

### 3. Don't fence me in...

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As I set out to write this chapter, I realise that after more than 15 years in what many call disciplinary no-man's land, a certain weariness of interdisciplinary politics has set in. I've come to a point where I just want to get on with my work, whatever its disciplinary label. And at that point being asked to write a personal essay on interdisciplinary experiences, I argued with myself: what justification do I need to take time off from that work? Maybe the fact that I managed to get tenured on merits of interdisciplinarity counts for something?!

This book is about putting the 'social' into Industrial Ecology—through dialogues between disciplines. Yes, dialogue would have been nice, but that rarely happened during those 15 years—'languages' were so different. There was more confusion and tension, and occasionally even open conflict. In my mind, dialogue entails a civil and constructive exchange, even when the participants are very different, as the researchers within industrial ecology<sup>1</sup> are. Roughly speaking, there are the engineers (with their long-time allies the natural scientists) and there are the social scientists. And although both engineering and social scientists come in many different kinds and have their own internal debates, it is in the exchange between these two main groups where I've observed most misunderstandings.

Over the years I've noticed that when engineers initiate interdisciplinary work, it often resembles attempts at social engineering, while when social scientists put forward their work, it is not unusual that many engineers find it completely irrelevant. In preparation for this chapter, I found several articles on the troubles and joys with interdisciplinary research when combining the environmental and social sciences (one article is even dated back in 1972<sup>2</sup>). I found it strange that almost all articles mirror the same reflections, but hardly any deals with the topic of academic quality in interdisciplinary research. If, by reflecting on some hard-earned experiences from my research<sup>3</sup>, I could contribute

to a dialogue on quality in interdisciplinary work in this field, the role of disciplines and disciplining, then that could be my calling.

‘CROSSDISCIPLINARITY CAN MAKE EVERYBODY CROSS...’

For sure, there are many variants of interdisciplinarity (multi-, inter-, transdisciplinarity), some more fashionable than other, but I want to start by taking a step back: there are many disciplines, and when trying to deal with a mix of them, the researcher sooner or later ends up feeling ‘mixed up’... Not only do scholars of each field have their own ideas on what qualifies as good research, but many scholars also hold implicit and rather inflexible notions of what constitutes interdisciplinarity—as if there only were one way of mixing disciplines! The clash of academic values may be considerable. And I realised this sooner, rather than later, as a young academic—at the first meeting with my multi-disciplinary group of four supervisors.

The general plan for my PhD studies was that I should do something about life-cycle assessment (LCA) and decision making in companies. I knew it wasn’t going to be easy, but I saw it as an exciting challenge and I thought I was pretty well prepared for the topic. I had already worked for more than a year as an assistant in various research projects—the most important one was a national packaging study (consisting of many LCAs) for the Swedish Ministry of Environment (SOU1991:77). My basic training had been in chemical engineering at Chalmers University of Technology, with a specialisation in environmental chemistry. In addition, I had taken courses on, for example, business administration, economics, political science and history of technology, which had led me to contacts with the Swedish Ministry of Environment for whom I conducted my MSc diploma project on environmental investments in industry. On top of that, both the research agency funding my project and the environmental work group at the Swedish Federation of Industries were extremely positive to my project. A multidisciplinary group of supervisors was assembled, consisting of two researchers at the business school (a general management researcher and a specialist in decision making and business accounting) and two from Chalmers (the head of our environmental division and the LCA specialist who had led the great packaging project). And, at least two of them had experience of multidisciplinary projects. So, I had some familiarity with academic life, background training, and competent and enthusiastic support—at least so I thought.

At the first meeting with my four supervisors, one of the supervisors from the business school exclaimed: “But this will never amount to anything of scientific value!” He continued: ‘Drop whatever it is that you’re writing on. You’ve got to take at least 2 years of courses here before you can have anything to say.’

This he exclaimed, after having heard about the work we had done so far at my group at Chalmers: the writing of a couple of journal papers on LCA methodology about learnings from the big packaging project, a tentative plan for my doctoral studies with a list of topics I thought I needed to learn more about. A purpose of the meeting had been to solicit from the business school supervisors what courses and readings they thought suitable for my needs. When he so flatly condemned what was being put forward, I gasped for words. Also my Chalmers supervisors seemed deflated by his assault—no one said a word in defence.

I struggled to comprehend the situation. The meeting ended without nothing much being decided. Afterwards, nothing really changed, and gradually I felt my situation grow insupportable. A couple of months later, I had to take time out from my PhD studies (i.e., sick leave) to figure out whether or not to continue and, if so, how. The relative silence of my Chalmers supervisors at the meeting had surprised me, but it soon became clear to me that although I was a beginner at research, I was already the more experienced of talking to the “other” discipline. Philosophers of science sometimes label interdisciplinarity as either ‘big’ or ‘small’, indicating ‘distances’ between academic fields, where ‘small’ typically means collaboration between fields within the same faculty (e.g. within the engineering sciences) and ‘big’ refers to collaboration between different faculties (for example, the engineering and the social sciences). What we had at that first meeting was a case of big interdisciplinarity but with little awareness of the distances, and I sat amidst the resulting clash.

Looking back, I see the struggle for academic supremacy taking place during that meeting, but also the lack of some kind of interdisciplinary moderator. Somehow I decided to continue, but after that I only met with my supervisors one by one, never in a group, and never the dismissive one. (The irony is that he was chosen as supervisor for he was known as a kind, understanding and soft-spoken man.) I remember myself constantly explaining Chalmers ways to the remaining business school supervisor and vice versa. Thus I became the interpreter between the different disciplinarians, my supervisors. Strangely enough, I thought, but there I was, the young beginner, translating between my senior and more “experienced” supervisors. I couldn’t but lose some of the respect of my senior peers, but I also gained a sense of self-confidence—whatever I would achieve under such crossfire, it would be more than they ever had. (Another irony is that the articles I was supposed to give up are among my most cited ones.) The supremacy issue was resolved technically—I was after all a PhD student at Chalmers where the PhD curriculum was flexible. Instead of having to take a compulsory set of courses as one did at the business school, I could take elective courses in my own pace, letting research projects, knowledge needs and curiosity define course selection. The issue of quality, however, was never really raised again by any. Nevertheless it continued to haunt me. I had realised that such

assaults on interdisciplinary research were to be expected. So, if I was to continue, I had to learn as much as possible about different academic disciplines and their scholars in order to be able to defend my ideas academically. Thus started my amateur ethnographic study of academia and nomadic criss-crossing across its different fields.

## UNTANGLING CROSS CONFUSION

By now, I can see several reasons to what happened at that meeting and on other similar occasions. For example, I've seen similar questioning of the work of my doctoral students, even from other environmental and interdisciplinary researchers. What I didn't realise in the beginning was that the type of interdisciplinary research I started with my PhD is rather uncommon.

One reason, I think, why both I and my PhD students are met with suspicion despite interdisciplinarity being so fashionable, is that the organising of our interdisciplinarity deviates from what is considered 'normal' interdisciplinarity. 'Normal' interdisciplinarity typically takes place when researchers of different backgrounds take part in a multidisciplinary project. That is what I call *collaborative* interdisciplinarity, while what I did for my PhD was more solitary and integrative. In this *integrative* interdisciplinarity, the researcher, not a (multi-people) project, has to harbour and synthesise the different types of knowledge as well as choose between different academic norms and conventions. By doing so, I immediately deviated not only from any of the disciplines I attempted to integrate, but also from 'normal' interdisciplinarity, the collaborative kind<sup>4</sup>. Unless one's work fit into the 'normal' mould, one is often met with suspicion and sometimes even blunt rejection, but that is nothing that good academic self-defence and discussion can resolve. My trouble was that I was too inexperienced at that first critical meeting.

Another reason is related to processes for judging the quality of research and a curious absence of this among industrial ecology researchers. Engaging in interdisciplinary collaborations is for most a positive experience, although strange things happen too. The meeting with other disciplines and scholars is, according to them, most interesting, rewarding, a great learning, etc. They had, as I see it, (only) engaged in friendly conversation over a neighbourly fence, sometimes borrowing a tool or two. The conversation is not without misunderstandings, and there is usually quite a bit of bad-mouthing behind the back of one's academic neighbour. This crossdisciplinary behaviour is strange in that it somehow confirms and reinforces the idea of a fence. An engineer with such an interdisciplinary experience is often still foremost an engineer (and so is the social scientist). The interdisciplinary conversation even seems to have induced a crippling politeness concerning discussions on academic quality. The

engineers typically don't get involved in the quality assessment of the neighbour's work (nor let the neighbour evaluate them either)—they are mainly concerned of what is done in their own plot (and vice versa). This evasive behaviour can be observed for example in relation to PhD theses and their examination. Many times I've observed engineering PhD candidates who have carried out some piece of qualitative research being evaluated by an examination committee without any competence on qualitative research. Alternatively, I've observed uncritical borrowing from other academic fields resulting in extensive application of outdated or contested theories where caution should have been advised but nothing was said. When raising issues related to quality (justification for methods chosen or theories applied, internal consistency), the typical answer I hear is: 'But this is such a young field, and we're only just learning.' The trouble, as I see it, is that such an excuse is quickly exhausted and we should be better at defending our research. Somehow this lack ought to reflect on processes related to wider academic recognition – I don't think it is only a desire for independence that has led to that so many multidisciplinary environmental research groups to locate themselves organisationally outside the regular faculty organisation. It is after all there one finds the longest traditions of discussing and judging research quality. If we cannot justify our IE research within academia, then maybe it doesn't belong there..? In contrast to collaborative researchers, I've had to cross fences, trespass, try to blend in, try hard to not be exposed as an impostor or a fake when doing integrative research. Still, I revert constantly between different academic identities and orientations. By not honouring disciplinary fences, I've become an unusual crossbreed, even among other environmental interdisciplinarians. At the technical university people address me as the 'social scientist' while at the business school people refer to me as the 'engineer'. That means that I am constantly cast as the 'other'. This used to sadden me because I felt no one really understood my research, nor appreciated my efforts, but by now I can derive some pleasure from not having to have conformed, from not having been 'disciplined' into established expectations and behaviours. Simultaneously I realise that if my integrative work does not have a clear academic home, how can its quality be judged? In fact, I've had the same piece of research evaluated as 'completely unscientific' by an interdisciplinary environmental research council; as 'unserious and opportunistic' by an interdisciplinary environmental research assessment panel; it received a best poster award at an interdisciplinary environmental conference; it has received a royal distinction from an interdisciplinary environmental committee; and with a basic research council, the same research was characterised as 'world-leading'. How does one make sense of such contradictory evaluations? Whom can I take seriously?

The third reason has to do with overall purposes of research. The urgency of the environmental problem has so far mostly led to a focus on practical

recommendations, measures and remedies in research—this is why transdisciplinary research (as it has come to be understood within this environmental field<sup>5</sup>) has become so popular. Environmental urgency has also led to interdisciplinary and environmental research mainly being esteemed on grounds of its practical and direct usefulness—not so much by its contribution to theory, whatever the type of theory. But is it so that a focus on practical relevance can outweigh inattention to theoretical advancement? One trouble with focusing on solving practical problems in IE is that the research often ends up with measures and remedies resting on the researchers' inarticulate and common-sensical assumptions about how society works (for example, on roles of actors in society, what decision making is, how companies operate, etc.). The focus on practical problems also means that much of the interdisciplinary research mainly consists of applied research, which in turn, presumes that there is basic research that can be applied to the practical problems. But how many of us haven't found existing theories lacking, inadequate, somehow incomplete or too narrow in scope? That doesn't mean that we should give up on theories. So I ask: what if there is a need for more *basic*, interdisciplinary environmental research, that focuses on a rich understanding of the environmental problem of society and on a more integrative development of theoretical knowledge in the field? To paraphrase Latour (1993): Reality is not divided in disciplines, so why study it through disciplines? And when I aim at either understanding the social organisation of environmental efforts in industry or try developing some integrative socio-environmental theory, I have to deal with the irritation from colleagues whose hidden assumptions<sup>6</sup> I have exposed or those who think that my research is not useful enough. I don't want urgency, nor crossdisciplinary politeness, to become excuses for dodging issues related to academic quality, forthright dialogue and theoretical advancement. Why isn't there room for all these issues?

### **Sense and Orientation?**

My first interdisciplinary experience was upsetting and took some hard reflecting to recover from. I've used it as a lens to make sense of meetings between scholars of different denominations. While much written about interdisciplinarity discusses it on a conceptual level (for example whether concepts are borrowed, added to each other or synthesised), my perspective is more organisational and people-oriented (for example about organisational practices and routines, communities, interests, norms and behaviour), which is why I mainly distinguish between collaborative and solitary/integrative interdisciplinary research. Many of the tensions I've observed over the years stem from such differences. The interdisciplinary combination of concepts is a type of problem that can be

resolved, but is academic organisation a problem to be solved? For me, it came down to developing navigation strategies in order to find my orientations around the many academic fields. To carefully think out the grounding of my research became very important and then to defend it, like all researchers do. The difference is in the nature of the defence. In more established research fields, one can learn the art of academic self-defence by ‘imitating’ one’s peers and by learning the ‘scripts’ of the debate within the field. In my case, that was insufficient. Who was there to imitate? And it was almost impossible to predict what direction critique would come from. Doing integrative interdisciplinary research, I realised, requires a multidisciplinary understanding of how researchers understand (and don’t understand), the overall philosophy of their research and to be able to introduce and explain very basic premises of research and concepts to many different types of researchers in ways that are meaningful to them. The problem is, one can never learn enough... and situations when one is uncomfortably speechless and simply unable to get across should only be expected. Now, I do what I can to also help my PhD students to prepare for academic self-defence of the higher school, to support them through periods of feeling lonely and to encourage them to seek out their own academic allies and sources of influence.

My academic vagabonding together with my ethnographic studies<sup>7</sup> made me quite knowledgeable about academia and the roles of university in society in general. I often find myself interpreting, explaining and mediating between different disciplinarians, something that has come to be appreciated in contexts such as the faculty senate at Chalmers, although it took me a couple of years before I realised how an outsider like myself could have insights central to discussions there. But, as I said in the beginning, I’d rather get on with my research, so I’ll use this opportunity to hand over observations from my academic explorations. I start with a description of the ‘tribes’ before turning to the travelling tips. I hope these descriptions can guide anyone engaging in interdisciplinary research by informing them *about* the ‘other’ and the peculiarities to be expected, or even propel them to learn *from* the ‘other’. While the learning *about* other research communities supports effective collaborations, the learning *from* other research communities can lead to more integrative forms of research. This means that for integrative interdisciplinarity, academic mixing goes further. By learning *from* the ‘other’, one replaces some of one’s practices by those of the other. This can result in new kinds of mongrelized researchers<sup>8</sup>.

In any case, my first travelling tip is to develop communication skills, and here the term ‘interdisciplinary’ acquires a special meaning. ‘Interdisciplinary’ in this particular sense is understood as a skill of *interpreting between* different disciplines. Interdisciplinarity, in this literal meaning, is a very useful skill in multi-disciplinary collaborations to facilitate communication and learning. With

greater interdisciplinary skills comes a deeper knowledge about different academic communities, their forms of reasoning and methodologies, thereby enabling the putting together of more integrated forms of research.

A word of caution to the reader is probably in place, here. I paint my descriptions of the engineering and social scientist with a broad brush, bordering on stereotype caricatures. My description of engineering researchers is perhaps more critical than that of the social scientists, but it might help the reader to think many of the flaws I describe are my own that I've had to deal with during my interdisciplinary journey. When comparing the reasoning and methods in different academic milieus, I uncovered thought patterns and values that had been bestowed upon me (and everyone else) through education (e.g. reductionism)—it was a kind of 'intellectual, academic therapy' that I underwent. Some realisations did not come easy, but they allowed me to avoid 'auto-pilot' thinking. This doesn't mean that I don't have any critical remarks about social scientists, only that those remarks are fewer.

### **Kings of Things**

Perhaps the most distinctive feature of engineers is their love for practical problem solving. There is even a book with the title *The existential pleasures of engineering* wholly devoted to the deep-felt satisfaction stemming from solving complicated problems, usually technical problems. To master complicated physical conditions and technical objects is the height of engineering. The more complicated, the more satisfying—hence Kings of Things. This also means that the engineering sciences mainly are applied sciences, using more basic science to develop solutions to all sorts of problems, including the environmental problems in our societies.

The sense of environmental urgency goes down well with the engineers' love of practical problem solving. It even gives them a feeling of responsibility for seeing to environmental problems. However, this is also a major source of frustration in relations with social scientists. Especially those social scientists, who aim at understanding and explicating the many dimensions of a problem, are particularly difficult for engineers to stomach. With the social scientists' the rich understanding of problems, the engineers don't understand why the social scientists don't use it for developing solutions, and not even for putting forward practical recommendations. Most of the bad-mouthing taking place behind the backs of social scientists concerns the engineers frustration with this: 'They don't contribute with anything useful; the point in their research is practically irrelevant.'

One must remember that the type of knowledge engineers are used to applying is that of the natural sciences (mainly physics and chemistry) and this



has several side effects complicating their communication with social scientists. Reality is often seen by engineers as objective, possible to describe in a general way, possibly even with a grand unifying theory. With this perspective on reality follows a strong tendency to generalise. There is for example one law of gravity, and it applies everywhere in the universe. Although appropriate when it comes to the laws of nature, engineers tend to bring this inclination for generalisation into other realms, such as social realities, as a matter of course. Generalisation together with their focus on practical solutions makes them typically very goal-oriented, and it is not unusual to hear engineers discuss problems related to work organisation or gender equality as if there were a single, commonsensical, natural, objective (and optimal) practical solution. It might go as far as having a unified understanding of society, enabling the formulation of grand solutions, a gung ho mentality ready to take on any kind of problem, and ensuing a slight hubris.

With this in mind, it might not be strange to understand that engineers often have difficulties in seeing and understanding that problems are perceived differently by different actors, and that there can be many ways of dealing with problems. It is not unusual for them to become frustrated when confronted with social processes ensuring equal value to a plurality of perspectives. When it comes to environmental problems, they often seek broad technical solutions to these, putting a lot of energy into persuading policy-makers and the public about the suitability of these. The extent to which they bring social scientists into their work is to have them design information campaigns that educate people about the necessity for the identified (usually technical) solutions. Simon Guy and Elizabeth Shove describe these processes extensively in their book *The Sociology of Energy, Buildings and the Environment: Constructing Knowledge, Designing Practice* (2000).

Engineering researchers interested in environmental problems realise that there are social dimensions to environmental problems, and that social scientists might not be interested in the afore-mentioned information campaigns. So, instead of collaborating with social scientists, engineers are not afraid of doing a bit of social science themselves. Since engineering is basically an applied science, it is quite natural for engineers to think that also social science should be possible to apply to their problems. And together with their gung ho and commonsensical mentality they will approach the social sciences, fully convinced that they are capable of that too. However, they will not readily give up their objective understanding of reality and their tendency to broad generalisation, and it is likely that they will miss out on important subtleties and the point in plurality. 'Engineers are good at doing bad social science', as an observant colleague once said<sup>9</sup>.

Engineers may learn to use the methods of social scientists, mainly surveys and interviewing, but when it comes to taking stock of theories, that is a whole different matter. To begin with, engineers are not likely to use their empirical findings for formal theorising, because, as I've said, engineering is basically an applied science. They may, however, use their empirical findings for more commonsensical reasoning. When they do work with theories, they look for a theory from which they can draw out recommendations for problem solving. But, without an overview of theories and schools of theories in the social sciences, the engineers may pick one 'from the pile' and be happy with that, not really knowing the full implications of their selection. Often engineers feel comfortable with theoretical schools in the social sciences that have a similar logic as engineering: rational and objective. This means that they prefer to collaborate with certain kinds of social scientists: economists, and possibly also psychologists. Sociologists, however, especially those with a social constructivist perspective are difficult for engineers to understand. Although engineers can understand some of the messages from a social constructivist, it will be extremely difficult for engineers to take the consequences of such insights in relation to their own knowledge perspective (epistemology).

Speaking of epistemology, it is also worth remembering that the engineering scientists within Industrial Ecology have almost all experienced an intellectual revelation when they got in contact with systems thinking. Systems thinking is a school of thought that actually fits very well with the engineer's understanding of chemical process industry, automated production facilities, computer systems, etc., but their education rests strongly on the heritage of the basic sciences and their tradition of a reductionist school of thought. Discovering systems thinking is usually therefore described by Industrial Ecology engineers in exhilarating words, as if all pieces have fallen into place.

It is of course a good insight for a researcher to come to grips with different schools of thought. However, there are two aspects that are somewhat problematic. One is their rather inconsistent application of systems thinking. A most telling example is the formulation of the allocation rules in the LCA standard (ISO14041, 1998). The teleological principle, that methodological choices and the design of the model depends on the purpose of the model, is completely set aside by a strict and prescribed hierarchy of methodological options, irrespective of the purpose of the LCA. The teleological principle, however, is expressed in the opening paragraph of the standard, that methodological choices depend on the purpose of the LCA. I explain such inconsistencies as an incomplete understanding of systems thinking, or that the full consequences of that logic are not taken. The other problem is that although the engineers have another school of thought besides reductionism, they are not fully prepared to accept and understand yet another school of thought, namely

social constructivism. So they just leave it at that and stay with systems thinking which is supportive to problem solving and, if not for generalisations, then at least for broad overviews. I sometimes wonder if there is not a slight feeling of overview, authority and control (to not say omnipotence) fuelling the passion for systems thinking? How else can one explain the presentation on an Industrial Ecology blog: ‘Industrial Ecology—The Science of Sustainability’?

## **Seismographs of the Social**

Referring to the social scientists as a single group is a too sweeping a characterisation, but engineers who find it hard to distinguish one type of social scientist from another often do this. However, the group of social scientists is more heterogeneous than the group of engineers. The differences are made up by not only different areas of research and interest, but also by the representation of different schools of thought and theories. There are systems thinkers among them too, but also social constructionists, post-colonialists, structuralists, post-modernists, essentialists, feminists, to list a few. This results in a pluralism among social scientists, un-paralleled and poorly understood among engineering researchers. This pluralism in knowledge perspectives fosters an open-minded and allowing culture among social scientists, but the engineer should not believe that everything is met with friendly acceptance. I would say that there are more conflicts among social scientists than among engineers. A management scholar about economists: ‘No way I’ll work with them—it’s such an imperialistic science!’ or an anthropologist about a management scholar: ‘Postmodernists are such opportunists...’ Such conflicts are often rooted in fundamental differences in views on the individual’s agency in society and knowledge perspectives. There are usually ideological dimensions to these differences. Although differences can be stark to social scientists, they appear often vague to engineers, who usually have a rather inarticulated or naive position on these matters. The trouble is, at least for engineers, that the social scientists are not clearly ‘labelled’. Nevertheless, the social scientists have their codes for informing others about their position, but these are too subtle and abstract for engineers. I still have trouble to separate different sorts of social scientists, even after more than 15 years, so I’ve taken the habit of asking them directly: ‘What is your position on postmodernism?’ or ‘What type of theories are you interested in and why?’

Pluralism has its effects on the cross-disciplinary exchange between engineers and social scientists. Social scientists tend to show great patience with engineers, no matter what simplistic or authoritarian suggestions for social change they put forward. I sometimes understand their patience as listening to yet another voice in the pluralistic choir. On other occasions, it is more a matter of listening and observing the engineers and their doings as a study of object,

thereby allowing the engineers to be as ‘engineery’ as they like. Either way, this comes across to the engineers as the social scientists not seeming particularly engaged and feeds an insecurity in the engineers about whether or not the social scientists really are interested in cross-disciplinary exchange.

What the engineers might not register is the social scientists’ great respect for the engineers’ technical and environmental knowledge. On many occasions I have wondered at why social scientists (and I do mean those working on environmental topics) are so cautious when it comes to describing environmental problems. It is as if they don’t think it will ever be possible for them to understand environmental problems or environmental technology other than in the broadest sense. Thus they usually speak of it only in very general categories (i.e. ‘environment’, ‘technology’). The diversity of environmental problems (for example, global warming, eutrophication, biodiversity, etc) and the understanding that dealing with one environmental problem can have negative effects on other environmental problems are self-evident knowledge among IE engineers, but such relationships seem curiously lost on social scientists, which is something that puzzles the engineers. Similarly, concerning environmental technology, distinctions between end-of-pipe technology and pollution prevention measures are both fundamental and self-evident for IE engineers’ analysis of environmental management. When such distinct technical categories are lumped together as ‘environmental technology’ by social scientists, engineers’ often start to doubt the relevance or applicability of the work of the social scientists.

Despite social scientists forming such a diverse group in terms of perspectives, there is more unity when it comes to research interests in general. In contrast to engineers, practical problem solving is not their prime ambition. Instead, they are more interested in understanding the ‘anatomy’ of problems, phenomena or processes. They record their observations and assemble their descriptions through a multitude of methods, too many to mention, but many of them involve the researcher directly as an observer and interpreter. So, in various ways they act as “seismographs of the social”.

This can also be another reason for their vague renderings of environmental problems and technology—the majority of them are simply not that interested in physical things. Social scientists are more into people and society. It is all about people’s attitudes, behaviours, discourses, communication, norms, change, and such things. That the physical world should have so little place when it comes to environmental research is just too strange from an engineering perspective. Fortunately, some environmental social scientists are realising this too. For example, in 2006, Kallio and Nordberg concluded in a review article that biophysical dimension was missing in environmental management research and the anthropologist Wilk concluded that the phenomenon of bottled water could at

the same time be made perfect sense of using logics of the social, but that it does not make any environmental sense.

Just because social scientists have a rich understanding of a problem doesn't mean that they readily will propose a practical solution or recommendation, which is something unfathomable to many engineers. One way I understand it is that social scientists are usually very careful to not mix their research role and their personal political opinion. Through the understanding of a problem they will also see that there are many ways of dealing with it, and to propose one way in particular would mean taking a political stance or playing in the hands of some interest groups. Another way to understand it is that just because they have studied a particular phenomenon a lot does not mean that they know how to manage it practically. They are foremost 'knowledge workers', not managers, politicians, corporate decision makers, public administrators, NGOs activists, etc. The description made by the social scientist can be seen as an image (of for example a change process in an organisation) alternative to the images held by the people in the studied organisation. The practical relevance of this alternative image lies in its ability to give the people in the organisation new ways of seeing their situation, and since they are the best at doing their own job (not the researcher), they will see what can be done.

The interest in understanding also means that social scientists are more interested in theorising and in theory development. It is not unusual that they are familiar with the historical development of theories and that they have read texts that are more than 30 years old. Generally I would say that social scientists have a more text-based culture than engineering researchers. Social scientists both read and publish books to a greater extent than do engineers. Also, they cite on an average a greater number of references in their articles than do engineers. Besides pluralism and the urge to understand, such practical differences in publishing patterns also need to be remembered in interdisciplinary endeavours. Engineers who rarely read any article older than five years must rethink their literature search strategies if they are to get in contact with the major works of the social sciences.

## **Getting Across**

Academic research work means quite different things in different disciplines. Anyone in for some interdisciplinary research is bound to end up on some kind of intellectual and cultural journey. As all journeys, it can be bumpy and uncomfortable at times, but there are several ways to prepare for it.

The most useful knowledge for my interdisciplinary ventures has been a solid grounding in philosophy of science. Recognising different ontologies, epistemologies, axiologies<sup>10</sup> and methodologies has helped me tremendously

when figuring out the logics of research in different communities. This “grammar” of intellectual work was essential for liberating myself intellectually from the implicit thought patterns from my basic training; it is essential now when I evaluate interdisciplinary work with regard to internal consistency; it guides me when I relate the importance of findings from different fields to each other. I simply cannot see how I could identify, nor carry out, good interdisciplinary research without this orientation in different schools of thought.

Equally important is to be able to present one’s interdisciplinary work to all kinds of scholars. This is tricky because the presentation needs to be adapted to different audiences. A major part of interdisciplinary communication is to educate one side about the other, and the trick is to understand underlying thought patterns. Otherwise, it will be difficult to get across when schools of thought are different. In collaborations, it might be good to have someone who is not directly involved the empirical work of the project and who can act the role of interdisciplinary facilitator—I certainly wish someone had taken that role at my first meeting with my four supervisors... But, all this intellectual knowledge about other communities is facilitated by having some cultural knowledge as well. There are many roads for accessing other research fields. One obvious way is to spend some time in other research groups, not just meet the researchers at conferences. Another is via reading, but not necessarily the research articles—textbooks, book reviews, editorials, review papers can be better ways for learning about debated ideas in other fields.

All this is not easy, but I’ve never heard anyone regret interdisciplinarity when it comes to research<sup>11</sup>. In spite of this, there exist myths that interdisciplinary work has little academic value, for example, for tenure and in research assessments. Also, some metaphors used for interdisciplinary research have a negative ring to them: research ends up ‘in between’ or in disciplinary ‘no man’s land’. Sometimes I wonder what’s behind such statements. Are they not said to discipline researchers to stay within their fold? To me, interdisciplinarity has become an expression for academic freedom – freedom to follow a line of reasoning when exploring a problem. The circumstance that some sociologists speak of the democratisation of academic knowledge supports this notion. They ask: why should scholars monopolise their knowledge within disciplines, shouldn’t it be free for any scholar to pursue?

Research outside the cultural confines of a discipline also need quality assessment, but what I’ve witnessed too often so far in the IE sphere are pretty random affairs. I think this might have to do with a circumstance that quality assessment is much dependent on cultural norms and practices within a disciplinary community, no matter how much we want to believe otherwise. And when we can’t rely on our own cultural norms and conventions, we get lost. Here, we do need dialogue! I hope that my cultural descriptions and the

identification of the importance of knowledge perspectives can do something to advance that dialogue. This book in a way forms a forum for such a dialogue, but it needs to continue, possibly through forums created that culturally support interdisciplinary research, e.g. IE awards or IE travel grants.

I also hope by attaching more positive notions to interdisciplinarity, it will encourage daring intellectual crossbreeding and freer intellectual pursuit. Even if a nomadic academic lifestyle is not for everyone, please, don't fence me in...

Oh, give me land, lots of land  
Under starry skies above.  
*Don't Fence Me In.*  
Let me ride through the wide open  
Country that I love.  
*Don't Fence Me In.*  
Let me be by myself in the evening breeze,  
Listen to the murmur of the cottonwood trees.  
Send me off forever,  
but I ask you, please,  
*Don't Fence Me In.*

*(Words and music by Cole Porter & Robert Fletcher, ©1942, from the film Hollywood Canteen, reprinted with permission.)*

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## NOTES

<sup>1</sup> At our department, we prefer to speak of Environmental Systems Analysis. This is a more neutral label than Industrial Ecology, with its loaded metaphor.

<sup>2</sup> The article is written by James McEvoy at the Department of Sociology and Division of Environmental Studies, University of California, Davis, California.

<sup>3</sup> I've studied and led research on LCA/LCM practices in industry for some 15 years, e.g. Baumann 1998; Rex & Baumann 2007. Another research interest concerns socio-material interactions, where I aim to understand how the social shapes material flows and vice versa, e.g. Baumann 2008.

<sup>4</sup> Formas is a major Swedish research council for environmental research. It has a special committee for evaluating interdisciplinary research proposals. Its guidelines explain what they mean by interdisciplinary research: only collaborations between two departments. A research proposal from a multi-disciplinary department is not accepted.

<sup>5</sup> The term 'transdisciplinary' research has several meanings. Transdisciplinarity can be understood as a type of knowing that transgresses the knowing in a single discipline (e.g. Nicolescu 2002). In this sense, transdisciplinarity is about intellectual synthesis. Transdisciplinarity can also be understood as a way of working where scientific knowledge and extra-scientific experience come together for practical problem-solving (e.g. Mittelstrass 2001). It is the latter meaning that has gained ground in Industrial Ecology circles. For further reading on transdisciplinarity, see the Swiss academy of sciences' bibliography on [www.transdisciplinarity.ch](http://www.transdisciplinarity.ch).

<sup>6</sup> For example, much research in the LCA community concerns the development of tools, e.g. tools for ecodesign. This research is to a large extent built upon the researchers' assumption about what should help ecodesign. Research findings about the practice of ecodesigners shows that it is not a lack of tools that hinders ecodesign – this tends to provoke the tool designers...

<sup>7</sup> I have field journals from periods when I was a visiting researcher in the UK and in the US; I have recorded seminars on interdisciplinarity; I have done critical incident studies on interdisciplinarity; I have studied the situation for scholarly publishing for interdisciplinary environmental research. Of all this, only the last study is published (Baumann 2002).

<sup>8</sup> In contexts of interdisciplinarity, the term 'hybrid discipline' has come to stand for a new combination of disciplines, often on its way to forming a new discipline, e.g. bioinformatics. However, I prefer the notion of *mongrel* researchers in IE – sturdy and more varied than hybrids. IE then becomes what Østreng (2008) calls a 'multi-disciplinary discipline', rather than a hybrid discipline.

<sup>9</sup> This phrase was uttered during a seminar on transdisciplinarity at Chalmers in May 2007 during an exchange between the two research directors of two multidisciplinary centres, one in the UK, the other in Australia. I no longer remember which of the two who actually said it.

<sup>10</sup> ontology = perspective on reality; epistemology = perspective on knowledge; axiology = overall purpose of research

<sup>11</sup> Interdisciplinarity in a research context should not be mixed up with interdisciplinarity in educational programmes. The amount of administration and political diplomacy to coordinate several departments in different faculties can definitely lead to regretting an interdisciplinary initiative...



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