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## **Materialities, Spatialities, Globalities**

### **John Law**

#### **Global Visions Local Materialities**

Six hundred years ago the world was divided into a series of different regions. Europe, the Arab world, China, Japan, the civilisations of the Indus, the Mayas and the Incas, various sub-Saharan civilisations, these and others existed apart from one another. Yes, there were some contacts. Arabs and Christians were engaged in a sustained trial of strength around the Mediterranean. The Chinese made periodic forays far from home. And there was a trade in luxuries between Europe and Asia. But there was no 'world-system'(1). Economic, social and cultural life subsisted almost independently in the separate regions of the world. Indeed, one might say that those different regions existed in different worlds.

Between the years 1400 and 1900 this all changed. A single world-system emerged as Europe colonised and came to dominate most of these other regions. The world entered a period of sustained economic growth which included revolutions in agricultural production, the harnessing of new energy sources, the growth of manufacture and a world division of labour which depended on immeasurable improvements in transport and communications. At the same time, and as an inseparable part of this, a capitalist world order emerged. This was associated with huge increases in wealth and productivity. It was also characterised by massively unequal distributions in wealth, both within regions and to an even more marked extent, between core and peripheral regions. It was associated with the development of the European (subsequently the world-wide) nation state. And finally it was linked to the ever



increasing importance of knowledge as a resource closely related to economic production – and more recently to consumption and cultural change.

Many of the formal trappings of the imperialist world order have now disappeared. The past forty years has seen the virtual end of political colonialisation, and in certain respects the nation state appears to be under threat. But there is as much continuity as discontinuity. The nexus of capitalist enterprise, world trade, world division of labour, unequal division of resources, and growth in knowledge and communications has continued to develop apace. And it is clear, as we reach the year 2000, that in terms of the flow of goods, information and people we live in many respects in an era that is both mobile and global(2). Networks of information, of sociation, span the world.

Marx notoriously observed – following Shakespeare's Prospero in *The Tempest* – that in capitalism all that is solid melts into air. He was thinking of old feudal loyalties – and more generally any forms of life which were irrelevant to the logic of capitalist economic accumulation. His aphorism still applies. Economic and cultural stabilities are more than ever elusive and ungraspable. The global economy with its information and capital flows is dominatory, generating asymmetries and distributing and redistributing opportunities and miseries ever more rapidly. Social relations are disembedded from local contexts and stretched across time and space. The world is compressed and our links are distanced at the same time(3). And, as a part of all this, cultural production is also more rapid than ever. Fragmented, its diasporic and hybrid character can be taken as a sign for the totality of a cultural shift.

In social science this story has been told in a number of different ways: as capitalist accumulation and world-domination; as a process of industrialisation; and, more recently, as a story about the networks of globalisation, and a shift from production to culture and consumption. Our brief sketch indeed reflects all of these, and this is a necessary context for what follows. But what we are most concerned with in this Chapter is the nexus of knowledge, space and economy as seen from one particular point of view: a concern with what we will call *materiality*. So what does this mean? And where does it come from?

The most straightforward answer is that materiality is about stuff, the stuff of the world. Straightforwardly, we can imagine three kinds of stuff. First there are objects. Here, then, a concern with materiality is a concern with machines, houses and supermarkets. It is about satellite communications, military technologies, motor-cars, the growth, the distribution and the consumption of tea and coffee. It is about the fancy corporate headquarters of the multinationals – or the *favelas*, the slums, of Rio de Janeiro. It is about the water supply in a Zimbabwe village, or the cable networks beneath the streets of London.

So stuff is about objects. But it is also about bodies too – for bodies are material. So it is about how bodies display themselves in clothes and cosmetics as objects of the gaze, come to embody their conditions of work, are added to or repaired by prostheses. It is about the conditions of childbirth or the embodiments of child-rearing. It is about blind bodies as they find their way around museums or try to get on and off the bus. It is about ability and disability.

So objects and bodies are stuff. They are material. But so too are information and media, and this is our third category of materiality. Texts such as this, newspapers, the pictures on the television at night, books in libraries, CD roms, maps, films, statistical tables, spreadsheets, musical scores, architect's drawings, engineering designs, all of these are information – but information in material form.

Until recently social science has had problems in thinking about materiality. Materials have usually been present in what's written because it's so *obvious* that the world and its relations are made of materials. But, at the same time, they have also been strangely absent from it – perhaps because it is so obvious that the world is made of materials that they've been taken-for-granted. And when they haven't been taken-for-granted sometimes the role of materials have been hyped up into some kind of drama in which we learn that technological changes determine how we live. The current candidate for this is the Web, though the same was said about the printing press, electricity and the electric telegraph. But this 'technological determinism' is too simple. This is because technologies are shaped by social circumstances. The Web is a case in point. Its origins lie in the US military concern to create robust



communication networks which would withstand Soviet nuclear attack(4). Had electronic communications developed under some other regime there is every reason to suppose that they would have been different in character. So instead of saying that technologies determine social life we need to say something more complicated, like: technologies-and-knowledge-about-technologies-and-a-good-deal-of-hard-work-and-capitalist-economic-relations together determine (parts of?) social life. Which catches fewer headlines, but is more realistic. And also reflects the way in which different materials – objects and technologies, bodies and texts are produced by and simultaneously produce social and economic relations.

So materials come in different shapes, forms, and kinds, and they interact together to reshape one another and produce effects. In the first part of this chapter we draw on a discipline called Science, Technology and Society (STS) to show how they interact to produce *knowledge or information*. The implication of this argument is that if we want to understand phenomena such as global capital flows, the transmission of information, cultural hybridity, or economic inequality, it is also important to ask *how the relations that produce these are materially brought into being and sustained in particular locations*. This takes us back to the point about the invisibility of materiality. Thus for all the talk about globalisation, this is a phenomenon that also takes material form and does so in particular locations. And these are worthy of study. Indeed, if we want to understand how globalisation is *achieved* we have no choice: we have to look at the ways in which it is materially produced.

This takes us into questions to do with *space*. As is obvious, globalisation or world systems are spatial phenomena. They are made by materials which are *in* space – but which also have *spatial effects*. Some of those spatial effects have to do with inequality and domination. For instance, the literature on economics tells us that information is costly and that profit – indeed good decision-making – depends upon, is often almost indistinguishable from, superior information, quicker information, less distorted information(5). The better telegraph, the faster steamboat, the more powerful intranet, these are key tools in achieving advantage. So material arrangements generate information. They also generate rapidly moving information, which is why we say that they have spatial effects. In important respects the City of London is closer to Wall Street than it is to inner-city Salford. And this leads us to reflect on the character of spatiality itself. So we'll make the argument that spatiality isn't just about the Euclidean space of the globe, the space dealt with in physical geography. We'll argue that it is also about material networks which imply a different *form* of space(6). And then we'll go on to argue that the asymmetries of global capitalism, of information, may be understood in terms of the interaction between Euclidean and network spaces. That they are a consequence of what one might think of as *spatial non-conformities*(7).

## Material Heterogeneity and Knowing Locations

To address global concerns it is often best to be local, specific and material. That is the assumption with which we start.

The place in which we might start is a managing director's office. It might be anywhere in a medium-sized enterprise. Actually it is the office of the director of Daresbury SERC Laboratory in the UK(8). It's furnished as one might expect. At one end, the end away from the door, there is a large desk and an office chair, a computer, a telephone and various other pieces of equipment. Then, at the other end of the table, nearer the door, there is a modest boardroom table, a table for meetings. It seats six, perhaps eight, people in comfortable upright chairs. Then there is a third area to one side, an informal area, with a coffee table, three or four easy chairs, a few magazines and scientific publications. This is where the director relaxes with high status guests. Where they may drink coffee and eat biscuits.

So where does the coffee come from? We might respond to this by talking about the global and link it with the local. By talking, say, of Andrew's office as the end point of a network associated with coffee beans produced in Columbia or Kenya. And this is not, of course, incorrect. However, for us this move already makes too many assumptions about the materiality of connections, and of how the global and the local are different in character. So we want to remain for the time being in Andrew's office without moving to sub-tropical plantations. In which case to find out where the coffee comes from we need to move through one of the doors into a large room where the secretaries work, typing, fielding phone calls, emails and visitors, keeping diaries, ordering up tickets, reports, and, yes, making coffee. Two



rooms, then, with doors that lead also onto a corridor where people may wait to visit the managing director. A corridor where the trappings of power – the pile carpet, the décor – are suddenly absent.

The details don't matter. And in one way they are trivial. Everyone knows that power attracts trappings. But this is the first lesson from STS – though it also comes from the writing of empirical philosopher Michel Foucault. For in the analysis of materiality these are *not just trappings*. They are not idle. They are also performative. That is they act. And as they form part of a materially heterogeneous network of bits and pieces of all kinds, that participate in the generation of information, of power relations, of subjectivities and objectivities(9).

This is more obvious for some trappings than others. For instance Andrew, the managing director, is frowning at his computer. This is because he's discovered that the biggest project in the laboratory is seriously behind schedule, though it's only been going for a few months. But how does he know this? How has this been made visible? How has this information come into being? The answer is that he's got a spreadsheet up on the PC which tells him how much work time (they call it 'manpower') has gone into the project so far. And he's comparing this with what they planned – and the two are very different. The project is a number of months behind schedule. Indeed, though this isn't obvious in any other way, it's used up most of its contingency time already.

We may think of Andrew, then, not just as a man but more specifically as a *knowing location*. Or a point of surveillance. But he's only a point of surveillance – he only knows – because *he is at the right place in a network of materially heterogeneous elements*. This is the argument, then, about material heterogeneity. We might number: his computer; its software; the figures typed into the spreadsheet; the process of collating those figures carried out by people in the finance department; the work of filling in the time sheets that is done (or supposedly done) on a monthly basis by all employees; the decisions that those employees have made about how to allocate their time (for in practice most work doesn't come in half-day blocks which is all the time sheets allow). And then we can extend the network: into the power company (no electricity, no surveillance), the work of the programmers both locally and at Microsoft, the decisions by previous directors to implement a time-booking system, the production of the time sheets; and then the car that Andrew drove to work; the fact that he and the other employees are paid; the telephone and the email that allow him to summon the other senior managers to an emergency meeting. For, yes, the point of this STS analysis is that the relations that produce knowing locations, information, are endless. That they are materially heterogeneous. And, one way or another, they all have to be in more or less working condition if there is to be such a thing as a 'knowing location'. We're saying, then, that *knowing is a relational effect*.

Let's state this more formally. In approaching knowledge in this way we're using what one might think of as a *semiotics of materiality*. It is about *materiality* for the reasons we have discussed: because knowledge, power, and subjectivities are all produced in circumstances that are materially heterogeneous. This means, inter alia, that the distinctions between human and non-human, between ideas and objects, between knowledge and infrastructure – that all of these are seriously overdrawn. And it is a *semiotics* because it assumes that what is produced, together with whatever goes to produce it, secures its significance, meaning, or status not because it is essentially this way or that, but rather because of how everything interacts together. So Andrew is a managing director not because this is given in the order of things, but because he is at the centre of a network. The spreadsheet is a spreadsheet because it relates to him, his computer, the power supply and everything else in a particular way. If something goes wrong then Andrew isn't a managing director any more – and the spreadsheet is similarly no longer a spreadsheet. A semiotics of materiality suggests that objects, materials, information, people and (one might add) the divisions between big and small or global and local, these are all relational effects. They are nothing more than relational effects. Which is why it is so important to study how they are produced(10).

### **Knowing at a Distance, Acting at a Distance**

Here is another story about knowledge. It is more obviously about globalisation than the events in a laboratory, but it too is about material specificities. It's about the early stages of



the imperialist expansion that we mentioned above, the early stages of the growth of the world system in the sixteenth century. It is about the Portuguese route to India(11).

Though there are a few exceptions, most of the histories of the Portuguese expansion mention their ships and navigational tools as important but essentially infrastructural items, means to the Portuguese end of seizing the spice trade from the Venetians and the Arabs, indulging in holy war, or discovering previously unknown sources of gold(12). Like the props for managing directors, powerful people and information-gatherers there is a division between social actors on the one hand and important but essentially uninteresting furniture on the other. But as we have just seen, an STS semiotics of materiality refuses this division and prior judgement about what is important or not, and says that if we want to understand how knowledge is produced we need to look at the whole set of heterogeneous elements, human and social on the one hand, and non-human and technical on the other. So how does this work for the Portuguese?

The quick answer is that the ship, its crew and its surroundings (or the navigator, his tables and instruments, and the sun or the stars) need to be seen as a *continuous network*. If the different parts stay in place, if their relations with their neighbours hold them in role, then the network as a whole generates knowledges. For instance, the Portuguese navigator together with his instruments, astronomical tables, and appropriate sightings of (say) the North Star, could determine the latitude of the vessel(13). The whole network of elements, arrayed together, produced that (vital) knowledge. Other physical effects might also result. The vessel itself, its equipment, its provisions and stores, its crew, knowledge of how to catch the winds, to take advantage of the currents, how to steer a course, knowledge of location, plus charts – these were parts of a network which helped (if all the parts successfully held one another in place) to sustain a watertight and seaworthy ship rather than (for instance) a collection of drowning mariners and a mess of wood splintered somewhere on a reef.

The argument once again is that knowledge, objects and people (or 'subjects') are *relational effects* or *emergent phenomena*. STS writer and philosopher Bruno Latour has a very particular way of saying this. He talks of *immutable mobiles*. In this way of talking, the immutable mobile is a *network of elements that holds its shape as it moves*.(14) Indeed like a ship. Or, one might add, in cybernetic mode, like the electronic symbols, the bits and bytes of contemporary communication. So in this kind of account the vessel or the electronic symbol is a network that holds its shape and moves through Euclidean space(15). But, we could add, so too is the navigator-chart-instrument-table network (or the electronic network). Or, indeed, the chart all by itself.

Do networks of relations hold their shape as they pass through geographical space? This is the crucial (if oversimplified) question which links knowledge with space. Or, restated, do (sub)networks insert themselves into larger networks of relations which are sufficiently stable so that they hold their shape and may pass through geographical space? These questions are ways of talking both about *action at a distance* or domination, and about *knowledge at a distance* or surveillance. For if the Portuguese were able to control the spice trade for nearly a century, if they were able to bombard the inhabitants of Calicut into submission, if they were able to get to India and get back, then this is because they succeeded by luck or good judgement in generating an array, a global network, within which immutable mobiles might circulate. Such that if a command was given in Lisbon, then war might be fought in India. Such that if a command was given in Lisbon it was both heard and enacted in India.

'Action at a distance'. 'Knowledge at a distance'. A note is needed here about distance and about space. For this, as we noted in the introduction, is an important, indeed a vital, twist to the argument. We want to suggest that making action and knowledge at a distance not only makes action, knowledge and global asymmetry – though it certainly does all of these things. In addition we want, and somewhat counter-intuitively, to suggest that it also *makes distance or space*(16), performs these into being. Which means that distances and space don't exist by themselves as part of the order of things. But rather that they are created.

That's a simple statement of a counterintuitive notion. But what does it mean? Let's start to answer by thinking empirically. Here the story is that before the Portuguese got to work, Lisbon and Calicut (in India) simply didn't exist for one another. They were in separate worlds. They existed (as we are saying) in different spaces. So it was through their efforts that the



Portuguese turned Lisbon and India into places that, though they were distant from one another, were nevertheless in the same world, in the same space. Yes, it took many months to make the passage between the two in one of their vessels. Yes, it also took a lot of effort, time, skill and bravery to move from the Tagus to Calicut and back. It is because of this effort and the work involved in displacement that they were indeed distant from one another. But they were also distant *because they were connected together* in a single world rather than belonging to separate worlds.

We're saying, then, that locations which don't communicate with one another, which know nothing of one another, don't exist for one another exist in entirely *different worlds* or spaces. Like the Incas and the Arabs who, so far as is known, never communicated, never knew of one another. The argument is that *distance demands communication and interaction*. Its very possibility, *depends* on communication or interaction. It depends on joining things up within – and thereby *making* – a single space. And if this is difficult to see – if, for instance, it seems that the Incas and the Arabs really belonged to a single world, existed within a single geographical space – this is because geographical space has somehow come to seem natural. As if it were given. And because (for the case of the Incas and the Arabs) we have chosen to ignore the work of more recent historical geographers who have drawn them onto regions in a single world map. And because we have got so used to the work of the geographers together with the networks of trade, of air traffic control, of electronic links and all the rest, that we have come to experience the geographical space that it makes as if it were natural, something given in the order of things. Something that has to be that way. But we're saying that *it isn't natural*. Rather, geographical space, global space, is a material semiotic effect. It is something that is made.

Let's note that the same logic works for Andrew's office. It is linked to other locations on the globe, to be sure. It is located in a world-geographical space. But – and – this is because of the work involved in making and maintaining all the email, telephone and transport links which join it to other offices and laboratories around the globe. The work of keeping up the materially heterogeneous links which maintain the mobilities between places, and define their distances. The materially heterogeneous enactments and performances which create a global geographical space on the one hand and locations in that space such as Daresbury Laboratory on the other. Again, then, we want to say that the possibility of globality – and location in globality – is sustained in that work.

## Capitalisation 1

In this semiotics of materiality knowing, knowing at a distance, acting, acting at a distance, and the making of space, are all *relational effects*. And they are *materially heterogeneous* effects. Materials of all kinds are being disciplined, constituted, organised, and/or organising themselves to produce knowledges, subjects, objects, distances and locations. We might, with Foucault, note that this is the effect of a strategic ordering of elements. They could be ordered otherwise in which case knowing, location, and all the rest would be different. And then we'd need to add, again like Foucault, that strategy does not necessarily imply the presence of a self-conscious strategist. But this does not mean that there are not centres of accumulation. Places where surplus accrues. Places of profit. It does not mean, in other words, that what we are calling 'capitalisation' does not take place. So, crucial questions in the context of globalisation are: what can be said about accumulation? and how are asymmetries between the centres of accumulation and the rest generated?

There are several responses. Responses that have to do with the configuration of the heterogeneous material elements which make up the network of relations.

One has to do with *delegation*. 'Will you act as my agent at a distance? Will you stay reliable? Will you hold together? Or will you turn traitor, turn turtle, or go native?' In terms of a network logic of material relations these are the same questions. And they have the same logic as the immutable mobile. The issue is, will the configuration of bits and pieces that allow me to profit stay the same, or not? If the king issues an order to bombard Calicut, will it be followed through? Will the ships get there? Will the gunpowder stay dry? Will the crews follow their orders? Will they have avoided disease? If the answer to these questions is yes, then we are in the realm of immutable mobiles. If not, then not. And the same logic works for the laboratory too, albeit on a less dramatic geographical scale. Will the employees do as they



are asked? Will their instruments, their computers, bend themselves to the project? Or will they not?

Delegation, then, may be understood in a semiotics of materiality as a way of talking about the immutable mobile. Delegation is sending something out which will hold its shape – so that the centre does not have to do the dirty work itself. Which is, to be sure, not simply a moral but also a practical matter. If the King of Portugal or Vasco da Gama had been obliged to subdue the Indians alone and with their bare hands they would not have been up to the task. Delegation, then, is also something which works through a series of tiers. It is an arrangement in which you push the levers and something happens, something that magnifies itself in the next stage, and then again. (Think of the tiers of simplification and delegation implied in building a spreadsheet). And, crucially, it is also something that happens in a play between *different material forms*. For delegation into non-human materials – cannon, prison walls, marching orders – is often particularly effective (though there are no guarantees, and the integrity of physical materials is, itself, a relational effect.)(17)

But successful delegation, the successful creation of immutable mobiles, the capacity to know and act at a distance, has other asymmetry-relevant effects. Or it may be thought of in different ways. For instance, it may be thought of as the creation of what STS scholar Michel Callon calls an *obligatory point of passage*. For the obligatory point of passage is the central node in a network of delegation, so to speak its panopticon. The place of privilege(18). This, then, is a second feature of material relations which creates asymmetries.

In what we have written we have already come across two obvious obligatory points of passage. On the one hand there is Andrew-and-his-spreadsheet. And on the other, there is the Portuguese state and some of its officials and traders. Here is the argument. Those caught up in one or other of these networks of relations have no choice: if they want to move, if they want to achieve their goals, then they have to do so by making a detour. A detour via Andrew-and-his spreadsheet. Or via Lisbon-and-its-spice-markets. So the pepper growers in India can't sell their crop to the Arabs any more. The network of the Portuguese – their guns, their money – have cut the old links. If they want to make money then they are necessarily enrolled into the Portuguese network. They, or more precisely, their crops, make the long detour via the Cape of Good Hope and Lisbon to get to the European market. They then become faithful delegates of the (newly distant) Portuguese centre, tributaries no doubt held in place by fear and need rather than love or affection. But this makes little difference from a semiotic point of view. For held in place they are. Contributing their ha'pennyworth to the network, buttressing it, and at the same time adding to, further performing, its centre as an obligatory point of passage. As a place of privilege. A centre of accumulation.

But the same is happening at Daresbury Laboratory. Employees do not, for the most part, turn up in Andrew's office in person to receive their orders. Instead immutable mobiles emerge from this obligatory point of passage, delegates that faithfully perform themselves across the space of the laboratory. Such that the elements which make up the network of the laboratory find that they are being displaced, moved to work on new projects, acting in ways that they would not otherwise have done. Being enrolled to act as clients of (what has therefore become) a centre, an obligatory point of passage, a privileged location that can see and act at a distance. That makes the distance and masters it, all at the same time. So Andrew does not bend the workings of the laboratory by himself. He delegates to (what he hopes will be) faithful emissaries. And into other material forms – for instance in the shape of minutes, memoranda and pay checks. Just like the Portuguese monarch. Which tells us, as we already noted, that 'Andrew' (and the Portuguese monarch) is a heterogeneous relational effect rather than someone whose powers are given in his body.

Delegation and obligatory points of passage are crucial to capitalisation and its asymmetries. But these are also a play around *scale effects*. We've noted that distance is a product, an effect. Made and mastered in the creation of immutable mobiles. But delegation also makes spatial effects. For as we've hinted above, immutable mobiles passing to and from (and thereby creating) a centre also play havoc with scale. We will need to return to and revise the notion of scale below. But for the moment let's note that knowledge of distant events, distant actors, also implies that these are rendered small and simple. This is a version of the argument about power and delegation. Just as Andrew and the Portuguese monarch cannot do all the dirty work themselves, so they cannot know all about everything that goes on within



their networks, know all about the dirty work. But, nevertheless, and this is one of the features of power, in some general sense they *need* to know about it. Knowing at a distance, then, necessarily implies pretty heroic simplifications and reductions. And it therefore also implies pretty heroic manipulations of *scale*. This means that that which is large in the geographical sense, spread out over time and over space, gets reduced to a report, to a map (and the development of mariners' maps counts as an exemplary case here) or, in the case of Andrew, to a set of figures in a spreadsheet. Everything – or representatives of everything – are being brought to one place, all at one time. That which was big is thereby being rendered small. And, as it is being rendered small, it generates a capacity to see far for the privileged centre. And, crucially, it also generates a capacity so see what would otherwise not have been visible – indeed what would in some sense not otherwise have existed. Which is, to be sure, where we came in: with Andrew-and-his-spreadsheet and the discovery/creation of a delay that would otherwise not have been visible. A Foucauldian point, one that derives from attention to a semiotics of materiality.(19)

Delegation, the making of obligatory points of passage, and scale reversals – all these are configurational features of the asymmetrical networks of capitalisation which grow out of and produce immutable mobiles. Now we want to mention a fourth and final feature. This has to do with the production and concentration of *discretion*. To say it quickly: with the growth of action and representation at a distance there also grows discretion. To act, or not to act. To act in this way or, alternatively, to act in that. Empirically this is easiest seen for Andrew-and-his-spreadsheet. For he can see far enough – and he can successfully act in enough ways – that there are a *variety of courses of action* open to him. But how might we think of this in terms of the configurations of materially heterogeneous networks?

The STS suggestion is quite simple, and it has to do with the asymmetry generated between the centre (which becomes a centre because it is an obligatory point of passage for a series of tributaries) and those peripheral tributaries which are indeed peripheral precisely because they have no options, no choice. But, stood on its head, what this tells us is that it is probable (not certain) that *because there are many tributaries to the centre, the centre correspondingly has many options*. It has many alternative possibilities for acting at a distance, mobilising this rather than that tributary. The argument, then, has to do with redundancy. The centre enjoys the luxury of redundancy. For it, there are no obligatory points of passage in its heterogeneous networks. If one 'circuit', if one set of immutable mobiles gets choked off, goes native, is turned into matchwood on a reef with drowned mariners, then it can always act through another. Send another vessel (which, since the shipping losses on the Portuguese route to India were heroic, was a very common occurrence). Which is not, to be sure, a recourse that is open to the client who is forced to pass through an obligatory point of passage. Like the unfortunate ruler of Calicut and his spice traders.

Our topic is knowledge and globalisation. But it is also capitalisation and power. We will return to the issue of capitalisation and spatiality below. As we have noted above, spatiality needs to be rethought. We have offered some suggestions about this – to do with scale and the making of distance. In this section, however, we have particularly attended to features of the logic of capitalisation or accumulation as seen from the point of view of such a material semiotics. In insisting on *how* it is that knowledges and actions get generated and distributed to particular locations in the social world, and noting how these may be understood as relational strategies or features of the shape of self-sustaining heterogeneous networks, we have identified four crucial moments: *delegation* (which may take material forms), the creation of *obligatory points of passage*, play with *scale and size*, and finally the far from even distribution of *discretion*.

## Spatial Enactment

Distance, we have asserted, is made – and putatively mastered – all in the same moment. Lisbon and Calicut become places in a single space only when immutable mobiles such as ships shuttle between them – or, to bring the example up to date, with the growth of cartography, GIS, or the financial networks of the world. Until that moment they simply exist in different worlds. This is the crucial move if we are to understand spatiality – and the phenomena of globalisation – from the standpoint of a material semiotics. As we have argued



above, *space is made*. It is a creation. It is a material outcome. Like objects, places, or obligatory points of passage it is an *effect*. It does not exist outside its performance.

This step is at least as radical as the STS argument that materials may be understood as relational effects. It's a radical step because as we've noted above, notwithstanding twentieth-century excitements about the relativity of space-time, in six-hundred years of surveying, cartography, nation-building and GIS, the idea that there is (a single) geographical space has been naturalised for Euro-Americans. This means that it is very difficult to imagine space as anything other than some kind of a neutral container, a medium, within which places – like Lisbon and Calicut – may be located. And this in turn means that any attempt to challenge this picture is very hard work and runs against the grain of common sense. As is indeed suggested by the tropes about global space-time compression which, though they index a sense of variability in distance and speed, tend at the same time to re-enact this naturalised geographical view of space.

There are, to be sure, straws in the wind. The idea that space might be treated as a *performance* – and that geographical space as a neutral container or surface is likewise to be understood as an enactment – is being explored in parts of cultural geography as well as STS. One easy way of opening up the subject is to remember – as geographer David Harvey shows – that it takes a great deal of effort to create a map. Setting up triangulation points, trudging around France, educating the necessary surveyors, defining the length of the basic measure, assembling the appropriate instruments, making the actual measurements, transcribing them onto the flat surface of a sheet of paper – all of this is far from a trivial exercise. From an STS point of view it is an exercise in building a materially heterogeneous network – and of generating representations or immutable mobiles that may be brought together to make the depiction of a Euclidean space. For our earlier description of the heterogeneous engineering involved in knowing and acting in a laboratory – or at the centre of the Portuguese empire – applies just as much here. A privileged centre comes to represent what had never previously been brought together – or at least not in the form of a set of consistent spatial co-ordinates. To generate what (in the case of many cartographic conventions) is aptly called a 'view from nowhere.'<sup>(20)</sup> Which has then shown a progressive tendency to naturalise itself as some kind of 'objective space' within which we are all located.

Unsurprisingly, all of this is costly. It is a finding of STS that metrology – the making of metrication, of mensurability – is not a trivial exercise. And in the context of spatiality a number of writers – most notably David Turnbull as well as David Harvey – have noted the symbiotic link between that effort and the process of (European) nation-building<sup>(21)</sup>. Precise geographical maps are important for state power in various ways – for instance they define frontiers and create measures for (taxable) plots of land. They also, as we saw earlier, allow global domination. But the effort put into creating a measurable geographical space demands huge resources and, historically, this came in large measure from the early-modern European state. Knowledge and power as usual are associated with one another, sustaining and performing one another. But behind this important point hides one that is even more crucial if we want to understand the asymmetries of global knowledge and power. It is the proposal, rehearsed above, that rather than being given in the order of things, space, however naturalised it may seem, is always an effect or an outcome of materially heterogeneous relations. It is sustained and enacted in those heterogeneous relations. It involves a lot of work by all the elements bound up in and producing the network. It is precisely an outcome of a 'performance' that is not given in advance<sup>(22)</sup>.

## Multiple Spaces, Interacting Spaces, Capitalisation 2

So spaces are *made*. But if they are made, then how do we know that they are all the same? How do we know that they are all, for instance, geographical? That they all map onto one another in a nice neat way?

The answer is: *we don't*. And, indeed, there is no particular reason for assuming that they will map nicely onto one another.

Annemarie Mol has explored the possibility of such spatial complexities in a quite different context<sup>(23)</sup>. The argument runs so. If there were indeed a single space with objects located within it, then (as geographical common-sense usually imagines) cartography would be a



struggle to discover the co-ordinates of the different objects within that single space. If one looked at the process of mapping over time, one might find that mistakes were made, the process might be painful and slow, moving around might be difficult and expensive, but in the end some kind of consensus about the location of objects within that single space would emerge. The series of triangulations would, so to speak, be convergent.

This is an appealing story. First, it fits with our notions of common sense. And second, much of the history of cartography is indeed written in this mode: the discovery of continents, their location, the eradication of error, the definition of a single spatial set of co-ordinates (ending, no doubt, with the satellite global navigational system which can determine location to a within a few centimetres), and the elucidation of the relations between different systems of cartographic projection – it is a history of progress, a history which uncovers spatial reality. But it is a history that doesn't work so well if space is understood as an effect of material relations, of the performance of heterogeneous elements defined and linked together, rather than something which was already there waiting to be discovered.

So if space is being *made* and the history of globalisation from the early cartographers onwards is about the making of a single geographical space, then what needs to be said? The answer is that looked at in this way, a great deal of energy and effort has been put into the *creation* of a network of heterogeneous materials which *perform one particular version of* spatiality. This is a version of spatiality that has become so important that it has become an obligatory point of passage for many. As it has, indeed, for late twentieth century mariners who are no longer obliged to wrestle with sextants, star charts and tables of stellar and solar positions, but use satellite-based global positioning systems instead.

So what we're saying is that geographical space may have become an obligatory point of passage for many mariners (and others). But if the STS story about the performance of space is right, then it is nothing more than the effect of a particular well elaborated, well delegated, well-embedded set of heterogeneous material relations. This in turn means that it (and they) could be otherwise. Or (we suggest more radically) perhaps actually *are* otherwise. For notwithstanding the triumph of geographical space there are, we want to say, *alternative kinds of material relations and alternative kinds of spaces* which exist alongside geographical space.

Let's look at this empirically. Andrew sits at his computer and frowns at his spreadsheet. This is the product, as we have seen, of a materially heterogeneous set of relations. He can see far – some distance across the site of the laboratory to objects and events that are otherwise dispersed or invisible, but also some distance into time, into the future, perhaps a year or more. These are the variations in scale which we described above. Space – and time too – are being scaled down. There is 'space-time distancing'. Andrew, we might say, travels very fast through space and time, with his immutable but heterogeneous mobiles. He is disembedded.

But, though we used the language earlier, there is a problem if we put it in this way. For what are we doing if we say that he 'travels very fast through space and time'? The answer is: if we talk in these terms then we are naturalising what we have been seeking to de-naturalise in this chapter. In other words, we are buying into a specific version of space with its system of spatial (and temporal) co-ordinates. We are assuming that 'real distances' are given (for instance) in metres or kilometres. And (by analogy) that 'real time' is given in minutes or months. This is a way of talking which thus assumes that what is happening is a process of speeding up *within* a pre-existing space-time box whose co-ordinates have been set in the order of things. Obviously this is one possibility, but if we are serious in arguing that spatiality (we need to add temporality) are effects of materially heterogeneous enactments or performances, then we need instead to say something different. We need to say that the privilege of Andrew's location is a double effect. It is

- *the effect of the performance of a particular version of spatiality and temporality*, in which proximity or distance take a network form that has to do with the rapid transmission of immutable mobiles.

And it is also:



- *the result of the intersection of that network form of proximity with other and different spatial and temporal forms* – and in particular geographical distance and elapsed time.

Our argument is that it is the interaction between these two forms of space and time (the way in which what is close in one is distant in another) which generates the privileges which accrue to Andrew's location, his ability to capitalise. This means that what we're proposing is a reversal. Instead of saying that messages or information or action speed up within a single space and time frame, we are saying that several intersecting spatialities and temporalities get created. The fidelity of the immutable mobile – its immutability – is a network phenomenon, while its speed – its mobility – is an effect of network immobility within geographical space and chronological time. Can Andrew see things that those working on the project have not, cannot? Can he *act* 'at a distance' upon them, and bend their actions? If the answer to these two questions is yes, then they are tributaries to him – in because he is able to take a shortcut through network space. While the others do not see 'so far' so fast.

The same logic of spatial and temporal complexity applies to phenomena which are more conventionally global in character. The Portuguese, it is true, displaced the Arab merchants from the Arabian sea by means of military might as well as geographical speed. But they did this because their vessels, their crews, their cannon, had been assembled together into a network, a set of immutable mobiles, which made it possible for the Portuguese state to act at a distance. This located Lisbon and Calicut as distant points on the same world map, but meant that that distance was irrelevant. This was the creation, in other words, a new form of spatiality that was 'global' in scope, while the Arab merchants and sailors were being left to their own devices, with no state intervening on their behalf. Immutable mobiles their vessels may have been – but only up to the point where they met the first ruthless European navigators, with *their* own networks of immutable mobiles and their own complex versions of spatiality. At which point the Arabs turned out to be infinitely distant from their home ports, infinitely distant from the support they might have wished – and therefore no longer immutable mobiles at all.

## Conclusion

We have made an argument about the links between materiality, information, spatiality and capitalisation which runs, in summary form, like this:

- It is a mistake to talk of knowledge, global networks and flows, or sociality, without at the same time noting that these are always *materially produced* in specific and local circumstances.
- It also is a mistake to imagine that materials are passive while people are active. Instead materials (human, textual and technological or artefactual) define one another and hold one another in place. All, in other words, contribute to the performance, *human and non-human* alike.
- If this 'semiotics of materiality' is accepted, then there are no fixed distinctions between (say) humans and non-humans, or between subjects and objects. Instead, effects – including objects, subjects and knowledge – are all produced within *heterogeneous relations*.
- Material relations of various kinds are enacted and performed and take various forms. Here we have concentrated on *networks* which have their own (often implicit) strategic logic.
- This logic displays various features. One is that knowledge or information depends on, indeed are close to being co-terminous with, the existence of *immutable mobiles*.
- Other features of networks that tend to produce and enact economic and informational asymmetries include *delegation* into more durable materials, the creation of *obligatory passage points*, the generation of *scale effects*, and the production and variable concentration of *discretion*.
- As the mention of scale suggests, the relations produced in materially heterogeneous performances also have *spatial and temporal effects*. Networks produce geographical



spaces and the distances that make this up on the one hand, and chronological time and the metrics for measuring this on the other.

- If spaces and times are created there is no particular reason why they should be consistent with one another. Indeed, though we have only talked about network and geographical spaces here, it seems likely that *spaces and times are multiple*.
- Finally, important economic and informational asymmetries are also generated in the *interaction and interference between different spaces*. In particular, networks not only produce geographical space but they also allow rapid movement through geographical space – with consequent control and competitive advantage. This advantage may precisely be understood as an intersection between network and geographical space.

### **Afterword: Capitalisation and Spatial Interference**

Capitalisation, the ability to make and sustain an obligatory point of passage is an effect of heterogeneous materiality. It is an effect of the relations built up between different elements. Indeed as we earlier noted, there is a whole literature on what one might dub the cybernetics of capitalisation(24), competitive advantage, and the circulation of capital. This celebrates the importance of speed, or the immutable mobile in the form of the turnpike, the clipper, the steam packet, the telegraph, the printing press, the telephone and now, to be sure, the internet. Or then again, it attends to the capacity of the obligatory point of passage to process the information that it gathers, in the form of the invention of bureaucracy, of double entry book-keeping, of files, of mainframe computers, of post-its, of networked PCs, of data-bases and spreadsheets.

But to this literature we now need to add the ways in which different cybernetic systems, different obligatory points of passage *intersect* with one another. And, in particular, the ways in which the different spatialities and temporalities which they perform intersect with one another. For if capitalisation is about making obligatory points of passage, it is also about how networks draw from the efforts of neighbouring networks – while in turn protecting themselves from the depredations of their neighbours.

The gist of our argument is that capitalisation has to do with interactive effects – new and complex relations between networks which cannot necessarily be conceptualised as networks themselves. And there are various ways of imagining these. Feminist STS scholar Donna Haraway talks of diffraction effects and ‘interferences’(25). STS philosopher Annemarie Mol talks topologically (in which case Cartesian regions and networks become two topological possibilities to which others – for instance fluids – may be added)(26). One of the present authors, Kevin Hetherington, has imagined these interactions in terms of the generative function of a ‘blank figure’, like the zero point in the grid of Cartesian space (or an arithmetical series), in which case that zero is both within and outside the space in question(27). One may think, with philosopher Gilles Deleuze, of the fold and the shortcuts that folding make possible(28).

Such theoretical registers take us beyond the scope of the present chapter. But however it is conducted, the thrust of our argument is clear. If we attend to a material semiotics and the performed spatialities that this implies, to talk of ‘globalisation’ is at best a risky short cut and at worst seriously misleading. It is a risky short-cut because it implies some kind of totality, some kind of global system, and some kind of overall space-time box within which the phenomena which we touched on at the beginning of this chapter are located. A ‘global society’, a ‘global order’. Even a global disorder. But this misses out, or so we have suggested, both on the enacted materiality of that order and also the complex spatialities implied in that enactment. These, or so we suggest, need to be understood if we are to make sense of the asymmetries involved in making obligatory points of passage and the process of capitalisation.

### **Notes**

\* A number of friends and colleagues have helped us to think about materiality and spatiality. Important amongst these have been Bruno Latour and Annemarie Mol.

1. The term derives from Immanuel Wallerstein. See his (1974).



2. See, for instance, John Urry's (2000).
3. The terms 'distanciation' and is drawn from the work of Anthony Giddens and that of 'disembedding' from David Harvey. See (Giddens 1990; Giddens 1991; Harvey 1989).
4. For a brief account see Manuel Castells' (1996).
5. See, for instance, James Beniger's (1986).
6. See Nigel Thrift (1996).
7. See Kevin Hetherington (1999).
8. This case study is explored at greater length in John Law (1994).
9. Since the term 'network' has wide currency in social science (in the context of globalisation see, for instance, Manuel Castells' (1996) ), it is important to emphasise the semiotic specificity of the way in which we use the term here. It derives from a body of work sometimes called 'actor-network theory' elaborated in the first instance in the sociology of science and technology. For an introduction to the approach see Bruno Latour (1987) or John Law (1992) and the annotated bibliography maintained at <http://www.comp.lancs.ac.uk/sociology/antres.html>. For a current assessment of the approach see the papers in John Law and John Hassard (1999).
10. Semiotics is a branch of linguistics which says (to put it quickly) that the meaning of words depends on their relation to other words. That (for instance) 'man' acquires its meaning in relation to such other words as 'woman', 'boy', 'wimp' or 'ape'. STS - and some other similar approaches including the work of Michel Foucault, parts of feminism, areas of cultural studies concerned with the built environment, and parts of cultural geography extend this beyond words to say that objects and subjects (including people) - that is, all materials - have the attributes that they do as a result of their relations with other materials.
11. See John Law (1986; 1987)
12. There is a corresponding literature on those means in the beautiful ghetto of maritime history. For an example of a book that considers both the exploration and the maritime technologies see Diffie and Winus (1977).
13. The longitude was beyond the reckoning of the Portuguese depending, as it does, on very accurate timekeeping.
14. See Bruno Latour (1990).
15. Putting it this way is a convenience. As we note below, space needs to be imagined as a relational effect.
16. Makes it. And vanquishes it. In the same breath. Unless, of course, something goes wrong, in which case distance, which has been made, is indeed not vanquished.
17. For a review of materiality in this mode see John Law and Annemarie Mol (1995).
18. For discussion of the notion of obligatory point of passage see Michel Callon (1986).
19. The relevant reference is obviously Discipline and Punish (Foucault 1979), but see also Paul Rabinow's (Rabinow 1989) and David Harvey's (Harvey 1989).
20. This argument has been developed within feminist STS studies. See Donna Haraway's (1991), and (in a different and art-history context) Svetlana Alpers' (1989).
21. See Harvey (1989) and David Turnbull's forthcoming (1999).
22. See Kevin Hetherington (1997b).
23. See Annemarie Mol's (1998; 2000).
24. For an enthusiastic example of the genre see James Beniger (1986) and also, to a lesser extent, Thomas Hughes (1983).
25. See Donna Haraway (1997).



26. On fluids and networks as different topological metaphors see Annemarie Mol and John Law (1994), and Marianne de Laet and Annemarie Mol (2000).

27. See Michel Serres (1991), Mark C. Taylor (1993), David Appelbaum (1995), Kevin Hetherington (1997a), and Kevin Hetherington and Nick Lee (2000)

28. See Gilles Deleuze (1993); and Michel Serres (1988).

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