Care-ful Research: Sensibilities from STS

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Abstract

Science and Technology Studies (STS) suggests that that research is created within iterative and uncertain down-to-earth practices and cannot be rigidly designed. This entry therefore argues for an alternative care-ful approach to research which starts with concerns and articulates researchable questions by cultivating appropriate sensibilities. These are discipline-specific, and for STS include sensitivities to: material heterogeneities; webby relations and logics; non-coherence; otherness; normativities; and politics. To culture sensibilities implies the simultaneous creation of insensibilities in which other features of the world become difficult to detect or invisible. This also suggest the importance of cultivating research modesty, the willingness to be blindsided by the unexpected, and a sensitivity to the performativity of research.

1.Introduction

Science and Technology Studies (STS) explores how knowledge and artefacts are shaped by and in turn shape the social within down-to-earth and somewhat unruly practices. Almost entirely qualitative, over time the approach has been extended to many other areas including health care, bodies, subjectivities, organisations, political structures, geographies and environments. In part because it argues that all forms of knowing – including social science – unfold in iterative and uncertain practices, STS usually develops its theory through case studies of practice. And since practices do not follow simple rules this suggests that the extent to which research can be designed or guided by firm rules for its proper conduct is limited.

This does not mean, however, that we cannot make a stab at creating good qualitative research. In this entry we attempt this by offering an STS alternative to design. This we call care-ful research. We argue that good research of any kind reflects the iterative development of appropriate concerns, sensibilities and research questions. We lay out a particular (material-semiotic) STS version of those sensibilities which include openness to material heterogeneities, webby relations, non-coherence, otherness, and normativities and politics. We also discuss the fact that sensibilities always imply insensibilities. Throughout we mimic the unfolding character of STS practice by making our argument through case studies. These we mostly take from our own research. This is not because what we write is best. It's simply because we know all the gory details of its unfolding practice. Note, then, that this entry is emphatically not an introduction to STS either empirically or theoretically. (You'll need to go to a Handbook or an overview for that (Felt et al. 2017; Michael 2017).) It's an STS-based argument about sensibilities and the conduct of care-ful research.

A final introductory note on textual organisation. The case study snippets are in blue boxes. In the square brackets at the end of most boxes we offer further citations. These are chosen to illustrate the character of care-ful research and are mostly on quite different empirical topics. And finally,

rather than laying down rules for good research (we don't think that this can be done), we articulate research-relevant questions which we summarise in brown boxes.

2.Concerns and Sensibilities

Why am I doing this research? General though this question is, we cannot imagine good research in the absence of some kind of implicit or explicit response. We have to have reasons for doing what we do. One way of thinking about these is to treat them as concerns. To talk of concerns is to point, in a way that is neither specific nor necessarily particularly academic, to whatever it is that might be important or relevant or interesting, or worrisome (sexuality, populism, economic inequality, fake news, global climate change, pandemic?) It is to point to whatever lies behind the initial impetus to research. There is no right or wrong here: different researchers have different concerns. But our point is that explicitly or otherwise, concerns structure what we notice in the world, how we take it to be, what we think are the burning issues, and how we think the world should be. They inform research and give it a rationale.

But uneducated concerns are not enough. To be concerned about gender inequalities or neocolonialism does not define a researchable topic. Here is our next point. To do research is to find good ways of educating, articulating and giving shape to concerns. To make them researchable. (A concern with gender inequality becomes a specific research topic.) And this is a process that forces us to answer questions such as these. Do my concerns actually make research sense? How might I specify them to create a researchable issue or topic? Does it turn out that I need to reshape them? And if so, then how? Am I starting to see things that I did not see when I started? Do I need to narrow what I am seeing and what I want to know? And again, if so, then how? These are just sample questions, there are lots of others, and they reflect the iterative and somewhat unpredictable character of research in practice.

To articulate concerns is to also educate the sensibilities by learning to see and attend to things in research-productive ways. Again, the term is deliberately vague because educated seeing and hearing grows not only out of formal training and the important business of learning specific proficiencies. It also reflects the acquisition of much less specifiable embodied skills. So how to educate the sensibilities? Here again there are no regulations, just rules of thumb. A short list might include technical and disciplinary training. (How to write a questionnaire or conduct an interview.) The acquisition of social skills. (How to be with people in the course of fieldwork.) Cultivating the art of observing what might be significant. (How to be selective.) Learning how to take notes or records. (How to do this in the pouring rain when both your hands are full already?) The acquisition of the skills needed to pick through and organise unwieldy piles of material. (We'll let you into a secret: there is no perfect solution to this.) Cultivating the ability to write, even to write beautifully. (This includes knowing who we are writing for, the kind of difference we hope to make for whom, and how.) And learning the blessed art of reading well. (How have other authors worked and written? Why is this piece inspirational? Or what's the problem with it? What can we learn from it anyway? And where else might we find inspiration?)

When John was beginning, he puzzled over an American approach to geology called particle size analysis. Unlike stratigraphy, this measures the size of the grains of sand and pebbles in sedimentary

rocks. (In stratigraphy geologists look at how different kinds of rocks are laid down on one another.) What was the significance of this geological difference? Then he read a classic text by Karl Mannheim on conservative thought. Mannheim (roughly) says that German nineteenth century conservative thought was holistic, arguing that it is dangerous to mess with the body of society because society not just a collection of individuals. Suddenly there was a moment of inspiration. Perhaps stratigraphy was 'conservative' because it was holist, whereas particle size analysis reflected (American?) atomistic individualism.

This may or may not be a good intuition, but it tells us something about educating the sensibilities. Mannheim's writing has nothing to do with geology but turned out to be a source of inspiration. Perhaps the lesson is also this: read widely! (A good place to start might be the STS Handbook, (Felt et al. 2017).)

There is no one right way of thinking about the education of the sensibilities. But to do care-ful research is to work iteratively with concerns, to adapt and sharpen them as sensibilities, and turn them into researchable questions. It is to learn to think and see and feel and write in quite specific ways. It is also to learn how we want to make a difference with our research, again in quite specific ways. So, this is our first pitch. Different ways of doing research (disciplines? Sub-disciplines? Topics? Locations?) demand the education of different sensibilities.

Methods 1 Starting Questions

- Why am I doing this research? What **difference** do I hope to make?
- What are my **concerns**? Are they well-judged? Productive? How can I speak to them?
- How can I **articulate** my concerns? **Educate** them? Turn them into researchable **questions**? Do I need to **change** them?
- What are my **resources**? What am I (not) reading? And why? Is this broad enough? What other skills do I need? Where am I going to find them?

3. STS sensibilities for care-ful research

3.1 Vulnerabilities

Educating the sensibilities is slow and takes effort. It is unpredictable and iterative, and the extent to which it can be programmed and planned is uncertain. And (perhaps this isn't quite right, but we'll say it anyway), care-ful research never discovers what it originally expected to find. It expects to be blindsided.

Another research project. In the early 1990s John spent an ethnographic year in a large British physics laboratory. The concern was political. In an era of neoliberal government, the issue was: how was a preoccupation with market-like disciplines affecting (distorting?) science? The research plan was to see how performance indicators (numbers of papers written and all the rest) worked in practice. This plan came to a full stop in week one. It turned out that no one was in the slightest bit interested in performance indicators. (Law 1994)

What should we call this? A discovery? Empirical blindsiding? A process of learning? No doubt all three. But the irruption of the unexpected also happens in more radical ways.

Much later Wen-yuan invited John to lecture on STS in Taiwan. John told his audience that social structures are messy and multiple. He argued that social theory should to be open to that mess and stop pretending that structures are neat and tidy. A member of the audience politely disagreed. That might be fine in the UK, he said, but in Taiwan the problem is quite different. Describing a chaotic large-scale religious event, he said that we have too much mess in Taiwan. Too much chaos. What Taiwan needs, he said, is a way of thinking about how to order things sensibly. (Law and Lin 2011)

[See Helen Verran (1999) for a messy but productive encounter between two ways of counting in a Nigerian classroom.]

There is nothing here that would surprise an anthropologist. But, at that time John was not sensible to this possibility: that other worlds might be profoundly different in ways relevant to the framing of research methods. Be motivated by utterly different concerns.

Observations. Unlike the absence of performance indicators in the lab, this was not empirical blindsiding. Perhaps it was empirical-cum-conceptual-cum-political blindsiding. At any rate, it was a stark 'reminder' that ideas and theories and methods and concerns don't necessarily travel. And/or that knowledge is situated and works in particular ways in particular circumstances (Haraway 1988). And/or that others are different. There's a lot happening here. But for the moment this is our suggestion. Care-ful research is experimental but it is not just experimental. Instead, it prepares itself for the possibility that it will be thrown completely off track; that it may need to revisit and re-organise its concerns.

3.2 Materials

Care-ful research educates and re-educates its sensibilities. But what do people in STS sense out in their research? What do they take to be significant? Different STS scholars will give you different answers. No discipline is monolithic. But first on the list for us is a profound sensibility to materials.

John did fieldwork on salmon farms in Norway with anthropologist, colleague and friend, Marianne Lien. One day they visited a salmon hatchery, a large cool hall filled with big circular tanks and pipes. Here fertilised salmon eggs were incubated. Marianne talked with the woman working there. It was a lively conversation – in Norwegian. John's Norwegian is poor, so while they talked, he wandered round the room. After they left John said to Marianne: 'Goodness me, the pipes in there were amazing!' 'What pipes?' said Marianne. (Lien and Law 2015)

[See Michel Callon (1986) for a conflict in which he traces the links between 'materials' like fisherpeople, scallops, objects like nets, and scientific knowledge.]

The joke is not on Marianne. (John's lack of Norwegian was disabling.) Our point is that different disciplines educate different sensibilities. We've already seen that anthropologists are sensible to difference and to otherness. But STS researchers are almost always tuned into materials. The world

is not only pipes or tanks or walls or machines (people exist in the STS too), but attending to such materials is a core STS sensibility. It attends (see next box) to material heterogeneity. ('Heterogeneity', because there are many different kinds of materials.)

In the laboratory John was interested in 'materials.' He talked with people. He collected texts (agendas, minutes, budget spreadsheets, technical drawings, publicity materials, scientific reports, papers, instruction manuals; and printouts of raw data.) He looked at the architecture (there were many buildings). He attended to technologies (like machines and pipes.) He was interested in how all these operated. What they were for. And what they did in a larger sense.

Here's an example. There were high voltages in the laboratory and intense x-ray beams. It was a potentially a very dangerous place. Made, however, less dangerous by screens and fences and doors separating people from hazards. Doors with interlocks. If you opened the wrong door the power turned off automatically. The experiments crashed but you didn't get fried. (Law 1994, 143ff).

[See Bruno Latour, writing under a pseudonym, for the social actions of a door-closer (Johnson 1988).]

STS people debate how to think about materials. But almost without exception they attend to them. Often, they say (we develop this thought below) that 'the social' only holds together because other materials are caught up in it. This means that they are curious about the heterogeneity of those materials and the work that they are doing in relation to human goings on. Like, for instance, the work being done by budget spreadsheets (paperwork) to shape the organisation of the laboratory. Or those doors (a part of the architecture) which are doing various things, but in part materialising health and safety. For in so doing they are actively participating in one of the 'right ways' of running a laboratory (a good lab is also a safe lab). They are normative doors, not just material doors.

3.3 Normativities

STS is particularly sensitive to the values, the normativities or the politics embedded in materials.

Feminist STS scholar Donna Haraway describes a 1920s diorama in the American Natural History Museum. This shows a group of five gorillas set against an Edenic (supposedly Congolese) background dominated by a large male silverback, towering above them in a threatening pose. Haraway is doing a lot of analytical and political work here. (Please read the book, it is fascinating.) But one of her arguments is that this diorama depicts (what is taken to be) the natural order. What we are seeing, then, is a 'natural family', an organic whole, protected by a dominant male. (Haraway 1989)

[See Stefan Abrahamsson et al. (2015) for the conflicting normativities attached to omega-3.]

Here the materials are proposing a normative or political version of the world. Most obviously (there is a lot more going on) proper order becomes the heteronormative nuclear family. Haraway's own critical concern is to explore this and show that it is not 'natural': that domestic arrangements don't have to be this way. But normative and political concerns also run through the other cases that we

have touched on. The failed search for performance indicators in the laboratory was motivated by resistance to a politics that was (taken to be) undermining science. And the passionate argument in favour of mess that met resistance in Taiwan was motivated by a horror of the idea that there is one right way of doing social science research.

Most social sciences are more or less explicitly interested in the political and the normative. STS is particularly sensitive to how the materials of the world do this. And how alternatives might be imagined.

3.4 Associations

In this STS way of thinking materials buttress or undermine particular normative and political ways of ordering the world. But there is more to say about materials. Some STS people would disagree, but many say that materials are part of 'the social' too. So STS people often explore not only what materials are doing but also how they associate, as it were socially, with one another.

Primatologist Shirley Strum taught STS scholar Bruno Latour that baboon troops are hierarchical. Usually there is a dominant male who asserts himself physically. Snarls. A looming presence. That's what keeps him on top. But here's his problem, he needs to assert himself again. And again. And again. Hour after hour. Day after day. In the world of baboons there is no rest for the powerful male. Why? Because his body is his only material of domination. There's nothing else. No guns. No walls. No rules and regulations. No police force. No paperwork. No spreadsheets. No doors.

Now step back and ask: what would human society look like if we took away the materials? If it was just bodies, say, and language? Would the managers be able to manage? How powerful would the powerful be after the death of materials? (Strum and Latour 1987)

[See Marianne De Laet and Annemarie Mol (2000) for a different take on the heterogeneous extension of the social.]

Here we see a sensibility to heterogeneous association and how it holds together, for instance, hierarchically. Thinking in contrasts helps here. Baboons versus managers? Their differences are instructive. But looking at materials is trickier than it sounds. Why? Partly because, by and large, they don't look very interesting. A diorama of gorillas is exceptional, but a wall is a wall is a wall. Some walls attract attention, but most don't. They just stand there. Likewise doors. Here's the problem. Unless we are careful, most materials disappear into the background even when they are crucial to the associations of the social. Care-ful STS research teaches us to see that the mundane and brute is also lively, active, interesting and surprising. So how is this done? Various answers. We read (baboons and managers.) We practise looking at materials (all those pipes). And we return, again and again to the same nagging question: what are those materials up to (those spreadsheets, those interlocks?) Why are they more interesting than they might seem? How do they relate to other people and things? What are the associations? And what are the stories they might have to tell about those associations?

3.5 Webs

STS also sees relations. This runs through what we have been saying above. Managers are managers because they are part of a materially heterogeneous web. Health and safety regulations come in the form of interlocking doors. A gorilla diorama re-enacts the nuclear family. So, this is another STS sensibility: the sense that things (objects, people, texts, ideas, social structures, animals, natural phenomena) are shaped in a web of relations; more strongly, they are a web of relations.

The ships used by the Portuguese to create their empire were webs. John treated these carracks as networks of: hulls, masts, bowsprits, sails, spars, ropes, caulking and tar; deck hands, officers, bosuns and navigators; supplies and stores and places to rest and a galley. The argument? If you took something away (masts or fresh water) sooner (no mast) or later (no fresh water) you no longer had a working ship. (Law 1986)

[Webs may fail and then be re-ordered. See Uli Beisel and Tillmann Schneider (2012) for an ambulance that turned into a collective taxi]

This is the STS sensibility to 'relationality' (sorry, an ugly word). STS researchers wonder how bits and pieces weave themselves together to make something that holds (or not) to make a (normative) order. In the jargon, an 'actor' is a 'network'. You just have to look carefully and, if necessary, turn up the magnification. A sailing vessel? It's a web of relations between bits and pieces. But you can do the same for each of those bits and pieces. A mast is a web of wood and pins plus the tools and the skills of carpenters. And the same happens if you reduce the magnification. A mast is not a mast unless it is part of the weave of the vessel with its spars and its rigging and the skills of the sailors. A hull becomes wreckage if the vessel founders on rocks. And the navigator is just a passenger without his instruments. To approach anything in STS is to attend to how weavings create objects, people, texts, and proper relations – versions of the good and the bad. It is to know that it is possible to discover weavings all the way down – and all the way up. But how far should we spin those webs?

The Portuguese carracks carried guns to use on rival traders and recalcitrant locals. A working ship needs enough depth of water to sail in. The winds are part of the web (sails 'catch the wind'.) The currents too. And since it mustn't get lost, the web of the ship patches in navigational instruments too. So it weaves in the sun and the stars like Polaris, the north star. (These are 'sighted' in navigation.)

[For the idea that technical webs reach far see Thomas P. Hughes (1979) on electric power. And on scientific webs (though in a different idiom) see Steven Shapin (1984).]

In the webs of science (where knowledges are webby effects done in practices (Latour 1998)) Polaris is millions of light years from earth. But like the currents and the winds, it was a crucial part of the Portuguese weave. Polaris – or more correctly, its altitude above the northern horizon – was crucial to navigation. (It is a way of determining latitude.) So the sensibility says: don't stop with people and talk, don't stop with devices or technologies and don't stop with texts. Just keep on going. Follow relations. See where they lead you. If they take you to Polaris, then so be it.

But here's the challenge. If the webs go on for ever, when do we stop? Perhaps there are two main answers. One is purely pragmatic. We stop when we run out of time and resources and patience. (Let's be honest, in research this happens very often.) The other is more 'respectable:' we stop when we think we have answered the research question. Or perhaps (we're doing care-ful research) when we realise that it was the wrong question. So 'good research' is research that also speaks to our concerns and/or our questions.

What informed the research on Portuguese ships? Four concerns at least. One: to show how power was enacted and projected. Two: to show the importance of heterogeneous materials in ordering the weaves of world. (These we said above.) Three: to show that weavings may be macrosocial, imperial, and global. That this way of thinking is not just microsocial (which is what the critics said.) Four (this overlaps): to show that the macro and the micro work in the same way; that power is an effect of webs of relations at any scale.

The Portuguese study may or may not be good. But John stopped tracing the webs when he thought that those four concerns had been addressed. For better or for worse, in this study the 'Oriental' other was – othered.

[Cristóbal Bonelli (2012) explores how drugs erode indigeneity. Marisol de la Cadena (2010) looks at mountain-gods. Both speak to postcolonial concerns.]

3.6 Fragilities

STS is sensible to the uncertainties and the fragilities that go with processes. Think of the baboons. Hierarchy depends upon the body. It is a moment-by-moment achievement. Whereas, managers manage partly because materials such as spreadsheets are woven into the webs. But non-human materials are fragile too. Many Portuguese ships never made it back. Here's another example.

On the salmon farm in the fjord there are big round pens. Here millions of salmon grow before being slaughtered and sold. If all goes well this is profitable. Mostly, when Marianne and John were there, things went well. But the fish farm web is pretty fragile. It's like a daily struggle against entropy. Here are four of the things that may go wrong. One, if the nets get torn the fish escape. (Costly, and bad for the wild salmon gene pool.) Two, if the fish contract diseases or attract parasites they don't grow or they die, and they may infect wild salmon. Three, if these things happen the state may prevent farming. And four, if the price for salmon drops it becomes uneconomic. (The Chinese stopped buying Norwegian salmon when the Nobel Peace Prize was awarded to dissident Liu Xiaobo in 2010.) (Law 2006)

[Another failure: Bruno Latour (1996) on Aramis, a personal public transport system, that failed.]

Webs do not necessarily hold. Things that look solid aren't because the relations that make them up are processes, and those processes have to keep going. If they don't, then everything starts to unravel. In this sensing of the world, nothing is really secure, so STS asks 'how questions.' How did the Portuguese dominate the Indian Ocean for a century? How did this physics laboratory hold together? How did that fish farm keep entropy at bay? To put it differently, the sensibility is one of

educated awe. Or (yet another way of putting it) it is a way of thinking of the world in verbs, not nouns, of turning thing-nouns into process-verbs.

Another observation. STS is therefore sensitive to the contingency of things. At least in principle, they do not have to be the way they are. Biology, the feminists said, is not destiny. For STS realities are not destiny. Likewise, arrangements and hierarchies (Haraway 1991). Which is not to say that it is easy to create alternatives. It is not.

Methods 2 Questions about sensibilities

- Am I **vulnerable**? Am I open to being blindsided? How am I going to learn?
- What are the **materials**? And what are they doing **normatively** and **politically**?
- What would people be **without** other materials? Would **social structures** be possible in their absence? What would **power** look like?
- **How far** do I need to trace the weave of the world I'm looking at? Have I responded to my concerns?
- Have I sensed the potential **fragility** of webs? The effort of keeping things going? Have I asked '**how questions**'?
- Have I thought about **alternative ways of weaving the world**? And the role of my study in this?

4. In/sensibilities for care-ful storying

4.1 Multiplicities

STS sees webs and weaves. But what of the 'logic' of those webs and weaves? We have touched on this above. Can a door also be a health and safety object? Yes, potentially. But things may be woven into several logics. Or (more abstract), perhaps there isn't a single logic, a single structure running through the weaves at all. And, (is this yet another sensibility?), it's also okay to say this. To imagine that in practice social webs are not necessarily coherent. This is multiplicity (and the moment that John got into trouble in Taiwan.)

In the physics laboratory John asked about the history of one of its biggest machines. This was running fine but getting it to work had been a nightmare. One manager said: 'Yes, it was slow and there were teething troubles, but it's always like that with big new projects. We just kept working at it, and in the end we solved the technical puzzles and we got it working.' A second manager told a different story. 'It was a catastrophe. There was no real leadership. It only started working when they brought in the 'cowboys' – a whole team of new managers.'

Suddenly it was clear: there were two stories, two histories, and two logics. One was incremental and professional. The other was heroic and managerial. And they were running alongside one another. Perhaps, then, the organisation and its history were neither one nor the other. They were both. And both needed to be told.

In the final version John found four different logics. Each structured the world in its own particular practical and normative way. One: performance-oriented managerialism. (The challenge and the good: deliver to cost and time; take responsibility.) Two: a Weber-like bureaucratic commitment to administration. (Do things properly and legally. No fingers in the till.) Three: a Kuhn-like technical professionalism. (Solve the technical puzzles; do this rigorously.) And four: a charismatic visionary logic. (Pursue, achieve, this vision. Due process is much less important.) The laboratory, or at least its management, was all of these logics. (Law 1994, 73ff)

[Ingunn Moser (2008) who contrasts biomedical and care-related logics in dementia.]

This STS sensibility to multiplicity, comes in two parts. First, it goes looking for 'logics' (we use the word informally) woven in and through materials, texts and people. Logics in the plural. If someone says, 'there is only one logic' STS says 'no.' Though it knows, too, that the logics we see also depend on our concerns. (There was gendering in the lab but it wasn't the focus of the study.) Second, it asks how the logics interact. Do they support one another? (Entrepreneurs need administrators to pay the bills.) Do they undermine one another? (Entrepreneurs and charismatics don't like the 'paperwork' of administration.) Do they get all ravelled up together? (Administrative health and safety doors protect people and they keep experiments going too.) How are they negotiated? Or do they simply pass one another in the night? And the final political question: are some of these logics to be preferred? At least under certain circumstances? (Haraway 1991; Mol 2002; Mol 2008).

4.2 Partial perspectives

So there are multiple logics but what we notice also reflects our concerns. The message is that the weaves we see lie somewhere between the practices we are looking at and those of our own research. But there's another way of saying this: that to educate sensibilities is also to educate what we might think of as insensibilities. Necessarily, to look well is to look selectively. It is to learn, implicitly or otherwise, what can and should be ignored. (Pipes, the idea that mess is not to be celebrated.) We are back to blindsiding. About what we are not seeing, and what happens when it comes into view.

How did the Portuguese, a minor nation, dominate the Indian Ocean in the sixteenth century? You can answer this question in many ways, but John looked at the material webs that made ships – and empire – possible. So the story is selective. That's in the nature of research. But in the focus on materials, he left out God. The Portuguese used to say, 'If you want to learn how to pray, go to sea.' And God was central to sailing a ship in the early modern Christian world. One vessel in three never returned.

[See Brian Bloomfield and Theo Vurdubakis (1999) on the absence of God.]

Sometimes to ignore is simply not to notice. Walls or pipes don't look interesting. Or God, who may not feature large in the secular imagination. These got overlooked. But sometimes, to ignore is not just a question of not noticing. It's more like repression. Whatever is not being seen actively doesn't – perhaps cannot – fit the research concerns or sensibilities. Like the possible undesirability of mess. Or this.

John did not think much about colonial others: the Arabs displaced by the Portuguese; the people of Calicut bombarded into submission; or the long-term effects of colonialism in what are now Indonesia and Taiwan. Instead, he was concerned with 'the Portuguese expansion.' How these flimsy ships made it to the other end of the world and back, and how the Portuguese empire grew as a result.

This is something like repression. The alternative, the other, the world from the point of view of the Arab merchants or Calicut inhabitants, was pushed out of sight. Othered, it did not fit with the concern.

[See Dipesh Chakrabarty (2000) for an historical account of the colonial repressions in European scholarship. And Anna Tsing (2014) on the moment she realised that a 'mushroom sociology' is possible.]

To educate sensibilities is to cultivate insensibilities. That is how it is. We may complain about particular omissions or repressions, but it makes no sense to complain about selective blindness in general. All we can do is to recognise it. But then what? One answer is not to get paralysed. We cannot see it all. Another has to do with modesty: to recognise that there are always other stories to be told, that everything we know is 'situated' (Haraway 1988). To recognise that others will tell different stories (Haraway 2019). Or, indeed, that we may find ourselves telling different stories because our circumstances, concerns and sensibilities have changed. (Though to tell a different story is not necessarily to say that the original was bad.)

4.3 Seeing double

The sensibility to multiplicity unfolds in many different ways.

Wen-yuan has interviewed many Chinese doctors. Some work in their own clinics, and others in big hospitals. Dr Hsu works in a hospital. He is also a university professor and does laboratory research.

Talking to Wen-yuan he points to his scientific papers. Most are in good English-language journals. At the end of the interview, he says: 'Those are for research, you know! They're not really useful.' Then he talks enthusiastically about what he calls his 'hobby.' He points to set of notebooks. These are his lectures on pulsation – a crucial diagnostic technique in Chinese medicine – transcribed by his students. He says: 'It is very difficult to examine [pulsation] using laboratory science…. But it is like teaching disciples in the old days. Leading my interns into the world of traditional medicine …, this is what I think Chinese Medicine is really about.' (Lin 2017)

[Helen Verran (2002) describes an Australian encounter between ecologists and the aboriginal traditional landowners.]

Here a sensibility to multiplicity leads to two different worlds: into biomedicine and Chinese medicine with their different logics, realities, normativities, and versions of what it is to know and intervene. It is sensible to the possibility that things do not form a coherent whole. It is sensible to otherness, and it is sensitive to resistance (Law 2004). To how Hsu excavates a space for Chinese

medicine in a context dominated by biomedicine; about the tactics he uses to do 'Chinese' ways of knowing alongside 'Western' peer-reviewed bioscience. Here vision is split, finely tuned to things that do not fit the dominant logics of science as well as science itself (Haraway 1997). And, at least implicitly, it sides with Dr Hsu. It assumes that there are other ways of conceiving of bodies and practising medicine.

4.4 Performativity and Otherness

A sensibility to otherness. An ability to work with multiple realities, with double vision and non-coherence. That is our concern here.

In 2001 in the UK millions of farm animals were slaughtered to control a major outbreak of foot and mouth disease. But how to think about this? At the time John was concerned with fragility. He argued that agriculture was inherently unstable because foot and mouth disease was endemic in most of the world. Fifteen years later John and Wen-yuan revisited this disaster with a different postcolonial concern. They asked how a concept from Han Chinese classical philosophy might make sense of it. That concept is shi (shì, 勢). This term is fairly untranslatable into English, but roughly it means the propensity of things in relation to one another have changing (expanding and contracting, pulsing) proclivities to change. (Think of yin and yang, and the tai-chi symbol.) Here there are no underlying causes, but things ebb and flow in patterned and balanced ways – a form of reasoning that is alive in some contemporary Chinese medical practices were the diagnostic question is: have the propensities been blocked or become imbalanced, and if so, then how might this be put right?

But what about shi and foot and mouth disease? Classic military philosopher Sun Tzu says the great general is one who never fights battles because he foresees and takes advantage of the unfolding of propensities. Seen this way, the successful 2001 battle against foot and mouth was an abject failure. That's one possibility. Or (another), a sensibility to shi suggests we might look at events (the chaos on the failing pig farm where the epidemic started) like a Chinese medical practitioner. So, we wouldn't look for underlying causes. We'd look instead at situated movements and flows. We'd search out blockages in the farm like market prices (one), illness (two) and physical exhaustion (three). We'd say, then, that the farm was sick, and we'd imagine local remedies. (Law and Lin 2018)

[Other examples of 'non-English' ways of looking: harraga, an Arabic term in the context of so-called 'boat people' (M'charek 2020); obshcheye , a Russian term which doesn't quite mean 'commons' (Chernysheva and Sezneva 2020); and on making sense of kuru, Anderson (2009)

We're not arguing for 'Chinese social science.' Our concern is in/sensibility to otherness. It's like this. If we write in standard academic ways then we reaffirm these. That's not wrong. But we are also repressing alternative, conceptual, normative, political, institutional, epistemological, and metaphysical possibilities. That is the point of our 'Chinese' case. It shows that if we write in standard academic ways we attend to truth, not efficacy; and we write about underlying causes, not situated (and possibly aphoristic) interventions. Dr Hsu? He writes both science and he hands down effective practice to his apprentices. Both biomedical truths and clinical efficacies. They are quite different. So the STS sensibility here is also to the performativity of research. To what it is doing (Callon 2007; Law 2009; Mackenzie 2006) and to the possibility of alternatives. Haraway says that it

matters what stories tell stories, and it matters whose stories tell stories (Haraway 2019). For stories endorse and sustain specific versions of that world. What we choose what to live with and how to live with it. That's the sensibility at work here.

Methods 3 Telling Stories with materials

- Knowing that it is partial, contingent and **performative**, what kind of research am I doing? Am I happy with this?
- **What am I repressing**, and do I want to repress it? Does this index **alternative concerns**? Issues? Ideas about how the world should be?
- Who am I writing 'about?' Who am I writing for? And why? And is this division comfortable?
- What are my **responsibilities**? Socially, politically, ethically? To whom?
- What have I **learned** and **not learned**? What might my next step be?

5. Care-ful research

Here's our argument. Good research grows out of concerns and an iterative process in which sensibilities and concerns are educated and adapted to generate researchable questions and topics. Since STS is qualitative, working through empirical case studies, if you want to cultivate STS sensibilities you need to read its cases. It also means that for STS the extent to which it is possible to design research is limited. Yes, there are specific skills to be acquired. But research practices unfold more or less uncertainly, and a sensibility to those uncertainties is a core STS sensibility. Others we have touched on include sensitivities to: materials; normativities; the webs of association; the fragility of relations and objects; the multiplicity of logics running through webs; the situated character of our narratives; their performativity (political and otherwise); the possibility of alternatives; otherness; and the fact that insensibilities go along with sensibilities.

In this way of thinking good research is uncertain. And this is why we have offered the notion of care-ful research as a way of imagining the uncertain and iterative of the research process.

STS researcher Annemarie Mol looks at insulin dependent diabetes, a chronic condition that cannot be cured but can be managed. In the first instance this is a matter of regulating blood sugar levels by injecting insulin. But how much? If sugar levels get too high there are potentially devastating long-term side effects. If they get too low patients suffer from hypoglycaemia, lose consciousness, and suffer brain damage. It's a difficult, high-stakes balancing act. Insulin doses have to be calibrated, but so too do diet, exercise, general health, emotional states, and quality of life. (It might be bad for blood sugar to eat a cake, but if this is a moment of friendship?) All of these feed into and affect blood sugar levels.

In the clinic there are questions and answers. How did it go last month? A lot of exercise and hypoglycaemia? 'Hmm.' Or (next patient) a second pint at the pub – and high blood sugars? 'Well, okay, but.' There are multiple logics and goods here – medical, emotional, social, nutritional. Multiple concerns too. So there are guidelines (limits for desirable blood sugar levels) but no fixed rules. There is no such thing as perfection, because, month by month things change. So what do the

carers do? The answer, says Mol, is that they tinker and endlessly revise their tactics. Knowing they will be blindsided, they iterate and adapt. Such is the logic of care. (Mol 2009; Mol, Moser and Pols 2010)

This is where the idea of care-ful research comes from. Perhaps research can be understood as a chronic condition. That's the suggestion with which we end.

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