

Critical Making with Aluminium Sandcasting: Design Practice into Practice-led Research

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Abstract

This paper appraises design practice as research and how my own work continues to transform into practice-led research. I have worked as an academic and designer-maker of furniture and related products for 25 years. While I have gained much in personal new knowledge and insights it is only recently that I have begun to view my work as practice led-research. Some of the work discussed here has already been shown as an exhibition submission at The ADAPT-r Creative Practice Conference: Making Research – Researching Making (Arkitektskolen Aarhus, Sept 2015), with an accompanying short paper (Lambert 2015) cross-referencing my practice with key texts and the practice-led research of others. This paper expands key references and discusses in greater detail how design outcomes and making processes can shape a rigorous research context. Examples of my more recent work will also be discussed. From the outset I have been using new work, which is on-going, as a vehicle for exploring making as research – this is the experience of making as thinking through sand-casting with aluminium (figs. 1 and 2). Key stages of my making process – doing – have been captured in photographs and film, along with resulting casts. The prototypes have revealed new insights along with challenges (see section 4), which are also opportunities. This resonates with numerous sources on critical making discussed below and I will share my personal demystification of this with others seeking to re-shape their creative practices as research.



Fig.1 Pouring molten aluminium into sandcasts;
(Author, 2015)



Fig 2 Resulting casts with the sprue still attached.

Introduction

The UK Research Excellence Framework's (REF)ⁱ 2014 definition of research is: 'A process of investigation, leading to new insights, effectively shared.' (HEFCE 2011: 21–22: 48). My earlier paper (Lambert 2015) argued that all creative practice is a process of investigation, going on to state that there is a newly prevailing academic view of knowledge in doing, and making as thinking in creative practice. This is a view, which has been reinforced as I have investigated, read and conferred further. However, whereas I had previously held the belief that creative practice as research was struggling for acceptance as an equal to scientific epistemology, it is clear that practice-based researchers in the visual arts and design are gaining more credibility. As the HE research agenda demands a more interdisciplinary focus there are many examples of art school trained creatives teaming up with white-coated scientists in the pursuit of new knowledge and understanding. Indeed, this is not even new - in the 1950s CP Snow (1998) and Karl Popper both argued for more integration between the arts and the sciences. Creative thinking, serendipity and intuition have key roles in both practice-based creative research and in scientific discovery.

Donald Schön's seminal book The Reflective Practitioner (1983) has done much to underpin the credibility of practice-based research in design and the visual and performing arts. Schön discusses the notion of knowing by doing, describing how practical expertise is knowledge. John Dunnigan's essay on Thinking (2013) refers to critical making as the 'symbiotic relationship' between thinking and making, referring to embodied knowledge through working with your hands, 'the very process itself opens up new possibilities for deep expansive thinking and the serious enquiry that stimulates discovery.' (Dunnigan 2013: 98)

Dunnigan does not cite Schön, but their viewpoints, along with Charny (2011), Frayling (2011), Margetts (2011), Miller (2011), Ratto (2011), Ravelli et al. (2013), Scharge (2013), Sennett (2009) and Swann (2002) and, most notably of all, Ingold (2009, 2013, 2015), are the same – there is knowledge in doing.

Design Practice into Practice-led Research

In my earlier paper on this project (Lambert 2015) I evaluated research methods in design as it continues to establish itself as an academic discipline, observing that that our research methods have not so much been invented or applied to validate academic integrity, but unravelled and made visible. The practitioner can reposition their projects to frame premeditated research questions and objectives within their work.

As previously stated, creative practitioners have, arguably, always followed an investigative process of one kind or another, whether it be technological, aesthetic or socio-cultural. However, by comparison to research methods in science and social science, the epistemology of research methodology in art and design is still relatively new (Gray and Malins 2007: 18). PhDs in Art & Design have only existed for around 30 years (Ravelli et al. 2013: 396), and the reductive and positivist approaches that prevail in science are not usually appropriate in creative practice. In some cases attributes and terms of research have been borrowed or adapted from other disciplines, particularly social science, but in creative exploration ideas tend to emerge and grow on the move - sometimes impulsively, sometimes reflectively - rather than arising from the investigation of a hypothesis in controlled conditions. Indeed, some scientists are, apparently, dissatisfied with the dominance of positivist/reductive methods in their fields (Barrett 2007: 1), and are exploring creative and visual research methods as alternatives to empirical approaches (Wagner 2006; Prosser and Loxley 2008; Rose 2013)

Schön's notion of knowing by doing (Schön 1983: 21) is reiterated by Christopher Frayling and Martina Margetts both writing in the Power of Making the book which accompanied the eponymous exhibition at the V&A London in 2011. In his essay We Must All Turn to the Crafts, Frayling writes:

My introduction to the crafts as a form of knowledge, which differs from the usual modes of classroom teaching, came from reading Book III of Jean-Jacques Rousseau's educational treatise *Émile* (1762)... *Émile* is a strong polemic, cast in the form of a story about a boy and his tutor, against learning by rote and social conditioning ... [and instead is] concerned with the learning of a craft, in *Émile*'s case carpentry: "if instead of making a child stick to his books, I employ him in a workshop, his hands work to the advantage of his intellect, he becomes a philosopher while he thinks he is simply becoming an artisan." (Frayling 2011: 31).

Martina Margetts, opens her essay, Actions Not Words, with:

This essay proposes that making is a revelation of the human impulse to explore and express forms of knowledge and range of emotions; an impulse towards knowing and feeling, which shapes human action and hence the world we create. (Margetts 2011: 39)

And so she reiterates that making is thinking and knowledge for the remainder of her essay, concluding by paraphrasing Paul Valéry, 'the hand is a philosopher' (Margetts 2011: 43)

Richard Sennett (2008) and Matthew Crawford (2010) both argue that making is not only a form of philosophy, but that philosophy is rooted in makingⁱⁱ. Richard Sennett, referencing philosopher Hannah Arendt as well as renaissance thinker Pico della Mirandola, discusses two groups of makers - Animal Laborans – those for which making is labour, and Homo Faber – those for which making is thinking (Sennett 2009: 6; 72)

John Dunnigan's essay on Thinking (2013) echoes Sennett, and like Matt Ratto (2011) describes practice-led/based research as critical making,

Critical making requires critical thinking and social consciousness along with embodied knowledge if it is to be distinguished from making in general. Critical making should also be understood as different from production where the thinking is complete before the fabrication begins. (Dunnigan 2013: 98)

Tim Ingold goes further to unpick the process of making from the viewpoint of forming new knowledge and insight. In his book, Making: Anthropology, Archaeology, Art and Architecture (2013), Ingold refers to two approaches to making – hylomorphic and morphogenetic (Ingold, 2013: 20-22). In terms of hylomorphic making,

We are accustomed to think of making as a project. This is to start with an idea in mind of what we want to achieve, and with a supply of the raw material needed to achieve it. And it is to finish at the moment the material has taken on its intended form. (Ingold 2013: 20)

However, Ingold's preferred position is to think of making as, 'a process of growth. This is to place the maker from the outset as a participant in amongst a world of active materials... in anticipation of what might emerge.' (ibid: 21).

This is what Ingold calls morphogenetic making (ibid: 21). This clarity of understanding and insight maps onto an exploratory, sometimes impulsive or deliberately risky approach to creative practice and has helped to further endorse and validate making as an important research method within itself.

In helping us evaluate creative discovery in making, Ingold (2015) also refers to Margaret Boden, on creative ideas. Boden, Ingold explained, referred to 'P' creative ideas (P = psychological) and 'H' creative ideas (H = historical). 'A P creative idea is one where others have had it, but it's the first time you have had it. An H creative idea is one that no-one has had before. These give rise to human history.' (Ingold 2015)

It is important for us to understand these two distinctions. P creative work is by no means invalid as practice-led research. Unknowingly or not, a practitioner may well explore previously trodden ground, but new insights can still emerge. This resonates with Marcel Proust's famous quote 'The voyage of discovery is not in seeking new landscapes but in having new eyes' (Proust 1923)ⁱⁱⁱ. To what extent an H creative idea gives rise to human history can of course vary, and this is discussed below.

An anthropologist, Tim Ingold has been cited and referenced widely on making in recent years. At the ADAPT-r Creative Research Conference: Making Research - Researching Making in Aarhus (September 2015), which had a mixture of paper and exhibition submissions, Federico Del Vecchio (2015) presented an exhibit comprising of the bibliography of all the other papers presented at the conference. I was delighted to see so many familiar texts until I realised I was reading the bibliography for my own paper. However, conspicuous by his absence from my list was Ingold, who I had only started reading after the submission deadline and had been enthusiastically discussing earlier in the day. Ingold's writings were prominent among the other bibliographies. Many of us, it appears, are reading the same material to validate our creative work and practices as research.

New Knowledge in the Work and Processes of Others

It seems that the doing (the process) yields more new knowledge and insight than then the done (the outcome), as can be seen in Max Lamb's work. His hexagonal pewter table (2007), cast in the sand on a Cornish beach, has gained fame through an online video^{iv} of the making process. Marcus Fairs, summarises this in online design magazine Dezeen: 'the video is as much the cultural artefact as the stool itself.' (Fairs 2011)

Despite being a comparatively simple object, the Pewter Stool is rich in narrative. Tin mining was once the main industry in Cornwall and sand from local beaches was used in the casting foundries. The mould can only be used once, making each piece unique, and the unpredictability of working on a beach means that imperfections become an inevitable part of each object's charm. (Fairs 2011)

In the video of Lamb at work, using local materials the making of his stool becomes the delightful and informative element of what otherwise might be regarded as a crudely fabricated object. The making process is not only inspiring, but easily understood by the audience. While sharing and distributing processes on the internet is today commonplace, widening our exposure to this brings an additional dimension to the outcome, while the increasing the currency in process itself. It brings us closer to making, and provides further insight and reflection to our material world.

This was the point of the 2014 exhibition In the Making, at London's Design Museum, where objects were exhibited 'interrupted mid-production' (Barber and Osgerby 2014: 2). Indeed, the exhibition catalogue was presented as unbound pages with bleed and crop information normally only visible to those in the print works. Presenting everyday objects in the unfinished state reveals new insights for both designers and users.

We have curated this exhibition to capture and reveal a moment in the manufacturing process, unveiling everyday objects in their unfinished state. Often the object is as beautiful, if not more so, than the finished product. We want to demystify how these objects are made, in order to convey our sense of fascination and value that this knowledge can bring to inspiring new design ideas. (Barber and Osgerby 2014: 2)

The 2011 Power of Making exhibition at the V&A, in collaboration in the Crafts Council, also celebrated tacit knowledge in how things are made. That this knowledge has been presented in two world class design museums highlights the importance of making. It helps us understand and value everyday objects and brings the audience closer to appreciating the resources required to assemble our manufactured world.

Fewer and fewer people know how to make the things they use, need or want; or even how these things are made. This is one of the unfortunate legacies of the industrial revolution... The distance between user and maker is growing, and with it knowledge and understanding and appreciation are diminishing. (Charny 2011: 6)

My Own Practice

To explore design practice as practice-led research I started afresh with a new design enquiry. With my interest in micro-manufacture and inspired by Max Lamb I have been investigating aluminium sandcasting for the last year and a half.

As a furniture designer, my first foray into the process was to produce components for a simple stool which held the structural integrity of the piece overall. For this I created a two-part cavity mould from MDF patterns (fig. 3). On reflection, I realised that this pragmatic approach yielded little that I did not already know from the outset. I expected it to succeed and it did. I needed to take more risks: with more room for failure new and unexpected outcomes were more likely.



Fig. 3. Sandcasting mould using MDF patterns in a two part mould to create a cavity. (Lambert 2014)

I decided to step away from the familiarity of furniture design and create aluminium artefacts by playing with discarded packing as waste moulds. I have previously used Polystyrene foam, a much-used waste mould material, with varying success. I started to use packaging pellets arranged in a bowl in the sand (figs. 4 and 5).



Fig. 4 Polystyrene packaging pellets as a waste mould. (Lambert 2015)



Fig. 5 (right) for a sand-cast aluminium bowl. (Lambert 2015)

It is interesting to note the delight in others on viewing the first attempts. The unsuccessful or incomplete outcomes provide a deeper insight into the process, and finding out how to make it work stimulates discovery. In further iterations I have glued the pellets together in a ceramic bowl, using PVA. This has allowed a continuous flow of the molten metal and with both aluminium and bronze (figs. 6 and 7).



Fig. 6 Polystyrene pellets, glued together, are immersed in the sand to make a waste mould.



Fig. 7 A resulting bowl in bronze. (Lambert 2015)

The use of bubble-wrap was inspired by Czech designer Rony Plesl's glass Bubbles Bowl (2011, made using an entirely different process) – seeing bubble wrap represented in another material immediately gave rise to the possibility of molten metal passing into the bubble spaces when packed in sand (see figs. 8 and 9). The bubble-wrap was formed over mdf patterns, which are removed before installing the other half of the sand mould.

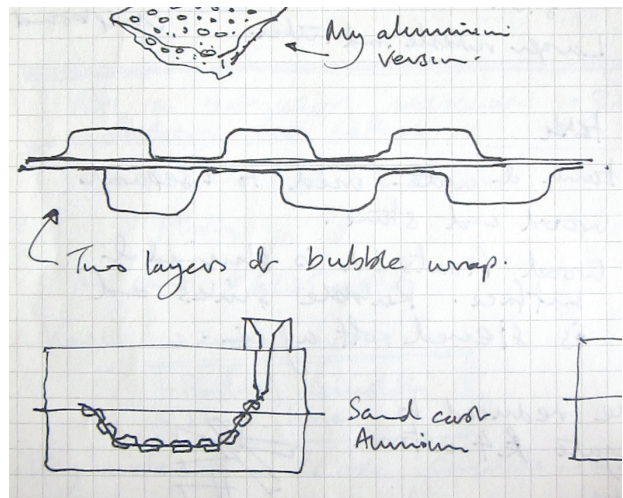


Fig. 8 Method for bubble as a waste mould.



Fig. 9 (right) early attempt for a sand-cast bowl. (Lambert 2015)

Key stages of the making process have been captured in photographs and video, the most exciting being the pouring of molten aluminium, and resulting cast, straight from the mould with the gates still attached (figs. 10 and 11)



Fig. 10 Pouring molten aluminium into sandcasts

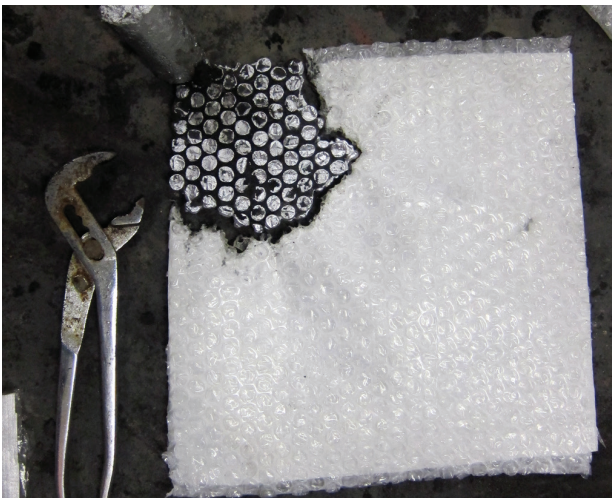


Fig. 11 Resulting casts with “pouring gates” still attached. (Lambert, 2014/2015)

Again, the first iterations of this process were not successful: the molten aluminium did not flow all the way through the space. With additional layers more space was created and latterly I have achieved a complete bowl with every pour, including with bronze (figs. 12 and 13).

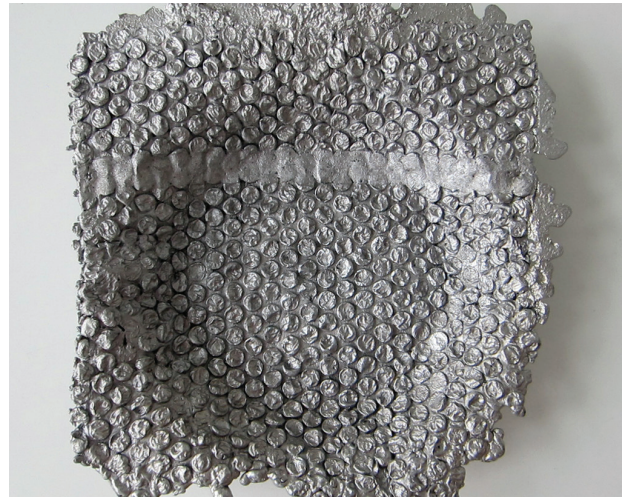
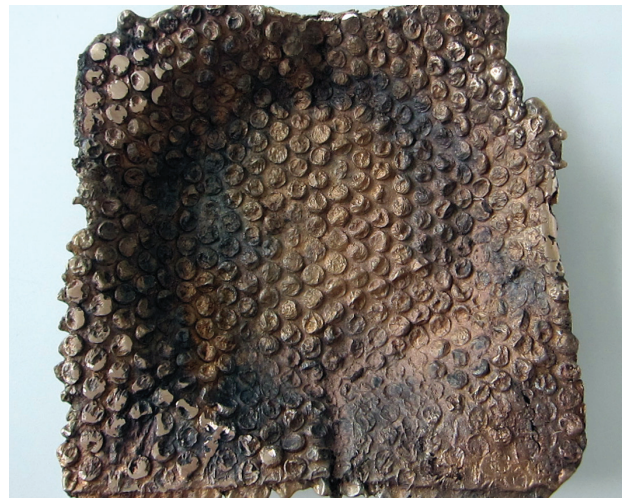


Fig. 12 Successful aluminium bowl



13 Bronze bowl. (Lambert, 2015)

I have also cast air-bag packing (fig. 14). These were successful at the first attempt, which somehow diminished the satisfaction in their making – there was nothing left to explore.



Fig. 14. Sandcasting of airbag packaging. (Lambert 2015)

Creatively, this process is very exciting, and there is great satisfaction and delight in pouring molten metal to take the form of familiar packaging materials. But so what? This is a question I feel it necessary to ask often as I work, and I put it to my peers in Aarhus, “I’ve done this work, so what?” One answer to this question by fellow delegate Anders Gammelgaard Nielsen was simply, ‘the ‘so what?’ is that you made it and brought it here for us to see, and enjoy and start a discussion.’^v

To the best of my knowledge no-one else has sandcast with bubble-wrap or polystyrene pellets, or at least they have not published this. This is my original technique, and I have been one of Dunnigan’s “form givers who bring ideas into the material world.” (Dunnigan 2013:95). Michael Scharge describes prototyping as play, ‘as much a medium of interpersonal interaction as a tool for discovery, insight and test.’ (Scharge, 2013:19), going on to state: ‘Play is a process that can give rise to new realities’ (Scharge, 2013: 25). The iterative modelling process used here is playful, and from the anecdotal positive feedback I have received the delight is certainly derived from the narrative of the process. Wagner refers to material artefacts as ‘objects of social inquiry’ (Wagner 2006: 57). With reference to this, the artefacts are research outcomes, that have seeded new scenarios for enquiry – a research outcome in itself – that will follow Studio Swine (see below) into a site specific and social context: to requote Dunnigan, ‘In critical making, the very process itself opens up new possibilities for deep expansive thinking and the serious enquiry that stimulates discovery.’ (Dunnigan 2013: 98).

The latest iteration of the bowls was recently cast using a home-made mini-foundry taken from Grant Thompson’s YouTube channel King of Random, and I am planning site specific experiments with off-grid mini-foundries. Studio Swine have used a mobile foundry, powered by used vegetable oil, for their project *Can City* in São Paulo (2015). Here, they have collected aluminium cans and cast aluminium stools on location “tuning the street into an improvised manufacturing line,”^{vi} and this has been very informative in shaping the next stage of my enquiry.

The process itself has raised new questions about sustainability and will harness waste as both materials and context. I am investigating ideas around the rationing of materials and, given that we are already mining landfill sites, whether or not we have already extracted all the virgin mineral resources we will ever need.

Conclusion

If all creative practice is a process of evaluated investigation, creative endeavour can easily be transposed to the UK REF 2014 definition of research ‘A process of [rigorous] investigation, leading to new insights, effectively shared’ (HEFCE 2011:24)

It is clear is that there is a prevailing academic view of knowledge in doing, and making as thinking in creative practice. Since Schön (1983) there has been an enormous body of published work that refers to knowledge in doing. Making as thinking in epistemological terms is clearly well established, and several handbooks on “doing” research in design, such as Crouch and Pearce (2012), ‘Thinking of creative practice in design as a dynamic relationship between the habitus and field empowers the researcher, because it locates design thinking in the context of a dialectical engagement between ideas and the material world’ (Crouch and Pearce 2012: 37); and Gray and Malins’ work (2004) have helped established terms such as practice-led and practice-based research, that help us to articulate creative endeavour with equal validity to more traditional forms of academic research, ‘it seemed important to claim part of the territory of research for the Creative and Performing Arts and Design, and to give identity to it by naming our research practice-led or practice-based research’ (Gray and Malins 2004: 3).

The analysis and reflection of our work and practice and that of others needs to be more than an introspective description. We are part of a heritage of creative practice and it is important to cross-reference our work with that of our peers and predecessors and, as Crouch and Pearce state above (Crouch and Pearce 2012: 37), understand its contextual relevance for now and the future. It remains for more of us in academia to embrace this and have the confidence to convey the value of our practices as research.

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The work of others

Lamb, M. (2007) Pewter Stool, Cornwall

Plesl, R (2011) Bubbles Bowl [Glass], Frozen Fountain, Amsterdam

Studio Swine (2015) Can City

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i The Research Excellence Framework (REF) is responsible for appraising the impact of research in UK Higher Education.

ii See also Indra Kagis McEwen's book, *Socrates' Ancestor: An Essay on Architectural Beginnings* (MIT, 1993)

iii Marcel Proust in Remembrance of Things Past 1923
iv <https://vimeo.com/9498805>

v Anders Gammelgaard Nielsen, Aarhus School of Architecture, Denmark

vi See <http://www.studioswine.com/can-city>

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