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Abstract: Paul Carter usefully provides the debate about creative research practices with a poetics that captures aspects of the dynamism of the material in the making process. However, Carter does not explicitly reconnect the implications of this poetics with that debate. This essay attempts to articulate those consequences by making explicit the 'other'ed, beyond-a-self that is necessary to postulate or explain how making can be a source of knowing. It explores i) the animism that underlies crafting materials, ii) the embodied being that harbours skills, and iii) the empathetic projections required in collaborations. It concludes by relating Carter's rhetorical project to Donald Schon's slogan, that 'design is a conversation with material situations.'

Knowing by Being-There Making: Explicating the Tacit Post-Subject in Use

Knowing What you are Making Happen

Makers know. They know, or feel like they know, when they are making something new, something that others will consider significant, others who share their making practices, but also others who are only an audience to the made. They know that they know, or feel that what they are feeling is type of knowing because there is a surety, a certainty, that is crucial to the process of making, of making decisions, of deciding what is to be made out of all the possibilities and unknowns at play when making. Only a kind of knowing, feeling like one knows, lets making happen; without the confidence of a knowing, without being able to trust that one knows what one is doing, making would be lost or paralysed, merely mucking about, amassing options without any criteria for selection.

Making is not all knowing. Clearly much if not most of it is not-knowing, wondering, exploring, trying. But if there were not some moments of knowing, moments at which the maker feels like they now know, that they have discovered something, something new, some way forward toward making the new come to presence, making would never amount to anything. These insights that motivate and sustain and guide making come as moments of silence in the constantly critical evaluation that is making.[1] These can be periods of productive silence, of flow, when each next move in the making seems to come of its own accord, with a strong, perhaps even clear, purpose, even if the final

outcome remains yet unknowable.[2] Or these can be pauses of restive silence, of contemplative appreciation, even wonderment, when what is being made is turned over in the hands or the mind so that one can feel its rightness, its coherence, its potentiality. When what is being made no longer provokes disgruntledness, when there is nothing more to comment on, nothing more to do, no more possibilities yearning to be tried, then it is made. It is done; it is now just making itself known.

Makers know that they know because they can and do get it wrong. Their knowing feelings can be off-the-mark, the outcome from a course of purposive flow insignificant, not new. They mistakenly discern potential where there is none, led astray by their surety, by their criticality and its falling actively or evaluatively silent. At these times, the only way to explain how they came to be so in error is to acknowledge the extent to which they had felt like they had known what they were doing at the time, how much they had then really felt that they were coming to know something new and significant, even though it turned out not to be. That it can be so clear when something made is neither new or significant seems to attest to the fact that making can access knowledge of the new and significant through what it does when it does.

The knowing of makers, in and as their making, is corroborated by others, during and after the making. It can be harder to attain the feeling of knowing-whilst-making when making collaboratively — there are more possibilities and unknowns at play, more decisions to be made, silences are harder to come by — but the recompense is confirmation of what seems to be known when making. Co-creators externalise the critical feedback between makers and the made that is inherent to making, allowing the feeling of knowing to appear more justified, the triangulation attesting to the coming to presence of the new and significant. Collaboration is no guarantor of successful knowing; group-think is perhaps more of a danger than the self-duping that can occur when working solo. But when the collaboration is truly dialogical, it will allow both more possibilities to be generated and more possibilities to be ruled out, thereby quality assuring what is being made.

However, the ultimate arbiter of how much making does involve knowing things of newness and significance, will always be those others not involved in the making, particularly those that come long, and longer, after the making. All making is a gift.[3] As a materialisation, an externalisation, making gives something to the world, the world in which others live. So even if something is initially made just for oneself, it will be there available for others, to notice, to appreciate, to use. But is anything ever really just made for oneself? Is it ever enough of a motivation to make, to make only for oneself? Isn't there always the need for an additional motivation, the hope or ambition that additional people will appreciate the made, even if it purports to have only been made for the maker? Isn't this extra incentive needed in order for the maker to begin and then see through to its end the difficult process of making, of making decisions about the never completely knowable, and labouring with mute materials and recalcitrant technologies to realise those decisions, to make them known? As such, as always to some extent other directed, the significance and newness that making feels it knows about when making, is ultimately dependent upon the evaluation of those that the made is given to, or given over

to in the end, as an artefact in the world. It is they that determine whether what the maker felt while making was true or mistaken group-think or self-duping. Importantly, when those who come after the making do assess the made to be new and significant, they are not just making a claim about the made, but about the makers, about the fact that the makers did indeed know, did know not just what they were skilfully doing, but further, knew something about the situation about which and in which they were making.[4] The newness and significance of the made attests to the insight of the makers, the knowledge that they must have discerned about the world, about the people in the world at that time and place, through and for making, in order to have made what they have made. And so we treat such knowledgeable artefacts and makers in particular ways, ways that finally confirm that what is at stake in the making is a knowing. We exhibit them, we copy them, we study them, we debate them, we let them influence what we make, but also what we do, how we see ourselves, what we say about ourselves. We organise ourselves so as to preserve and share and extend the knowing that lies in their making.

Research in General

Now none of this is new and significant, though there are still many who would insist that the knowing at work in making is only a feeling, is only like a knowing, is not yet knowledge; what gets made might be valuable, it may be beautiful or useful, and makers might be skilful, knowing how to manipulate materials and technologies, but making is not a form of knowing. If this is a minority position, the majority hold that making is a knowing but of a different kind from that involved in immaterial knowing, the knowing of ideas, of facts, of all that can, and only ever need be, made manifest in symbols, and is in fact inevitably perverted the moment it is made material.[5] (The majority here is historical as well as contemporary: from deprecations of *techne* as compared with *episteme* and *sophia* by Plato and to a much lesser extent Aristotle, to early modern distinctions between the arts and the sciences.) The key difference between the knowing of making and knowing proper is universality. Knowledge not sourced from making is codifiable and thereby transmittable because it is universal; whereas the knowledge of making cannot be extricated from the specificity of its material context. Making might therefore be a type of localised knowing, but as non-abstractable, it must be kept distinct from the knowing that lies at the foundation of the university. If making involves searches and findings, these are not the equivalent of researching truths.

Paul Carter's *Material Thinking* claims as its rationale the attempt to set out, in an exemplary fashion, cases of 'creative research.' He seeks to document collaborative artistic historical-place-making in various media in ways that make known the knowing at work in such acts of making. I think that there are several aspects to Carter's contribution to the long debate about the nature of 'makingly' knowing that are important,[6] all stemming from the fact that Carter is primarily a writer, a theorising-critic-story teller. As he describes in the opening chapter, his collaborations have involved a slide from a post-factum interpreter through contributor of textual input to co-maker. Carter's standing in cultural studies arms him with a linguistic confidence that, as he notes in his preface, is too often lacking in the makers from which current institutional circumstances now demand verbal accounts.[7] I do not mean by this that a humanities scholar can write where artists cannot ('dumb like a painter'), but that Carter's

disciplinary background and personal biography entitle and encourage him to be experimental in his writing, from the theoretical frameworks he employs to his word choice, where artists called to account in relation to the issue of research too often tend toward defensive if not the conservative forms of written expression. What is so refreshing about *Material Thinking* is that it explicitly sees its task as the generation of creative metaphors by which to access the research that is creative making. Carter makes almost no reference to the current debates about the nature of art-and-design-based research,[8] and it is probably just as well, as *Material Thinking* is thereby much freer about how it goes about expressing making's knowing. Its contribution is to develop a new vocabulary, or more properly, a new poetics, for what is at stake in these debates. By contrast too many characterisations of 'research-by-making' involve translating makingly knowing into a very limited set of terms, terms too uncritically accepted from the institutionally delimited language of 'research' — much as I have been doing so far for example, with the linguistic chain 'knowing, new, significant, justified, triangulated, sharable,' etc. Carter's contribution is consequently the rich new ideograms he invents to further how we might begin to understand and convey the knowing involved when making: a non-nostalgic kairotic remembering forward or clairvoyance through manipules of the *informe*, humidly colloidal criss-crossed blots.

Carter's lack of direct engagement with the research institution's terms of reference could be read as itself being a demonstrative attack on those terms. The university, and its funding agencies, are concerned with outcomes, with definitive findings, with knowing as a stopping point. By letting the makingly knowing of each his co-creative cases guide him, theorising from the ground up, rather than fitting making into this or that theoretical frame about research, Carter is able to, and keen to, maintain a certain open-endedness or finitude in the poetics he develops. His ideograms are presented performatively, acting out in how they are presented what they are trying to represent, non-nostalgic remembrances, handy mnemonics for seeing the way forward, blots of potentiality to be unpicked and reweaved in other(s') projects. They therefore strongly assert their partiality. Not needing to defend a thesis with regard to the knowing of making, Carter is able to develop more resonant ways of articulating that knowing, resonant in the sense of ringing true to the nature of practice more generally but also in the sense of amplifying those knowings so that they may begin to gain the attention of institutions arbitrating on what counts as practice-based research. My overall impression of *Making Thinking* is that it does seem to be one of the best examples I've seen of descriptions of creative processes that remains faithful to the non-generalisable specificity of such material practices, using terms firmly located within the particular constraints of each project, whilst nevertheless generating notions that are applicable and extendable beyond the time and place and nature of each project, that are still knowledges in that sense.

But this is in fact an important point, in danger of being underemphasised by the indiectness of Carter's performative approach. *Material Thinking* can be read as amounting to the demonstration of a new epistemology, one that could underwrite institutional respect for making as a form of researcherly knowing whilst still acknowledging its non-universalisability. That epistemology could be called one of generalisability. Generalising from a particular does not necessitate abstracting all the

way to a universal. What applies generally quite precisely applies in many, perhaps most cases, but not yet all. It is a genus, a kind, under which different sorts can be considered to be similar, but not identical. Or, it is generative, able to be repeated but with difference rather than replicated; it is reproducible in the biological sense, as opposed to cloning. This would amount to saying that whilst the knowing involved in making is not that of universal truths — i.e., it is a different form of knowing — it is also not that of utter particularities — i.e., it is nevertheless still of the order of knowledge. It is sharable, and it is sharable because it concerns, if not rules, conventions, things that come together, regularly enough to be more than idiosyncratic.[9] Making can be accepted as research to the extent that it is uncovering things that are useful and insightful for some other situations, for some other places, times and practices.[10]

Carter's *Material Thinking* lights upon this sort of general knowledge because his concern is place; not the specificity of place, but what place generates beyond its particulars, what is sharable about places. Nevertheless, given his performative discourse, Carter perhaps does not do enough to foreground what is significant about the form of knowing that he is revealing in his collaborative practices. Consequently, I would like to spend the rest of this article extrapolating the significance of Carter's approach, contextualising it so that it can form a stronger basis for the instituting making as a form of research.

Silencing Materials, Tools and Dialogue

Why is the knowing of making not easily articulated, not easily translated into symbols, requiring that it instead remain localised in the materiality of what has been made? Why, in short is knowing-in-making tacit?

There are many ways in which Michael Polanyi's notion of tacit knowing has been abused by defensive creative researchers.[11] Foremost is the fact that tacitness for Polanyi is not an ontological condition of certain practices like making, but merely their primary mode. That which is tacit is not constitutionally unable to be made explicit; it is just not ordinarily made explicit.[12] It can be made explicit, or more precisely, it can be made less tacit, but such acts of explicitation demand more creativity than mere translation; a poetics is demanded to overcome some inherent resistances.

What resistances then? It is important I think not to conflate the many ways in which the knowing involved in an expert act like making are difficult to articulate. Whilst they are related, they are nonetheless distinct instances of tacitness.

Materiality (craft)

Making involves working with materials. It involves a knowing about materials. That knowing is not the knowing of materials science, that is, the knowledge of properties, of that which of which materials are composed (eg atoms) and how (eg electrostatic arrays), of how the how of that composition causes those materials to behave in some ways (eg conductive) and not others (eg malleable). Makers are less concerned with what materials are — though they may know much of this sort of information, but not in ways that are new or significant — than in what materials can be made to become. This has always

been what makes makers suspicious to the more rationally minded. Makers do not so much see what is there physically in front of them, but rather see what might be there, what could become of what is there before them.[13] This subjunctive mode of perception is thoroughly interactive. It comes not from analysis of a material, from decomposition, but from experiments in synthesising something new with that material, from attempted compositions. This is why the knowing that results is partial, or only ever a general sort of knowing; it is a knowing that remains tied to the material conditions of the experiment through which it came to be known; 'I can do this with this material, because I once did this with this material; this does not mean that it can therefore do that, to know that, I would have to try to see whether it does.' The tacitness of this knowing therefore has less to do with the fact that what is at issue is materiality, as if materiality were itself inherently mute and mute-making. Rather it has more to do with the fact that what comes to be practically known about the materiality of a material by makers, is conditional, in both senses of the word: on the one hand the knowing is thoroughly empirical and therefore resistant to extrapolation beyond the conditions experienced by the maker in his or her experiments with the material; on the other hand the knowing is of the order of possibility and therefore resistant to articulation in the form of indicatives. This conditional knowing of materials is able to be articulated; ask a maker all that he knows about a material and he or she will be able to list what he or she believes can and cannot be done with a material.[14] And, in the case of makers of works judged to be new and significant, invariably what they will articulate that they know about a material will also be, *generally*, new and significant, indicating that such a material can be made to do what few others know they can.

Corporeality (skills)

Know-how resists articulation in two ways. Firstly, know-how becomes activated by being disarticulated. If I learn a task firstly as a set of explicit rules, becoming more adept at a task means no longer having to use such explicit rules; discrete actions get chunked into larger activities; and then activity series get integrated into single acts.[15] Expertise means being able to focus on ends rather than means; the know-how takes care of things without requiring explicit attention. Importantly, the integrative disarticulation that is the acquiring of expertise is not one-way; faced with a problem or a surprising situation, what differentiates an authentic expert from a mere task automator, is an ability to re-disaggregate the act, articulating each component action for scrutiny. Secondly, know-how is procedurally integrated via the body. What minds the actions comprising an act, allowing the expert to focus on the end rather than the means, or even on something else entirely, is their body. Hubert Dreyfus, amongst others, drawing on Heidegger and Merleau-Ponty has made clear that even purely mental expert tasks have an embodied aspect, a felt sense of whether they are 'on track' as they proceed.[16] Evidence is the sense of excitement and anxiety that we feel in our stomachs when an act being learned goes (publicly) right or wrong. Learning to do something expertly means getting a feel for the normal operation of that process, so that the interrelated senses of the body remain alert to any out-of-ordinary occurences. So, not only are expert level skills deliberately tacit-ed actions, but they are tacit-ed by being turned into wholistic bodily sensations. These skills can be articulated, for teaching for example, but such articulations involve not just remembering the actions that comprise an act, but also dis-membering how those acts

have been efficiently embodied; highly subjective feelings must be made sharable. However, to the extent that experts know how to do new and significant things, a poetics of their skill makes available strong general and generative knowledges.

Co-creativity (sharing)

No expertise is solo. If acts are not explicitly collaborative, they will nonetheless tend to involve negotiations with suppliers, sub-contractors, sellers. Even if conducted alone, the recipients of what is being expertly done will be in mind, as will, though less explicitly, those who are the origin of the expertise, ones teachers, with whom one is engaged in an implicit dialogue, having internalised their teachings as an ongoing critical reflection on ones practice. Creativity, if it is not to be merely variations of the same, must involve some exchange with otherness, with another. Exactly what makes creativity creative, its dialogical nature, makes it resistant to articulation. Dialogue depends on dynamic contexts hosting specific intentions and learned anticipations. Attaining some level of horizonal fusion between two participants (let alone more) requires sustained iterations of projecting and clarifying.[17] This is why communities of expert practice have distinct languages. Not only is there a jargon that can retain summaries of previous agreements and thereby accelerate the productivity of new dialogues, but there are also distinctive tools and artefacts, physical markers of what the dialogue has to date coalesced. These tradeable tokens are crucial to any successful project; however each project, in turn, involves the generation of its own idioms, nick-names for components and products in-development.[18] Robust communities of practice have mechanisms for translating project-specific currencies into that of the profession. The further translation into wider, more common terms is possible but difficult, with something of the peculiarities of the practice and each of its projects being lost.

As indicated, these three sources of tacitness interrelate in any instance of practice in ways that multiply the amount of tacitness that is being negotiated and consequently generated. What one is seeking to share during making is not something quite apparent, but rather has to do with what one understands of certain material possibilities; and those material possibilities are only discernible through ones skill sets and likewise only so demonstrable. There is an important consequence. Something must be underwriting how practitioners deal with these multiple complexities.

Animating Materials, Tools and Dialogue

Some of the best, because most practice-based, articulations of what is tacitly at stake in practice, remain Donald Schön's. One of the poetic strategies he notices in makers in relation to the discernment of material possibilities is 'back-talk.'[19] When a maker experiments with a material, the knowing about what the material can and cannot (be made to) do, is articulated, when it must be made explicit in educational contexts for example, as the material in dialogue with the maker, responding to his or her questions, with statements like, 'yes I can do that, but I do not like to; no, it only looks like that is something I am capabale of; yes that is something I am good at becoming.' On the one hand, the intuitive correctness of this observation seems uncontroversial; when making there is a sense in which the material seems to be speaking to us about its capabilities. On the other hand, this sort of anthropomorphism should strike us as quite unnatural;

obviously materials do not have intentions, let alone the ability to articulate them. This creative act, quite literally a ventriloquising performance, seems to suggest that part of being a maker involves extending ones self into things, projecting ones being empathetically into the inanimate. If there is a knowing that is associated with material possibilities for making, it is generated via this sort of projected back-talking. Clearly, if this is one of the key modes of articulating material thinking, there will be some embarrassment when attempting to institute it as a basis for research.[20] Except if it is more widespread.

Merleau-Ponty and Polanyi both draw attention to the common experience of incorporation, when tool users feel that a tool has become part of their body, to the extent that they are able to feel through the tool, as if their sensory perception capacities were now extended to the working ends of the tool.[21] Don Ihde gives the pointed example of a dentist who can feel tiny holes on the surface of your teeth as if his otherwise fat finger were now concentrated into the tip of a sharp metal spike.[22] Again, it is clear that practitioners do not have enlarged bodies or that they are in-dwelling their prosthetic tools. Nevertheless, anyone who has used a back scratcher or stirred a wooden spoon in sauce that is starting to stick to the surface of a pot recognises that this perceptual 'as-if' is intuitively correct, that we can come to empirically know things about the world through the devices we use, and that those feelings are no less certain for their seeming occurrence at the end of a tool. And if we feel that feeling through things, then it is much less strange that we should also hear back-talk from materials, that we can come to know things through making.

In fact, it is becoming well-established that dialogue, or authentic dialogue that is seeking to uncover something rather than just transmit the already uncovered, involves not just active listening, but the same sort of empathetic pre-emption that characterises material back-talk and tool in-dwelling. John Shotter, precisely as way of understanding the dialogue of expert practitioners, has assembled a social constructivist account of reference through the work of Bakhtin, Vygotsky and Wittgenstein.[23] This combination of theorists emphasise that cognition is always social, no matter how much it is occurring within the mind of an individual. Thinking is being-other, an exchange with the social internalised.[24] Dialogue is then the comparison of this being-other with others.[25] When I speak or write, I am doing so from the perspective of some other hearing or reading what I am still only just saying or writing.[26] I am them interpreting me, negotiating this otherness. I can only begin to enounce by pretending to be the recipient of that enunciation, ventriloquising their response. Being in an actual dialogue with an interlocutor depends upon each participant already being in an imagined dialogue with an interlocutor, in other words, upon each participant pre-tending (i.e., holding themselves before) to be the interlocutor. Dialogue is itself a practice, a practice involving the know-how of back-talk or otherness-in-dwelling.[27]

In each of these cases, it would appear that practitioners have, or at least experience, extended, if not distended, selves, subjectivities that are inherently intersubjective, projected into and through others and other things. Such non-subjective subjectivities are what make possible negotiation of the tacit complexities at play in co-creative skilled

material making. We cope with these complexes because we are those complexes. They are tacit because they are proximal, because they are how we are, how we are 'over there', how we are other(s).[28]

Knowing by Being-There Making

This is the ontological claim that I believe is informing the creative research epistemology that Carter is not polemically enough demonstrating. It is the counter-intuitive assertion that at play in the most practical and material activities of making are modes of being that we have only recently begun to discern theoretically. After the Cartesian subject comes the knowing practice of making.[29] Or to put it the other way around, Cartesian subjects can make, mechanistically, but if there is a knowing involved in that making, if there is a knowing that comes with and from that making, then makers are not centred rational minds, but corporeally interpersonal animists. They are literally instances of material thinking.

It is important to recognize that such an ontological claim is not merely a legitimation of creative research, but a wider claim about all types of knowing. This is not just an attempt to say that there is a knowing in making that deserves to be titled research, but a wider insistence that research, as a knowing, must also involve this sort of embodied social maker-beings. All forms of valid research involve the tacit being-other that is most explicit, even if still tacitly, in making. To know something is never to know something objectively, but to know it subjectively,[30] that is de-subjectively, by being it, experiencing generally what it is by becoming it.

Carter's creative poetics clearly capture this post-subject knowing involved in making. His metaphors blend the material and social in new and significant ways precisely by remaining only ever generally discernible. However, this new way of legitimating creative research perhaps remains too tacit in the performance of the text.

A Poetics to Come of Use Back-Talk

By way of epilogue, I would like to formulate what could be a critical question for Carter, or rather, for the future of material thinking. As a cultural studies writer, collaborating with artists, Carter is concerned primarily with what comes to be known through the projects seeking to make 'meanings.' These are new ways of understanding a place, or a culture, or some texts, or some media or art practices. To this extent, Carter's job of articulating knowing-in-making is actually easier than if his collaborations had been with designers, where the knowing at play concerns more 'uses' than meanings.[31] This is because use, according to all that has been argued in this article, about the incorporating practice of using tools and materials expertly, is precisely the source of most of the tacitness of practice. If use, or useful usability,[32] is the end of the making, and not just its means, articulating the new and significant knowing involved becomes significantly more difficult.

Another way to put this is via consideration of the notion of 'affordance.' An affordance is an 'actual possibility', a 'promised action opportunity.'[33] Affordances are the result of interactional perceptions, seeing not just a feature, but a future way of making use of that

feature. The key to understanding an affordance is to realise its utterly unsemiotic nature; affordances are the opposite of digital communications needing decoding. If they are communications, they are direct communications, without mediation, communications, as it were, between things and my body without the involvement of my mind. I do not see a shape, but a handle, or rather a 'handlable'; I see myself handling that shape; or more precisely, my hand sees that handlable, reaching out for it before I have even really 'seen' it (as if I were something other than my hand).[34] I am there already interacting with what I am still only sensing from a distance. This futural enactment accounts for the way affordances are not neutral offerings, but persuasively presented options; they have a pull; in their presence, we have a propensity towards them; their use comes intuitively because we are already in a sense (in the sense of seeing, or feeling, or hearing them, using them; we are already in-dwelling them, being there engaged with them. Use via affordances therefore happens through an ecological post-subject.[35]

Affordances are literally articulations, or joinings, material conjunctions of the capacity of tools and the skills of bodies. But for this very reason, they are constitutionally resistant to being articulated. To attempt to explain what a product knows about a body in such and such a situation, what it knows a body knows about what can and cannot be done with the things about it, is to either semiotise affordances, or to become mired in animistic relativisms.[36]

And yet, in as much as so much of our built environments are usefully useable, and do become transparently routine beneath our acts, this is exactly what designers must know. And in as much as there are not only new products being designed by designers, but products that enable new ways of being in the world, affordances must be designable (contra Gibson);[37] that is to say, designers must be able to come to know, through their practices of co-creative material making, new affordances, new and significant, even if still only ever general and generative, things about what humans can do, like to do and should do. Finding a poetics for this knowing-in-making-useful is the job Carter's *Material Thinking* leaves us with.[38]

Footnotes

[1] Donald Schön *The Reflective Practitioner* [New York: Basic Books, 1983].

[2] Mihalyi Csikszentmilalyi *Flow: The Psychology of Optimal Experience* [New York: Harper Collins, 1991].

[3] See Clive Dilnot "The Gift" in Buchanan, R. and V.Margolin *The Idea of Design* [Cambridge: MIT Press, 199X]. Dilnot is drawing on Elaine Scarry's *The Body in Pain: The Making and Unmaking of the World* [Cambridge: Harvard University Press, 1985] and Lewis Hyde *The Gift: Imagination and the Erotic Life of Property* [New York: Vintage, 1979].

[4] Heidegger draws attention to this hermeneutic circle in his "The Origin of the Work of Art" (in *Off the Beaten Track* [Cambridge: Cambridge University Press, 2002]) when insisting that the artwork *qua* art is the origin of the artist, i.e., makes its maker into an artist retrospectively as it were.

[5] Jacques Derrida has taught us that there is no immaterial knowledge, as logocentrism dreams, that all knowing is always already material, and pervertedly so. In the context of the argument that I will be making, this means that there is no knowing that is not of or by making.

[6] See for example the journal from the University of Hertfordshire, *Research in Practice*.

[7] "More than any other book, I have written this one with a reader in mind. Or is it an artist? Increasingly painters, craftspeople of every description, performers, designers and even architects find that their professional advancement is dependent on being able to put into works what they do or have done. These public workers do not have the luxury enjoyed by (the possibly imaginary) mute master I invoked before: in the present educational environment, the have little alternative but to masters the rhetorical game of theorising what they do. It is a vain, often humiliating, exercise – not because made things cannot bear interpretation but because the rules of the interpretative game deny intellectual recognition to those elements of material thinking that define its distinctive reach as creative research." *Material Thinking,* xvii.

[8] The exception is his citation from Catherin Bull's "Dilemmas for Creative Staff in a Research Active Faculty" on page 17.

[9] Compare with Allan Janik's distinction, in the context of clarifying the nature of tacit knowing, between practices that are regular and processes that are rule-governed: "Tacit Knowledge, Rule-Following and Learning" in Bo Göranzon & Magnus Florin eds *Artificial Intelligence, Culture and Language: On Education and Work* London: Springer, 1990.

[10] This argument bears some relation to Theodore Schatzki's sociologies of practices, which, he argues, operate as "site ontologies" rather than as individualist or more holistic ontologies of the social. See "A New Societist Social Ontology" *Philosophy of Social Sciences* Vol.33 No.2 (2003).

[11] 'Tacit Knowing' is the first of the lectures published as *The Tacit Dimension* [New York: Doubleday, 1966].

[12] See Allan Janik "Tacit Knowledge, Working Life and Scientific Method" in Goranzon, Bo & Ingela Josefson eds *Knowledge, Skill and Artificial Intelligence* [New York: Springer-Verlag, 1988].

[13] One of the most succinct accounts of this is provided by Ignacio Götz's paraphrase of Heidegger: "*Techne* is knowing, though knowing of a very special kind. It is knowing *beyond* the given. It is allegorical knowing. For why would one make A out of B if one had not glimpsed in B the possibility of it becoming A?" "Heidegger and the Art of Teaching" *Educational Theory* Vol.33 No.1 (1983), p3.

[14] This view, which comes from ethnographies of apprenticeship that reveal situated talk (deictic rather than theoretical — see for example Chaiklin. S. and J.Lave eds *Understanding Practice: Perspectives on Activity and Context* [Cambridge: Cambridge University Press, 1993], but also Peter Dormer *The Art of the Maker: Skill and its Meaning in Art, Craft and Design* [London: Thames & Hudson, 1991), is contrary to traditional accounts of craftsmen as dumb: see for example Christopher Alexander's characterisation of craft as unself-conscious evolutionary making in *Notes on a Synthesis of Form* and Hannah Arendt's account of artisans as not-yet-public in *The Human Condition* {Chicago: University of Chicago Press, 1970].

[15] This hierarchy is derived from Leont'ev who differentiates activity (overall motive), action (sub-goals) and operation (mechanistic actions). Importantly though, Leont'ev understands skilling as the movement from conscious activity through task-oriented actions to routine, and insists that the process is always reversible in the face of breakdowns. See Timothy Koschmann, Kari Kutti and Larry Hickman "The Concept of Breakdown in Heidegger, Leont'ev and Dewey and its Implications for Education" *Mind Culture and Activity* Vol.5 No.1 (1998). I will return below to Maxine Sheets-Johnstone's critique of Hubert Dreyfus' assumption, that I have repeated, that expert learning begins with instructions.

[16] Hubert Dreyfus' model for the acquisition of expertise was developed with his brother in the context of his critique of artificial intelligence: Dreyfus, H. and S.Dreyfus *Mind over Machine: The power of Human Intuition and Expertise in the Era of the Computer* [New York: Free Press, 1986]. It has been widely applied by Dreyfus to ethics, nursing and a critical review of online learning.

[17] I am using the terminology of Gadamerian hermeneutics which draws attention to the need for poetic play if two interlocutors are to successfully co-ordinate their communications, though has been critiqued for being insufficiently heeding of otherness. See *Dialogue and Deconstruction: The Derrida-Gadamer Encounter* [Albany: State University of New York Press, 1989].

[18] The importance of artefacts as place-markers for collaborative consensus has been most theoretically explained by Bruno Latour's actor-network-theory of practices, via his notion of 'immutable mobiles': "Visualization and Cognition: Thinking with Eyes and Hands" *Knowledge and Society* Vol.6 No.1 (1986). Strong case studies of the emergence and use of these momentos in the making of new technologies have been published by Lucy Suchman: "Affiliative Objects" *Organization* Vol.12 No.3 (2005).

[19] See discussion of "reflective conversation with the situation" in *The Reflective Practitioner*.

[20] Alf Hornborg describes the de-animistic education of modernism that renders animism interesting but irrelevant to the institutions of knowledge: "Animism, Fetishism and Objectivism as Strategies for Knowing (or not Knowing) the World" *Ethnos* Vol.71 No.1 (2006). Importantly for what I am arguing, Hornborg also notes that animistic knowing is inherently in-place general knowing, something that arises from the specific interactions of knower and known: "One reason why animism continues to intrigue us may be that this is precisely what animism *does*. Rather than viewing knowledge as *either* representation *or* construction, animism suggests the intermediate view that knowledge is a relation that shapes both the knower and the known. An animistic or 'relational' ontology is a mode of knowing that is not only constitutive of both the knower and the known — as is *all* knowledge, according to the cognitive scientists (Maturana and Varela) — but that crucially also *acknowledges* this fundamental condition, and thus also the responsibilities that must always adhere to the very act of 'knowing'… It is the long immersion in the concrete and experiential *specifics of place* that yields conditions conducive to 'relatedness' – vis-à-vis irreplaceable persons, localities and things [that we tend to animate]." (28)

[21] Polanyi's discussion of tool-'in-dwelling' is in *The Tacit Dimension* but the more substantial differentiation of attending-to attending-from, including the same example as Merleau-Ponty's, the blind person's cane, is in *Personal Knowledge: Towards a Post-Critical Philosophy* [Chicago: University of Chicago Press, 1962].

[22] *Technics and Praxis* [Dordrecht: D.Reidel, 1979]

[23] John Shotter and Arlene Katz "Articulating a Practice *from within* the Practice Itself: Establishing Formative Dialogues by the Use of a 'Social Poetics'" *Concepts and Transformation* Vol.1 No.s2/3 (1996).

[24] "The greatest change in children's capacity to use language as a problem-solving tool takes place… when socialized speech (which has previously been used to address an adult) *is turned inward*. Instead of appealing to the adult, children appeal to themselves, language thus takes on an *intrapersonal function* in addition to its *interpersonal use*." John Shotter quoting Vygotsky: *'Getting it':* 'Withness'-*Thinking and the Dialogical… in Practice* [manuscript: http://pubpages.unh.edu/~jds/bookpage.htm, 2006], 24.

[25] Eugene Gendlin's focusing method involves what he calls 'crossing' and 'dipping'; I 'dip' into some feeling I have about something that does not seem right; I give it a provisional name, comparing the feeling to that concept; and then I follow the semantic chain associated with that concept some way, recomparing some other provisional name with the feeling. In dialogue, this comparing happens between interlocutors who are each in parallel dipping in response to concepts crossed between them. See: http://www.focusing.org/gendlin.html.

[26] "From the very beginning [an] utterance is constructed while taking into account possible responsive reactions, for whose sake, in essence it is actually created… The entire utterance is constructed, as it were, *in anticipation of encountering this response*…. Forming itself in an atmosphere of the already spoken, the word is at the same time determined by *that which has not yet been said but which is needed and in fact anticipated by the answering word*." John Shotter quoting Bakhtin: *'Getting it': '*Withness'-*Thinking and the Dialogical… in Practice* [manuscript: www.johnshotter.com, 2006], 25.

[27] Maxine Sheets-Johnstone provides an account of apprenticeships that demonstrates how learning can only take place if watching an act being performed is already a proto-performing along with what is being watched. She then further argues that this must also be the case for verbal instructions, that these can only be instructive if the meaning of the words use lie in some rehearsed enactment of what they are describing. Sheets-Johnstone makes these claims ontological or at least ontogenetic by way of early childhood research on 'joint-attention' (being able to look where someone else is looking) and 'turn-taking'. See "Kinetic Tactile-Kinesthetic Bodies: Ontogenetical Foundations of Apprenticeship Learning" *Human Studies* Vol.23 (2000).

[28] This formula comes from Mikkel Borch-Jacobsen's attempts to deconstructively understand the agency of psychoanalysis, and rhetoric more generally: "Another does not affect me because I feel such and such an affect in regard to him, nor even because he succeeds in communicating an affect to me by way of words. He affects me because 'I' *am* that 'other', following an identification that is my affection, the strangest alteration of my proper autoaffection. My identity is my passion. And reciprocally, my passions are always identificatory." "Analytic Speech: From Restricted to General Rhetoric" reprinted in *The Emotional Tie: Psychoanalysis, Mimesis and Affect* [Stanford: Stanford University Press,1992], 73.

[29] I am alluding here to the poststructural collection edited by Eduardo Cadava *Who Comes after the Subject?* [New York: Routledge, 1991].

[30] This is exactly how Polanyi defended tacit knowing; his earlier larger text, *Personal Knowledge* articulated the extent to which scientific knowing was inescably and thankfully always already a form of personal knowing. As falsifiable fact finding, science was no less a form of knowing for Polanyi's argument; but it should now be considered to involve personal knowing, with the consequence that personal knowing should now be afforded greater respect.

[31] I am assuming here that the difference between art and design is the difference between the useless and the useful. However, on use as a foundation for meaning, see Heidegger's *Being and Time*.

[32] I am here indicating that my concern is with new and significant designs, that are authentically useful, or use-creating, which requires that they be usable, rather than with the business of design making less useful existing activities more usable.

[33] Latour characterises an affordance as a possibility and promise in see "Morality and Technology: The Ends of the Means" *Theory, Culture & Society* Vol.19 No.s5/6 (2002). 'Actual Possibilities' is the title of Aaron Sloman's conference paper from *Principles of Knowledge Representation and Reasoning: Proceedings of the Fifth International Conference*, 1996.

[34] Compare with Malcom McCullough's quotation from [Focillon] "The hand is not the mind's docile slave. It searches and experiments for its master's benefit; it has all sorts of adventures; it tries its chance." *Abstracting Craft: The Practiced Digital Hand* [Cambridge: MIT, 1996], 8.

[35] The term affordance comes from Gibson's ecological perception theory. In ecological relations, the boundary between one entity and another, or one entity and its environment, is the result of a decision by an observer rather than something inherent to the nature of an entity. Environments afford for entities to the extent the entities are already part of those environments.

[36] I am alluding here to Elaine Scarry's way of understanding designed affordances: "But it here becomes noticeable that artefacts must know a great deal more about their human makers than the particular needs they accommodate… A stepladder, for example, not only 'knows' (incorporates into its design the knowledge that) human beings are shorter than they often need to be, but also 'knows' that human beings tend to overstep themselves when lost in trying to be taller than they are: the top step may bear the words, 'Do not step onto this step' (i.e., 'I know that you will fall, even if you do not know that at this moment'). An object must be *self*-aware: its design must not only anticipate how it will be used (and even, how it might be oddly used) but how it will be installed and eventually removed." *The Body in Pain*, 303.

[37] There is long dispute about the extent to which Gibson's affordances are biological, universal, or cultural, from Donald Norman's change of position toward the conventional nature of affordances, to Alan Costall's "Socializing Affordances" *Theory and Psychology* Vol.5 (1995).

[38] One of the first comprehensive phenomenological accounts to my knowledge is Kurt Keller's "The Corporeal Order of Things: The *Spiel* of Usability" *Human Studies* Vol.28 (2005), but see also some of the research in HCI by Phil Turner and colleagues, eg "A Study of Familiarity" in M.Rauterberg et al eds *INTERACT'03 Proceedings* (2003).