

Integrated Thinking and Making in a Research Culture

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Introduction

Within a research environment, creative practitioners are required to communicate the systematic thinking that lies behind making. Practice is where problems, issues and contexts originate; it is also where research significance and contributions lie. In general, art training teaches us to speak, principally, about artefacts through reference to theory and through analysis and interpretation of artworks. These forms of contextualisation facilitate understanding of artefacts and the discourse or discourses that surround them and are central to the elucidation and clarification of research problems and outcomes. Yet while contextualization plays a vital role, it does not explicitly evidence the intricate making skills fundamental to methods of practice-based research. It is only through analysis and dissemination of the intrinsic and complex processes of making, that artists will be able to construct reliable methods that clearly, and unequivocally, distinguish research from practice and demonstrate the significance of artistic processes to the production and expansion of knowledge.

This paper reflects on some of the mental and physical making resources underlying my own art practice and these are contextualised through reference to a current research project titled *The Taxonomy of Antithesis and Wonder*. Its aim is to exemplify some of the ways in which I engage in the complexities of creative problem solving using an integrated, but by no means definitive, skill-set that while, specific to my own process of making, I hope nevertheless, add dimension to discussion about research methods.

The making resources I reference are presented for clarity's sake, as discrete, but do not in practice, occur in isolated or linear steps. The thinking behind making is convoluted and integrated, with much to-ing and fro-ing between the different states of engagement. The works states I refer to primarily reflect complex, non-verbal or intuitive states of knowledge building but these are, at all stages, underscored by the rigorous analytic, reflective and synthetic thought processes central to all research, and, also, by the specifics of disciplinary and technical knowledge. The scope of the paper will only allow reflection on the former but these thoughts must be understood within the context of these more analytic types of thinking. I also acknowledge that content is framed by work done by Robert and Michèle Root-Bernstein on synthetic learning that integrates many ways of experiencing and thinking, mental and physical, concrete and abstract and by the writings of Barbara Stafford on the critical function of analogy within creative invention.

The Taxonomy of Antithesis and Wonder

In December 2009 I received a generous research grant that provides resources for me to focus my research interests over three years. In the grant application, titled *The Taxonomy of Antithesis and Wonder*, I proposed to create artworks that explore idiosyncratic and interpretative forms of classification as alternatives to the established taxonomic frameworks that customarily shape the cultural and social construction of knowledge. With the gradual fracturing and compartmentalisation of information since the Baroque period knowledge has increasingly become contingent on differentiation and the separation of 'otherness'. The premise of the research project is to explore associative and heuristic methods of classification that construct a more nuanced picture of resemblance and connectedness and thereby demonstrate value in the connective aspects of human cognition that are not well captured by more rational approaches to classification.

To progress research I have been visiting and studying the collections of natural history and other well and lesser-known museums, not only to familiarise myself with collections but to also gain insight into how these sites influence both the form and distribution of knowledge. I have a specific interest in pre-enlightenment natural history collections, such as 'wunderkammer' or curiosity cabinets.

Wunderkammer clustered together objects drawn from the biological world with the inventions of humankind. Connections between discrete objects were made primarily through visual patterning, either through resemblance or comparison and were as Claire Preston notes grouped: 'to express antithesis: natural/artificial, normal/abnormal... ordinary/extraordinary, valuable/valueless, by material, by use, by size, by weight, by probability, by ability to astonish.' (Preston, C. 2000, p.169).

Objects were displayed cheek-by-jowl and in configurations intended to trigger insight about correspondences across the different realms of the material world. Stafford noted:

To think in the presence of a cryptic "*Wunderkammer*"... required a calculus of combinations for inferring the connections among thousands of unknown aspects or ciphers... and helping us to arrive at legitimate hypotheses about an increasingly complex universe... the jump to establish parallels... (that) transgress(es) disciplinary boundaries and organic and inorganic hierarchies and challenge Descartes' divorce between objective and subjective knowledge (Stafford, B. 1999, pp.122-3).

Analogy and Non-verbal Imaging States

As context to the research these early natural history collections are significant because they exemplify visual, associative and analogical correspondences, rather than the hierarchical narratives of later forms of taxonomy that were developed to group objects on the basis of evolutionary relationships, typically deduced from morphological and physiological similarities. Unlike the latter, such collections were defined by unhierarchical arrangements that sought correspondences and equivalences across material forms, whether man-made or natural. The work of Stafford has been informative because the author explores the concept of analogy as a kind of foundation for cognition arguing that analogical thinking brings together both our perceptual and cognitive skills. She argues that the associative ordering of

wunderkammer reveals a: 'nonalgorithmic technique for binding our perceptual system to our cognitive system' (Stafford, B. 1999, p.177) and claims that today 'we possess no language for talking about resemblance, only an exaggerated awareness of difference.' This, Stafford argues, has occurred because we have lost the 'link between visual images and concepts, the intuitive ways in which we think simply by visualizing' (Stafford, B. 1999, p61).

My reading on wunderkammer and analogy provided me with a framework for thinking about the mental and physical processes I use to create meaning in pictures and objects. Analogical thinking is understood as the processes through which attributes and relationships are abstracted from an object or representation that are different from the subject's literal form or function. These attributes are then deployed to make relevant likenesses or patterns in unlike things. Because analogical thinking largely occurs through non-verbal, intuitive and abstract forms of mental imaging, in order that analogical relationships can be applied to a specific purpose or intent, they need to be subjected to explicit forms of reasoning. Immanuel Kant wrote in his *Critique of Pure Reason* that "the intellect can intuit nothing, the senses can think nothing. Only through their union can knowledge arise' (quoted in Root-Bernstein, R. & M. 2001, p.306). The two forms together, however, can produce powerful results.

As Stafford points out, artists are particularly good at adapting or varying existing analogies (Stafford, B. 1999, p144). They instinctively deploy the perceptual and cognitive aspects of analogical thinking through placing objects in relationships, through linking form and content and in transferring ideas and materials from one domain to another as they work to resolve ideas in visual form. Indeed, with its basis in abstraction and transformation, analogy lies at the heart of what it means to think creatively; analogy helps artists to make leaps from existing knowledge to new worlds of understanding.

The perceptual and cognitive states underlying analogical thinking are certainly seminal in shaping the form and content of my artworks. For many years I have used collage as a key method for exercising ideas because it provides the spontaneity necessary for their development; source material is stripped back to its simplest form and then built up again through reprocessing and reinterpreting the imagery. Collage, not only involves the literal cutting, tearing, layering, and pasting of materials, but also the mental imaging that occurs alongside these physical processes. Materials are selected and manipulated in relation to ideas, sometimes logically, but as equally through a more intuitive sense of likeness across structures and sequences.

Through use of abstraction, juxtaposition and synthesis the mental (and material) techniques of collage mirror the intricate abstract mental states of analogical thinking. While in the initial stages the thinking is largely visual and intuitive, the relationships and patterns that emerge need the rigor of analytic thinking to be realised more coherently as both linguistic and visual analogies. In recent years I have begun to document, through photographs, the various stages of work-in-progress. In this record it is possible to see my visual thinking in action, or as Stafford notes to: 'see ourselves mentally laboring to combine many shifting and conflicting perceptions into a unified representation' (Stafford, B. 1999, p.146). As I play with patterns and structures with loose relationship to an original idea analogies develop that

become pivotal in structuring entire works. For example two photographs, when placed together, were the trigger for inquiry that resulted in one of the first works, titled the *Book Of Measure* (2010),¹ which I completed as part of the research project.



Figure 1. Pages from *The Book of Measure*, 2010.

The two photographs had been lying in my peripheral vision for some months, some distance apart on my worktable. I scanned them, digitally cropped them, altered their scale and removed unnecessary detail, before positioning them together. Each had been abstracted to attain a visual correlation but significantly, they resonated, as well, with intellectual associations that set in train inquiry into the measure of the world. While the process began, simply enough, through this analogical resonance, it took many hours of collecting and manipulating source material to bring the 187 pages of text and images of the 'book' into resolvable form. Experience has taught me not to close experimentation too quickly, or the work will not build the complexity (both visual and conceptual) essential to its successful resolve. Its resolve brought into play a complex of adjustments transformed through equilibrium of intuition, intention and realisation.

¹ The finished 'book' is 7.5 x 1.5 metres when displayed in grid-format along a wall. Content is organized within nine chapters: absolute; reveal; cause; value; less; keen; eclipse; trace; and means; there is also a title page, a contents listing, an introduction and index. The text, formed through repetitive scribbling, is illegible except for the title and chapter headings that are written backwards. The book commands authority through its standard organization, yet is clearly fictional. The juxtapositions between image and text present a discursive and interpretative space that is intended to expand thinking about how knowledge is organised to shape understanding of the world.



Figures 2. & 3. *The Book of Measure*, Tasmanian Museum and Art Gallery, 2010.



The floor of the studio is my favourite place to think and work. There is a convergence between the movement around the work and my capacity to visualize its dimensions both actual and conceptual. Movement brings about heightened physical awareness and heightened perception that bonds physical sensations with mental imaging. Motion, orientation, posture and visceral reactions of the body, crawling, standing, lunging, sorting, sensing, connecting, feeling and throwing out; I enter a flow state that bridges the seen and the unseen, the known and the unknown. I am literally and figuratively making patterns, in space, and in the work - I am making the work by working.



Figure 4. Work-in-progress (studio floor).

The author Catherine Dunton describes this experience as a form of choreography where one movement or gesture begets another and decisions are made in response to what has gone before. She comments:

The significance of the unique relationship between perception and facture is the attention is now caught up with intention. Once fixed, the next line, the next investigation of the eye is fatally influenced by these marks. The eye is no longer free to rove where it will but must enter into a highly sensitive relationship with the choreography of lines that take on their own rhythm and pace. The hand is not the tool of the mind reproducing the object after the eye's unremitting gaze. Rather its movements become a constituting part of the creative-perceptual process (Dunton, C. 1999 quoted in Jarvis, M. pp.201-13).

Analogical thinking derives largely through non-verbal and intuitive responses; we understand something immediately or instinctively without the need for conscious reasoning. For this reason intuitive processes make an uncomfortable fit in conventional research environments where methods and outcomes need to be reproducible and clearly measured. Yet all creative thinking is born of intuition and gut feelings. For Einstein these states occurred well before their meaning could be put into concrete form. He revealed this thus when he wrote:

The words of language, as they are written or spoken, do not seem to play any role in my mechanism of thought. The psychical entities which seem to serve as elements in thought are certain signs of and more or less clear images which can be “voluntarily” reproduced and combined...The above mentioned elements are, in my case, of visual and some kind of muscular type’ (quoted in Root-Bernstein, R. & M. 2001 p.3).



Figures 5. & 6. Pages from *The Book of Measure*, 2010.



Material and Transformational Thinking

Einstein's recognition of body thinking is tied in with material or tacit thinking, which has had significant airing in recent discussion about practice-based research.² There are variations across definitions and applications but Michael Polanyi's early work on the subject provides the origins of how we have come to understand tacit learning. Polanyi defined a type of knowledge that may only be gained through doing, through practise or through direct and repeated observation of making. Tacit knowledge, for Polanyi, is subjective knowledge that is rooted in individual experience (insights, intuitions, and hunches) and has two primary dimensions: procedural (the 'know-how') that arises through experience and cognitive (ingrained beliefs, perceptions, ideals, values and emotions). Because tacit knowledge is embedded learning it arises through experience and is normally demonstrated and imitated rather than verbally communicated. Polanyi's interest lay in reinserting subjectivity into the objective, impersonal ideals of scientific detachment and he argued that the knowledge that accrues through handling, though not easily articulated, is essential to all acts of invention:

Central to Michael Polanyi's thinking was the belief that creative acts (especially acts of discovery) are shot-through or charged with strong personal feelings and commitments... Arguing against the then dominant position that science was somehow value-free, Michael Polanyi sought to bring into creative tension a concern with reasoned and critical interrogation with other, more 'tacit', forms of knowing (Smith, M. K. 2003).

A key principle of tacit learning is that it brings together a scattering of intrinsic knowledge(s) that together create an intelligence that builds new understanding. Polanyi wrote that: 'our tacit powers can integrate a much larger number of variables at a far greater speed than any explicit procedure, registering each of these variables in turn, could possibly carry out' (Polyani, 1964, p.3). He explains this idea through the example of riding a bicycle:

I know how to ride a bicycle..., but this does not mean that I can tell by what principle I keep my balance on a bicycle... I may not have the slightest idea of this or even an entirely wrong idea of it, and yet I go on cycling... And suppose I cannot ride a bicycle, it would not help me if I were told that in order to compensate for a given angle of imbalance I must take a curve on the side of the imbalance, of which the radius r should be proportionate to the square of the velocity v over the imbalance... Such knowledge, though true, is ineffectual unless it is possessed by tacitly (Polyani, 1964, p.3).

² The term tacit knowledge was first used by Michael Polanyi to describe a type of knowledge that may only be gained through doing, through practical experimentation or through direct observation of making. More recently Paul Carter, Barbara Bolt, Ross Gibson, Michael Jarvis, Donald Schön (knowing-in-action) among others have contributed to this discussion. See **Polanyi**, Michael (1967); **Carter**, P. (2004); **Bolt**, B. (2001); **Jarvis**, M. (2007); **Gibson**, R. (2010); **Schön**, D. A. (1983).

Polyani's example demonstrates how tacit knowledge is tied to the experience of incorporation. He notably said 'we know much more than we can tell' (Polyani, 1964, p.10). The philosopher Karl Popper labelled this experience as a form of empathy, remarking: 'I think the most helpful suggestion that can be made... as to how one may get new ideas in general (is)... "sympathetic intuition" or "empathy"... You should enter your problem situation in such a way that you almost become a part of it' (quoted in Root-Bernstein, R. & M. 2001, p.187). Moreover, the philosopher Henri Bergson suggested that the most important insights could *only* arise in this way. He declared: 'It follows that an absolute can be reached only by an intuition, whereas the rest (of our knowledge) arises out of analysis. We here call intuition the sympathy by which one transports oneself to the interior of the object in order to coincide with its unique and therefore ineffable quality' (quoted in Root-Bernstein, R. & M. 2001, p.186).

As a maker artist I experience this empathetic immersion absolutely. For example, when painting the human face visualisations (mental imaging) mingling with the sense of touch; I 'feel through' the brush the contours of my face, I experience the hollow of my cheek and the form of my nose as my brush transcribes these features within two-dimensions. I know a face from without (observation) but equally feel (sense) it from within.

The *Cabinet of Doubt (The Ten Plagues)* (2011)³ a recent research outcome is an example of how tacit learning has been articulated into explicit concepts using metaphors and analogies. The idea was initiated by a few china fragments that I dug out of the ground in the children's graveyard at Cornelian Bay Cemetery, in Hobart. The fragments barely visible in the grass and dirt were some generations old and had been blown from graves and shattered by repeated lawn mowing. Their desolation was palpable and reverberated with ideas that had been consolidating obliquely in my thoughts.

³ The *Cabinet of Doubt (The Ten Plagues)* is a mixed-media piece, comprising a shelving unit housing various objects and a large framed drawing. By design, the cabinet itself is tall and shallow and has seven stainless steel shelves; it is perched precariously on spindly legs. On the shelves, and close to the front edge, are placed an assortment of handmade objects constructed from both natural and man-made elements (glass, porcelain, paint, paper, moss, cork, wood, metal and tin). Embedded in the objects are references to death, growth, construction and destruction and a suite of drawings of dandelions, decreasing from a full-blown flower to empty stalk, bring in a reference to time. Placed around the drawings and objects are pieces of weathered text, folded, shredded or printed on pages torn from an old diary. The text has been excised from the 'The Book of Exodus' and is an account of the ten plagues or calamities that God imposed on Egypt as a demonstration of his power. I had read that in his desire to increase his understanding of the relationship of divinity to morality, U.S President Thomas Jefferson cut from a Bible all references to miracles. I allude to his act through my own 'excision' not of miracles but of plagues and calamities that I intend to be viewed within the context of the instability of contemporary times. The drawing, also framed in wood, images multiple bird skins, legs tied with labels and stored on mass at the Tulane University, Museum of Natural History in New Orleans. It hangs on the wall beside the cabinet.



Figure 7. *The Cabinet of Doubt (The Ten Plagues)*, Criterion Gallery, 2011.



Figures 8. & 9. Work-in-progress (studio floor).



As with the 'book' the ideas inspired by the fragment were transformed through the kinaesthetic and visual demands of the media. As new elements were introduced, others were altered or rejected and slowly the work revealed itself through response to its material form and through its making. The making here is complex requiring sophisticated mental processing responsive to the making as it is happening. In transforming ideas into dimensional form I am simultaneously drawing on former experiences, mental imaging (projection), empathising, kinaesthetic thinking ('feeling' the specific qualities and potential of a given material or situation) and transformational and dimensional thinking (the conversion from one form to another, from one scale to another and/or from two dimensions to three or vice versa). The Root-Bernstein's wrote: 'we call the serial or simultaneous use of multiple imaginative tools in such a way that one (set of) tool(s) acts upon another (set) transforming or transformational thinking' (Root-Bernstein, R. & M. 2001 p.273). That all these forms of intelligence are interacting speaks of the complex dimensions of material thinking and tacit learning.

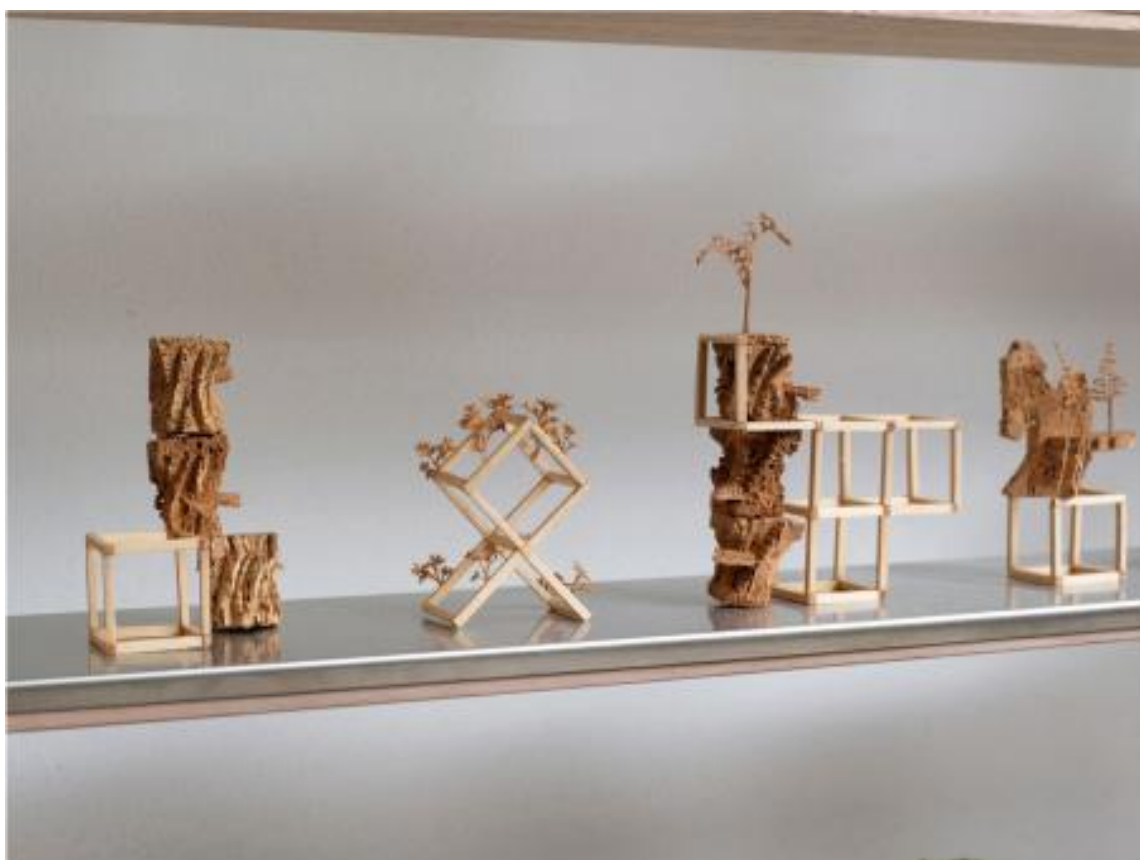


Figure 10. Detail *The Cabinet of Doubt (The Ten Plagues)*, 2011.

Concluding Remarks

Robert and Michèle Root-Bernstein's observation reminds us of the complex mental and physical resources that artists rely on to create artworks. My aim for this paper is to define a small but integrated

skill-set, that are personally specific and which only scratch the surface of the many and varied ways artists interact with the materials and processes of art-making, but which I hope add to discussion about research methods in the creative arts.

By-and-large, artists remain nervous about speaking about their creative processes. Whether this is so because it is difficult to express in words what is largely a non-verbal activity, or because we have not been taught to scrutinise our thinking in relation to making, is difficult to surmise. Yet it is only thinking about the methods with which we make that we will be able to demonstrate the significance of artistic process to the production and expansion of knowledge. And only then will we really begin to understand the dimensions of creative research and demonstrate unambiguously the value of creative activity to human experience.

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