chapter 3 **coordination**

Local Identities

The social science this book mobilizes and tries to contribute to isn't "social" in the conventional sense of the word. This story doesn't tell about people and the relations between them, or institutions and the way they function, or society and whatever it is that generates social order. Instead, this is a story about practices. About events. And one might not even want to call it a story, for there is no smooth ongoing narrative. Instead, I present you with sketches of separate scenes. With snapshots. They are juxtaposed to each other by way of specification or point of contrast. The important roles in these sketches are played by things as well as words, hands as well as eyes, technologies as well as organizational features. Together these heterogeneous ingredients allow me to tell about *atherosclerosis*. Not about the social causes and consequences of the disease, nor about the way patients, doctors, and whoever else involved perceives it. But about atherosclerosis itself. What it *is*.

Those who went through a lot of trouble in order to create a space for the social sciences alongside the natural ones may back away when they come across sentences like "atherosclerosis is. . . ." Or they might get angry. To them such sentences suggest that the domain they conquered with so much effort has been abandoned. To them this careless "is" might make it seem as if the warning that was introduced with so much effort, the warning that we cannot refer unproblematically to objects-out-there but should attend to the activity of referring itself, is being naively thrown overboard. But after the shift from an epistemological to a praxiographic appreciation of reality, telling about what atheroscle-

rosis *is* isn't quite what it used to be. Somewhere along the way the meaning of the word "is" has changed. Dramatically. This is what the change implies: the new "is" is one that is situated. It doesn't say what atherosclerosis is by nature, everywhere. It doesn't say what it is in and of itself, for nothing ever "is" alone. *To be is to be related.* The new talk about what is does not bracket the practicalities involved in enacting reality. It keeps them present.

Thus, atherosclerosis *is* an encroachment of the vessel lumen and a thickening of the vessel wall—in the department of pathology, under the microscope, once a bit of artery has been cut out of a body, sliced, stained, and fixed on a glass slide in order to judge an intervention. But in the outpatient clinic, when surgeons face the question "what to do?" atherosclerosis *is* something else. It is pain that occurs after a certain amount of exercise, pain when walking. It is a poorly nourished skin of one or even two legs, and it is bad pulsations in the dorsal foot artery. The praxiographic "is" is not universal, it is local. It requires a spatial specification. In this ontological genre, a sentence that tells what atherosclerosis is, is to be supplemented with another one that reveals *where* this is the case.

Thus, the trouble taken by social scientists to highlight the importance of representational activities isn't wasted. Instead, it is absorbed into a larger project: there's more work to do, if only because *enacting* is not a question of setting up proper references alone. The enactment of atherosclerosis as an enlarged intima of the vessel wall involves the representational art of making drawings and writing things down, the art of photography and that of printing. But it *also* is a matter of formaldehyde, staining fluids, knives, slides, microscopes. And when it comes to enacting atherosclerosis as a limited walking distance in the out-

System or Episteme

Social theory used to ask this question: how is society ordered? How does it hang together, form a whole? The performances that Goffman studied hung together. They unfolded patterns that preceded them. "The pre-established pattern of action which is unfolded during a performance and which may be presented or played through on other occasions may be called a 'part' or 'routine' " (Goffman [1959] 1971, 27). These parts and routines added up into what Parsons used to call *roles.* There was a variety of roles, each coherent in its own terms. Together they guaranteed the coherence of the social system. The *social system:* the very term incorporates a specific answer to the question of how society avoids disintegration: society hangs together as in a system. In this respect it is just like the body. Or, better, just like the body was supposed to be in Parsons's day. When Parsons tries to explain what a *system* is, he inserts footnotes to the physiologists of the late forties and early fifties who took part in inventing cybernetics to account for the way in which the body hangs together.

But is a society like a body? In the same epoch, the idea was severely attacked. Can-

patient clinic, this includes the notes written down in a file: "reported pain-free walking distance: 150 meters." But it also encompasses the way the doctor looks (or doesn't look) in the patients' eyes during the interview and the patients' attempt to assess the distance they walk from their house to the park. To be is not only to be represented, to be known, but also to be enacted in whichever imaginable other way.

The word "is" used here is a localized term. Ontology in medical practice is bound to a specific site and situation. In a single medical building there *are* many different atherosclerosis. And yet the building isn't divided into wings with doors that never get opened. The different forms of knowledge aren't divided into paradigms that are closed off from one another. It is one of the great miracles of hospital life: there are different atherosclerosis in the hospital but despite the differences between them they are connected. Atherosclerosis enacted is more than one—but less than many. *The body multiple* is not fragmented. Even if it is multiple, it also hangs together. The question to be asked, then, is how this is achieved. How are the different atherosclerosis enacted in the hospital related? How do they add up, fuse, come together? In this chapter I will address the question of how the body multiple hangs together and present various *forms of coordination.*

One Reality Wins

Objects have local identities. But the various sites in the hospital where I went to study atherosclerosis are not entirely separate: the lower leg that is dissected in the pathology department is brought there by a special messenger who walked up all the way from the operation theater, also carrying a small paper on which the "clinical condition" of the patient before the operation is noted down. After

guilhem was among those who articulated a way of framing the difference. The norms that mark the order of an organism, he wrote, are given. But a society has to find regulatory norms and set them, actively. As Canguilhem put it: "In any case the fact that one of the tasks of the entire social organization consists in its informing itself as to its possible purposes . . . seems to show clearly that, strictly speaking, it has no intrinsic finality. In the case of society, regulation is a need in search of its organ and its norms of exercise" ([1966] 1991, 252). But though modern society *is* not a body, Canguilhem held that it *mimics* bodies. Bodies maintain their integrity by keeping up norms that mark the difference between order and chaos, life and death. These norms vary; in an organism that is pathological they are set at a different level than in one that is healthy. But if no norms are maintained at all, the organism becomes disorganized. It still obeys the laws of physics and chemistry, but becomes a biological chaos. It dies.

The relation between society and body

the pathology examination the results go back to the treating surgeon on yet another form. All the paperwork about any single patient comes together in a file. Summaries turn a specific patient's atherosclerosis into a single object. And so do letters. Here's one sent to a general practitioner about a patient who has been diagnosed, admitted to the hospital, operated, and discharged again.

Your patient D. Zestra
date of birth: 13–04–1921
address: Street 30, Smalltown
hospital number: 2.892.130
Dear colleague,
Above mentioned patient was admitted in the department of Vascular Surgery, Surgical Unit, C 4-east, in academic hospital Z.
Admission facts
Date of admission: 01–08–1992
Date of discharge: 08–08–1992
Reason for admission: therapeutic intervention
Diagnosis upon admission: stenosis in common femoral artery left with intermittent claudication
Readmission: not planned
Anamnesis: *aggravating intermittent claudication with walking distance of 250 meters during which pain grew in left calf. There was no rest pain. The cardiac history was blank except for a hypertension.*
History:
1981: bifurcation prosthesis and amputation fifth toe left
1988: femoropopliteal autolog bypass of saphena magna vein left and right
1992: amaurosis fugax with infarct left frontoparietal hyperlipidemia
Physical examination: *in the left leg the femoral artery was palpable. Distal of this*

is one of mimicry, but organizing a society by means of norms is not the only possible way of doing so: the normative mode of ordering is a historical invention, according to Canguilhem. Those who invented it didn't call the norms their invention, but claimed that they had found them as positive facts, in society. "Between 1759, when the word 'normal' appeared, and 1834 when the word 'normalized' appeared, a normative class had won the power to identify—a beautiful example of ideological illusion—the function of social norms, whose content it determined, with the use that that class made of them" (246). The idea was elaborated in Michel Foucault's work. "The Normal is established as a principle of coercion in teaching with the introduction of a standardized education and the establishment of the *écoles normales* (teacher training colleges); it is established in the effort to organize a national medical

point there were no pulsations. In the right leg all pulsations were present those of the foot included. The capillary refill left was slower than right.

Supplementary diagnostic examinations: *ankle/arm index left 0.6 and right 1*

Duplex: stenosis of more than 50 percent in the common femoral artery left

Operation: *(02–08–92) endarterectomy in common femoral artery left*

Further course: *no postoperative complications. Patient could be mobilized fast. The ankle/arm index was 1 right and left 0.9. Discharged in a good overall condition.*

Summary:

Main diagnosis: *stenosis in left common femoral artery*

Side diagnosis: none

Therapy: endarterectomy in common femoral artery

Complications: none

Discharge to: home

Control afterward: outpatient clinic hospital Z

With collegial respect,

Dr. T. F. J. Xanders, surgeon

A. J. Yielstra, surgery resident

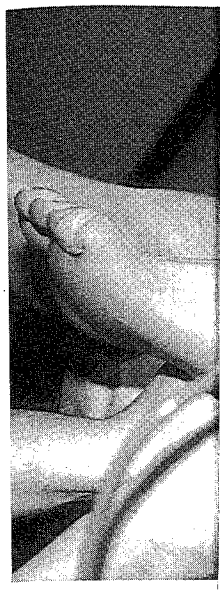
What kind of disease did this patient suffer from? The letter mentions several diagnostic techniques that each gave an answer to this question: the anamnesis, a physical examination, pressure measurements, and duplex Doppler scan. They jointly back up a single diagnosis. This patient, they say, has a stenosis in the common femoral artery of his left leg. How is this remarkable alignment of such different diagnostic findings into a single diagnosis practically achieved?

Let's move back in the patient's itinerary, to a moment when the writing of

profession and a hospital system capable of operating general norms of health; it is established in the standardization of industrial processes and products. . . . Like surveillance, and with it, normalization becomes one of the great instruments of power at the end of the classical era" (Foucault 1979, 184).

Parsons had a theory about the contribution of doctors to the maintenance of the social system. It said that it is part of the sick role that the sick must seek medical assistance. Doctors subsequently either sanction their patient's illness behavior or send them back to work again. It is in this way that physicians exert *social control.* They protect the social system from individuals who might want to enjoy the luxury of relief from their social obligations under the pretext of being unable to fulfill them. The Foucauldian concept of *normalization* also indicates that health care is important for the maintenance of social order. But Foucault's doctors do not control. They neither oblige people to stay in bed and get better nor to get up and go to work again. Instead, they set the standards of normality. They articulate what it

discharge letters is still far ahead. The decision about how to treat and whether or not to admit the patient still has to be made. There we are. In the outpatient clinic again. A vascular surgeon is seeing a new patient. The surgeon has written down this patient's walking distance and the results of his physical examination in the file on his desk. Both look serious. The *clinical diagnosis* is positive (positive for: disease present—instead of negative for: no disease found). The patient reported pain on walking, and the surgeon felt bad pulsations in several arteries. In the routine course of practice in hospital Z another diagnostic technique is now brought into play. The surgeon makes a phone call to check if the vascular laboratory is available, writes a note requesting the technician to check arm and ankle pressures of both legs, hands this note to the patient, and says: "Please, come back here afterward." If we accompany this patient we come across another mode of diagnosing, and delineating, vascular disease. Pressure measurement.

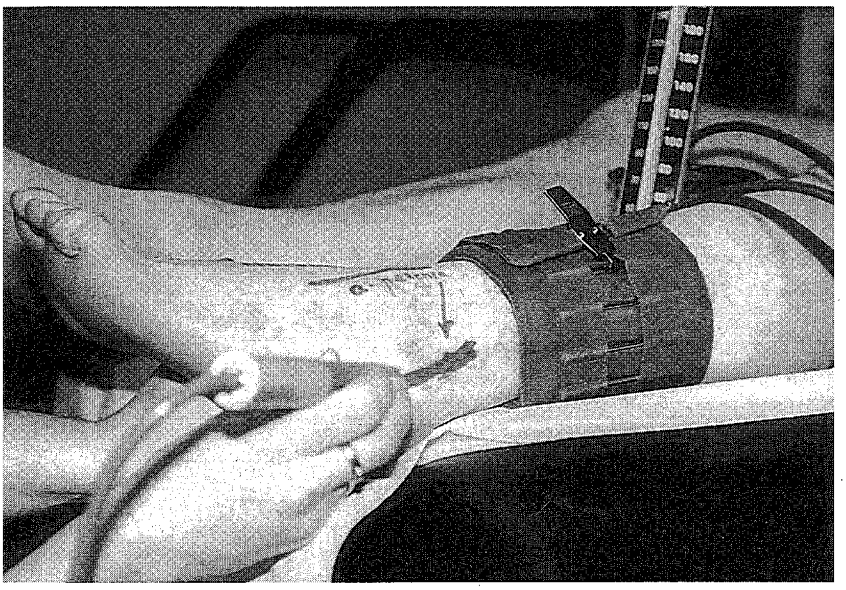


The technician measures the blood pressure in Mr. Manders's arm. She inflates a cuff around it. While she slowly allows the air to escape again she uses a stethoscope to listen to the artery in the elbow. An inflated cuff stops the blood from flowing. When some air has escaped, the sound of turbulent flow becomes audible. This is the moment the blood is able to push past the cuff when it is at its peak pressure, the systolic pressure. More air escapes and then the sound disappears again. It disappears at the point where the blood starts to flow undisturbed, able to resist cuff pressure all through the heart cycle. This second point is the blood's diastolic pressure. The technician writes both the higher and the lower number on a piece of paper.

She fits a larger cuff around Mr. Manders's ankle. In the ankle the stethoscope cannot be used. Instead, a small Doppler probe has to do the job. It sends out ultrasound and receives

is to be normal and to behave in a normal way. They may also actively intervene so as to bring about normal states. But unlike judges, doctors do not punish those who do not live up to their norms. Normality is not a law. Instead, those who do not manage to meet the standards of normality, the *abnormal,* are marginalized to the fringes of society. They come to find themselves in places where most do not want to be, places from which they will try to escape. Thus "normality" is something people come to positively desire, from the inside, instead of something that, like a rule, is imposed on them from the outside.

In framing his social theory, Foucault was not arguing with Parsons and other systems theorists. Instead he tried to stress—like Parsons, but without relating to him—that medicine is vital to society. It is a social power of a quite specific kind. "The power of the Norm appears through the disciplines. Is this the new law of modern society? Let us say rather that, since the eighteenth century, it has joined other powers—the Law, the Word (*parole*) and



the reflections back again. If ultrasound is reflected by an object that is moving away, its reflections have a longer wavelength than the ultrasound emitted—and vice versa. This is the Doppler effect. The Doppler apparatus (to which the probe is attached) makes the difference between emitted and received waves audible. The technician moves the probe around until she's found the artery. We can all hear when she does, for at that moment the flow of blood reflects the ultrasound. "Pshew, pshew, pshew," we hear. When the cuff is inflated, this sound disappears. To come back again as soon as the systolic blood pressure is able to resist the cuff pressure. Movement. Flow. Pshew, pshew.

When blood pressure in an ankle is lower than in the arms, pressure is lost along the way. Like the pain-free walking distance of the clinic and the thickening of the vessel wall in the department of pathology, the *pressure loss* established in the vascular laboratory is a measure of the severity of the patient's atherosclerosis. In hospital Z, pressure loss is expressed as an index: the ankle pressure divided by the arm pressure. An index of 0.9 is used as the cutoff point: lower numbers are classified as pathological.

There is a story that explains how pain when walking and pressure drop hang together inside the body. The thick intima comes in, too. This is how it goes. When a thick intima encroaches the vessel lumen, resistance to the blood flow increases. This leads to pressure drop. The low blood pressure in the lower limb isn't high enough to supply the tissues with much blood. When the muscles are exercised the oxygen supply falls short. The muscles therefore burn their sugars without oxygen and produce lactic acid. This is painful. A convincing story. But does it hold? Well, it does as long as the various atherosclerosis enacted of a single patient all have more or less the same degree of severity. No, let's be more precise. We cannot know anything about the cross section of the arteries

the Text, Tradition—imposing new delimitations upon them" (184). In establishing the power of the norm, medicine is a crucial discipline, because medical knowledge mediates between the order of the body and the order of society. It is within medical knowledge that the normal and the deviant person are differentiated. It is within medical knowledge such as it has taken shape since the early nineteenth century that "disease" is no longer thematized as a species inhabiting an organism, but as a deviant state of that organism. Since that time medicine has started to set the standards that modern people want to live up to. Thus, it is medicine that allows society to mimic organisms. And its own knowledge hangs together, too. It forms an epistème: a logically coherent *body of knowledge.*

This body of knowledge doesn't emerge out of isolated scientific activities and then invade society. New knowledge is not a product of clever minds. It emerges when scientific work is done in new sociomaterial settings. Foucault attributes inno-

of Mr. Manders. But his complaints and pressure drop are both investigated. When the results of these two diagnostic techniques coincide they jointly enact a common object. Mr. Manders's atherosclerosis.

When the technician has finished measuring, she takes a form. Mr. Manders is asked for his plastic hospital identity card and with a device that rolls over it so that the letters leave marks, Mr. Manders's identity is coded onto the form. Then the technician fills the appropriate boxes on the form with her findings. She tries to avoid mistakes. So she seeks confirmation from the patient: "It's in your left leg, isn't it, Mr. Manders?" Mr. Manders nods and says that, yes, it's in his left leg. He adds with a smile: "So, I could be a doctor of the blood vessels myself then. For I could feel it, that it's in my left leg." The technician is not impressed. "Of course you can feel it. I measure what you feel all right."

To Mr. Manders, the cuffs, the stethoscope, and the Doppler with its strange sounds that shift in tune with every heartbeat are pretty impressive technologies. He observes the work of the technician as attentively as I do. If doctors need the outcomes of all this work and equipment in order to know about his disease, Mr. Manders can be proud of himself. Or so he jokes. He needs no equipment at all to have access to his leg arteries. He can feel them.

The technician, however, sees nothing special in Mr. Manders's ability to feel what she measures. Complaints simply correlate with a drop in pressure because they are both signs of a single disease, hidden deep inside the body: he feels it, she measures it. Inside the body the one causes the other. Thus, their correlation is self-evident. Or is it? Complaints and pressure drop often coincide, but not always. Here's a second scene.

vative force to the novel organization of the French health care system at the beginning of the nineteenth century. This generated the birth of the clinic. It was with the specific hospital organization that emerged at that time that it became possible and reasonable to open up corpses in order to find disease inside them. Speaking about the new hospital organization, Foucault remarks: "It so happened that it was on the basis of this tertiary spatialization that the whole of medical experience was overturned and defined for its most concrete perceptions, new dimensions, and a new foundation" (1973, 16). Medical knowledge, medical perception itself, is as social in its origins as in its effects. And it is material as well: a *discourse* that structures buildings, instruments, gestures. That differentiates between normal and pathological organisms and thus mediates between the coherence of the body and the order of society.

Associations and Multiplication

The idea that medicine is not just a personal affair between a doctor and a patient has never left the literature since. It has become commonplace, something we all know, a truism: that medicine is as social

A week later I spend another day with the same technician. A patient, let's call him Mr. Somers, lies on the examination table. Again cuffs are inflated and allowed to slowly deflate. Again the stethoscope is used to listen to the sound of turbulence in the arm arteries and the Doppler apparatus is used to listen to the velocity of the ankle flow. The technician writes down her numbers. She makes her calculations. There's the ankle/arm index. It's within the normal range.

"I can find nothing. Nothing at all," the technician says to the patient in a tone that's meant to reassure him. But it doesn't. "That's very strange," Mr. Somers replies, "for I feel something. It hurts a lot when I walk." The technician shrugs: "Well, there's nothing wrong." Mr. Somers insists: "Oh, but that's strange. Are you sure? I admit, they're only my feelings, *but then they are my feelings." His tone is one of disbelief. Disappointment. The technician, in what is clearly meant to be her closing remark, sounds impatient. "Well, you'd better discuss that with your doctor, then, what all you feel."*

All self-evidence has vanished. When the patient's feelings and the results of the pressure measurements contradict each other, they are no longer signs of a single object. The story that relates pain and pressures falters. What to do?

At this point it is possible to sustain the singularity of the object, but then one signifier must be discarded. Both patient and technician make an attempt in that direction. Mr. Somers wonders whether there may be something wrong with the measurements, for he's convinced of the reality of his pain. The technician sides with "her" pressures: she downgrades Mr. Somers feelings to "what all you feel" and gladly shifts the responsibility of dealing with these feelings further back to a doctor. What is this doctor to do? Two diverging signs cannot have a single object as their common source. But on the form the patient carries

an endeavor as it could be and that knowledge and power, science and society, are intertwined. That knowledge is material. However, Foucault has been abandoned in other ways. He has been abandoned in his insistence that medicine has a unificatory power. He has been abandoned in his suggestion that society mimics organisms and thus hangs together in a single epistème. We, these days, no longer believe in coherent sets of norms imposed in a single order. So how did we lose this faith?

There are various ways that lead from it. The first abandons Foucault by taking distance of the coherence of *structures* and their power to impose themselves. "In Paris we still believe in structures because we take care not to test their loyalty" (Latour 1988, 178). Latour claims that as soon as they are seriously investigated, structures do not appear to hold. And however influential it may be, (medical) science does not have the power to impose its order on society. The very example Latour draws on when arguing this is one in which a scientific discipline ended up changing society: the *pasteurization* of France. But

from the vascular laboratory back to the outpatient clinic, the name "Somers" is printed as clearly as on his patient's file. And doesn't a single name come with a coherent body?

In order to achieve such coherence, a hierarchy between diverging measurements may be established. This is often done. In cases where two facts contradict each other, one may be accorded more weight than the other. In the case of clinical complaints and pressure measurement, a hierarchy with the lab on top looks like this. If Mr. Somers has complaints but his pressures are all right, then he is in trouble, but such trouble does not have a vascular origin. The question of where the pain comes from must be asked again. The vascular surgeon will say this to the patient. "No, Mr. Somers, I'm really sorry, there's nothing I can do for you. I don't doubt that you have a lot of pain, but I'm only good at unplugging vessels, and your vessels are in no need of unplugging." A Dutch surgeon is supposed to then refer Mr. Somers back to his general practitioner.

A hierarchy between subjective "complaints" and objectifying "laboratory findings" is institutionalized in the very routine that says that all patients with clinical disease go to the lab before further therapeutic measures are considered. And yet it isn't solid. There are other modes of establishing coherence as well. Sometimes the clinic is on the top of the hierarchy. Pressure measurements are not necessarily "believed" in.

A surgeon talking about pressure measurement: "It's wrong to blindly believe pressure measurements. There are all kinds of exceptions. For instance, in diabetic patients you sometimes see that the arteries are so calcified that it's hard to compress them with a cuff. A good technician will notice this. But of course some don't and they go on measuring and put down fancy numbers that have no meaning at all. And then if the treating surgeon sees those numbers, and doesn't think twice, the patient is wrongly declared not to have a vascular problem. While his vessels are calcified all over and some may be as good as occluded."

this did not come about because Pasteur lay one single order on others who were passive. Latour turns each and everyone involved in this change into an active entity, and his favorite theoretical term for describing the process of France's pasteurization is *association*.

The vaccination practices designed in the laboratory of Pasteur in the Rue d'Ulm in Paris spread out through French farms rather quickly. But this was not due to their power or their scientificity. Rather, by moving between lab and farm himself, Pasteur had made clear to those concerned that farmers had something to gain from an alliance with the lab. Whoever vaccinated their cows with Pasteur's vaccines protected them against anthrax. This made farmers eager to associate themselves with Pasteur's lab. But not everybody was as eager as the farmers, and the new scientific discourse had no power to impose itself

Sometimes the clinic wins. The measurements of the laboratory are discarded. And this is the way to discard them: to *unbracket* the practicalities of measurement. To stop hiding, but include the activities of gathering knowledge about the body in one's story about it. To show what may go wrong there, for instance, by telling that it is among the specificities of a successful pressure measurement that the arteries are compressed when the cuff is inflated. If the patient's arteries are too calcified to allow for proper compression, pressure measurement loses its value. This can only be pointed out if one doesn't get mesmerized by the numbers that pour out of machines, but is prepared to take a step back in order to consider how such numbers are created.

Thus, though an object that hangs together inside the body tends to be established by *bracketing* the practicalities of measurement, sometimes this no longer works. Incoherence, however, can then often be kept at bay by *unbracketing* those same practicalities again. Practicalities that were diligently hidden are again attended to. If thus the gaps can be explained, the singularity of the body and its diseases is maintained. Don't trust tests, doctors therefore teach their students, they can fool you. Learn what they do. Get acquainted with their technicalities and know when to trust and when to discard them. This goes for all tests. Any single test outcome can be discarded. Explained away.

Two surgery residents are early for the weekly meeting where difficult vascular cases are discussed. One of them calls to the other and points at a small piece of paper. "Here, look at this. Have you seen the pressure measurements of Mr. Iljaz? It's unbelievable. I can't believe it. If you look at these numbers he can hardly have any blood in his feet at all. And he came to the outpatient clinic all alone, on his motorbike. Said he had some pain. I can't believe it. Some pain. On these figures alone I'd say here's someone who can't walk at all. Who's screaming."

on those who were not. Doctors with private practices, for instance, had nothing to gain from following Pasteur. So they didn't. They preferred to maintain confidentiality in their relations with patients and refused to tell outsiders whom to vaccinate. Even when the first serums were produced doctors did not prescribe them, for in order to do so they would have had to hand their patients over to other professionals. Private doctors only started to "believe" in serums once the Pasteur laboratory put these on the market, and the doctors were free to use them in their own surgeries when they considered it appropriate.

So "science" doesn't have the power to impose itself. If it spreads this is because there are actors outside the laboratory who associate themselves with it. And they may pick through what is on offer and take bits and pieces. They do not get overwhelmed by a massive structure or a coherent epistème. Latour talks about *chains of associations* instead. Chains

Here the clinical diagnosis is doubted on the basis of the laboratory numbers. Sure, in the clinic Mr. Iljaz was diagnosed as someone with a probable arterial disease in his legs, that is why he was sent to the vascular laboratory in the first place. But the clinical picture wasn't dramatic. Mr. Iljaz still walked and drove around on his motorbike. He reported pain but not agony. His pressure measurements, however, show a very severe degree of atherosclerosis.

The incoherence is big enough to warrant an explanation. What can it be?

The others enter the meeting room one by one. A senior internist has joined the residents. "Yeah, that really is something," he nods, "but we've seen cases like that before. Probably these people have only become worse very gradually. What happens is that their muscle metabolism alters. As long as people have time for it, the adaptation may go a very long way. And then. What's this patient, let's see. Does he have diabetes? For that is also something to bear in mind. If he's developed a neuropathy, he may no longer feel any pain at all. It happens that you can stick a needle in peoples' feet without them even blinking."

Crucial to enacting a clinical diagnosis is the patient's capacity to feel pain. The patient may feel no pain if his movements have slowed down and his muscles have adapted to a low level of oxygen. And a patient doesn't feel pain either if his nervous system is in a bad state due to long-standing diabetes. A limited capacity to feel pain may explain the discrepancy between clinical findings and pressure measurement. But there are more possible explanations for the gap. Clinical diagnosis, after all, doesn't simply depend on the patient's body, but also on the clinical interview. It is quite difficult to do this well.

After the meeting a student asks the resident who was on duty in the outpatient clinic: "Does this Mr. Iljaz speak proper Dutch, or did you have an interpreter?" The resident

that form networks. These may be long or short, strong or weak. Their coherence is a material and a practical matter, not a question of logic. Strength depends on what sustains the associations. It is defined by the activities required to disrupt them and bring about fragmentation. "The consistency of an alliance is revealed by the number of actors that must be brought together to separate it" (206).

Latour dissolves the power of logical coherence by arguing that in as far as the world hangs together this is a matter of practical associations. How far these associations reach isn't given with the birth of a new configuration. Unlike epistèmes, networks are open. The elements within a network may link up with other elements, outside the network. But such external links are not different from internal links. They're all associations. Each new and successful association makes a network larger. But however great the difference between the coherence in a network and *logical* coherence, to talk of "associations" does have a homogenizing effect. Either an association

sighs. "Yeah, come to think of it, he may have underreported his complaints. His Dutch was poor. And I didn't have a lot of time either. You're right, with someone to translate we might do better in cases like this. Well. I'll try to talk to him properly as soon as we've got him admitted. Ask some family member to help. Or, indeed, the interpreter."

Lab outcomes and the results of a clinical diagnosis are supposed to line up. But sometimes they don't. Then it requires some coordination work to still align them. Ask a few questions. Were the arteries too hard to be compressed by a cuff? Did the lack of blood come about so slowly that the muscles adapted? Were the patient's nerves in a bad state? Did the language that doctor and patient used during the interview suit both—or was only one of them fluent in it? In the specificities of the practicalities of enacting a disease, an explanation may be found for the inconsistency of two diagnoses. One of them wins. The other is discarded. Thus a single patient ends up with a single atherosclerosis.

A Composite Picture

Do patients always have a single atherosclerosis? Do the names of individuals always come with coherent bodies? No. It is more complicated. When different tests give different outcomes, it is not obligatory to abandon one. It is also possible to understand the objects of two different techniques as indeed being different objects. In such a scheme both *pain when walking* and *pressure drop* are troubles that may plague a patient. Troubles that have a relation, but not necessarily one that is linear. Troubles in their own right.

I found an intriguing example of this in an article that reports on the effects of treatment of arterial disease. The effects of two treatments are compared. The

is made or it isn't. An element is either inside or outside a network. Coordination is established or not. There are no distinctive *forms* of coordination.

The second way of abandoning Foucault differs from the first in precisely this respect. It multiplies. Instead of describing a single coherent discourse, or tracing a single large network of contingent associations, it distinguishes many . . . *Many what?* There are different answers to this question in the literature. Different ways of multiplying have established themselves, side by side. And there is yet another complication: even if some of those who multiply come *after Foucault* in the sense that they multiply what one might still call discourses, others draw on quite different traditions. Intellectual history isn't like a single tree with endlessly subdividing branches. Instead, there are overlaps, resonances, shared topics, and crossovers between traditions that are quite alien to each other in other respects.

So how to relate to these widely spread and equally relevant literatures? I'll make a list. A list of multipliers.

first treatment is percutaneous transluminal angioplasty (PTA), which works by inserting a balloon in a vessel and inflating it to widen the lumen. The second treatment is exercise. We'll come to talk of both of these in the next chapters. What only counts for now is that in the study, each of these treatments appeared effective. But they had different effects.

"In a prospective randomized trial, Creasy et al. (1) compared the results of percutaneous transluminal angioplasty (PTA) and exercise in the treatment of intermittent claudication. In patients treated by PTA a significant rise in ABPI [ankle/brachial pressure index, a way of expressing the outcomes of pressure measurement, in this book referred to as the ankle/arm index] was seen without increase in maximum walking distance, whereas those who received exercise training showed a significant increase in maximum walking distance without an increase in ABPI." (From van der Heijden FH, Eikelboom BC, Banga JD, Mali WP: The management of superficial femoral artery occlusive disease. British Journal of Surgery *1993; 80:959–996; reference (1) cited is Creasey TS, McMillan PJ, Fletcher EWL, Collin J, Morris PJ: Is percutaneous transluminal angioplasty better than exercise for claudication? Preliminary results from a prospective randomised trial.* European Journal for Vascular Surgery *1990; 4:135–140).*

One treatment, PTA, improved the ankle pressure. The other treatment, exercise, improved the patient's walking distance. In the study quoted here, both indicators of the degree of the patient's vascular disease were measured. Contrary to the expectations they did not run parallel. What to do? Discard either one of them? There is another option. It is to say that if they do not run parallel they may be objects in their own right. Different objects.

Sometimes this is done. The outcomes of two diagnostic techniques are drawn out of their signifying role. Instead of signs of a single atherosclerosis underneath, they are accepted to be what they are on the surface. Pressures—or complaints. If they differ, neither needs to be abandoned. Their difference

1. There are those who talk of *social worlds.* Social worlds are groups of people who share perceptions and ways of talking about them. They have similar interpretations and attribute similar meanings to the events they encounter. Surgeons and social workers may belong to different social worlds. Or lay people and professionals. Or scientists and clinicians (Strauss 1978).

2. Others distinguish between *versions* of the world. Like social worlds, versions are perspectival in character, they are ways of interpreting, but they do not neatly overlap with groups of people. A single person may be both a physicist and a musician and thus be engaged alternately in the ways of worldmaking of physics and music (Goodman 1978).

3. Individuals do not coincide with the next multiplier either: the *frame.* People may draw on various frames, depending on the specificities of a situation. In so-

implies no incoherence, for the two measurement techniques do not assess the same disease. They each have their own object. In this sense a single patient may now be diagnosed as having two "atheroscleroses," pain on walking and pressure drop. These two objects do not necessarily coincide.

If the outcomes of diagnostic techniques are taken to stand for different objects, however, these may be aligned again to form a single one. The form of coordination that comes into play here is that of adding things together. Don't bother about whether they're *really* similar or different. Don't try to explain how they hang together inside the body. Forget about the body. Just add up your findings. With pressure drop and pain, the "criteria for success according to Rutherford" make exactly this move. In the Rutherford calculation, indicators of success are not played out against each other, but added up. If one is positive and the other negative, neither has to be discarded. They can even be substituted for one another.

In the literature, the "criteria for success according to Rutherford" are used over and over again. Not only by Rutherford himself, but by many others as well. This allows comparison between different studies that evaluate treatment outcomes. In the "criteria for success according to Rutherford" improvement is defined in a composite way. It is a combination of clinical symptoms and ankle/arm index. Various categories of improvement are differentiated. For example, the best score is +3, markedly improved. This is scored when (a) symptoms have either disappeared or markedly improved, while (b) the ankle/arm index is increased to more than 0.9. The most striking addition, however, is improvement category +1, minimally improved. This is scored when (a) the ankle/arm index is increased more than 0.1, while (b) the symptoms have not made a jump from one symptom category to another, or vice versa (F. van der Heijden: Semiclosed endarterectomy of the superficial femoral artery. Thesis, Utrecht, 1994).

cial medicine, for instance, two frames can be distinguished. There is a clinical frame, held together by the aim of "helping people," and an administrative frame held together by the aim of distinguishing between the "objectively sick" and other people. These imply two ways of interpreting but also two ways of acting: asking questions, filling forms, doing a physical examination (Dodier 1994).

4. And then there are *modes of ordering*. Modes of ordering do not primarily order meanings (like "versions") or actions (like "frames"). They have neither a thinker/feeler nor an actor at their center: individuals are ordered along with them. Modes of ordering pervade organizations, or habits, or buildings, or techniques, or gestures. They may order anything: what it is they order is part of what turns them into one "mode" or another (Law 1994).

Out of all these multipliers "modes of ordering" most resemble Foucault's "dis-

The patient's situation is defined as improved as soon as one indicator has improved even if the second indicator has not changed. An increase in ankle/arm index without improvement of the clinical symptoms: fine. Or vice versa: less severe clinical symptoms but no change in the ankle/arm index: fine again. No indicator is discarded, no gap between them warrants explanation. Treatment has been for the better if *either* pressures *or* walking distance are improved.

Addition is a powerful way of creating singularity. This becomes clear at the moment surgeons do not ask "what is the matter?" but rather "what to do?" Because when the vascular surgeons of hospital Z try to decide "what to do," they are not only interested in complaints and the results of pressure measurement. They draw in a lot more elements.

The man sits on a chair facing the surgeon. He's 84. He lives in a home. He looks worn out. Tired. "Listen, Mr. Winter," the doctor says, "there is indeed something wrong with your arteries. That's what we've found out in this examination you've had, the pressure measurement. I've got the numbers here. They're not very, very bad, but they're bad. Maybe we are able to do something about it. I can't promise. But if we can, it's either with a small balloon, or with an operation. We need more information to know what's possible. But we are only going to submit you to more examinations if you would actually want treatment. If you don't, well, that's fine. You're not in danger or anything. The treatment, if it is possible that is, the treatment would just be to allow you to walk better. So maybe you could think about that, about whether you would want treatment."

Mr. Winter's pain-free walking distance is some 120 meters. The ankle/arm index of his right leg is 0.7. These findings are added up to the diagnosis "impaired blood flow in right leg." They are enough not to send the patient back

courses." Look at the list I've just presented: it follows the decentering of the subject. The subject shifts from a central sense maker, to a decentered sense maker, to an actor centralized by the analysis, to a being performed in various modes of ordering. But this doesn't imply that "modes of ordering" are simply "discourses" multiplied while everything else has stayed the same. John Law claims to have taken several steps while abandoning the Foucault he has digested. And he suggests that his readers do so with him. "My proposal is that we take the notion of discourse and cut it down to size. This means: first, we should treat it as a set of patterns that might be imputed to the networks of the social; second, we should look for discourses in the plural, not discourse in the singular; third, we should treat discourses as ordering attempts, not orders; fourth we should explore how they are performed, embodied and told in different materials; and fifth, we should consider the ways in which they interact, change, or indeed face extinction" (95).

So where can one go after the *discourse*? In the literature there are two great roads

immediately to the general practitioner, but instead to consider treatment. Is treatment an option? This depends on a series of further assessments. The first of these is social. Does the patient's bad right leg seriously hamper him in his daily life? Maybe he lives in a home, is taken care of, and hardly ever wants to go out anyway. Then invasive treatment is unlikely to improve his life. What does Mr. Winter think about it? Does he think an operation might improve his life enough to be worth the hospital admission, the suffering, the recovery time, and the risks of getting worse instead of better? Is he *motivated?*

The "atherosclerosis that requires invasive treatment" is a composite object. The social reality of living with atherosclerosis is included in this patchwork. *Social atherosclerosis* is added to the other versions of the disease. There is no expectation of a linear relation between walking distance or ankle/arm index and "disturbance of daily life" and/or "motivation." It is precisely because nobody expects there to be a linear relation between a patient's physical disease and what we might call his "social disease" that the latter deserves separate attention. Thus, the fact that different objects may be added together and thereby turned into one doesn't depend on the projected existence of a single object that was waiting in the body. Singularity can also be deliberately strived after. It can be produced. The *result* of addition is a single object. An atherosclerosis that should be treated invasively. Or not.

Coordination into singularity doesn't depend on the possibility to refer to a preexisting object. It is a task. This is what designing treatment entails. That the various realities of atherosclerosis are balanced, added up, subtracted. That, in one way or another, they are fused into a composite whole.

In the decision-making meeting, the test results of Mrs. Stienstra have been laid out. I was in the outpatient clinic when Mrs. Stienstra came in. A sociable woman, well into her

to follow. One is a product of doubts about the *force* by which a discourse hangs together as a whole. This doubt leads to the invention of *networks* that gradually come to hang together by means of small forces—forces that the analyst cannot presume to be there, but must be able to point out: *associations.* The other road is paved by doubts about the *extent* of the discourse that hangs together. This leads to the pluralization of a single order into different coexisting, no, not *orders* but, in processual terms, *modes of ordering* that interact, change, or face extinction.

You may read the present book as wrestling with some of the questions raised by these two ways of building on—but also moving away from—Foucault. A first question: it may be that, at least in each empirical study, it is possible to follow the associations made within a single network. But what if there are two or more networks? How then to articulate the difference between associations *within* and *between* net-

seventies. Eager to live, to go out. Outgoing. "Now, what's this?" a senior surgeon says to a younger one, pointing his finger at some test result. "You want to operate on this patient? And she has these vessels? Are you serious? It's not that bad, is it? Why don't you just wait and see and tell her to keep moving?" The younger one stays calm. "Well, yes. You may be right. But the problem is: this woman so much likes to go to places. Last year she still traveled and now she can't and it's what she lives for. So why not give it a try?"

Another reality is added to the results of various tests. Social atherosclerosis. It may be important, or not. It may have a lot of weight, or little. It has some striking similarities with what sociologists who investigate it with their own techniques call *illness*. What are the techniques for enacting social atherosclerosis in the consulting room? They are difficult to handle. Difficult for patients who have to tell appropriate stories, show well-balanced emotions, be articulate. And also difficult for the doctor who has to ask good questions, listen carefully, and even understand what isn't articulated. The social reality of living with disease may be so bad that some patients would rather die than undergo more treatment. They may say that in as many words. But it also happens that they say nothing at all.

Surgeon to resident: "Yeah, I've seen the results for that patient. What's he called again? Vandervoort. You're right: his pressures are bad. Yes. There can't be much of a lumen left. But somehow I don't believe we should do an intervention. I don't think he wants any of this. It's his children that want treatment. They do all the talking. To tell you the truth, I don't really know how to proceed. If it weren't for these children, I would already have stopped this whole circus. But if I do nothing, and he deteriorates, which he's likely to do, well, we can expect his children to get angry."

The "disease to be treated" is a composite object. The elements that compose it may stretch all the way from the numbers that come out of the vascu-

works and—more important still—might it be the case that different networks hang together in different ways, are there different *kinds* of association? And this is a second question: what turns one mode of ordering into a *mode* of ordering and what terms might we use for the way in which it differs from another? These two questions, then, inform my inquiries into forms of *coordination* between different enactments of atherosclerosis in hospital Z.

Paradigm

In 1962 Thomas Kuhn published *The Structure of Scientific Revolutions* (Kuhn 1962). A quote. "An investigator who hoped to learn something about what scientists took the atomic theory to be, asked a distinguished physicist and an eminent chemist whether a single atom of helium was or was not a molecule. Both answered without hesitation, but their answers were not the same. For the chemist the atom of helium was a

lar laboratory to the possible future anger of someone's disappointed children. Such different elements together make a patchwork. A patchwork singularity, the disease-to-be-treated of a specific patient. A composite reality that is also a judgment about what to do.

Translations

When clinical findings and pressure measurement suggest it might be worthwhile to engage in invasive treatment, the vascular surgeons of hospital Z ask their patients about their daily life and try to find out whether or not patients are motivated for invasive treatment. "Would you want invasive treatment?" they say. Only if the patient's social atherosclerosis is bad enough and if treatment is likely to improve the patient's situation will more facts be assembled. More facts. The design of treatment is not just a matter of (a) establishing the presence of vascular disease and (b) establishing the necessity of invasive treatment. There is a third necessary ingredient. In order to choose an appropriate invasive treatment the patient's vascular disease must (c) be *localized* and *quantified.*

In the next chapter I'll pay more attention to the various invasive treatments and their indication criteria. Now it is enough to know that in the design of treatment the *site* and the *size* of a patient's vascular disease are important. How do the surgeons of hospital Z find out about these? There are several possibilities. Here I'll focus on two of them, duplex Doppler and angiography, and on some of the similarities and differences between their objects. Angiography is the older of these diagnostic techniques. It is invasive.

They stand around the patient. There's three of them. They're clad in sterile green. They wear aprons to protect themselves against the X-rays and gloves to protect the patient against their microbes. The moment the needle finds the artery in the groin is tense. Yes. There it is.

molecule because it behaved like one with respect to the kinetic theory of gases. For the physicist, on the other hand, the helium atom was not a molecule because it displayed no molecular spectrum. Presumably both men were talking of the same particle, but they were viewing it through their own research training and practice" (50–51).

With this story Kuhn illustrates the nature of a *paradigm.* A physicist and a chemist live in different worlds and answer simple but vital questions differently. It fits within the chemist's research training and practice to call a helium atom a molecule. But within the physicist's research training and practice it doesn't. They work within different paradigms. When it was coined, the term *paradigm* first helped Kuhn to move out of a *fragmented* world. Out of too radical a pluralism that separated the building blocks of science out into independent *sense data.* Many a philosopher of science in Kuhn's day took *sense data*

Blood spurts out. Then the puncture in the artery is blocked by the catheter. This is pushed in and pushed in. It moves down. On the monitor its movements can be followed. There it goes. Good. Now stop it. Yes. It's where it should be. A technician approaches and attaches the automatic dye injector. The patient lies pale and sedated on the examination table. One of the residents addresses the patient's head. "Could you please lie quietly, Mrs. Lensi? You will get a sudden warm feeling in your leg, that's all right, that's how it should be. But if it hurts, please call us and we'll be with you straight away, all right?" Leaving Mrs. Lensi alone on the examination table all the others—one radiologist, two residents, a visitor from Switzerland who wants to learn new methods, a technician, and me—retreat to the adjacent room. Here the buttons of the impressive X-ray machine can be pushed. Clack. The dye injector injects dye. And immediately a card with holes in it sets the X-ray machine taking pictures. Paff, paff, paff. One after the other.

An angiographic picture shows the lumina of the arteries downstream from the place where dye has been injected. Like bone mass, the dye used in an angiographic procedure is opaque to X-rays. It casts a shadow on the X-ray plate. Angiographic images thus show the lumina of the vascular tree below the point of injection in a two-dimensional, anatomical mode. The site of the stenosis can be pointed out with a finger and expressed in the anatomical language in which parts of arteries each have their own technical name. But the size of the disease is more difficult to assess. It is expressed in percentages lumen loss.

Decision-making meeting. The light box. A surgeon walks up to the angiogram under discussion. "How much did you make of this?" he asks the radiologists, his finger pointing toward a stenosis. "Seventy percent? Come on, that's not 70 percent. If you compare it with

to be devoid of meaning. They were literally data: given to the bare and naive senses. But nothing, or so Kuhn argued, is devoid of meaning. Data aren't isolated entities floating around in a homogeneous void. The senses only perceive what makes sense to them. And only that which fits with earlier perceptions and with theories about them may hope to make sense. The only exceptions to this are a few anomalies that linger in the margins until, one day, they fit into a new paradigm.

Thus, paradigm is a term that designates connectedness. The connectedness within physics or within chemistry. Or the connectedness within Aristotelianism. But it was precisely the connectedness inside these paradigms that made it possible to articulate the differences between them. And made it clear that the radically pluralist world where all sense data float independently, is, paradoxically, homogeneous. The sense data that a scientific theory was supposed to draw together come from a place that in being devoid of meaning, is, indeed, a void. There is no relatedness, and thus no difference in it. Pointing out the relatedness between *some* data but not others led to cleavages in this homogeneous *whole* of science. Physics

the earlier part there, if you take that bit as the normal part, up here, I'd say it's almost 90 percent, this lumen loss."

Despite the high interobserver variability (the official name for such disagreement) practicing vascular surgeons have little problem with the accuracy of angiography. They listen to the judgments of the radiologists and, moreover, interpret the images themselves. In the end they come to some conclusion. They do not need a reproducible fact: what they need is a decision. Angiography helps them to decide.

And yet a new diagnostic technique has made its way into the diagnosis of arterial disease. Angiography involves risks for the patient: some people are allergic to X-ray dyes, they may get very sick or, in rare cases, die. Others are left with a large blue bruise in their groin from the puncture. After classical angiography it is therefore necessary to monitor the patient—and this implies hospital admission. The younger technique, duplex, has none of these problems. It is noninvasive.

A small room. A patient, Mr. Fransen, lies on an examination table. Next to his head there is a large apparatus with lots of buttons, two monitors. Out of the apparatus come the cords of several probes. A technician moves one of these probes over Mr. Fransen's abdomen. His legs. From time to time the technician squeezes some gel between probe and skin, to conduct the ultrasound that the probe sends out and receives back again. There's little talk. The technician only looks at his right hand once in a while. Most of the time he is silently watching the screens. There are white shadows: echos of ultrasound reflected by tissue. Sometimes a vessel. He aims his probe at its interior and red and blue become visible: flowing blood. Flowing blood reflects ultrasound with a different wavelength than what has been emitted.

and chemistry do not link up with one another smoothly; there is a gap between them, as there is between the Aristotelian paradigm and that of Newton. They are incommensurable. There is no longer an atomic plurality of data that comes with a homogeneous science: the connectedness within paradigms comes with differences between them.

The differences between paradigms are unlike those between sense data. Incommensurability doesn't imply that the borders between paradigms have no crossing points. *Translations* may be possible. In some cases. Such translations require not only linguistic skills. The human senses involved have to be able to perceive different data as well. They must be able to make a *Gestalt switch.* And if the data depend on instruments, which in modern sciences they tend to do, then these instruments must likewise allow for translations. Sometimes they don't. That is not a matter of attributing meanings, but one of doing experiments. It is a practical matter. Ian Hacking puts it like this: "New and old theory are incommensurable in an entirely straightforward sense. They have

The colors on the screen represent the blood's velocity. If it is red it is flowing away from the probe; if it is blue it is approaching it. (But the apparatus allows the technician to adjust the colors.) The apparatus is also capable of making this information—velocity—audible. Pshew, pshew. Shifts in velocity over every heartbeat. And it can be represented as a graph. There, on one of the two small screens, look at it. The plot of an average graph of several heartbeats. Every so often the technician pushes a button and the images on the screens are saved and printed.

The ultrasound emitted and received back by the duplex apparatus has no known side effects. The gel is soluble in water. It makes things easier if the patient does not eat before an examination that involves the arteries in his abdomen, but after the hour, two hours that the examination takes, the patient can do whatever he wants again. Eat, go home on a motorbike or even a bicycle.

So the new technique is more "patient friendly" than the older one. But this is not enough to make it acceptable as a diagnostic device. Vascular surgeons do not only want a safe diagnostic technique, but also one that is reliable. Are the outcomes of duplex as good as those of angiography? Duplex and angiography present different data. An angiographic image shows the vessel lumen, and duplex tells about blood velocity. The objects of these two techniques are different. How then can duplex be *as good as* angiography in assessing atherosclerosis? How to compare the width of a vessel lumen with blood velocity?

In order to coordinate their outcomes, duplex and angiography were *made* comparable. This work was well under way when I began my fieldwork. One of my informants in hospital Z defended a thesis about it.

"The aim of this thesis was to study the ability of duplex scanning to accurately assess stenoses and occlusions of the aortoiliac and femoropopliteal arteries in patients with atherosclerotic disease, and set proper diagnostic criteria for the detection by duplex scanning

no common measure because the instruments providing the measurements for the one are inapt for the other. This is a scientific fact that has nothing to do with "meaning change" and other semantic notions that have been associated with incommensurability" (Hacking 1992, 56–57).

Science, or so Hacking states, is not unified "in part because phenomena are produced by fundamentally different techniques" (57). The plethora of techniques makes for a multiplication of reality. The unification of the sciences is no longer viable, not even as a promise at the horizon. "We staunchly believed that science must in the end be unified, because it tries to tell the truth about the world, and there is surely only one world. (What a strange statement, as if we had tried counting worlds.)" (57). We staunchly believed. Ian Hacking puts it in the past. "We" no longer believe that data are independent of the technology that makes them. Thus, since there are many techniques, there are many

of haemodynamically significant arterial lesions" (D. A. Legemate: Duplex scanning of aortoiliac and femoropopliteal arteries. Thesis, Utrecht, 1991, p. 95).

The ability of duplex to accurately assess stenoses and occlusions was established by comparing duplex outcomes with those of angiography.

"In this prospective study in 61 patients duplex scanning was compared to angiography in the assessment of atherosclerotic lesions of the aortoiliac and femoropopliteal arteries" (D. A. Legemate: Duplex scanning of aortoiliac and femoropopliteal arteries. Thesis, Utrecht, 1991, p. 60).

So how to correlate duplex outcomes with those of angiography? A duplex graph shows the changes in blood velocity over the beat of a heart. Various parameters may be derived from this. The flow profile, for instance, or the height of the graph's peak (the peak systolic velocity [PSV]). Or total flow: it might be possible to try that, to find out the vessel diameter with the echo and to measure the area beneath the curve, to then calculate the total blood flow.

But the favorite duplex parameter of my informants was the PSV ratio. This is the ratio of the peak systolic velocity inside a stenosis and the peak systolic velocity in a normal part of the same artery just before or just after the stenosis. The PSV ratio is a relative value, a matter of increase only; the absolute velocities are calculated away. It is this parameter that, in the quoted study, was correlated with the outcomes of angiography. Once a parameter was picked, the question could be asked whether its values were the same or different as the outcome of angiography. But how to compare PSV ratios with lumen loss? What might be their common measure? In the study quoted this problem was solved by dividing the angiograms of the sixty-one patients involved into three categories: lesions lower then 50 percent lumen loss; lesions between 50 and 99 percent

worlds as well, even if it makes no sense to try to count them. In theory, and with examples mostly drawn from physics, Hacking has outlined the technique-dependent multiplicity of *objects* that forms the topic of the present book already quite a while ago. But luckily there is something left to develop, for Hacking hasn't talked about how to separate out "science" when we no longer believe in its unity, nor about how different knowledges manage their coexistence.

Is it wise to talk about the disunity of science with this term, *paradigm*, that has come to be such a popular one for doing so? In order to answer that question, I'll take you to a very different part of the literature, one that, in the sixties when Kuhn wrote his well-placed intervention, was quite far removed from the discussions about science in which he intervened. However far away the literatures about science and society were those days, "paradigm" resonates with a specific so-

lumen loss; and occlusions. Then the tinkering started. Would it be possible to find cutoff points for the PSV ratio that would allow duplex to divide the same group of patients in more or less the same way in these same three categories? The answer was yes. It turned out that a PSV ratio of 2.5 proved a good cutoff point for differentiating between lesions of more and less than 50 percent lumen loss.

"Although in some studies a PSV ratio of 2 has been used to differentiate between stenoses of less or more than 50%, analysis of our results showed that this value would have given a markedly lower positive predictive value (64%) than a PSV ratio of 2.5 (ppv 82%)" (D. A. Legemate: Duplex scanning of aortoiliac and femoropopliteal arteries. Thesis, Utrecht, 1991, p. 96).

A PSV ratio of 2.5 or more has a correlation (a positive predictive value, to be accurate) of 82 percent with a loss of more than 50 percent of the vessel diameter as assessed on the basis of angiography. This turns a PSV ratio of 2.5 or more into a good parameter. One that is better than a PSV ratio of 2 because it correlates with angiographic findings better. Duplex findings are given meaning by setting up ways to translate them—a PSV ratio larger than 2.5 for instance—into angiographic findings—a stenosis between 50 and 99 percent. The possibilities for quantification are thus established—duplex can quantify arterial disease—and simplified—the quantification is no longer a scale with small gradients of difference, but a matter of classification into three groups. And this is how the objects of angiography and duplex are coordinated into a single common one: the severity of some patient's stenosis.

In the room in hospital Z where technicians write down their duplex find-

cial scientific way of articulating connectedness. Paradigm resonates with *culture*. However much Kuhn claimed he was after something different, the two terms have a similar way of drawing some things together into a coherent whole and thereby differentiating them from others. They turn what might have seemed to be isolated fragments together into wholes *and* postulate that instead of a single homogeneous universe we inhabit different worlds. "The concept of culture used by anthropologists was, of course, invented by European theorists to account for the collective articulations of human diversity. Rejecting both evolutionism and the overly broad entities of race and civilization, the idea of culture posited the existence of local, functionally integrated units. For all its supposed relativism, though, the concept's model of totality, basically organic in structure, was not different from the nineteenth-century concepts it replaced. Only its plurality was new" (Clifford 1988, 273).

The term *culture* indicates plurality. But within each culture, again and again, there is—there was—a relatedness that resembles that of the organism. That is why

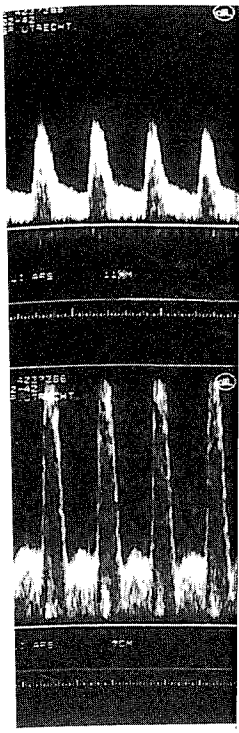
ings, the shortest possible summary of the thesis quoted here is printed on a page: the various PSV ratios and the "lumen loss" with which they correlate.

PSV ratio smaller than 2.5: a stenosis smaller than 50 percent. PSV ratio equal to or larger than 2.5: a stenosis larger than 50 percent. No sign: occlusion.

This translation rule *submits* duplex to angiography. It does not submit a given duplex graph to an angiographic image once they have both been made available and evaluated. Instead it submits the very way duplex graphs are read. Some of the proponents of duplex are critical of this submission.

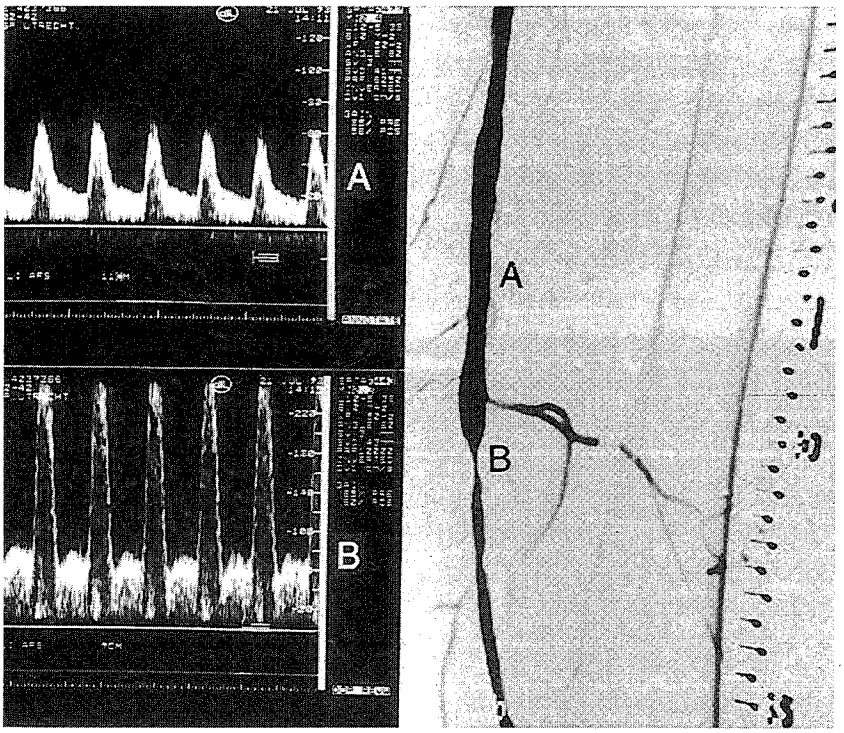
Physiologist who has done duplex research: "They wonder what information they can get out of duplex by comparing it with angiography. Doing so, they accept angiography as the gold standard. But there are a lot more problems with angiography than with duplex. Angiography shows only two dimensions, it shows the vessel diameter, but not the entire surface of a lumen. And it expresses the severity of a stenosis as an index: a percentage of loss. But in arteries that were small to begin with a 50 percent loss is far worse than in larger arteries. Then there's the interobserver variability. Sure, duplex is technician dependent. If the technician misses a stenosis it can never be retrieved. But once you have a good technician, duplex outcomes are far easier to replicate. In angiography different observers never get to agree."

However fierce such criticism may be, in hospital Z duplex outcomes are nevertheless translated into percentages of lumen loss, which means that duplex is made to speak about the same object as angiography. Both technologies can be used to localize and quantify this object: a patient's stenosis. It is in this way that duplex gradually became an understandable, acceptable technique. But translations are never smooth. The study quoted talked about an overlap of 82 percent



Clifford, in the late eighties, tried to get away from it. And this indicates that by that time an era was ending that had begun, or so Marilyn Strathern tells us, early in the twentieth century with, or after, Morgan. "Morgan belonged to an era that had just finished debating whether humankind had one of many origins; Clifford speaks for a world that has ceased to see either unity or plurality in an unambiguous way. What lie between those are years of modernist scholarship with their vision of a plurality of cultures and societies whose comparison rested on the unifying effect of this or that governing perspective. Each perspective simultaneously pluralized the subject matter of anthropological study and held out the promise of a holistic understanding that would show elements fitted together and parts completed" (Strathern 1992b, 111).

Strathern tries to develop what it might mean to see neither unity nor plurality in an unambiguous way. Doing so, she criticizes the image of *fragmentation,* since fragments suggest regret about a whole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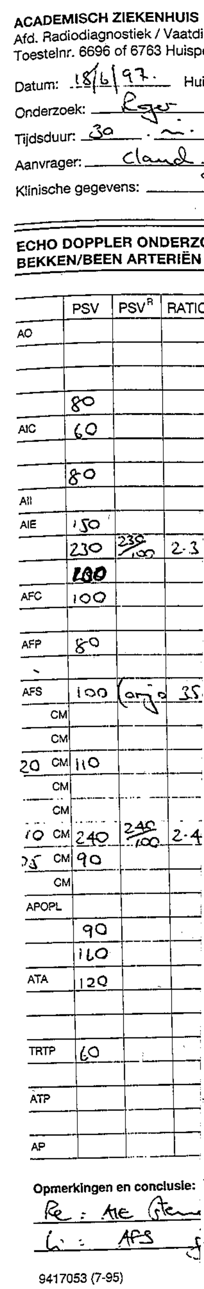
between the patient categories diagnosed by duplex and angiography. A difference of 18 percent is accepted as a part of the bargain of gaining the availability of the safe duplex as a diagnostic tool. Correlation studies make tests similar by taming the difference between them to a "reasonably small percentage."

In written articles, rules for translating duplex parameters into percentages of lumen loss may be established. These rules can then be used in the hospital. In hospital Z, photocopies of a page with translation rules that came out of the locally conducted study were at hand in the vascular laboratory. In addition, the vascular laboratory also has a visual method for translating duplex findings into the iconography of angiography.

While the patient dresses I follow the duplex technician to another room. Here light boxes make it possible to look at images printed on transparent plastic. The technician takes his prints out of a machine. They show the duplex graphs and the white echoes with red and blue that were printed each time he pressed his button. He looks at them carefully. Then he takes a form out of a stack. It allows him to write down PSV *ratios for various parts of the artery. And there's a drawing in the middle. It shows the aorta and the larger leg arteries in schematic form. The technician draws a stenosis in this image: he enlarges the vessel wall of the left femoral artery with a blue pen. Marks the picture until half of its lumen has gone, at more or less the height (he notes the amount of centimeters above the knee) where he's just found an impressive increase in blood velocity.*

The technician translates a velocity increase into a loss of vessel lumen with a pen. The outcome of a duplex test—a graph, hard to grasp—a PSV ratio, a number with as yet no meaning—is translated into a picture that is far more easy to read for those who are used to angiography. It is a pencil drawing in which the color blue represents what in an angiographic image would be a white shadow. If ever there were one, this is a translation.

that has exploded. She also criticizes the separating out of *elements* that may combine in whatever way they please, since this image evokes isolated genes that inherit independently, leaving the offspring with bits and pieces of both lines of ancestors. She wants us to get away from traditional *scales* in which the local is part of something larger, an encompassing globality. But how to get away from the idea that there are cultural packages, coherent inside and different from what is elsewhere? One of the counter images that Strathern mobilizes is that of *partial connections.* It alludes to what, not in itself but through the act of comparison, appears to be both similar and different. Not like a single large cloth that is cut into smaller pieces after which the lost unity is simply a form to be sought. Not a functional unit nor an antagonistic opposition. But inside and outside. Strathern gives the example of the scholar who is simultaneously a feminist and an anthropologist. Being one shapes


ACADEMISCH ZIEKENHUIS
Afd. Radiodiagnostiek / Vaatdi
Toestelnr. 6696 of 6763 Huisp

Datum: 18/6/97 Hu
Onderzoek: Eger
Tijdsduur: 30 ...
Aanvrager: Claud
Klinische gegevens:

ECHO DOPPLER ONDERZ
BEKKEN/BEEN ARTERIËN

	PSV	PSV^R	RATIO
AO			
	80		
AIC	60		
	80		
AII			
AIE	150		
	230	230/100	2.3
	100		
AFC	100		
AFP	80		
AFS	100	(angio	35
CM			
CM			
20 CM	110		
CM			
CM			
10 CM	240	240/100	2.4
25 CM	90		
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APOPL			
	90		
	160		
ATA	120		
TRTP	60		
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Afd. Radiodiagnostiek / Vaatdiagnostiek
Toestelnr. 6696 of 6763 Huispostnr. E 01.341

Datum: 18/6/97. Huispostnr.:
Onderzoek: Roger Leffen
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Aanvrager: Claud. int.
Klinische gegevens: Burger

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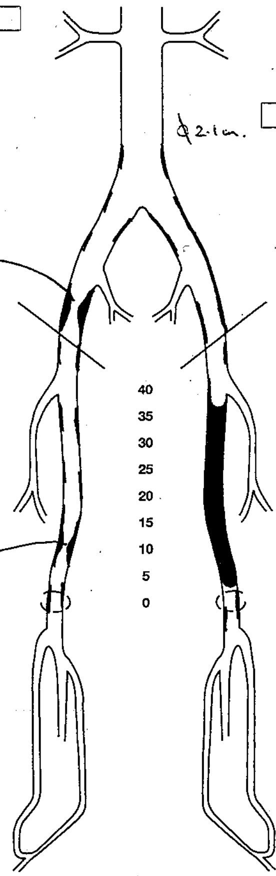
ECHO DOPPLER ONDERZOEK
BEKKEN/BEEN ARTERIËN

	PSV	PSV[R]	RATIO	% STENOSE
AO				
	80			
AIC	60			
	80			
AII				
AIE	150			
	230	230/100	2.3	<50%
	100			
AFC	100			
AFP	80			
AFS	100	(onja 35cm)		
CM				
CM				
20 CM	110			
CM				
CM				
10 CM	240	240/100	2.4	±50%
05 CM	90			
CM				
APOPL				
	90			
	110			
ATA	120			
TRTP	60			
ATP				
AP				

R



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	PSV	PSV[R]	RATIO	% STENOSE
AIC	70			
	80			
AII				
AIE	220			
	130			
AFC	160			
AFP	210			
AFS	—			
CM	—			
CM	—			
CM	—			
CM	—			
CM	—			
CM	—			
CM	—			
CM	—			
APOPL	15			
ATA	9.			
TRTP	20			
ATP				
AP				

Opmerkingen en conclusie: - Jonge mondvoorgeschiktheden
Re: AIE stenose < 50%, AFS stenose ± 50%.
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9417053 (7-95)

Duplex parameters have gained their meaning by submission to angiography. The calibration of duplex as representational device depended on taking angiography as the gold standard. Only after such a calibration has been put into place is it possible to conclude, in any specific patient, that the duplex and the angiography give either the same result—or one that is different.

In the weekly meeting the case of Mrs. Veger is presented by a radiologist. His hand waves vaguely in the direction of a video screen above him, which shows a duplex graph. "On the duplex," he says, "she seemed to have a stenosis." Then he moves his hand from up there to the light box in front of him on which several angiographic images are suspended. "In reality," he then continues, "she appeared to have this vascular system. Instead of a single stenosis, these pictures show a lot of grave irregularities in the width of the vessel lumen."

The duplex and the angiography of a single patient, Mrs. Veger, say different things. It is like the pressure measurement and the complaints we came across earlier. If they differ, the radiologist takes it that they cannot both be right. He makes the angiography win. There's no argument about which technique might be right and why. There is no explanation that explains away the results of one technique. In this case, the hierarchy is blunter. It is a matter of representational power. The duplex makes things "seem." The angiographic pictures show "reality."

Hierarchies between representational devices may shift in character over time. The radiologist just quoted wasn't very familiar with the new technique. But since duplex is used more and more, it gradually becomes harder to wave a hand at it and say it makes things "seem." On the very day I noted the ex-

and informs the other while they are also different identities. They are not different places the person walks between or can take refuge in. Neither are they alternating facades or two sides engaged in a dialogue. Not two different persons or one person divided into two. But they are partially connected, more than one, and less than many (Strathern 1991, 35). *More than one and less than many.* There it is: in the literature. It is there already! The very image that here, in this book, I try to sketch (give flesh to, develop, color) when talking about the reality of atherosclerosis.

The Organism

Relating to the literature helps to give words backgrounds. A history. Points of contrast. If you have read this subtext so far this may help you to situate the double move made above: to study the multiplication of a single disease *and* the coordination of this multitude into singularity. It should also help you to appreciate why I do not talk of *systems, discourses, paradigms,* or *cultures* when talking about medicine. These terms, however different, all somehow resonate the image of the organism as a model for what it is to hang together.

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ample just quoted I witnessed another scene. It shows that even then angiography wasn't always on the top of the hierarchy.

The same meeting, ten minutes later. The case of Mrs. Takens who had an operation six months earlier. Since then her bypass has clogged up again. But how far exactly? It might be occluded, for the angiographic picture shows no dye beyond a critical point: the white stops abruptly. The duplex, however, still shows a peaking graph below this point. Flow. One of the radiology residents asks: "In a case like this, when the angio says 'closed' and the duplex says 'open,' what should one believe?" Two surgeons, speaking with a single voice, say: "Duplex." And then one of them tells how he once studied seventeen cases like this: patients whose angiography showed an occlusion while their duplex showed flow. In all seventeen cases duplex proved to be in line with the findings on operation. "It was only seventeen cases, so I couldn't publish it. But there were no exceptions."

The two surgeons who speak up for duplex here have done a lot of research on the technique. So much research that they are able to make it win sometimes—like in those cases where angiography shows an occlusion and duplex doesn't. An arbiter is cited that makes the duplex win: it is a surgical reality par excellence. It is the reality of the arteries that become visible once a patient's body is anesthetized and opened up with knives in an operation. The blood vessels that the surgeon can see from the inside with his naked eyes—so long as there is no blood flowing through them.

Coordination

If we no longer presume "disease" to be a universal object hidden under *the* body's skin, but make the praxiographic shift to studying bodies and diseases while they are being enacted in daily hospital practices, multiplication follows. In practice a disease, atherosclerosis, is no longer *one*. Followed while being enacted atherosclerosis multiplies—for practices are many. But the ontology

What is it to hang together? In more recent literatures (but how to name all relevant titles, they are so many?) there are other images around. Of clashes that bind. Of coming to celebrate in the same ancestral house or of writing in the same journals. Of engaging in practices that *make* connectedness. Of making translations that draw together *and* establish difference at the same time. There are images around of the patchwork, the fractal, the landscape, the mixture. And there are blanks: what it is to hang together is turned into an open question. The question of how objects, subjects, situations, and events are differentiated into separate elements and how they are coordinated together is opened up for study.

Is thus the image of the organism left behind? Maybe something else is happening. Maybe this image, too, is altering. How does the organism hang

that comes with equating what *is* with what *is done* is not of a pluralist kind. The manyfoldedness of objects enacted does not imply their fragmentation. Although atherosclerosis in the hospital comes in different versions, these somehow hang together. A single patient tends to be supplied, if not with a single disease, then at least with a single treatment decision. Clinical findings, pressure measurement, social inquiries, duplex outcomes, and angiographic images are all brought together in the patient's file. Together they support the conclusion to treat invasively—or not to do so. This, then, is what I would like the term *multiple* to convey: that there is manyfoldedness, but not pluralism. In the hospital *the body* (singular) is *multiple* (many). The drawing together of a diversity of objects that go by a single name involves various modes of coordination. In this chapter, a few of these modes of coordination were presented. To summarize.

The first form of coordination on which coherence-in-tension depends is to *add up* test outcomes. It comes in two varieties. One of the forms of addition projects a common object behind the various test outcomes: "the disease." If the projections do not overlap, one of them is made to win. A hierarchy is established and the discrepancy between the tests is explained away. The second form of addition comes with no worries about discrepancies. It does not suggest that tests have a common object. Instead, it takes tests as suggestions for action: one bad test outcome may be a reason to treat; two or three bad test outcomes give more reason to treat.

A second form of coordination is that of the *calibration* of test outcomes. If test outcomes were listened to as if they were each speaking for themselves alone, they might get confined within different paradigms. The question whether different tests say the same thing or rather something different would not be answerable—indeed it could hardly be asked. The possibility to negoti-

together? Physiology still has answers to this question—and is investing into improving them. And so do anatomy, genetics, clinical epidemiology, and all other branches of biomedicine. But it has also become possible to give a new *kind* of answer to this same old question. An anthropological answer. It tells that in the hospital the organism hangs together thanks to the paperwork that travels from one department to the other; the correlation studies that correlate the outcomes of different diagnostic tests; the formulae and pictures that translate numbers and other data back and forth; the meetings where different specialisms come to agree on the diagnosis and treatment of individual patients. The organism in hospital Z (and other places like it) has gaps and tensions inside it. It hangs together, but not quite as a *whole*. It is more than one and less than many. So where we started out with a society that mimics the organism, what we end up with is an organism that clashes and coheres—just like society.

ate between clinical notes, pressure measurement numbers, duplex graphs, and angiographic images only arises thanks to the correlation studies that actively make them comparable with one another. The threat of incommensurability is countered in practice by establishing common measures. Correlation studies allow for the possibility (never friction free) of *translations*.