Fantasies of making
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Introduction

This paper uses ideas of the host, transmission, and the stranger to explore our relation to industrially produced objects and to the making process that creates these objects. These terms will be used to explore the potential of both the object and the images of its manufacture to host ideas, examining the transmission of these ideas to the stranger, who is removed and at a distance from the production process of the products of industrial manufacture. Here the encounter is no longer firsthand, but mediated by film or photograph.

Points of visibility

In order to further define the context, the paper uses a definition from Peter Dormer who draws the distinction between craft and non-craft production with the terms 'personal know how' to describe craft process and 'distributed knowledge' to describe the systems of industrial production.[1] 'Distributed knowledge' is a term which suggests an impersonal relation, marked by distance and disconnectedness: the position of the stranger. In this context our access to and understanding of production is usually gained through points of visibility, photographs, or films which are often presented in publicity and marketing material or in popular science, and which offer glimpses of complicated, high technology manufacturing processes. These images provide important insights with the potential to contribute to our understanding of and relationship to things. However, the ways in which making is made visible are rarely neutral or purely objective; the articulation of making is constructed, staged and released for specific agendas, which effects transmission.

Focus of enquiry: flat glass production

To explore this relation between host, transmission, and stranger, I will examine two production processes of flat glass: the float glass process invented in 1959 and its historical precedent, the crown glass process, employed until the nineteenth century. The paper uses as its evidence information both in the object, referring to the physical effect of process upon material, and information outside the object, including images of industrial manufacture (both historical and contemporary), a film of a magic trick from *YouTube* and a short clip of a popular science television show.

The stranger's understanding

The paper demonstrates the stranger's understanding by examining a number of misunderstandings of glass and its manufacturing processes. It proposes that despite our encounters with the depiction of manufacturing process we remain the stranger. However, the paper concludes that we might want to remain so; a situation in which fantasies of making blossom; fantasies which allow us to form subjective and personal relations to the objects and processes of mass production.

Float glass – an objective material?

On 20 January 1959 Pilkington Glass announced a new and revolutionary process for the production of flat glass, known as the float process. The product of this process, float glass, is created by pouring molten glass onto the surface of molten tin, on which the glass floats and forms. The surface of the glass which forms against the mirror-like surface of the tin becomes correspondingly flat, while the topside of the glass sheet becomes perfectly smooth in the heated atmosphere of the furnace. As the ribbon of glass moves along the production line any flaws in the material are detected by a computer and the corresponding section removed. The result is a material with perfect surfaces and a consistency of finish, produced at the rate of fifteen metres of glass per minute.[2]

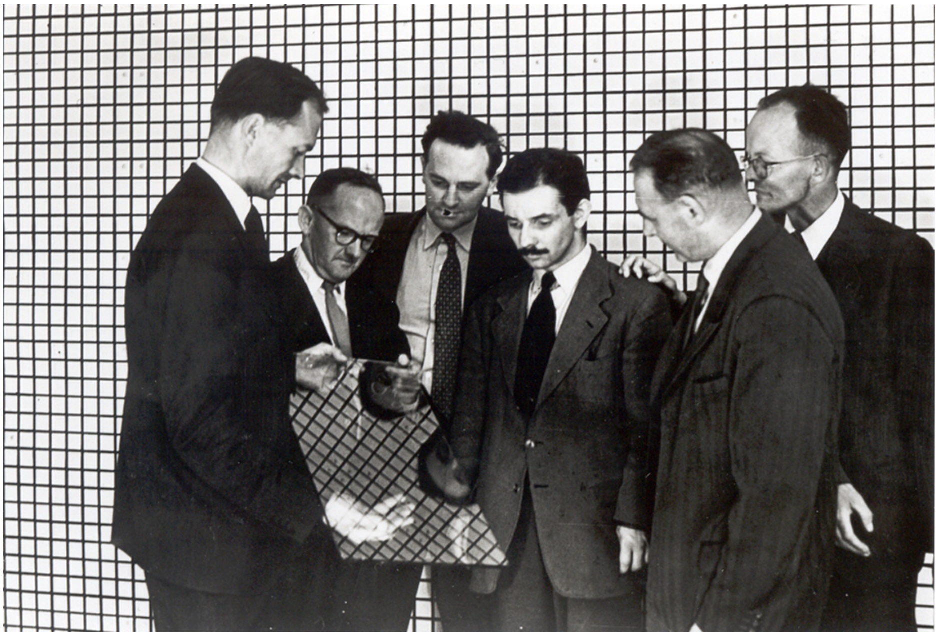

Fig. 1. The float development team (1959): Alastair Pilkington (far left); on his left E.Litherland, production manager, Cowley Hill; George Dickinson, development manager; J.E.C Thomas, tanks manager; Jack Topping, special examiner; Richard Barradell-Smith (ex-Rolls Royce), leader of the float development team. Image courtesy of Pilkington Group Ltd.

To aid the introduction and public explanation of this new process, Pilkington Glass released printed material, a film and numerous images. Released in 1959 this image shows six men from the float development team. On the left Alistair Pilkington, a mechanical scientist credited with the invention of float, presents a piece of float glass to the rest of the team, who are gathered around it, looking at its surface (Fig. 1).

The piece of glass held in the image is transparent and, if held at another angle, would be seen through and would be barely visible. Held at this specific angle, however, the transparent sheet becomes a reflective plane on which an image forms. The reflection consists of two elements: a section of the background grid and the tops of two of the men's heads.

This reflected information fuses with the object to form an image. The reflected grid transforms transparency and invisibility into an image of embedded technology, implying calculation and perfection, while the reflection of the men's craniums suggests that this is a material made by thinking; the meeting of mental calculation and material. The reflection acts as a visual signifier of the high technology and rationality that created this material, but which is no longer visible in the material itself.

The development of float glass is part of a significant change in the methodologies of glass production that started at the end of the nineteenth century, which Michael Wigginton describes as a change from 'an empirical set of crafts, to technologies informed by science as the processes and the chemistries became understood.'[3] Float's successful development and the subsequent exacting control of the process, relied on a total understanding of the chemical and physical properties of this material and of this new process. Seven years in development, this was achieved by the application of logical scientific process by a team of scientists and engineers.

A comparison of this image with earlier depictions of manufacture, such as Diderot and d'Alembert's depiction of glass production in the eighteenth century (which will be discussed later), demonstrates this fundamental shift in production. This is a different set of people involved in this material's manufacture. These are not the craftsmen who have physically engaged with material and process, but technologists and scientists who have calculated the manufacture of this material.

Following the public announcement in 1959 the development of float continued throughout the 1960s, the process only becoming a fully operational and economically viable proposition in the late 1960s.[4] In this same decade, Jean Baudrillard, in *The System of Objects*, discusses glass's 'purity, reliability and objectivity', writing that 'glass eliminates all confusion'.[5] Although Baudrillard's text does not refer to float specifically, his terms 'purity, reliability and objectivity' seem to describe float precisely: 'purity' describing its unblemished surface and clarity; 'reliability', the exacting control and consistency of product; 'objectivity', its method of production, which takes place in a sealed chamber and is mediated through a computer terminal set in a distant control room (fig. 2). This is a manufacturing process of disconnectedness, of 'distributed knowledge'.

Float glass is a material synonymous with perfection and visually devoid of any sign of its manufacture. However, it is these qualities, and the lack of a visible trace of the manufacturing process, which make it a canvas for projected ideas, ideas in conflict with its technological nature.

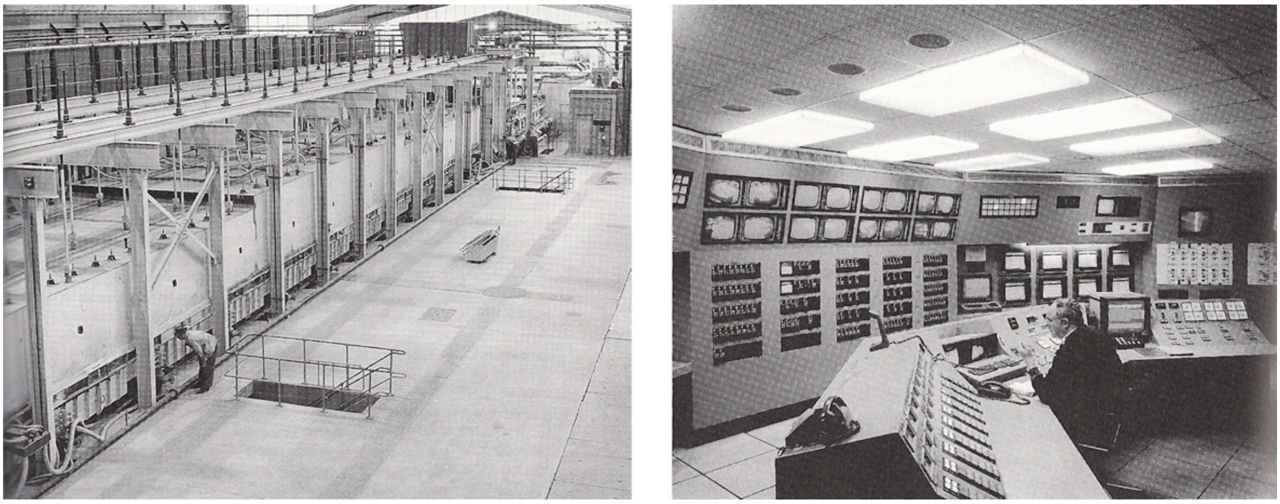

Fig. 2. Left: Float Bath CH3, 1962. Right: Bath control room, UK5, St Helens 1986. Images courtesy of Pilkington Group Ltd

The magician actively creating confusion

Moving from the production of float glass to an example of its use, I will examine the use of glass in magic and conjuring tricks, specifically looking at the way in which these tricks manipulate an audience's understanding of material. The following examples present ideas of material which oppose and contradict the objective and technological nature of float.

These ideas may be traced to float's historical manufacturing precedent: blown plate glass, and the physical effects of this earlier making process upon material. The information that resides in the object of this earlier manufacturing process continues to effect the perception of float.

In an online video, contemporary American magician Criss Angel performs a trick in which he seemingly climbs through a plate glass window in front of a live audience. At the beginning of the illusion, while tapping his hand against the glass, Angel says: 'Now a lot of people would say glass is a solid, some would say it is a liquid [...] and a solid cannot pass through a solid. Unless it was really a liquid?'.[6]

Earlier precedents of magic tricks in which sheet glass is penetrated are relatively common, although they usually take place on a smaller scale. A few examples from the 1950s include: 'Bending Glass', described by its marketing literature as 'a practical demonstration of the impossible', 'Dove Through Glass,' and 'Warlocks Amazing Frame', in which, with the application of a magic word, a series of objects including a metal rod, a ribbon, and a magic wand pass through a sheet of glass.

In these historical examples and in Angel's contemporary trick, the same implication is made, that instead of the glass sheet breaking or its solidity forming a impenetrable barrier as we would expect, the glass sheet gives way, either bending or flowing, allowing the magic wand, the ribbon, the dove, or even the magician himself to pass through.

The use of sheet glass in magic and conjuring tricks often serves to counter the suspicion of the audience. Employed as a transparent barrier, its transparency provides the audience with visual access, and suggests a climate of openness between magician and audience, as any interference from the magician would be seen. However, questions of the fundamental nature of glass and its classification as a substance (liquid, solid, or super-cooled liquid?) and the audience's lack of knowledge provide the magician with the opportunity to actively create confusion.

This is reflected in Angel's statement, which is an attempt to mystify or confuse the audience about the physical nature of glass. It is used to create a situation in which the normal rules of the physical world are confused, in the attempt to establish circumstances in which magic can be the only explanation of the events that we are witnessing.

The myth of glass flow

Angel's statement makes reference to a common urban myth that suggests that glass is a liquid and will therefore continue to flow after its manufacture and over the duration of its existence as an object. The myth cites as its evidence that cross section of antique glass windowpanes are thicker at the bottom than at the top, with the hypothesis that if glass is a liquid it will be effected by gravity and flow over time.

Any number of examples could be presented as evidence of this myth, but particularly pertinent to this paper is an example from the popular science program *How Do They Do It?*. In the film we see a Pilkington operative (wearing a Pilkington baseball cap and T-shirt) standing in front of the float production line, stating:

> Glass is classed as a super-cooled liquid, that in as much is it's never in a completely stable form, if you put it in your windows in twenty years time it will be slightly thicker at the bottom than when it was installed.[7]

The physical phenomena that inspired the myth (the uneven cross-section of antique windows) is in fact evidence of hand-making, and is the result of a manufacturing process called crown glass, which is an earlier method for the manufacture of flat glass used until the nineteenth-century and a historical precedent of float.

The crown glass process involved the blowing of a sphere, which was transferred from blowing iron to 'puntil' iron, and then heated and spun, using centrifugal force to 'throw' the glass into a flat disk. When cold, this disk would be cut into sections to be used as windowpanes. The physical effect of the centrifugal force created a varying thickness of cross-section. After the disk had been cut into sections for windowpanes, the glazier would position the thicker edge at the bottom of the window. It is the physical effect of process and this subsequent action of the glazier that has led to the myth of glass flow.

This common misconception has been categorically disproved,[8] but the idea continues to prevail and infect the rationality and objectivity of float.

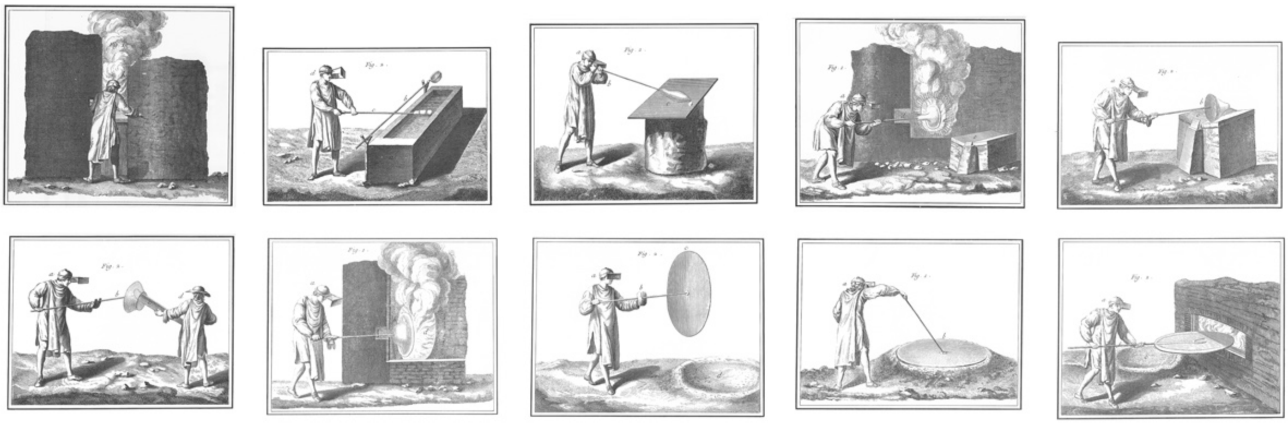

Fig. 3. Diderot and d'Alembert's *Encyclopedia* (1751) Crown glass, Plates 1 18. Charles C. Gillispie, A Diderot Pictorial Encyclopedia of Trades and Industry., New York: Dover Publications Inc., 1993, pp. 209 275.

Diderot and d'Alembert's *Encyclopedia* (1751) – the perfection of material

The Crown process is depicted in Diderot and d'Alembert's *Encyclopedia* (1751) through a series of eighteen engraved plates. Each plate depicts one stage of the process, each contributing to the development of the sequence. Through the specific ordering of the engravings this manufacturing process is described (fig. 3).

The sixteenth plate in this sequence is significant because it appears to have a dual aim, describing at once the process and the product (fig.4). The image functions to describe a stage in the ongoing process, and the detail of the glass disk and the way that it is rendered suggests qualities specific to its function and use beyond the workshop.

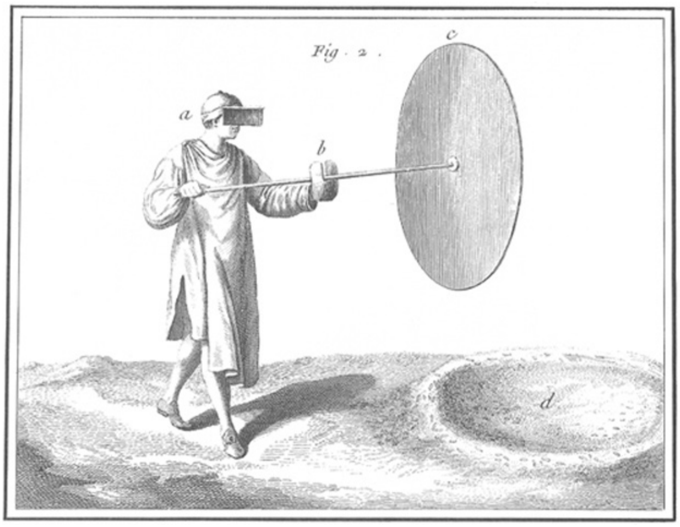

Fig 4. Diderot and d'Alembert's Encyclopedia (1751) Crown glass, Plate 16.

Fig 5. Ingrid Phillips demonstrating the crown glass method at the glass department of Edinburgh College of Art (May 2010). Photograph: Jerome Harrington

The image describes the point at which product becomes distinguishable from its manufacturing process. The previous fifteen images depict stages in which the glass is shaped and formed. We see nondescript shapes, where material is being coaxed towards product. In comparison, the sixteenth plate depicts a moment of revelation, where amorphous form is transformed into flat and perfect material. It is the first instance in the sequence of engravings where the output of this process – window glass – becomes visible. The methods used to render the glass disk seem to reinforce this juncture.

The surface of the glass is depicted with a series of completely straight parallel lines which run from the top to the bottom, implying a uniform thickness and perfectly flat surface, and its edge has been drawn to look sharp and square. These qualities imply that the disk is now a sheet of glass; usable material ready to be set straight into a window.

However, the drawing depicts the glass disk in a way that is physically inaccurate. A blown disk would never be this flat nor its thickness this uniform, and the edge would be rounded by the continual heating of the process. We see no evidence of the hand making that inspired the myth of glass flow.

It is difficult to discern whether this image intentionally sets out to communicate the material in this perfect form, or if this is the by-product of creating an understandable graphic representation within the limits of a particular medium. It is also possible that it is the result of naivety about this making process; maybe it was drawn by the stranger, demonstrating that a disconnection to manufacturing process is not just a contemporary phenomena.

In *The Craftsman*, Richard Sennett outlines the ways in which Diderot and d'Alembert's depictions of process are edited and composed; for example, through the exclusion of dirt or the serenity of expression on the makers faces. He writes: 'Throughout, the volumes illustrate people engaged sometimes in dull, sometimes dangerous, sometimes in complicated labor; the expressions on all the faces tends to be one of serenity'.[9]

A comparison of Diderot and d'Alembert's sixteenth plate with a contemporary photograph of this same moment in the process demonstrates the extent to which strain, heat and physical effort has been edited from Diderot and d'Alembert's depiction (fig. 5). The sixteenth plate communicates both perfection in the object being produced and – by the exclusion of effort – perfection in its manufacturing process.

Sennett explores how Diderot and d'Alembert's images portray the dignity of work and the worker, and the extent to which the *Encyclopedia* is an embodiment of the principles of the Enlightenment period in which it was produced. Sennett's text suggests that images of manufacture are products of their time, and of the circumstances in which they were made; which of course effects transmission (the ability of the images to communicate). Any subsequent understanding and relation to process and material that these images construct, is a relation based upon an inaccurate description.

Conclusion – fantasies of making

The host

By exploring the specific example of flat glass production, this paper has aimed to demonstrate how a relation and understanding of manufactured objects is constructed from information both inside the object and outside it.

Float's perfection as a material is in evidence both in the perfection of its surfaces which are visually devoid of any sign of its manufacture, and in the images of its manufacture, which reaffirm its technological nature. However, it is exactly the lack of a visible trace of the manufacturing process that makes float a canvas for projected ideas. The perfection of float is effected by ideas generated by a much earlier object, the material of crown glass where the physical effect of process is evident in the cross section of the glass disk. The ideas of glass flow which are applied to float are hosted in this object, and are fueled by a gap in our knowledge, which is demonstrated clearly in the use of glass in magic and conjuring tricks.

The stranger

While writing this paper I have spoken with a number of people, giving a quick outline of the nature of the paper. When people are told that the idea of glass flow is a myth, there is a palpable sense of disappointment. We do not seem to want an objective material.

This paper ends with a proposition: perhaps we want to remain as the stranger. This position allows us to continue to be amazed and fascinated by material and by process. These 'fantasies of making' allow us to form subjective positions to the products of 'distributed knowledge', forming personal relations to and understanding of the products of mass production.

NOTES

1. Peter Dormer (ed.), ‘Craft and the Turing Test for practical thinking’, in *The Culture of Craft*, Manchester: Manchester University Press, 1997, pp. 137–158.
2. Michael Wigginton, *Glass in Architecture*, London: Phaidon Press, 1996, p. 65.
3. Wigginton, *Glass in Architecture*, p. 63.
4. David Bricknell, *FLOAT: Pilkingtons' Glass Revolution*, Lancaster: Carnegie Publishing, 2009, p. 96. ‘[A]nd it was only in 1971 that the board was confident enough to plan to substitute all flat glasses, both sheet and plate with float’.
5. Jean Baudrillard (1968), *The System of Objects*, tr. by James Benedict. London: Verso, 1996, p. 41.
6. Criss Angel, *Criss Angel Walks Through Glass* <http://www.metacafe.com/watch/37292/criss_angel_walks_through_glass/> [accessed 21 June 2010]
7. *How Do They Do It?,* Discovery Channel, 25 June 2006 [TV program].
8. Edgar Dutra Zanotto, May 1998 (pages 392–395), <http://www.df.unipi.it/~leporini/DFWebSite/ReviewsTg/CathedralGlasses.pdf> [accessed 21 June 2010]. The myth is categorically disproved in a paper called ‘Do Cathedral Glasses Flow?’ (1997) by glass materials engineer Edgar Dutra Zanotto, who investigated whether it is possible for glass to flow at room temperature. His research concluded that ‘window glasses may flow at ambient temperature only over incredibly long times, which exceed the limits of human history.’ In fact Dutra Zanotto's calculation demonstrates that significant flow would take well beyond the age of the Universe.
9. Richard Sennet, *The Craftsman*, New Haven, CT: Yale University Press, 2008, p. 93.