Revised Dec. 15, 2021

Ways We are Connected to the World:
Craft and/or Science?

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Abstract
Craft research is becoming an established, but sometimes also controversial, part of the international academic community. Consequently, it is a science in the socially accepted sense. However, as the experience from Sweden shows there are also doubts about whether craft research is yet to be considered as a full-blown science, because it has not yet reached a 'theoretical level'.

   In this paper I focus on the notion of science in order to find meeting points between the methodological and the epistemological aspects of the sciences and the crafts, which means the human aspects of the sciences and the crafts. In particular I want to throw light on the human aspects of theories, with reference to Thomas Kuhn's ideas of normal science. A main point is that 'theories' may be expressed in and by practices, not only by words, but that we should not ask if a theory is expressed in words *or* practices *or* in other ways.

    I argue that the most important entrance to the understanding of the notions of science, craft and theory is through the notion of communities of mutual learning, which cannot grow and develop without both agreements and disagreements, sometimes perhaps unsolvable disagreements. However, 'unsolvable' is not a final stop, but rather a point of departure for further, or other, questions.

1. Introduction
 Resistance against establishing craft science as a 'normal' science in an academic setting seems to depend more on a one-sided picture of science than on prejudices about the crafts. At least, that is my point of departure in this paper and the reason for focusing so much on science. My goal is to present a perspective from which it is easier to see how the sciences and the crafts are, or could be, related to each other and how an evolving craft science discipline can develop knowledge that is not possible to develop in other sciences.

    However, a perspective needs to be anchored in the world and in our most basic convictions about it and about how we can improve knowledge. Such an anchoring cannot be 'scientific' in the sense of being as a result of scientific investigation. It is rather part of a framework for establishing an idea of 'science'. This is a starting point:

- There are features of the world that are only available – or *made* available – by craft practices.

This formulation is chosen because it contrasts with a statement often made in connection with science: There are features of the world that are only available – or made available – by the sciences, which implies that the features in questions are made available in conceptual form, in language, mathematics and other symbolisms included. Remember Galileo's often quoted words in *The Assayer*, that 'the great book of the universe [...] is written in the language of mathematics', which we must learn to comprehend in order to understand it (Drake 1980: 70). Now some clarifications of how I use the key words:

I use 'science' both as a general term covering all kinds of (academically) established research areas, that is, like the comprehensive German 'Wissenshaft' – and the Swedish 'Vetenskap' – and also as a term for the kinds of natural sciences that are strongly associated with our understanding of the aspects of reality that are not available to the human (bodily) senses or everyday experiences. This points in the direction of some natural sciences, most of all physics. This idea of making something beyond 'the senses and everyday experiences' available opens questions about 'how' and 'through what' – the traditional answer is given in terms of 'theory' (and 'theoretical thinking') to which we will turn later.

The crafts are historically strongly associated with manual labour: sweating bodies and dirty hands, all that is a contrast to the work of the human intellect and represented in linguistic or other symbolic forms, that is, as 'theory'. This old separation explains many of the problems that meet attempts so establish craft science as a full-blown science. 'Craft science' here means science through craft, a form of practice-based or practice-led research (Kokko *et al*. 2020: 182-183). That this separation is still so strong is surprising in view of all the well-argued critique against the conceptual dichotomies body-mind and intellectual-manual. From a philosophical and political perspective, the critique has been carefully argued from Marxist, phenomenological and pragmatist intellectual traditions, as well as in discussion about tacit knowledge. This means, then, that some work is still to be done.

I have in several texts argued for a notion of human knowledge that avoids the dichotomies just mentioned, most detailed in *The Knowing in Practices and the Practice of Knowing* (Molander 2015). My approach to knowledge will be visible later in this text.

The word craft will here simply refer to practices that are ordinarily called crafts and exist as established trades or professions, that is, with established demands on training, education and forms of certification. Moreover, in a craft there are common standards for being judged as a skilled craftsperson or a master of the trade. I exclude here purely 'intellectual crafts'; a craftsperson uses materials to make things for human use. It is still possible to talk, like C. Wright Mills does in an almost classical paper, about 'intellectual craftmanship' (Mills 1959), but that is not directly relevant to my discussion here.

The readers who I in particular want to reach are craft researchers who see themselves both as (good) craftspeople and as scientists, but who are not happy about all demands that may come with such an identity, for example, demands for 'theory'. There is a wide variety of possible demands on 'science' and it is important that craftspeople *as* researchers choose what is the best kinds of demands for their own research and for the future development of the craft sciences. But everything is not up for grabs.

2. How to be a good scientist
Here I will give a basic but minimal characterization of what (good) science is, formulated as norms that should be valued and adhered to by a (good) scientist. In this section I use science in the comprehensive sense, that is, not excluding the humanities.

I call the minimal characterization Bengt Molander's simple idea of a good scientist, or of the *ethos* of science. I label it this way to avoid the impression that the text speaks from some universal or godlike point of view; it is not because it is very original.

- Find out what others have said about the same topic or problem.

- Tell others what you have to say in such a way that others can make their own judgments about it.

- Speak with your own voice.

I have used these formulations in addressing researchers and graduate students from established academic fields of research, not as a final answer but as a starting point for discussions. It is obvious that the perspective on science here is 'theoretical' in the sense that it takes for granted – by using words like say, tell and speak – that what is part of science is always expressible in language. Moreover, in what can be called 'the theoretical knowledge tradition', the material of which science is built are statements which are seen as pictures of or representations of bits and pieces of reality – that express knowledge if the pictures catch the bits and pieces of reality as they are (Molander 2015: 77-84). We move away from that picture.

My simple theory can be changed to accommodate other ways of expressing ideas, experiences and insights. The first point of my *not so simple theory* would go something like this:

- Find out what others have said about, thought about and experienced in connection with the same topic or problem, not necessarily defined by a particular formulation; a 'problem' may be a problematic situation. Experience may be shown or demonstrated in *many* ways. You can 'think through your hands' (Groth 2017).

Or you can think through your feet, because that is another way of meeting the world. And your hands may get dirty in the process, as in Tina Westerlund's craft research on the propagation of plants (Westerlund 2017). Please note that I wrote 'would go something like this'. This is because we have entered a way of thinking of science and the crafts where a 'theory' (or other kinds of result) is not necessarily defined by one specific formulation. There may by several formulations and no formulation 'catches' the (full) meaning. Formulations are tools in the process to get other people on the right track to a better understanding, to make aspects of the world accessible, not to say something about the world or human ideas as they 'are in themselves'. The perspective here is that science is not a relation between bits of language and bits of the world, but *between people* talking about the world to the best of their knowledge.

The second point of my not so simple theory might be expressed (something) like this: Communicate (show, demonstrate) to others what you have experienced or thought (learnt) yourself in such a way that they can make their own judgments about it.

The third point could really be formulated as in the simple theory, 'Speak with your own voice', if 'speak' is understood in a wide sense, covering all kinds of ways to show or exhibit something to other people. This also implies a responsibility: Do express what you have to express *as a person*. Express *your* thoughts and experiences and take responsibility for them.

The point of my not so simple theory is to open up for all possible ways of communicating or expressing experiences from the practice of various crafts, using their own ways of demonstration and their own languages, some of which can be described as multi-modal.

Even if my theory is formulated as a demand for (good) scientist, what is at stake are communities of scientists. Science is about shared learning and insights.

3. The human side of science: learning communities

'Science' is to be understood – as part of my strategy in this paper – primarily with reference to communities, communities of communication and learning. Training is counted as a form of learning, of course. In this section I describe certain further characteristics of communities that can hold together and sustain learning over time. Science and scientist change over time.

The dimension of time with which we have to operate can stretch out over several generations of scientists within one discipline or subject. One aspect of the learning is the training of the next generation of scientists (here and in the following, always within one discipline or subject). Another kind of learning is learning within the community of scientists who have finished their organized (formal) training and are admitted into the community of working scientists.

This demand for learning is a demand for development that leads to progress in a science. The demand for progress evolved as a demand for original research work – not only collectively but also individually – together with processes of professionalization and specialization in particular during the 19th century. It is now part of the idea (and ideal) of 'modern' science.

There is, to sum up, a demand for *progress*, *development*, *continued learning*. What does this imply for demands on – or: What does this presuppose of – the community and for the political structure that the community is being part of? I suggest the following three main points:

- Alternatives – alternative ideas, hypotheses, ways of practicing, and maybe other things.

- Possibilities of questioning and a critical stance.

- The possibility of living (*a*critically) in/with the alternatives.

The first two points, we may say, are expressions of – or demands for – a liberal scientific and political culture. It is part of the idea of mutual learning that learning cannot grow and develop without disagreements, sometimes perhaps unsolvable disagreements. However, 'unsolvable' is not a final answer, rather it is a point of departure for further, or other, questions.

A liberal culture allowing critical questions and free discussions is not sufficient. People must also actually find or create alternatives – and stand up for them. A scientific community may fail to develop or progress not only because certain alternatives are forbidden to discuss or explore, but also for lack of ideas or encouragement – or lack of hard work.

The third point covers several different but connected ideas, which all should be explored in more detail, not least in the context of a future craft science. The first is that scientific ideas, many of them if not all, should *make sense in our lives*, not only as strange artworks on a paper or screen. In brief: They should mean something *in life*. In particular, the ideas and results of craft science (research) shall make sense in the professional lives of craftspeople, or to emphasize the dimension of time: should be made sense of. We shall return to that in the next section, in connection with Kuhn's ideas.

The third point also covers the idea of and the importance of *tacit knowing*, in particular as it has been worked out by Michael Polanyi (Polanyi 1958; Polanyi 1966). He has argued convincingly for a notion of personal knowledge (skills included) that is available only from

an acritical stance, by which he means acritical from the point of view of the individual person. He has in that context also explored the notion of 'dwelling in' one's skilled practice (Polanyi 1958: 59; Polanyi 1966: 17-18). The notion of dwelling, as a notion inspired by Heidegger, opens up also for further perspectives on the acritical side of skills, for example as explored by Tim Ingold (Ingold 2000: part II). In this context it is relevant to mention also the influential work of Hubert Dreyfus, which focusses on the notion of expertise. At the basis of his work is the phenomenological fact, or at least idea, that a skilled person (a master, an expert) acts *immediately*, as it were without thinking, within his or her field of skills (Dreyfus & Dreyfus 1986).

The notion of tacit knowledge has been much debated; this debate is covered in my (Molander 2015). Within the framework of my discussion here, it is important to note that "tacit" means inexpressible in the form of statements alone, which means that science in the theoretical knowledge tradition cannot adequately use it or cover it. Such knowledge can be demonstrated, shown or expressed in practices, craft practices and other ones.

As a last topic in the section, I return briefly to a topic mentioned in the beginning of this section: learning in the sense of training of the next generation of scientists. At stake is the conflict or at least tension between thinking freely and critically and being trained to do the right things in the right circumstances, as it were acritically: How much freedom of alternatives is suitable? How to educate people to become free? These questions are, of course, equally relevant to the education and training of craftspeople. The professional (scientific or craft) communities must find ways of living also with the unresolved and the open questions. We return to this duality or dialectic in section 5 below.

4. Thomas Kuhn on the notion of normal science
In this section I borrow some ideas of 'normal science' from Thomas Kuhn's *The Structure of Scientific Revolutions* (1970), an influential but also in some respects controversial book. In his book he constructs an analytical and conceptual framework, which he uses in a historical investigation of the development of a selection of fields of research. I use parts of his conceptual framework and adapt to my purposes; I don't need to go into his accounts of the history of scientific discipline, which, together with the concept of scientific revolution, are the most controversial aspects of his book. Of course, constructing and using a conceptual framework amounts to giving form to the reality to be investigated and discussed.

Kuhn's book was crucial to a change of what are seen as the most basic carriers of meaning in the sciences, a change from statements (including symbolic formulas) to the communities of scientists who by using the statements build and maintain the meaning of both the statements and the practices in which they are meaningfully used. As already seen, in my approach to science I share this idea.

The topic of this section is connected with the third demand on, or presupposition of, scientific communities as communities of learning, that is, the possibility of living (*a*critically) in/with the alternatives. Many fields of science are so specialized and dependent on a technical (intra-scientific) and mathematical vocabulary, that they cannot be made part of the ordinary lifeworld of people outside the scientific setting. However, scientists learn to *live* in the language and practices of their science; the practices are not only formal plays with symbols. We can here talk about internal scientific lifeworlds; my use of the word 'lifeworld' refers to what a community takes as given and do not question, that is, accepts acritically. This serves as a bridge to the relevant parts of Kuhn's conceptual framework, the perspective from which he investigates and discusses science.

I will take up three of Kuhn's connected to his concept of 'normal science':

- Meaning/sense in science is crucially connected to *problem solving*, in the broadest possible sense.

- Problem solving is learned in practice by reference to *concrete examples*, 'exemplars', and the skill of problem solving exists (partly) as tacit knowledge.

- Knowledge exists in the form of communities – 'scientific' – which develop over time: *communities of mutual learning*.

'In the broadest possible sense' in the formulation of the first point means primarily that problems are not necessarily well formulated, or not formulated at all; a 'problem' may be a problematic situation, as mentioned in connection with my not so simple theory above. Problem solving is not an isolated and separable part of a scientific practice, I have therefore chosen the formulation 'connected to', instead of something stronger. Scientific practices exist as wholes, where no 'parts' can be said to be *the* primary or most basic. The idea of such wholes is part of Kuhn's idea of a scientific paradigm, or with a term he uses in the postscript, disciplinary matrix (Kuhn 1970: 174-210)

The emphasis on problem *solving* does not mean that unsolved problems are not important, but it indicates that problems that are solved – or partly solved – are more important in the (normal) development in the sciences. This is part of the picture of science that I want to put forward, not a truth that can be proved.

The second point expresses what I think is the most important and original of Kuhn's ideas. The message is that the most important way of learning to solve problems is not by learning rules (or a 'theory') for problem solving, but by building up a skill of problem solving by solving (other) concrete problems. This can learned but cannot be taught only by giving instructions. It is more a matter of students growing into a community by sharing, and sometimes improving, the skills of the practice. Here it is worth noticing that 'learning' by students and by (formally) well qualified scientists are not essentially different, though perhaps we would rather talk about 'developing' skills, in the case of qualified scientists.

A scientific problem is not the property of individual scientists, nor are problem solutions. To negotiate and share the skill-and-understanding with others in the community *is part of the skill* built up in the community. This is basically what the third point expresses. I repeat it here without further comments: Knowledge exists in the form of communities – 'scientific' – which develop over time: *communities of mutual learning*.

Very much the same things that I have said about science – marked by the three points in this section – is equally valid for communities of craft practices. This parallel is important when the nature and possibility of craft science, as science through craft, is to be assessed.

Now we turn to a theme that may, at least apparently, show important differences between (normal) sciences and the crafts: the role of theory.

5. The 'in between' of human understanding
According to standard dictionaries and encyclopedias, theories are typically general statements, or a structured collection of such statements, which state general connections between phenomena. We can find some more interesting ideas when we turn to the conceptual (and etymological) history of 'theory'. Before exploring that I will point out a certain duality (dialectic) in our contemporary notion of theory, understood in a more open way than only general connections expressed in (systems of) statements: Theories are ideas about possible connections in and features of the world. Moreover, theories are ideas that can be shared with others in the community, not necessarily only by linguistic means.

Theories face in two directions, or perhaps three as I argued in (Molander 2017). One direction points towards the world, the 'real' objects (or processes, or whatever) and the 'real' connections between them. Theories, if correct, tell humans *about* connections in the world. On the other hand, theories are *for* the orientation of human beings in the world. They are orientation systems, part of our finding our ways around in the world. I have called these the object directed notion of theory and the subject directed, respectively (Molander 2017; Molander forthcoming). This is the basic duality or dialectic, and we want to keep, if possible, the two sides together. The duality seems to be strongly connected to the still common dualism between the mind and the world, between the contents of consciousness and the material world. The stronger this dualism, the more difficult to keep the two sides together. We must therefore look in a non-dualist direction.

The notion of practice provides us with a good alternative. I saw it earlier as a third, 'practice directed', alternative (Molander 2017; Molander forthcoming). Now I prefer to see it as a more comprehensive understanding, according to which the duality mentioned disappear or at least can stop worrying us. This alternative says that a theory, that is a good theory, is something that *connects us* to reality (cf. the next section about 'good'). Think about the craft practices. Craftspeople have established worldly practices in which they meet, understand and (re)make the world; and to a high degree understand it through (re)making it. Perspectives on the practice and its place in society is part of this understanding; this implies a conceptual form, though not all can be said in words. Theory in this sense connects the craft practitioners with the world, and, through them, the rest of us as well. Similar things can be said about other practices as well. But what then is 'theory' in a practice? What are 'ideas' in a practice perspective?

I will argue for an answer in two steps. In the remaining part of this section, I give a brief and rough account of two of the conceptual origins of the notion of theory and suggest how they, with some help from Hans-Georg Gadamer, deepen our understanding of 'theory' as connection with the world while keeping to a certain extent the duality (dialectics) of the notion. My argument will continue in the next section, about the *use* of theories.

'Theory' comes from the Greek word *theoria*, which means (something like) a looking at, viewing, contemplation, speculation; also a sight, a spectacle. A theoretician, a *theoros*, is then a spectator, looker on. We can distinguish two philosophically interesting early meanings. The first is from Plato, who used *theoria* as a key term in his philosophy. It was a notion of seeing, but not with your worldly or bodily senses, it was with your soul or your reason, and in order to accomplish it the soul must be philosophically trained and developed in order not to be bound to the changing pictures of the world delivered by the worldly senses. This way the soul could get access to, get connected to, the (really) real, the unchanging world of 'ideas' or conceptual forms.

This notion of theory is impossible to transpose into a contemporary view of science. It is, however, easy to see a connection to the standard way of focusing on the 'conceptual forms' in the form of statements, and, more importantly to what I called the object directed sense of theory. The idea that good theory shall keep us in connected with the world, not only for talking about it, is still there, but often with the added modern sceptical thought that humans can never know 'what reality is in itself'.

The second philosophically – and scientifically – interesting notion is a notion of theoria as a cultural and religious practice, with Greek roots older than Plato's notion. Here I follow Nightingale, *Spectacles of Truth in Classical Greek Philosophy* (2004). The focus is now on the *theoros*, the theoretician. The *theoros* is sent out from his – it was a man – local culture (a city-state) to witness a (sacral) spectacle in a foreign culture (city-state), and then returns home to give an eyewitness report. The theoretician is a spectator, a witness, with the task to report when returning home.

This second notion of *theoria* is also historically set in in culture that is difficult to fully grasp for us. However, it is fairly easy to take the idea of a witness with a task to report into a contemporary scientific setting – 'scientific' here in the wide sense.

Let us think of some examples. A social anthropologist moves into a foreign culture in order to live *as* a native but still be a witness, that is not 'going native'. Social researchers working in their own society may try to 'get foreign' by explicitly carry out their investigations with reference to theories, in the sense of explicit ideas that is not part of the common understanding (common prejudices) in their society. Quite generally, we can say: if you are not a foreigner, it may pay to see things *as* a foreigner. On the other hand, if you *are* a foreigner, is very difficult to report in a good way to the culture in which you are a foreigner. We could also play with the idea of (real) reality as something sacred, the great X that we, in a sceptical tradition, always are foreigners to.

What does this mean for possible notions of craft science? There have indeed been many ways of approaching the crafts as a (relative) foreigner, for example in academic fields like art history, ethnology and architecture. Much research on the crafts, especially on craft objects, have been carried out this way, also many good and interesting ones. But his is not the idea of craft science through craft.

If we turn around and put the craftspeople and their own practices at the centre, we meet again the apparent dilemma of being a witness and being a native at the same time. I have touched on this briefly in connection with the demand on 'living (*a*critically) in/with the alternatives' as discussed in section 3 above. If we focus on theory, and more generally, ideas as connections to the world, which we actually know quite a lot about – through practices that works fairly well – the dilemma disappears and turns into a strategy of learning and investigation.

Good theories are not only a matter of talking about the world; they are part of our connection with the world. Moreover, they shall make aspects of the world available to us, aspects that are not available in other ways. The emphasis here is on *make* – make available. *Acting* and *time* are then put at the centre. As human beings and as organisms we are active in the world, in the practices, acting-and-thinking in between what we know and what we don't know. We look for alternatives, or, when we fail, they force themselves on us. There is simply no The One Perspective that gives access the world. We must, like the *theoros*, move in between perspectives. The hermeneutic philosopher Hans-Georg Gadamer have put this very succinctly. He says that the true place of hermeneutics – that is, understanding – is between strangeness and familiarity (Gadamer 1988: 76). Here 'understanding' can be taken in a wide sense. For a skilled craftsperson, acting is a form of understanding. It is a form of intellectual work, as the cabinet maker Thomas Tempte has forcefully argued (Tempte 1982).

In the next section we shall further explore the use of theories in the dimension of acting and time. My focus on use is inspired by Ludwig Wittgenstein's perspective on language in his *Philosophical Investigations* (2009).

6. The ways we are connected to the world

Theories may be expressed not only in language, but also in acting, in practices, as well as in tools and other kinds of equipment. Skills are of course expressed through practices, but also other kinds of knowledge and insight – together with convictions, hypotheses and phantasies. It is not so easy to point to 'the expressions' here, but I will try to make a good argument for seeing theories-in-use as the key notion. One good reason for talking about expressions here is that practices and the ways – or styles – with which they are carried out can be 'read' by experienced colleagues in the same practice (sometimes over historical time periods). The ways and styles of acting is set in a context of human purposes and meanings, that is, in a conceptual form. Parts of it can be symbolized in practice-specific notation, as argued by

Harald Høgseth (2013) We shall avoid the question whether theories (or other things) are expressed, or expressible, in language *or* in acting *or* in other ways.

As argued with reference to Kuhn's notion of normal science, scientific statements get and have their meaning through their use in scientific communities. Actually, this can be expressed more generally, not limited to scientific practices: A formulation of a theory has its full meaning only in the context of the practices in which it is meaningfully – and reasonably successfully – used. Formulations can be used for clarifying problems, preparing and carrying out experiments, give advice to colleagues, and indeed make sharp analytical tools of the theories-in-use. Theories-in-use are *good* to the extent that they connect us to the world and give us good orientation in how we go on in the practice and in the world. Formulations are often of great help for orientation, but they can also make us disoriented and can even break (good) connections with a practice and the world. The words may cloud the world, so to speak.

Connection and orientation are key notions, as argued earlier in the context of a certain duality in the notion of theory. Now I try to formulate a context that keep the two sides together.

Orientation and connection to the world must be understood in the dimensions of time and acting. Theories are open towards the future or open the future for us. Or, in the worst possible scenarios, close the world for us. We can talk about this feature as future-directedness.

There are also other kinds of 'things' with which we are connected to the world and which are also future-directed in this sense: tools and practices. Tools, and for that matter other types of equipment, not only make it possible to master (instrumentally) the world, but to open the world for us in various ways. To use a notion introduced by James J. Gibson (2015), they provide us with affordances, which I here use in a more inclusive sense than limited to visual perception: the world *invites us* to use it in various ways. Again, this shows that tools, as well as affordances, are not only "things" but conceptually structured in terms of human purposes and possibilities – *and* the ways we talk about them.

Similar things can be said about scientific and craft practices – whether scientific or craft practices or other. They are not only means-ends structures, they are meaningful wholes with which (skilled) practitioners both orient themselves in the world, primarily in the context of their practices, and maintain their connections with the world.

I take it for granted here, that practitioners *are* connected to the world. For Descartes and later dualists – who categorically separate mind (soul) and matter (body) – the point of departure is rather that any connection must be proved, and until proved we have to live with the threat of scepticism. Here I follow the American pragmatists, or perhaps plain common (and scientific) sense, in not doubting our basic connection with the world (Molander 2015: 62-64; Putnam 2017). This doesn't mean that we master everything. We make mistakes and misjudge or pass over the limits of what we master, but we do that as connected to the world, and we can often learn to do better.

So far I have argued that tools and practices are similar to formulated theories with regard to world-connectedness and future-directedness, and perhaps also with regard to being partly conceptually structured. Statements and other bits and pieces of language are often taken to be paradigm examples of what is (fully) conceptualized. This is, I think, a mistake. Statements are 'in themselves' only partly conceptualized, because their meaning is dependent on their actual use, which can be described as 'practical', if you wish.

It would also be misleading to say that tools and practices 'are' theories, or 'are' (full) expressions of theories. Theories, in the sense that they can be said to be scientific or not scientific, must exist in a frame of language use. They must be partly expressible in language, but not in language as an abstract picture of the world, but language-as-part-of-practices.

Language as well as other symbolisms are used in all practices. At best they are tailored to 'fit reality', that is to keep us (practitioners) connected to it and guide us successfully further on in the practice. Certainly, many such languages are far from 'scientific'. They answer primarily to the demands of the practice and its criteria for exactness, adequate cover of the practice field and easiness of use.

To sum up, 'theories' as I have approached the notion here, are not fully expressed in statements, nor in statements *and* tool *and* practices: it is more a matter of being placed in the world and going on with skills, convictions, hypotheses and doubts – all 'expressed' in the way we go on and how we respond to what happens as we proceed. 'Theory' as used here share several features with the concept of 'paradigm' as used by Kuhn, but it is also different in important ways, and therefore I use the more open notions of theory and perspective.

7. Connecting to the world through other people. Some words by way of conclusion

My point of departure was a resistance against recognizing craft science, science through craft, as a full-blown science, which I think depends more on a narrow understanding of what a science is and ought to be than on prejudices about the crafts. This was the reason for spending much time on a fairly simple but also more open framework for understanding science, which does not exclude that sciences through crafts can be counted as or developed as 'real' or full-blown sciences. What picture of the relationship between the crafts and the sciences has emerged in my line of argument?

I have argued along two lines. I have, on the one hand, played (seriously) with the notion of *theory* in order to disarm those who find it lacking in craft science – and in fact argued that it can be as much theory in the crafts as in any science, with less words perhaps. On the other hand, I have opened for *seeing similarities* between the sciences and the crafts, by arguing that the sciences are to be understood essentially as communities of mutual learning, that is, as practices. At quite many points, I have also indicated similarities between scientific practices and craft practices. Both are, in their modern forms, learning communities. That is, they are open for discussion and continued mutual learning, by experimentation, imagination and argumentation. In a sense, establishing craft science, or craft sciences, means to develop communities across the borders. But what about the differences, 'the border'?

I said in the beginning that there are features of the world that are only available – or *made* available – by craft practices. In a sense it is true, or almost true, that the key means for making reality available in the crafts are 'our hands and our senses', if not understood too literally. The sciences, understood in the (modern) traditional way, try to make the world available by language, in the form of statements and symbolic formulas. With a slight exaggeration we might say the sciences make the world available through – and in – representations, while the crafts make it available by our presence and activities in it.

But again, we can turn to the 'other side' and find similarities between the sciences and the crafts. Craftspeople also use all kinds of representations in their practices, like drawings, sketches, descriptions and material models. But the connections with reality is not through the representations 'in themselves' but through their *use* in the respective practices. Further investigations into these aspects of craft practices have to go into the various crafts, that is, we need further investigations *through* craft. This ends my main line of argument. I turn now to some final words about communities and understanding between strangeness and familiarity.

Our connections with reality (the world, environments) in our practices are built upon and presuppose working connections between fellow practitioners (and others concerned). We are all the time dependent on others, access to reality ('knowledge') is deeply social. No one person can proclaim what is the case and what is not. If others who are serious and want to know what is the case disagree, there must we ways of coming to an agreement, possibly

after more investigations and discussion. Understanding is however not only a matter of investigation and discussion; it is a matter of living and doing things together. I end with an example that illustrates this point in a beautiful way. The example is given by the Norwegian carpenter Ole Thorstensen in his book *En snekkers dagbok* (*The Diary of a Carpenter,* 2015). Here Ole is in the process of making a loft conversion and he talks about carrying timber, that is, things that are both long and heavy (my own translation):

> Something of the finest I can say about other people, is that we have lifted heavy things together, lifted heavily. It is a very peculiar experience to carry something heavy at each end and feel the movements of the other propagate through the object. […] Everybody that could, should lift things together now and then; it is a fine way to get to know each other. (Thorstensen 2015: 99)

[Citatet, norskt original:

Noe av det fineste jeg kan si om andre er at vi har løftet tungt sammen, bokstavelig talt tungt. Det er en helt særegen opplevelse å bære i hver sin ende av noe tungt og kjenne den andres bevegelser forplante seg gjennom gjenstanden. […] Alle som kan burde løfte sammen av og til, det er en fin måte å bli kjent på.]

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