a primitive term. As we learn from archaeologists, techniques imply articulated subprograms of action which are spreading in space and time (Leroi-Gourhan, 1964). In other words, they imply not a society, which is a later hybrid, but some sort of social organization to hold together nonhumans extracted from very different seasons, matters, and places. A bow and arrow, a hammer, a net, a piece of clothing, are made of many different bits and pieces which have to be recombined in a time and space sequence bearing no relation to their natural settings. So, techniques are what happened to tools and nonhuman actants when they were processed by a form of social organization that allowed them to be extracted, recombined, and socialized. Even the simplest techniques are sociotechnical. Even at this primitive layer of meaning we cannot separate forms of organization from technical practices.

## 3. SOCIAL COMPLICATION

But what type of social life can explain such a recombination? Remember that there is no society at this stage, no overarching framework, no dispatcher of roles and functions, and that we only have interactions among prehumans. Shirley Strum and I have called this third layer of meaning *social complication* (Strum & Latour, 1987). Complex interactions are now marked and traced by nonhumans brought to bear on social relations. Why would the enrollment of nonhumans be of any use? Because they can *stabilize* social negotiations. At this stage, nonhumans offer an extraordinary feature: They are at once pliable and durable; they can be shaped very fast, but, once shaped, they last much longer than the interaction that has fabricated them. Social interactions, on the other hand, are extremely labile and transitory. More exactly, they are either negotiable but transient, or, if they are encoded for instance in the genetic makeup, they are extremely durable but impossible to easily renegotiate. By bringing in nonhumans, the contradiction of durability and negotiability is solved. It is now possible to trace interactions, to blackbox them, to recombine highly complicated tasks, to nest subprograms one into another. What was impossible for highly complex social animals to do becomes possible when prehumans transfer the use of tools not to gain access to food, but to trace, fix, underline, and materialize their interactions. The social realm, although still made only of interactions, becomes visible and gains some durability through its own tracers.

## 2. THE BASIC TOOL KIT

But those tools themselves, where do they come from? They are our only witnesses for hundreds of thousands of years. Many archeologists try to go straight from what I will call the *basic tool kit* to techniques as if they were
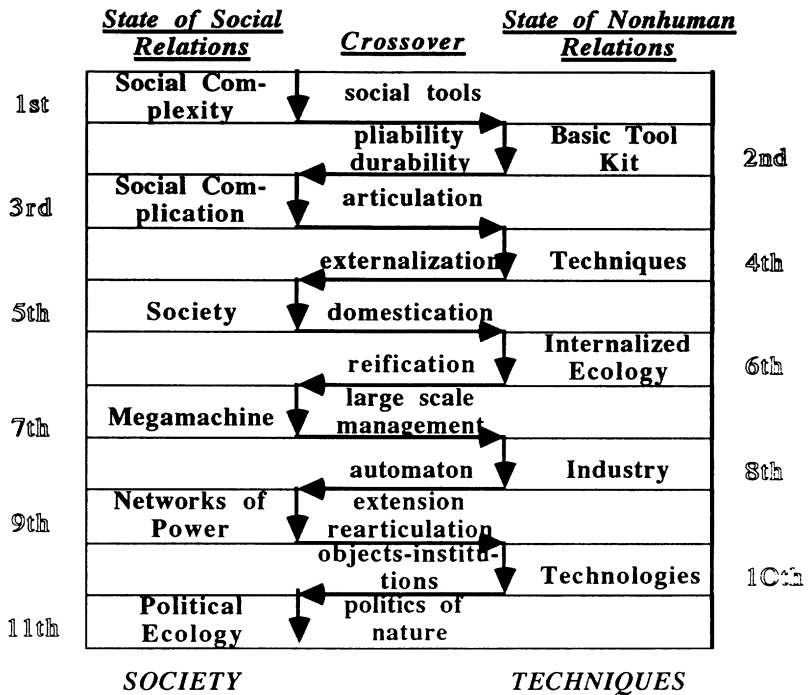
| | *State of Social Relations* | *Crossover* | *State of Nonhuman Relations* | |
|---|---|---|---|---|
| 1st | Social Com-plexity ↓ | social tools → | | |
| | | pliability durability ↓ | Basic Tool Kit ↓ | 2nd |
| 3rd | Social Com-plication ↓ | articulation → | | |
| | | externalization ↓ | Techniques | 4th |
| 5th | Society ↓ | domestication → | | |
| | | reification ↓ | Internalized Ecology | 6th |
| 7th | Megamachine ↓ | large scale management ↓ | | |
| | | automaton ↓ | Industry | 8th |
| 9th | Networks of Power ↓ | extension rearticulation ↓ | | |
| | | objects-institu-tions ↓ | Technologies | 10th |
| 11th | Political Ecology ↓ | politics of nature ↓ | | |

*SOCIETY*                    *TECHNIQUES*

**Figure 2:** Two opposed spheres of society and techniques are replaced by 11 layers of sociotechnical associations (built in the way described in Figure 1). The most important feature is neither the final result nor the two outside columns but the central one where properties are exchanged.

directly related by a sort of Darwinian evolution of tools into composite tools. In the humblest flints some archaeologists are ready to see the first inceptions of techniques, of industry, of technology as if a direct route linked stones and nuclear plants. But look at Figure 2. There is no direct route. It is as if some social theorists wanted to go straight from social complication to society, to megamachines, to networks, as if you could infer from the earliest tool industry the existence of a divison of labor. But there is no direct route in this case either. There are no two parallel histories, the first for the technical infrastructure and the other for the social superstructure, but only one sociotechnical history. There are not two parallel histories, one for the function and the other for the style, one for the material world and the other for symbolic representation. At every stage, according to my pragmatogony, it is through the commerce with nonhumans that the necessary social skills and properties are learned, and it is only by reimporting those skills back to the nonhumans that they are made to do different things and play different roles.

Even the basic tool kit, this epitome of the *Homo faber* myth, cannot be accounted for by a sudden access to objective matter, to the obduracy of stones, straw, and wood. What is a tool, then, in my genealogy? It is the extension of *social* tools to nonhumans! Remember the complex social negotiation that Machiavellian baboons, chimpanzees, gorillas, and vervets are supposed to enter, according to primatologists (Byrne & Whiten, 1988)? They have few techniques, to be sure, but are perfectly able, as Hans Kummer (1993) has shown, to devise social tools through the manipulation and modification of one another in their complex strategies (De Waal, 1982; Strum, 1987). If you grant the prehumans of my own mythology at least the same kind of *social complexity* (see below), you may generate tools simply by shifting this ability, through a crossover, to nonhumans. Just treat pieces of stone and wood as social partners and modify them so that you can act on another. Prehuman tool use, in contrast to the ad hoc use of implements by primates to fulfill a task, would then be the extension of a skill rehearsed in the realm of social interaction. Even the most primitive tools already require some sort of social life, but one which is very different from my earlier episodes (later episodes in terms of the mythical history recounted here).

## 1. SOCIAL COMPLEXITY

We are now back to the point where I started: to the sitcom of Clairborne, Crook, and Sharman; to the Machiavellian intelligence of primates, engaged in Garfinkelian interactions so as to repair the constantly decaying social order, manipulating one another to survive in groups of many conspecifics who are constantly interfering with one another. We are back to what Strum (1987) calls social complexity. I could go further and show you that even this "primitive term" is no freer from contact with nonhumans than any of the later stages, but I will spare you the rest of my pragmatogony, the rest of this mad pursuit into the logical origin of society and techniques.

## BREAKING FREE FROM THE DUALIST PARADIGM

Let me recapitulate our little trip (see Figure 2). Let us consider the meaning of this seemingly dialectical history (which does not rely on any dialectical movement because the contradiction between object and subject is not the engine of its plot). What does it show us?

Even if this very speculative genealogy is entirely false, it shows, at the very least, that it is perfectly possible to imagine an alternative to the dualist paradigm I have criticized so much. We are not forever stuck in the boring alternation between two different substances, one made of objects and matter and the other of subjects and symbols. We are not forever limited to "not only, but also" types of explanation. According to my origin myth, it is impossible even to conceive

of an artifact that does not incorporate social relations, or to define a social structure without the integration of nonhumans into it. Every human interaction is sociotechnical.

Second, and more importantly, it is no longer true to say that once we abandon the dichotomy between society and techniques, we are simply faced with a seamless web of factors (Hughes, 1986) in which everything is included in everything else and vice versa, as so many of my critics like to argue (Collins & Yearley, 1992; Schaffer, 1991). On the contrary, the properties of humans and nonhumans cannot be swapped haphazardly. Not only does there exist a strict order in the acquisition of properties, but for each of the layers I have peeled away, the meaning of the word sociotechnical may be clarified by considering the crossover: what has been learned from the nonhumans and reimported back onto the social link, what has been rehearsed in the social realm and exported back to the nonhumans. Nonhumans too have a history. They are not material objects or constraints. Sociotechnical$_1$ is different from sociotechnical$_6$ or sociotechnical$_7$ or sociotechnical$_8$ or sociotechnical$_{11}$. Simply by adding little subscripts we are now able to qualify the meaning of these confusing terms. There is no longer one single big vertical dichotomy between society and techniques, and in its stead we can make many horizontal distinctions between the various meanings of sociotechnical hybrids. It is possible to have our cake and eat it too, that is, to remain monist and still be able to differentiate.

Third, it should be clear from Figure 2 that there is a sense, nonetheless, in which the old dualism was right. We do indeed have to alternate between the state of social relations and the state of nonhuman relations, but this is not the same as alternating between humanism and objectivity. The mistake of the dualist paradigm comes from its definition of humanism. The very shape of humans, our very body, is already made in large part of sociotechnical negotiations and artifacts. So, considering the human as that which must be protected against the encroachment of technology, or, symmetrically, considering techniques as efficient material objective forces that have to be purged from the polluted effects of human interests and subjectivity, is tantamount to saying that we want to get rid of our humanity. We are sociotechnical animals. We are never limited to social ties. We are never faced with objects. Where should we position humanity, then? Humanity should be positioned in the crossover, in the middle column of Figure 2, as the very possibility of mediating between different mediators.

Fourth, in the pragmatogony I have attempted in this article, I reasoned as if we alternated from the social to the nonhuman repertoire, always through the same move: When we wanted to understand how an object comes to the collective, we looked at what type of social relevance with which it had first to be endowed, and when we wanted to understand how a social interaction could sustain a durable social link, we looked for those nonhumans which could lend their properties so as to render the social order more durable. This meant retracing the creation of a collective by the enrollment of nonhumans. I wanted to demonstrate that it is possible to pay respect to technical mediation without

using the dualist paradigm, without inventing those two artifacts, a society, on the one hand, and an objective world, on the other. But *scale* is another feature of that movement. At each of the 11 moves I have retraced, a much larger number of humans are mixed with a much larger number of nonhumans, to the point where, today, the whole planet is internalized in the making of our politics, of our legal system, and, soon, of our morality.

The illusion of modernity was to believe that the more we grew the more distant objectivity and subjectivity would become, thus creating a future radically different from our past. After the paradigm shift in our conception of science and technology, we now know that this will never be the case, indeed that this has *never been* the case. Objectivity and subjectivity are not opposed, they grow together, and they grow irreversibly together, thus breaking the great divide between so-called traditional and modern collectives.

With this pragmatogony, no matter how implausible it might appear, I hope I have convinced the reader, at the very least, that this cannot be done by considering the artifacts with which we share so much of our society as mere things. They deserve better, they deserve to be housed in our intellectual culture as so many fully fledged social actors. They mediate our social action? No, they are *us*.

## NOTES

1. See Callon and Latour (1992) and, for a philosophical treatment, see Latour (1993b). For a fascinating critique of the political thrust of the principle of symmetry, see Lee and Brown (1994, this issue).

2. See, for real examples, Strum (1987).

3. For a recent presentation of the various schools of technology studies, see Bijker and Law (1992).

4. For a classical version of this argument, see Winner (1986); for his response to the new symmetrical studies of technology, see Winner (1993).

5. I use the word *collective* as a substantive to mean the tangle (as conventionally understood) of the society (humans-among-themselves) and the objective world (things-in-themselves).

6. This term is borrowed from genetics where it indicates a random reshuffling of genes when chromosomes are duplicatd and then spread apart. It is reused here, metaphorically, to indicate an exchange of properties between social and nonsocial entities.

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