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• *ABSTRACT*

This is a paper about the topological presuppositions that frame the performance of social similarity and difference. It argues that 'the social' does not exist as a single spatial type, but rather performs itself in a recursive and topologically heterogeneous manner. Using material drawn from a study of the way in which tropical doctors handle anaemia, it explores three different social topologies. First, there are 'regions' in which objects are clustered together, and boundaries are drawn round each cluster. Second, there are 'networks' in which distance is a function of relations between elements, and difference a matter of relational variety. These two forms of spatiality are often mobilized in social theory. However, we argue that there are other kinds of social space, and here consider the possible character of a third, that of 'fluid spatiality'. In this, places are neither delineated by boundaries, nor linked through stable relations: instead, entities may be similar and *dissimilar at different locations within fluid space. In addition, they may transform themselves without creating difference.*

Regions, Networks and Fluids: Anaemia and Social Topology

Annemarie Mol and John Law

> '*A person with anaemia*', writes a village health care handbook for health workers and others 'in places where there is no doctor', '*has thin blood. This happens when blood is lost or destroyed faster than his body can replace it*'.[1]

There's a person. She has thin blood. She is sitting on an iron stool in front of the health worker, dizzy and tired. Now *where* is her anaemia? Where is it to be found? Awkward questions! For it isn't anywhere specific in the body.

> *The body circulates blood to all its organs. The blood keeps the cells of these organs alive and functioning properly.*[2]

When an anatomist does a dissection she finds blood vessels all over the body. They form a network which ignores internal bodily boundaries. Enabling blood – or at least the oxygen and the other

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supplies it carries – to reach all cells, this network is so finely branched that it can't be depicted completely in a single drawing. So only the larger blood vessels are drawn in the atlas of anatomy: arteries in red; and veins in blue. But such problems of scale are only the first obstacle to answering the 'where' question. For while they hamper the depiction of the network of *vessels* as a whole, anatomists have even more trouble locating *blood 'itself'*. Look at the person–patient–body sitting over there on that iron stool. *Where* is her blood? Is it in the lungs, in the legs, in the brain? Is it in the vessels, or isn't it? This is a real problem – for white cells migrate through vessel walls – as do soluble compounds.

Anatomy doesn't get much of a handle on these questions. They don't really fit with the logic of its practice. In the dissecting room blood isn't localized. When a fresh corpse is dissected, its blood is constantly sucked away to get a better view of the other organs. And when students learn about anatomy, they dissect corpses which have been soaking in formaldehyde for at least six months. So if there is any blood left at all, then it certainly isn't a liquid, but comes in the form of solid black clots.

This is a paper about blood. And about space. This much is clear by now: 'blood' disturbs the spatial securities of anatomy. It doesn't fit. But 'anaemia', as we argue in what follows, disturbs other kinds of spatial securities. Those of social theory.

How 'anaemia' doesn't fit is in part an empirical matter. For this reason our argument too is largely empirical. We discuss medical texts about 'anaemia' and a series of interviews with doctors who have practised in the tropics, where anaemia is common and often bad.[3] In addition, however, the matter of fitting and not fitting is a question of method. We listened for stories which challenge the social theory equivalent of anatomy. And we tried not to organize our material in terms of the spatial categories we wanted to unsettle.[4]

Though the substance of this article is empirical, its object is theoretical. For if 'anaemia' unsettles spatial securities, then to talk about it is to explore something about the character of social theory. Or, to be more precise, it is to explore the *topological presuppositions* which frame the performance of social similarity and difference.

As a branch of mathematics, *topology* deals with spatial types.

Unlike anatomy, topology doesn't localize objects in terms of a given set of coordinates.[5] Instead, it articulates *different rules for localizing* in a *variety of coordinate systems*. Thus it doesn't limit itself to the three standard axes, X, Y and Z, but invents alternative systems of axes. In each of these, another set of mathematical operations is permitted which generates its own 'points' and 'lines'. These do not necessarily map on to those generated in an alternative axial system. Even the activity of 'mapping' itself differs between one space and another. Topology, in short, extends the possibilities of mathematics far beyond its original *Euclidean* restrictions by articulating other spaces.

We have taken the notion of 'topology' from mathematics,[6] and, in the process of bringing it to social theory, we have necessarily also altered it. Here's our argument. 'The social' doesn't exist as a single spatial type. Rather, it performs several *kinds of space* in which different 'operations' take place. First, there are *regions* in which objects are clustered together and boundaries are drawn around each cluster. Second, there are *networks* in which distance is a function of the relations between the elements and difference a matter of relational variety. These are the two topologies with which social theory is familiar. The first is old and secure, while the second, being newer, is still proud of its ability to cross boundaries. However, there are other kinds of space too, and in this paper we touch on one of these. Sometimes, we suggest, neither boundaries nor relations mark the difference between one place and another. Instead, sometimes boundaries come and go, allow leakage or disappear altogether, while relations transform themselves without fracture. Sometimes, then, social space behaves like a *fluid*.

Our story also has its own spatiality. We tell it in a linear manner because we want it to be audible to our fellow academics. It has a beginning and an end. 'A point'. A conclusion. So we won't, as Leigh Star would like,[7] tell poems. Or sing songs. And least of all will we transport ourselves to Africa as the sun goes down and the stars speak to the physician, weary to her bones after 12 hours in the clinic. But we will try to be symmetrical,[8] and avoid taking topological sides. True: we are especially fond of fluid spaces since they do without the solidity of regions and the formality of networks. We like the way they churn and flow. But we will try not to sympathize too much with all this movement, or suggest that it entails a theoretical revolution.

We won't spill blood, disposing of the old in favour of the new. Our plea will be for topological multiplicity rather than uniformity.

Regions of Anaemia

What is anaemia? A 'clear comprehensive guide' to 'common medical problems in the tropics' describes it in this way:

> *Anaemia is said to be present when there is not enough RBC Hb (red blood cell haemoglobin) in the blood. Normally there is more than 10g haemoglobin in each decilitre of blood.*[9]

So that's *what* it is. But *where* is it? Let's not try to locate it in the body this time, but on the surface of the Earth. Let's be geographers instead of anatomists.

There is hardly any anaemia in the Netherlands, where the tropical doctors we interviewed were trained and have come back to live and work again. The precise results of the studies which attempt to quantify anaemia in the Netherlands differ. One of the methods of quantification is to count patients diagnosed as anaemic by general practitioners. But the results of such studies differ: 1.4% of the Dutch population is anaemic says a first, 1.7% a second, 2% a third.[10] Despite the fact that these numbers vary, they all point in a similar direction. They are *low*. This isn't the case everywhere in the world.

> *Anaemia is one of the commonest causes of ill health in many tropical countries.*[11]

In 'tropical countries' anaemia is caused by many factors and leads to ill health in many people. To know how many, we need to narrow our scope. First, let's focus on 'Africa'. This isn't such an obvious entity to compare with 'the Netherlands', but most of our informants have worked in an African country and freely use the generic term, so we won't argue with them. Second, let's focus, if only for the purposes of counting, on anaemias caused by malnutrition. So we're not speaking of a *tropical* disease here, but of a *nutritional* one.[12] What is its prevalence in Africa?

> *The prevalence varies from one country to another and, in the same country, from one place to another. It also varies with the time of the year. . . .*

> *Unfortunately the available studies of nutritional anaemia from different parts of the [African] continent are not easy to compare. On the one hand, different techniques and methods have been employed and, on the other, different criteria for defining anaemia have been used.*[13]

Many of the authors of medical texts are quite capable of listing the complexities that occur when numbers are being compared. They are as attentive to the material production of facts as any constructivist. But life goes on.

> *Be that as it may, in a study of anaemia in children under the age of four years in Mauritius, Scott (1960) found that about 50 per cent had haemoglobin levels below 10.8 g/dl of blood. In Kenya, Foy and Kondi (1957) found for rural adult peasants living at an altitude of 90 to 180 m above sea level that 32.3 per cent of them had haemoglobin levels below 8.0 g/dl. In a rural population of 1467 peasants living on the coastal belt of Tanzania, Vaughan et al. (1973) found that 37.3 per cent of the population had haemoglobin levels below 10 g/dl.*[14]

There are yet more numbers, ranging from 9.5% to 44.3%, though the 50% mentioned above is the highest.[15] So there is no overlap, no unanimity, but again this array of numbers also points in a similar direction: they are all *high*.

The doctors tell the same story as the books and journals. In the Netherlands there's hardly any anaemia, they say. But in Africa there is a lot. So while prescribing iron is seldom necessary in the one, it may be done as a matter of routine in the other.[16]

> *Look here, we have, with this 'foodprogram' of ours, we have no right to have anaemia. The African has. . . . An African has always a little anaemia, a little malaria, a little worms, and a little . . . everything. So giving iron supplements is almost always justified, at least for people's wellbeing. That's how I reason. I don't know if I'm right.*

So in Africa anaemia is more frequent than in the Netherlands. And it's more severe too. Diagnosing anaemia in Dutch general practice is a question of detecting minor departures from the norm. While in tropical practice it isn't.

> *Anaemia in the Netherlands is, well, it isn't a bother, but it's 'Oh well'. That's what it is, 'Oh well'. And anaemia in the tropics is something else. It's one of the very concrete problems.*

As with so many other afflictions and diseases, anaemia hits people in 'the tropics' very hard. It affects them much more severely than those who visit their general practitioners in the

Netherlands. 'Here' hospital admission for anaemia is unheard of. Haemoglobin levels may drop very low after an accident or an operation, when there is dramatic blood loss. Otherwise there are only slight anaemias, and they are rare.

> *In Kenya up to 70% of inpatients have varying severity of anemia. . . . In 14% of the children, anemia is the primary cause of hospital admission. In one recent study of anemia in childhood, 6.4% of the anemic children had a hemoglobin level of 3 g/dl or lower.*[17]

The findings of studies such as these are echoed by our informants.

> *They came in with an Hb, a haemoglobin level, that was sometimes a quarter, sometimes an eighth, of what it is here. Sometimes you were simply amazed how long those people could carry on with such a small amount of blood.*

Haemoglobin levels are not the same all over the world. In one region *more people* have anaemia than in another. And these anaemias are also *more severe*. Now these are regional facts. They are facts formulated within a regional topology. A topology in which there is one region in which anaemia is 'oh, well', a region which is distinguished from another where it is 'a very concrete problem'.

How are these regions generated? How are their boundaries drawn? When a region is defined the differences *inside* it are suppressed. They are minimized or marginalized. We quoted some findings about the prevalence of anaemia in the Netherlands above. We noted that they differ – 1.4%, 1.7% and 2% – but then we foregrounded their similarity. By saying that they are 'low' they are compared – or better contrasted – with the 'high' numbers produced by African studies. And the fact that figures from the latter displayed an even greater variety, ranging from 9.5% to 50%, didn't stop us from grouping them together. So that is the effect of averaging. Two regions are brought into being, the Netherlands and Africa. The first only has a little anaemia, whereas the other has a lot.

In practice there are complications. For instance, there's a problem about exactly how to draw the boundaries between the regions. It's easy to distinguish in a rough and ready way between 'here' and 'there', the Netherlands and Africa. But what about those areas of Africa with little malaria, reasonable food supplies,

a substantial local middle class and only a low level of anaemia?[18] Where do these fit in? Should not more regions be distinguished: the city from the countryside; lowland areas from mountainous territories? Shouldn't a proper regional map have five or six colours instead of two?

The problem of normal values is still more complicated. Just because haemoglobin levels in Africa are lower than those in the Netherlands, it doesn't necessarily follow that there's more anaemia in the one than in the other. This is only the case if the same haemoglobin level is taken as the lower limit of the normal range in both locations. This is the view of the World Health Organization. But not everyone agrees. And if the standard against which haemoglobin levels are measured is varied, any comparison between the regions starts to change. So producing such local norms is yet another form of regionalism. It implies the need to set specific 'normal haemoglobin levels' region by region.[19]

However, such complications don't necessarily mean defeat. They can either be sorted out in due course, or they can simply be treated as a complicated and ever-present backdrop (as, indeed, they have been for many years). For the moment, therefore, the important discovery is that it's possible to *create* a regional map of anaemia. This is a map depicting a homogenous field divided by boundaries which distinguish between regions where anaemia is abundant and those in which it is scarce. So it's possible to build a version of the social in which space is exclusive. Neat divisions, no overlap. Here or there, each place is located at one side of a boundary. It is thus that an 'inside' and an 'outside' are created. What is similar is close. What is different, is elsewhere.[20]

The Laboratory Network

> To create regional maps is to stress similarities within regions and differences across boundaries. But to do this there must also be numbers, numbers which tell about haemoglobin levels. And numbers demand measurements. But measuring haemoglobin levels isn't easy. You need a machine. And someone who knows how to use it. In the Netherlands there are expensive photo-electric meters in all hospital laboratories and simpler devices in many general practices. But what of Africa?

In articles which report surveys of haemoglobin levels, the

'materials and methods' sections mention measurement techniques. Sometimes these reports make it sound as if the process of measurement was unproblematic.

> *The haemoglobin concentration and red cell indices were measured by a Coulter S + IV automated analyser.*[21]

However, other articles mention problems and talk about coping with them. These suggest that it can be pretty hard work to make a 'haemoglobin measurement'.

> *Haemoglobin estimations were performed using a Delphi haemoglobinometer (or the Lovibond method if the haemoglobinometer was not working for some reason).*[22]

This phrase – with its deliberate, self-strengthening modesty – suggests that 'measurement' wasn't possible because a Delphi haemoglobinometer only permitted 'estimations'. It also warns that this device, inaccurate as it was, didn't work at times, and had to be helped out by the Lovibond method. So machines may be good or bad. But it is not simply a matter of scientific prudence: for machines don't determine haemoglobin levels all by themselves. Someone has to help them. Even the Coulter S + IV automated analyzer needs to be fed with blood which someone has had to draw from the patients' veins. And the Delphi haemoglobinometer depends so much more on the way in which it is used that the authors reporting its results feel the need to note in their method section that:

> *The laboratory and ward staff were the same for the two periods [we ran this study].*[23]

How is it possible to say that severe anaemia is common in Africa, whereas it is unusual in the Netherlands? How is it possible to create regional maps? This requires a *network of haemoglobin measurement*. Machines which measure haemoglobin levels. And people who have the skills to use those machines. So this is how the work of creating numbers and generating a homogenous space within which comparisons make sense and boundaries become possible.

This is the point made by actor-network theory. It says that the space in which regions can be drawn and differentiated exists. But it doesn't exist in the order of things. Rather, it is an

effect or a product which depends on another quite different kind of space, the space of networks. This isn't regional in character, but is generated within a *network topology*.[24]

A network is a series of elements with well defined relations between them. The metaphor comes from semiotics where it is applied to language. But the elements of a network do not need to be words, and the relations between them don't necessarily have to do with the question of giving each other meaning. Network elements may be machines or gestures. And their relations include all sorts of co-constitutions.

In a network space, then, proximity isn't metric. And 'here' and 'there' are not objects or attributes that lie inside or outside a set of boundaries. Proximity has, instead, to do with the identity of the semiotic pattern. It is a question of the network elements and the way they hang together. Places with *a similar set of elements and similar relations between them* are close to one another, and those with different elements or relations are far apart.

If it is actually used on arrival, then the haemoglobin meter that travels from a factory in Germany or Korea to the Netherlands and Africa turns the laboratories in both regions into a similar place. They are both 'labs'. They are close for they are both part of the haemoglobin-measurement network. English language handbooks and the bi- or trilingual technicians they instruct also partake in this network. As do the nurses who tap venous blood. And the substance they add to the blood to prevent it from clotting. And the blood itself, of course. Networks may contain all sorts of elements: they're heterogeneous.[25]

In actor-network theory there is much writing about the way in which networks *generate* regions by crossing boundaries and spreading themselves.[26] This is the point of Bruno Latour's notion of the *immutable mobile*. An entity such as a text or a device is immutable when its elements do not change and the relationship between them is not altered. It holds itself stable wherever it goes. And it is mobile because, *from the point of view of a regional topology*, it displaces itself from one place to another.[27]

So the 'space-time travel' of these mobiles is only 'space-time travel' from the point of view of a regional topology. However

many kilometers there may be between two haemoglobin meters, in a network topology they are close to one another. Together they form a specific node in the network of measurement – a network which stretches all the way from 'needle' to 'number' via 'nurse' and 'normal distribution'. So the argument is that 'space–time travel' is better seen as an *inter-topological effect*: an effect of one topology meeting the other. As Bob Cooper observes, what happens is that network invariances 'fold' regional surfaces. The network brings together two or more locations that are far away from each other on a regional map.[28]

The Limits of the Network

In the Netherlands the work of surveying the haemoglobin levels of patients who visit their general practitioner can be superimposed quite easily on the day-to-day work of general practitioners. 'Here', after all, the diagnosis 'anaemia' is written in a patient's file when this is established, and this only occurs once someone's haemoglobin level is measured and deemed to be too low.[29] Thus, all it takes to make the data that allow a comparison between the Netherlands and another region, is the addition of a pile of forms to those already in the doctor's surgery; and then a way of making her fill them in properly.[30] In the Netherlands the difference between common medical practice and epidemiological research is simply a matter of writing things down.[31]

But it is different in Africa. It is *possible* to arrange things 'there' so that numbers about the population are created. In this or that specific hospital, clinic or dispensary everything can be installed in a way that allows the assembly of local numbers. These can then be magnified to any suitable size. Thus, it is *possible* for epidemiology to make 'there' comparable with 'here' and so to generate haemoglobin regions together with their differences in anaemia. It is *possible*, but in Africa the business of making numbers doesn't easily link up existing medical practice. For the haemoglobin-measurement network hasn't spread everywhere in Africa to become an element of day-to-day medical care.

In tropical medicine as a whole the laboratory is a problem, because a laboratory isn't just a laboratory. It is a system of people who work there, who are stimulated, controlled, a system of quality checks. And often it is an imported

system. So you try, you try to work like here, but you lack all these things: continuous supervision, feedback, quality checks. And then you have the physical circumstances: apparatus which has to be transported along bumpy roads, the climate.[32]

Machines may get transported. Or they may not, for the roads are bumpy. So even if they reach the capital they don't necessarily make it to the rest of the country.

Yes, in Harare you had it all, you had sufficient apparatus and laboratory staff. So there Hbs were done much more [than in the rest of Zimbabwe].

In rural clinics or hospitals in smaller towns, doctors may often have to rely on devices that were designed a long time ago.

For a while we had this thing, the Sali method. . . . But often it didn't work because the batteries were flat. And then there was a photocoloric affair. But only for a short time. Then something happened to it. And yes, sometimes we used this old fashioned method with a drop of blood on a blotting paper, a standardised one, and you had to compare it with a colour chart: going from rose to red to dark red. Gave you a very rough impression.

Then the devices, whether new or 'outdated', transported with such difficulty to the middle of nowhere, don't automatically keep on working once they get there. They have to be maintained, and calibrated:

The problem was that the calibration fluids had always expired. And then we scoured the whole country, ordered it abroad, never got it.

As we mentioned above, machines don't work all by themselves. They need people to put blood in them, to calibrate them, and to read the results. But people can be imported, too. And thus perform in exactly the way the machines demand.

In South Africa I worked in a hospital with nuns, and the laboratory technician was a nun as well, a German nun, so that was always good. So I am a . . . I discriminate like hell, but with pleasure! [Laughs]

But most technicians in Africa are local people. And by European standards many of them aren't sufficiently accurate. Maybe they're not disciplined to obey the demands of machines early enough in life. Maybe they're simply too busy.

Yes, you have to stay attentive yourself, because they did have something like,

now, yes, well. Look it could be so busy that, for instance, they didn't do the test and just wrote down a number.

Such problems are common, so unlike doctors in the Netherlands, tropical doctors don't depend on 'haemoglobin measurements' in their day-to-day work. If such measurements are ordered at all, then they're taken to be an indication of what might be the case with a patient. Tropical doctors do not build on numbers. They tend to be sceptical about the test results provided by their laboratories:

So sometimes you think, well, probably he has an Hb of 5 and then you send it in and then it is 5. But then you do it again the next day and it may be 8. It may also be 2. That is simply the laboratory. Those values fluctuate more often than not. . . . Okay, maybe I exaggerate the outcomes. I said that 5 could mean 8 or 2, but maybe I mean, it could be that 5 meant 7 or 4, something like that.

This is the familiar story of *the failing network*. Remember what's at stake. African medicine is quite like medicine in the Netherlands if haemoglobin measurement is transported in proper working order. If the bits and pieces within the haemoglobin network are held in place. This is the point of the immutable mobile. The laws of Newton are as true in the Gabon as in London *if* the structure of bits and pieces that makes it true in London is successfully transported from Europe to Africa.[33] The laws of innoculation are the same in a farm in Pouilly le Fort as they are in the École Normale Supérieure in Paris so long as the farm is turned into a research laboratory. In both cases the regional surface can be folded and the play between the two topologies deployed *but only if the network holds*. However, if the elements falter, or the relations between them start to change, then so too do truths. And haemoglobin levels. And this, to be sure, is what is happening in the present case. Haemoglobin measurement, it turns out, is not immutable. As its devices and techniques move from the centre to the periphery, their truths become progressively less 'reliable'. The folded surface of the region starts to flatten out, and the space-time tunnel of the network dissolves.[34]

Perhaps there are two ways of looking at this. One is to stay with the network and explore how it struggles to maintain the identity of its elements and the links between them, and then to note that there are other networks out there folding the planes of the

regional worlds in their own ways. This is the course generally adopted by actor-network analysis. And it is a fecund course. For the *principle* of invariant transformation may be common to all network-spaces, but their forms are different and they generate different kinds of regions.

The other alternative is to make the same move as that made by actor-network theory when it analyzed the way in which networks generate and supplant regions. It is to ask whether there are *other* spaces around, spaces that have topological properties which aren't like those of regions or networks. So if we do this, where does it take us?

The Clinical Gaze

Though the haemoglobin-measurement network doesn't cover the entire world, it does make it possible to claim that there is 'more anaemia' in Africa than in the Netherlands. It does this by measuring such levels in a few clinics and generalizing the findings, an art which is called extrapolation.[35] But the work of dealing with individual patients cannot be extrapolated. It has to be performed at every single spot, all over again. That haemoglobin meters don't work properly everywhere is therefore harder for practitioners than for epidemiologists. How to track down anaemic patients in the context of *day-to-day medical care*? The author of an article describing various relatively transportable methods for measuring haemoglobin levels observes that:

> *Much anaemia is missed or not followed to recovery because time or money is not available to get a venous sample of blood tested.*[36]

And it goes on:

> *The present paper describes some currently available methods for testing the degree of anaemia from a finger-prick test.*[37]

The object is to extend the network by creating more immutable mobiles, arrangements that will remain stable under a wider range of circumstances. However, in addition to measurement there's another way of finding out whether or not a patient has anaemia. This requires the cooperation of bodies only, not that of machines.

In contrast to the haemoglobin tests of the *laboratory*, it is called *clinical*, the clinical method. This is older than laboratory methods. It diagnoses anaemia by looking at symptoms and signs. And it doesn't disappear when the laboratory appears, not even in the Netherlands. We'll come to that. For now the question is: how does it work in Africa?

Tropical doctors talk about it like this. They say that when a patient comes in, the doctor looks at her eyelids, gums and nailbeds. These should all be pink. If they're pale, then the patient is anaemic. It's a rough and ready technique. But if the haemoglobin level is low enough, it works.[38]

> *I don't know if I could distinguish a 10 from a 15. Those are all people who are simply beautifully pink, probably. But below that you can, with a clinical gaze, you can pick out something.*

So the clinical gaze can pick out anaemic patients in the absence of a laboratory.[39] Indeed, in the article just mentioned, it is said to be better than a bad laboratory and is recommended.

> *Ability to make a crude assessment of the degree of anaemia by looking at mucous membranes remains the most valuable screening method. There is much to be said for avoiding tests of the degree of anaemia that are grossly inaccurate: instead, train staff to become efficient in looking at mucous membranes.*[40]

So in addition to the laboratory, there is a clinical way of screening patients and finding anaemia. It makes use of experience rather than accuracy. Thus, while local technicians are scorned for their laboratory inaccuracies, they are credited for their experience when it comes to observing pallor. Some tropical doctors told us their local staff were far better at this than they were themselves.

> *And so you can say, if you have observed thousands of those people that way, and the technicians working in those laboratories did observe that way, well, they could more or less say it. Say: 'it will turn out to be this [haemoglobin level]'. And the nurses, too, they said: 'look, utterly pale'. Others – and I am incapable of that – others looked at the tongue. 'Stick out that tongue: is it pale?'*

So the clinical gaze doesn't create sharp numbers.[41] But it certainly produces diagnoses. Effective diagnoses. Diagnoses that work so well that the absence of a haemoglobin test may even go unnoticed.

> *I worked for one year in Mozambique, practically without a laboratory. . . . I*

don't even remember if we could do a haemoglobin test. I believe we couldn't. But it didn't matter.

That networks have limits, that the network of haemoglobin measurement fails to reach every corner of Zimbabwe let alone Mozambique, is a story familiar to network analysis. It isn't surprising. But perhaps this is: from the point of view of day-to-day medical care, the absence of the laboratory hardly makes a difference. It just doesn't matter because you can lower an eyelid and look at its colour.

While you talked, you took their pulse, immediately, and you did this [lowers his eyelid] while talking. Within 30 seconds, in some sort of reflex.

So nothing is missing. Tropical doctors don't *need* laboratories. They routinely diagnose anaemia anyway – using their eyes.

A question. Is it that anaemia is diagnosed everywhere because *another network* reaches the places that the network of haemoglobin measurement cannot reach? A network of gestures and skills in which clinical assessment of anaemia is embodied? In the Netherlands, after all, clinical methods are used too. Is it, therefore, that there is another kind of immutable mobile which makes it possible to transport the diagnosis of anaemia all the way from the Netherlands to the tropics, one that doesn't have to do with machines but rather with the clinical gaze?

This is an attractive possibility. Such things do happen. Networks co-exist and they may interweave with one another. But we don't think that this is what is happening here. *For clinical diagnosis isn't invariant.* Its elements change. And the way they hold together varies from one place to another. Here, then, the mobile doesn't simply move. It is mutable too.

Anaemia Flowing

In the Netherlands people who walk into a general practitioner's office do not go through all kinds of laboratory tests before they see a doctor. The haemoglobin levels of the Dutch are only measured after these people have talked about their *complaints*. The clinic precedes the laboratory. Listening for complaints – the

stories patients tell about *dizziness, tiredness and shortness of breath* – this is the crucial element of the clinical method in the Netherlands.[42]

In Africa it is different. Tropical doctors say that in their African practices asking patients about their complaints often doesn't work. For dizziness, tiredness, shortness of breath may be so routine, so much a part of people's everyday life, that people just accept them, and don't complain about them to a doctor.

> *And these people didn't have the typical anaemia complaints. They didn't come with those. They [the complaints] were so normal.*

On the other hand, sometimes people do complain, but the specificities don't get across. There may be a language problem. Or the circumstances for a proper conversation may be wrong. As one Dutch doctor says:

> *But, I myself, then, I worked in English. This was translated by the nurses and whether all these translations got across? Like 'hey, do you see little stars flickering in front of your eyes?' or 'are you tired?' Yes, they were tired. They were all tired. But what does tiredness mean? Was it sleeplessness, was it 'I always fall asleep', or: 'I cannot move myself forward any more'? We never went into all that, not really.*

So the doctor doesn't speak the local languages. And the patients do not speak Dutch. Fortunately, the doctor and the nurse both speak English. The translation continues. And back again. This makes for slow progress. Which only serves to exacerbate the problem of time.

> *You didn't have time for it, either. One minute for each patient! Good God. Yes, try to imagine. I mean an outpatient consultation, how did it proceed? I'm sitting here, a patient enters, a nurse is sitting over there and the patient starts to tell a story. The nurse listens, tries to list the complaints. Over here is a second patient, in front of me, and another nurse sits by my side. She translates what this patient is saying and while I'm examining she translates back [what I say] about the treatment and what should be done. It happens all at once. And there's a third patient lying behind that screen in the corner, who gets a quick physical examination. So that's how we got our consultations done. No time to ask questions, examine thoroughly, no, no time at all. It's all routine.*

In the middle of the routine, the urgency, and the heat of an outpatient consultation, the complaints that a patient might make about anaemia are hardly part of its reality. White eyelids are.

So 'the clinical method' isn't invariant.[43] It's a matter of listening here and looking there. And while in the Netherlands the clinical method is used to select those patients whose blood is going to be checked by the laboratory, in Africa it may well lead directly to treatment.[44]

> *We didn't have anything else: we had our clinical gaze. And that is looking at the conjunctiva, the eyelids. In the Netherlands that's impossible. Why? . . . It is said you can't point yourself in the right direction in this way. In Kenya you can because the anaemia may be so severe. I already said so: 3 g/dl, in the Netherlands you never come across a child who has that. There they come in daily.*

In the Netherlands a doctor does not rely on her gaze for, rare exceptions apart, patients only have a marginal level of anaemia, and their eyelids, nails and skins do not turn noticeably pale. In Africa it is different: the pallor may be so impressive that it points immediately, as it were, in 'the right direction'.

So there is anaemia in Africa. It is a question of observation, a matter of the clinical gaze. And though there may be a laboratory to back up the gaze, if there isn't then this doesn't matter. If only because the anaemia is severe, the laboratory isn't felt to be missing. In the Netherlands there is also anaemia. This is a question, first, of complaints. If they are taken to be complaints about anaemia, the patient's haemoglobin level is measured before any treatment is decided. So there is anaemia 'here' and anaemia 'there'. But they are not part of a single network. The elements do not hold firm and the links between them vary.

But this sounds as if there were two regions, not this time of anaemia itself, but rather of medicine as a diagnostic and therapeutic endeavour. One region in which complaints discovered by clinical means lead to laboratory measurements – which means that the diagnosis of anaemia is a result of their joint effort. And another in which clinical observation does all the work by itself. But no, that's not right. For there is no clear boundary, no line of fracture where one variant stops and the other begins. Laboratories are sometimes to be found in Africa. And on the emergency ward of a Dutch hospital a blood bag may be attached before laboratory results come through. The

> shortness of breath talked about by a Dutch patient may be visible when an African patient sits down hastily, breathing fast. And the tropical doctor may bring her routine gesture of lowering an eyelid home with her when she returns to the Netherlands. And sometimes keep on making use of it for a while.[45]
>
> So what we're dealing with is not a single clinical network with elements that hang together through invariant relations, transporting the same 'anaemia' everywhere. Nor is it two interweaving networks – laboratory and clinic – each travelling round the world with its own 'anaemia'. And neither is it two regions where each is defined by a specific form of medical care which uses its own methods to delineate its own 'anaemia'. What we're witnessing is something different. We're looking at *variation without boundaries and transformation without discontinuity*. We're looking at flows. The space with which we're dealing is *fluid*.

Isn't this a plausible way of talking about what happens to anaemia as the Dutch physician moves from the Netherlands to the new context of her clinic in Zimbabwe? For the 'anaemia' she learned about in medical school doesn't disappear as she steps on to the aircraft. Not at all. And neither does it shift, as it were like an ontological rupture. But the anaemia she finds in Africa isn't familiar either. So in the weeks after she arrives, she starts to absorb what's novel about it. She learns that there are no machines. Or that the figures they produce aren't accurate. But she finds that there are plenty of white eyelids, which she only ever read about in books before. And she discovers that there are pallid skins – though she can't yet 'see' that they are pallid. The local nurses are far better at this than she is.

So perhaps the physician flows from the Netherlands to Zimbabwe. And then she flows back again at the end of her contract into a Dutch general practice where there are few white eyelids or sallow skins, but lots of complaints and laboratory forms to be filled in. And, as she flows, so too does 'her anaemia'. The argument, then, is that 'anaemia', like blood itself, may be thought of as a fluid. And – this is the promise of a fluid topology – so long as it flows there is the possibility that the transformations that it undergoes will not lead to abrupt changes. For *fluidity generates the possibility of invariant transformation*.

A Fluid Space

> The social inhabits multiple topologies. There's one that is regional and homogeneous, which distinguishes its objects by talking of territories and setting boundaries between areas. There's another that comes in the form of networks, where similarities have to do with syntactical stability and differences reflect grammatical dissimilarity. But there are others too, and one of them is fluid. For there are social objects which exist in, draw upon and recursively form fluid spaces that are defined by liquid continuity. Sometimes fluid spaces perform sharp boundaries. But sometimes they do not – though one object gives way to another. So there are mixtures and gradients. And inside these mixtures everything informs everything else – the world doesn't collapse if some things suddenly fail to appear.

First, then, the question of boundaries. In fluid spaces there are often, perhaps usually, no clear *boundaries*. Typically, the objects generated inside them – the objects that generate them – aren't well defined. Thus, even the boundary between the normal and the pathological which is so important to medicine isn't given once and for all. Any attempt to fix it tends to falter. For what counts as a normal, non-anaemic patient in tropical practice?

> *Well, I think that, at a particular moment, that's a fiction. You can say that there are specific yardsticks you can aim for. But it is also how you're moving. You're going down or up. . . . It's more a matter of trying to correct deviance than of striving after some absolute number.*

In a fluid space normality is a gradient rather than a cut-off point. When they deal with anaemia, tropical doctors aren't trying to reach a specific threshold, but to nudge the Hb level in the right direction. To push it up a bit. And much the same is true for the person of the patient. A doctor may base her medical decisions on findings from places located far beyond the patient's skin. Or, to put it differently, a person overflows her surroundings, and she does so in ways that are *quite unpredictable*.[46]

> *So you give iron and maybe some vitamins. Based on the person, what you find in your examination, and on the situation in the country around. For instance: there's only corn at the moment, no green vegetables.*

A proper examination may thus extend from the colour of the skin

to that of the eyelids, from the eyelids to the way the patient walks, and from there to the food she's eating, or anythng else that seems appropriate.

> *So you look for other types of arguments too. Yes. They aren't improper arguments. . . . You ask where someone comes from, you know. And then I 'geographied' them in my head and yes, sometimes you knew enough by then. If it was a war zone. And what she planned to do – if she says, I'm going back to Mozambique. This was the hospital in Zimbabwe, at the Mozambique border. Or you saw that her two older children weren't very healthy either. People often talked about their obligations. They wanted to go home for a variety of reasons. You let it all play its part.*

In a fluid space it's not possible to determine identities nice and neatly, once and for all. Or to distinguish inside from outside, this place from somewhere else. Similarity and difference aren't like identity and non-identity. They come, as it were, in varying shades and colours. They go together.

So the logic of fluid objects isn't so different from Wittgenstein's notion of the family resemblance. But it isn't quite the same either.[47] For changes in fluids are not simply permutations of elements such as noses or ears that can be assembled in a random manner, as if at the toss of a dice. They are better seen as being composed of various more or less viscous combinations.[48] Which means that it may or may not be possible to separate a fluid into its component parts. And it may or may not be possible to mix these in with the components of another fluid.

This, then, is the second point. A fluid world is a world of *mixtures*. Mixtures that can sometimes be separated. But not always, not necessarily. For though a sugar solution may crystallize and the kidneys separate urine from blood, the egg and the oil in mayonnaise are irreversibly altered when they are mixed. And so it is in medicine too, for even if the epidemiologist is able to distinguish between diagnosis and treatment, they are inseparable for the practitioner. In an urgent case, death may intervene while you wait for a diagnosis.

> *Someone comes in. Bleeding. So you give blood. You attach a blood supply without knowing what the problem is. Without knowing exactly. You simply have to give blood and watch out to see if the heart can cope. And operate fast to put the patient together again.*

But even when imminent death appears unlikely, diagnosis gets mixed up with treatment. Medical practitioners aren't after knowledge for its own sake. They want to intervene. Their diagnosis is *prefigured* by the therapy that will 'follow' from it.[49]

> *I could do like five things for people in Africa. For doctors in the Netherlands it's pretty much the same, it's restricted. So what have you got: painkillers, anti-malaria drugs, iron, you've got antibiotics. Some 20 to 30 medicines that you use in Africa, that are available. So you have to make your choice between those: which one is the best choice given the patient's situation? Apart from that, you have surgical procedures. So you always think somewhat the other way around [from therapy to diagnosis, that is] for diagnosis is sometimes unnecessary and sometimes very simple.*

Looked at in this way 'anaemia' is an excellent diagnosis. For iron is a nice treatment. A good place to start. It's cheap. And it's widely available.

> *So iron went out of the door by the jar, so to speak. It was available everywhere.*

The availability of iron is mixed up with the detection of anaemia.[50] If there is no iron, no way to instruct people about diets, no way of curing them of worms or malaria, if there is no food, then detecting anaemia isn't very urgent and the question of determining precise haemoglobin levels is even less pressing. So the fluid metaphor suggests that we are dealing with something that is viscous: with things that tend to stick together. But it also points to a possible difference – a difference between fluid and network spaces. For in a network things that go together depend on one another. If you take one away, the consequences are likely to be disastrous. But in a fluid it isn't like that because there is no 'obligatory point of passage'; no place past which everything else has to file; no panopticon; no centre of translation; which means that *every* individual element may be superfluous. In Harare it may be useful to know people's haemoglobin levels. But in the Mozambique war zone, where iron and food are scarce, the absence of a laboratory is scarcely noticeable at all. Because, even if the laboratory were to do what it was made for, what it produces would not.

> *When all is said and done maybe it isn't all that relevant to have a laboratory do all these things. Because what you're doing, is, let's say, wanting precision or sophistication on one point, while you don't have it on other points. So it's somewhat out of proportion.*

The figures produced by laboratories are out of proportion to the realities of Mozambique, where precise treatment is impossible. But there are a lot of other places which manage just as well without laboratories. It all depends on the circumstances.

> *It is a problem here, too, you see. There is always a friction between what clinicians want to know and what the lab provides. Then the lab often has the idea: hey, look, I am sitting here in the middle of the night, doing urgent measurements and then the results are never used. And this is partly true. It is. This is in the nature of medicine, that laboratory outcomes, haemoglobin levels among them, are only one piece of information among many. If you have to manage without them, well, the world doesn't collapse if you're a clinician.*

So without the laboratory the world doesn't collapse. The network of the laboratory may collapse, but not the world – if you're a clinician, and if you're prepared – and able – to swim.[51]

So this is a third point: a point that has to do with *robustness*. For the clinician the world does not collapse in the absence of a laboratory. Tropical doctors know all about this absence – and many others. And yet they still go on working. So they say that even where complaints are hardly put into words, and each patient sees the doctor for only a few minutes, anaemia is still diagnosed and treated.

In fluid spaces objects don't collapse easily. But why? Maybe it's because there is no single strongpoint to be defended in order to preserve continuity. Like guerrilla armies, fluids melt back into the night. They circumvent. They infiltrate. For since continuity has nothing to do with the integrity of territory in a fluid space, there are no fixed frontiers to be patrolled. Neither is there need for police action to safeguard the stability of elements and their linkages – for there is no network structure to be protected. The world does not, as it were, have to be configured and set to rights. It is this, or so we believe, which gives fluids and the objects composing them their ability to move. To travel everywhere. Or almost.[52]

It may well be that it's because they do not cling to anything in particular, but work adaptably, that tropical doctors are able to accommodate themselves to whatever is required. And still keep the blood flowing.[53]

A fluid space, then, isn't quite like a regional one. Difference inside a fluid space isn't necessarily marked by boundaries. It

> isn't always sharp. It moves. And a fluid space isn't quite like a network, either. For in a fluid elements inform each other. But the way they do so may continuously alter. The bonds within fluid spaces aren't stable. Any single component – if it can be singled out – can be missed. But if we put it like this our story sounds rather regional. It sounds as if we're saying that there are sharp divisions between the three types of space. And as if they were independent from one another. But this isn't right. Quite to the contrary, in fact. Because the three topologies have *intricate relations*. They co-exist. And this is our *fourth* point.

We suggested earlier that when a region is created, variations between the elements inside it are suppressed and forgotten. Variables inside regions are averaged and fixed. But in a fluid space all variables are variable. So perhaps it sounds as if fluids are the 'others' of regions: that their elements are the noise, the unconscious, the deviance suppressed by regional order.[54] Again, we suggested that a network is composed of immutable mobiles. With invariable links between them. If the linkages inside it start to vary, a network may start to dissolve. Dissolve: the metaphor is appropriate. For the mutable mobiles may end up as a part of a fluid space. Like the haemoglobin measurement in the African clinic: used but not trusted. Used as an element that only has significance in relation to many others.

> So fluid spaces are no 'better' than regions or networks. They are no more attractive. Or virtuous. And they don't 'really' get at the chaos. For the social doesn't simply organize itself into a liquid form – not even in a fluid space. Fluid objects absorb all kinds of elements that could only ever have come into being within the logic of other topologies. Doctors who diagnose anaemia use numbers and observations. They mix them together happily. They may *see* a haemoglobin level when they look at an eyelid. They may say 'gosh, she's got a low haemoglobin level' if a patient sits down gasping for breath or her conjunctiva are white.

Fluids aren't solid. Or stable. Or the only spatial types around. It's all contingent. But that doesn't imply there's nothing more to say. We learned a great deal about anaemia from the tropical

doctors we interviewed – even if we also learned that nothing we learned is fixed. That it may be different if we go and ask elsewhere. Or in another year or two.

> The study of fluids, then, will be a study of the relations, repulsions and attractions which form a flow. Repulsions which sometimes, to be sure, mean that a fluid encounters its limits. Where the doctors, the technicians, the nurses and the iron tablets stop – there there is no anaemia. There may be death. But no anaemia. So fluids encounter their limits at the moment when they no longer absorb their surroundings. Where, perhaps, they start to evaporate. Or where they encounter another immiscible liquid. But fluids, or so our story suggests, are also remarkably robust.
>
> So *how* does anaemia flow? How does it move between the Netherlands and Africa and back again? The answer can only be empirical. It may flow in people's skills, or as a part of the attributes of devices, or in the form of written words – any or all of these may carry anaemia. It may swallow up a regional form for a little while, or absorb part of a network. And as it moves, it changes in shape and character. With more or less viscosity, it picks up and incorporates. Or it lets go. And so, indeed, it changes even as it stays the same. There may be a lot of it, or only a little. It may be severe, or only slight. It may lead to one kind of action, or another. But most important is the way in which all its instances join together. For if we are dealing with 'anaemia' over and over again, something that keeps on differing but also stays the same, then this is because it *transforms itself from one arrangement into another without discontinuity*.

• NOTES

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journal. Finally, we would like to thank the Netherlands Organization for Scientific Research (NWO) for its Fellowship support for Annemarie Mol without which it would not have been possible to undertake the present work.

1. D. Werner, *Where There Is No Doctor: A Village Health Care Handbook* (London: Macmillan, 1978), 125.

2. C.R. Schull, *Common Medical Problems in the Tropics: A Clear Comprehensive Guide* (London: Macmillan, 1987), 182.

3. The material about 'anaemia' used in this paper draws upon an analysis of the textbooks used in Dutch medical schools; widely used handbooks for tropical medicine, some of them written for 'health workers'; and extensive interviews with former Dutch tropical doctors, some of whom now work as general practitioners in the Netherlands.

As the interviews were conducted in Dutch, the use of quotations is a problem. People don't form 'proper' sentences when they speak, and finding an English equivalent for a somewhat strange Dutch expression is often extremely hard. However, since we're not attempting a detailed analysis of expressions, interactions, or the beliefs of the doctors in question, we decided to make easy readable translations, which pose fewer grammatical problems than the original quotes.

We should also observe that we treat the interviews as if they were a single source, a single overall story. Of course there are differences between the various interviewees – though they aren't much greater than the variations within each interview. But, more important, these differences aren't relevant for the argument that we want to make.

4. An example of an extreme version of regional social thought would be that of Jürgen Habermas, where he seeks to separate 'life world' from 'system', and sort out all the concomitant subdivisions (for instance, power versus money, or morality versus ethics). For the most recent substantive step in this project, see Jürgen Habermas, *Faculität und Geltung, Beiträge zur Diskurstheorie des Rechts und des demokratischen Rechtsstaat* (Frankfurt am Main: Suhrkamp, 1992). But there are many other examples – see, for instance, Erving Goffman, *The Presentation of Self in Everyday Life* (Harmondsworth, Middx: Penguin, 1971). For an example of network theorizing, see Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Milton Keynes, Bucks.: Open University Press, 1987).

5. One could say that anatomy is a topography, a map-making practice. Like geographical topographies, it localizes its objects within a set of coordinates, taking these coordinates as tools, rather than as an object of reflection. For an analysis of the spaces of geography, see François Dagognet, *Une Epistémologie de l'Espace Concret: Neo-Géographie* (Paris: Vrin, 1977); and for the relation between the spatial tradition of anatomy and that of geography, see Dagognet, *Faces, Surfaces, Interfaces* (Paris: Vrin, 1982).

6. This movement is inspired by the work of Michel Serres. Serres brings to the fore the implicit spatial notions in a range of theories and other texts. See especially: Michel Serres, *Le Passage du Nord-Ouest* (Paris: Les Editions du Minuit, 1980), and Serres, *Statues* (Paris: Editions François Bourin, 1987). For the transportation of this strategy to science studies, see Annemarie Mol, 'Topografie als methode van kennisonderzoek: Over het naast elkaar bestaan van enkele bloedarmoedes', *Kennis en Methode*, Vol. 15 (1991), 314–30.

7. Susan Leigh Star, 'Leaks of Experience' (personal communication).

8. The term comes originally from the writing of David Bloor, *Knowledge and Social Imagery* (London: Routledge & Kegan Paul, 1976). See its extension by Michel Callon, 'Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St. Brieuc Bay', in John Law (ed.), *Power, Action and Belief: A New Sociology of Knowledge?, Sociological Review Monograph* No. 32 (London: Routledge & Kegan Paul, 1986), 196–233; and more recently by Law, *Organizing Modernity* (Oxford: Blackwell, 1994).

9. Schull, op. cit. note 2, 182. Sometimes a single number, such as 10 g/dl, is listed as the lowest healthy haemoglobin level for the entire population. In setting the norm for a 'normal haemoglobin level' it is more common, however, to distinguish between children of various age groups, men, women who are pregnant and those who are not. Schull adds in a footnote to his '10 g/dl': 'In countries which have good public health services, anaemia is diagnosed if the Hb is less than the following: men 13 g/dl; non-pregnant women 12 g/dl; pregnant women 11 g/dl.'

10. Joost Zaat, *De macht der gewoonte: Over de huisarts en zijn laboratoriumonderzoek* (Amsterdam: Thesis Publishers, 1991). Each of these numbers is generated by superimposing epidemiological data-gathering on the work of general practitioners. In the Dutch system, access to a general practitioner is easy: for most people, and for all on lower incomes, an unlimited number of visits is included in their health-care insurance. With the exception of emergencies, patients can only see a specialist if they are referred.

11. David Weatherall and Prawase Wasi, 'Anemia', in Kenneth Warren and Adel Mahmoud (eds), *Tropical and Geographical Medicine* (New York: McGraw-Hill, 1990), 55–65.

12. Calling a disease 'tropical' attributes its incidence to climate or geographical location, while calling it 'nutritional' stresses lack of food and other resources.

13. Aaron Eben John Masawe, 'Nutritional Anaemias', *Clinics in Haematology*, Vol. 10 (1981), 815–42.

14. Ibid. We have omitted Masawe's discussion both of mean haemoglobin levels and the causes of anaemia found in these studies (which in some cases included non-nutritional anaemias) because such complications do not affect our basic argument.

15. Such numbers are about different populations, created with different research techniques, by different organizations and for different purposes. So even if they're all products of *epidemiology*, the discipline mapping the distribution of diseases over geographical and social spaces, their great variety isn't all that surprising. We quote from the epidemiological literature here, in an analytical mode, but don't go further into the intricacies of epidemiological studies because they only serve as a backdrop for the interviews.

16. Iron is a crucial component of the haemoglobin molecule: in anaemic patients the iron supply of the body is usually depleted.

17. Edward Kasili, 'Malnutrition and Infections as Causes of Childhood Anemia in Tropical Africa', *The American Journal of Pediatric Hematology/Oncology*, Vol. 12 (1990), 375–77.

18. This relates to the old discussion as to whether international relations should be discussed in terms of the North–South distinction or that of social class. Does it

make best sense to distinguish the Western world and the 'local upper class' on the one hand, and the 'local poor' on the other?

19. The production of a norm for any population by drawing a gaussian curve through a series of highly variable haemoglobin levels is in itself an activity which produces regions. All the differences between individuals are suppressed in order to end up with the mean, the median and the lowest acceptable haemoglobin level for 'the population'. This population may map on to a geographical region (for instance that of a nation) or on a social one (for instance people with low incomes). For the many contingencies involved in the production of statistics, see Aaron V. Cicourel, *Method and Measurement in Sociology* (New York: Free Press, 1964); Harold Garfinkel, *Studies in Ethnomethodology* (Englewood Cliffs, NJ: Prentice-Hall, 1967); J. Maxwell Atkinson, *Discovering Suicide: Studies in the Social Organization of Sudden Death* (London: Macmillan, 1978); Ian Hacking, *The Taming of Chance* (Cambridge: Cambridge University Press, 1990). For the shift in social medicine from geographical to social regionalism, see Eddy Houwaart, *De hygiënisten: Artsen, staat en volksgezondheid in Nederland 1840–1890* (Groningen: Historische Uitgeverij, 1991).

20. We leave open the question about what follows from the production of such regions. But note there is a range of possibilities. From indifference, to medical concern, from hard work by tropical doctors, to an easy association between 'Africa' and 'disease' – which can be mobilized to depict both black bodies and the continent as unruly, decaying, chaotic and hopeless. For a historical analysis of the latter association, see Jean Comaroff, 'The Diseased Heart of Africa', in Shirley Lindenbaum and Margaret Lock (eds), *Knowledge, Power and Practice: The Anthropology of Medicine and Everyday Life* (Berkeley, CA: University of California Press, 1993), 305–29.

21. Saadiya Aziz-Karim et al., 'Anaemia in Pregnancy – A Study of 709 Women in Karachi', *Tropical Doctor*, Vol. 20 (1990), 184–85.

22. J.A. Dorward, J.K. Knowles and I.M. Dorward, 'Treatment of Severe Anaemia in Children in a Rural Hospital', *Tropical Doctor*, Vol. 19 (1989), 155–58.

23. Ibid.

24. The argument is developed in a number of locations. See, in particular, Bruno Latour, 'Drawing Things Together', in Michael Lynch and Steve Woolgar (eds), *Representation in Scientific Practice* (Cambridge, MA: MIT Press, 1990), 19–68; for a witty and interesting recent study of three cases, see Joseph O'Connell, 'Metrology: The Creation of Universality by the Circulation of Particulars', *Social Studies of Science*, Vol. 23 (1993), 129–73.

25. For an instance of this argument, see John Law, 'On the Methods of Long-Distance Control: Vessels, Navigation, and the Portuguese Route to India', in Law (ed.), op. cit. note 8, 234–63.

26. See, in particular, Bruno Latour, *The Pasteurization of France* (Cambridge, MA: Harvard University Press, 1988); Latour, op. cit. note 24; and Law, op. cit. note 25.

27. The network character of machines is considered in Madeleine Akrich, 'The De-scription of Technical Objects', in Wiebe E. Bijker and John Law (eds), *Shaping Technology – Building Society* (Cambridge, MA: MIT Press, 1992), 205–24.

28. An inter-topological effect occurs where the operational rules of one space interfere with those of another: see Robert Cooper, 'Formal Organization as

Representation: Remote Control, Displacement and Abbreviation', in Mike Reed and M. Hughes (eds), *Rethinking Organization* (London: Sage, 1992), 254–72.

29. What counts as a low haemoglobin level isn't unambiguous, even in the Netherlands. For an analysis in which the statistical approach to this question (the subject of the present paper) is contrasted with a pathophysiological and clinical alternative, see Annemarie Mol and Marc Berg, 'Principles and Practices of Medicine: On the Co-existence of Various Anemias', *Culture, Medicine and Psychiatry*, forthcoming.

30. The use of computers for file-keeping in general practice circumvents even the forms. What now becomes essential is the software that allows the retrieval of epidemiologically interesting data. With the pharmaceutical industry now giving computers free to general practitioners who are willing to take part in clinical trials, the development of research-friendly software is certain to follow quickly.

31. Even so Dutch epidemiologists complain. There are currently almost 200 (!) different methods of assembling epidemiological facts about death and disease in the Dutch population of less than 15 million. Since individuals have no 'health care identification number' it is almost impossible to link the various outputs of these systems. Moreover, upon closer inspection 'just adding a form to work-as-usual' is a gross simplification of what happens when practitioners are asked to gather epidemiological data. Categories used for one activity do not overlap with those used for another. For an insightful analysis of this, concentrating on the case of social medicine, see Nicolas Dodier, *L'expertise médicale: Essai de sociologie sur l'exercise du jugement* (Paris: Métailié, 1993).

32. Here the word 'laboratory' is not the place where new knowledge is made, the location of science in action. In common medical usage 'the laboratory' is the collection of machines (from blood test to CT-scans) that is used in the daily assessment of patients. Thus, a small device such as a simple Hb-meter is not taken away from 'the laboratory' in order to raise a world: it *is* a laboratory. Throughout this article, we will use the term 'the laboratory' in this way.

33. As is explained eloquently in Latour, op. cit. note 26.

34. For several examples of networks that failed in the attempt to cross the ocean from the West to another region, which also show that the missing link is usually something nobody knew to be a link in the first place, see Madeleine Akrich, *Inscription et coordination socio-technique: Anthropology de quelques dispositifs énergétiques* (Paris: Thèse Ecole de Mines, 1993).

35. For the history of this art, see Hacking, op. cit. note 19. And for the problematic nature of the inductive adventures involved, see Aaron V. Cicourel, *Theory and Method in a Study of Argentine Fertility* (New York: Wiley, 1974).

36. Elizabeth Topley, 'Testing Degree of Anaemia', *Tropical Doctor*, Vol. 16 (1986), 3–8.

37. Ibid. Many haemoglobin measurement devices need a relatively large sample of blood which has to be drawn from a vein (usually in the arm) with a hollow needle. A method which uses little blood and demands only a small prick in the finger is easier – even though there are still problems in ensuring sterility and preventing the spread of malaria, HIV and other infections.

38. In his classical discussion about the relation between laboratory and clinic in medicine, Georges Canguilhem, in *Le Normal et le Pathologique* (Paris: Presses Universitaires de France, 1966), stresses the fact that clinical knowledge is older than that of the laboratory. He does so in order to defend the systematic primacy of

the clinic. It is, he tells us, only through people's experience of suffering that laboratories ever came into being in the first place. It is only through suffering that we got to know about disease.

In addition, it is important to note that measuring haemoglobin levels in peripheral blood is not the first or the only laboratory test for anaemia. It more or less replaced the counting of red cells in blood films under the microscope, and came to dominate haemocrit measurements, measurements of the red cell volume, which are still in use. For an insider's history, see M. Wintrobe, *Hematology, The Blossoming of a Science: A Story of Inspiration and Effort* (Philadelphia, PA: Lea & Febiger, 1985).

39. This quote is a typical compromise between the older clinical method that saw anaemia as a degree of whiteness and the newer laboratory method that measures haemoglobin levels. For what happens is that the doctor talks about 'seeing' this or that haemoglobin level: a 15, a 10 or less. This is a good example of the way new techniques aren't simply added to older ones, but also lead them to change. Observing eyelids didn't stay the same after the start of haemoglobin measurements, for in addition to being a 'sign of anaemia' a white eyelid also became a possible indicator of a 'low haemoglobin level'. For a good example of the way clinical diagnosis was altered by new machines, see Bernike Pasveer, 'Depiction in Medicine as a Two-way Affair: X-ray Pictures and Pulmonary Tuberculosis in the Early Twentieth Century', in Ilana Löwy (ed.), *Medicine and Change: Historical and Sociological Studies in Medical Innovation* (Paris: Les Editions Inserm, 1993), 85–106.

40. Topley, op. cit. note 36.

41. Though numbers, it shouldn't be forgotten, also have variable degrees of precision and fluidity. For the argument that 'around ten o'clock' may be a more appropriate number in a lot of contexts than '10.03h.', see Michael Lynch, 'Method: Measurement–Ordinary and Scientific Measurement as Ethnomethodological Phenomena', in Graham Button (ed.), *Ethnomethodology and the Human Sciences* (Cambridge: Cambridge University Press, 1992), 77–108.

42. To further complicate this: many Dutch patients do not simply talk about anaemia-related complaints, but also come to their doctor with a medical story: 'Doctor, I am so tired, I think I have anaemia, can I have my haemoglobin level checked?' According to current clinical epidemiological wisdom, the haemoglobin levels of such patients are no lower than those of control groups, and are thus no more likely to need haemoglobin measurements. According to current social psychological wisdom, however, a 'negative lab finding' makes it easier for a general practitioner to discuss the events that led to the patient's tiredness. For an analysis of this double bind, based on interviews with Dutch general practitioners, see Annemarie Mol, 'Van wie is de theorie? Bloedarmoede en de metapositie', *Gezondheid*, Vol. 1 (1993), 5–16.

43. 'The clinical gaze' is a common expression among doctors for their clinical diagnosis, whether this is made by looking or listening. It comes in a variety of forms, many of which do not map on to the clinical gaze Michel Foucault talks about in *La Naissance de la Clinique* (Paris: Presses Universitaires de France, 1963). Foucault pointed at the way in which 'modern medicine' links signs and symptoms on the surfaces of the body to the lesions pathologists find in the organs when they open up a corpse. Modern medicine, however, has many alternatives. Sometimes pathology is part of them. Sometimes it isn't. In medicine's dealings

with anaemia, pathology is marginal. It would be possible for a pathologist to differentiate between the deformations of red blood cells in a range of variants of anaemia. In practice this differentiation is rarely made and if it is, then it is done by a haematologist. Deformed red blood cells are certainly not a fundamental or even necessary part of the definition of anaemia. And neither are the deformations pathologists may find in the corpse of someone who died from anaemia. They may be relevant to the question of the death certificate, but they don't link to the diagnosis and treatment of living patients.

44. Low haemoglobin levels may occur without patients complaining about them. Thus, to wait for patients to come and complain is to give the clinical method priority in the detection of anaemia, even if the laboratory has the final say over the diagnosis. In many Dutch hospitals all patients who are admitted have a battery of blood tests, haemoglobin tests among them. In these circumstances the laboratory alone determines who is anaemic: see Mol & Berg, op. cit. note 29.

45. Interviews with Dutch general practitioners reveal an impressive variation in the extent to which they believe in and/or find themselves capable of observing paleness. Some build on it whereas others never even try to look at eyelids. And while some (white) tropical doctors told us that anaemia is easier to 'see' in patients with a white skin than in patients with a brown skin, general practitioners who haven't practised outside the Netherlands never mention the ease of such observations.

46. It is a standard claim of contemporary social theory that 'the person' is not coeval with the body. But the distinctive feature of fluid space is the unpredictability of the link between person and body.

47. Marilyn Strathern has pointed out that the family resemblance metaphor may be fused with a notion of kinship that is paramount in Western societies: a genetic one. This entails the idea that there are traits which can be isolated from one another, like genes, and combined in whatever way. Strathern reproaches Clifford for incorporating this genetic notion in his ideal of mixing cultures, trait by trait. See Marilyn Strathern, *Reproducing the Future: Anthropology, Kinship and the New Reproductive Technologies* (Manchester: Manchester University Press, 1992).

48. The faltering of regional boundaries and the instability of network elements amount to the same thing if stable elements are understood as entities with clear boundaries. Steve Woolgar explores this, contrasting rounded things with a fluid metaphor, that of the flux of varying viscosity: see Steve Woolgar, 'Configuring the User: The Case of Usability Trials', in John Law (ed.), *A Sociology of Monsters: Essays on Power, Technology and Domination* (London: Routledge, 1991), 58–99.

49. For this, see also Marc Berg, 'The Construction of Medical Disposals: Medical Sociology and Medical Problem Solving in Clinical Practice', *Sociology of Health and Illness*, Vol. 14 (1992), 151–80.

50. Some of the doctors interviewed said that for them giving iron was also a way to draw patients into Western medicine. The discussion about the place of Western medicine between other resources that African patients draw upon, falls outside the scope of this paper. But see, for instance, Didier Fassin, *Pouvoir et maladie en Afrique* (Paris: Presses Universitaires de France, 1992).

51. This points to a relationship between fluid topology and the tradition in sociology that, following the work of Wittgenstein, insists on the flexibility of rule-following. Pointing out the differences between instances time and again, is one

possible expression of a fluid topology though there are many others. See Ludwig Wittgenstein, *Philosophical Investigations* (Oxford: Blackwell, 1953).

52. Networks may achieve robustness by means of syntactical substitutability where one equivalent set of links does the work of another and the syntax is sustained. If we might call this 'centred redundancy', then fluids perform 'decentred redundancy', except that the notion of 'redundancy' is closely linked to that of network.

53. A somewhat similar argument, turning around the notion of ambivalence, is developed by Vicky Singleton in her study of the British cervical screening programme: see Vicky Singleton, *Science, Women and Ambivalence: An Actor-Network Analysis of the Cervical Screening Programme* (unpublished PhD thesis, University of Lancaster, 1992); and Singleton and Mike Michael, 'Actor-Networks and Ambivalence: General Practitioners in the UK Cervical Screening Programme', *Social Studies of Science*, Vol. 23 (1993), 227–64.

54. Blood vessels themselves (or should we say: the stories histologists tell about them?) suggest another interesting way to be both a region and a fluid. In some measure vessels are well-bounded regions that keep their constituents inside them. Large arteries have solid walls. But the small hair vessels in most organs (except the brain) are permeable to endless chemical substances and many cells – a form of imagery that suggests that the network metaphor is taken from the technology it is used to talk about, while we tap biology's body for fluid metaphors.

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