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## Hand and mind — shaping experience

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## Abstract

*We live in an increasingly virtual, mediated and disembodied world in which the role of our hands, the experience of physical touch, and the sharing of gestures and emotions has been diminished by the technology which pervades so much of our daily lives. We make meaning of our world, develop emotional connections and communicate with one another through our senses and our hands play a vital part in this process; they inform our perception of experience and express our emotional responses to it. Hand making has until recently been synonymous with the creative process of craft, however many artists and designers now routinely use digital technology within their practice or as the vehicle to express their artworks. The analogue crafting process, involving the expression of artistic intent by working a medium using the hands, is not only a fundamental human skill but has been shown to have a significant impact on the development of creative thought. By comparison, the interfaces most commonly used to craft digitally lack haptic sensitivity. If touch, physical manipulation of materials and hand gestures inform novel thinking then how does the integration of technology affect creative cognition? How important is bodily acquired knowledge and physical manipulation of materials within creative practice?*

*This paper draws from recent research that explores how physical experience and in particular the use of the hands, are instrumental in the development of creative thought. By examining the creative practice of an artist who integrates hand and digital processes it has been possible to observe how new ideas are shaped and influenced. Using ethnographic qualitative research methods, that integrate analysis of audiovisual recorded data with photographic documentation, it has been possible to gain insight into how technology is impacting upon the creative process and reveal the importance of the hands in developing imaginative thought.*

## Keywords

creative practice; digital processes; making; hand and mind; textile design.

# 1. Introduction

Our hands play a vital role in shaping our everyday experience. They reach out to inform our bodies about the world around us and to relay back into the world our physical response (Wing, Haggard et al. 1996; Wilson 1998). Fingers and thumbs manipulate and reshape our environment and hand gesture and signs play a vital role in communicating information and emotion to those around us. Our hands are our interface with the world; they are vital to who we are and how we think (Goldin-Meadow 2003).

Technology is changing the way we experience and interact with the world. Our bodies are cocooned in micro climate controlled protective clothing, air conditioned buildings and modes of transport designed for comfort and convenience. We are increasingly distanced from the physical world that informs our sensory perception, influences our thinking and shapes our experience of living. The use of digital technology frequently denies our hands the rich tactile stimulation fundamental to everyday living. Once it was essential to touch, grasp, move, position, stroke, hold and manipulate objects by hand, sometimes intuitively and sometimes in practiced procedures resulting from tacitly remembered skills; increasingly we have digital tools that replace many of these hand activities. Mouse and keyboard computer interfaces restrict hand and finger movement to simple click and press actions; portable mobile devices, information and household appliances with embedded electronics simplify our lifestyles, speed up our living and enable us to cram our waking lives with information, communication and simulated experience. The operation of these devices requires nimble fingers in limited physical space: micro movements, muscular control and clean hands.

What impact do these changes in hand experience have on the way we think, respond and interact with the world? If hand use is our fundamental human interface with the world, are we being increasingly deprived of cognitive stimulation through the digital interfaces we use? Shneiderman (2002) contends that *'we should question every application of technology to ensure that its benefits outweigh its costs'*; what then, is the cost of using technology to both body and mind? What do we gain and what do we lose? How can technology be improved to benefit from the sensate experiences of the hands?

The research that informs this paper has been investigating the importance of the connection between physical experience and creative cognition; in particular the role of making by hand in creative digital processes. Case study observations of art making have been found to be a useful way of gaining insight into individual approaches to creative practice (Edmonds, Weakley et al. 2005; Treadaway 2006). Although assertions and generalisations concerning the workings of the human mind are difficult to validate through observational qualitative research, it has been possible in this study to identify and highlight a number of key findings which illuminate the importance of the hands in shaping experience and influencing creative practice.

## 2. Case study research

Findings presented in this paper are drawn substantially from a recently completed AHRC (Arts and Humanities Research Council) funded case study on the fine artist Charlotte Hodes. The project has provided an opportunity to examine in depth the working processes of an artist whose practice combines digital and hand cut and paste techniques. As Associate artist at the Wallace collection in London, winner of the Jerwood Prize for drawing in 2007 and now Senior Research Fellow at the London College of Fashion, Hodes has gained international reputation as key British art practitioner working quite literally at the cutting edge of the field. Her hand worked papercuts combine her expertise in drawing, composition, digital manipulation, digital print and collage/cut and paste techniques. It is her combined use of hand and digital processes that recommended her as a subject for the study and through the use of video documentation and interview it has been possible to observe and analyse the ways in which hand use plays a crucial role in the development of her creative thinking, decision making and practice. The case study took place over the period of six months and documents the development of a new body of work for a solo exhibition held at the University of Northumbria, Newcastle upon Tyne, UK in April-May 2008 (Figure 1). Crucial stages in the making process were video recorded while the artist made concurrent observations and reflections on her practice. The researcher gently prompted these observations in order to probe more deeply into activities that were being described and maintain the focus of the study. Hodes also kept a research journal in which the development of ideas were recorded and reflected upon. Following these sessions the researcher edited the video recordings to make a short documentary DVD to be shown in the exhibition along side the artworks. The researcher undertook the editing process providing her with the opportunity for detailed observation of the artist at work and facilitating analysis of the research data.



Figure 1. Floating, Apricot Pink from 'Drawing Skirts' 2008 Charlotte Hodes, 101x150cm, digitally manipulated drawing, inkjet and collage

### 3. Hand and mind

Findings from the Hodes case study has highlighted aspects of physical experience that influence the development and selection of new ideas in her work and are fundamental to the development of both her thinking and the art work she creates. These include physical experiences of the whole body, notably the hand and specifically those perceived through the sense of touch. The following sections introduce instances from the research relating to these three aspects of physical experience and illustrate their importance to Hodes' creative practice.

#### 3.1 Experience of the body

Hodes has used the human figure as a motif extensively in her work and drawing of the human form is an important and integral aspect of her practice. Trained as a painter at the Slade School of Art in London, Hodes is able to execute fluid and expressive drawn marks that express her aesthetic intentions and encapsulate her physical experiences. Her tacit skills in working with pencil line on paper are clearly evident in the research video data. By comparison, she finds the experience of drawing digitally using a Wacom® graphics tablet and pen very limiting in both expression and intent. Hodes frequently

incorporates the human figure in her work, usually as an outline or simplified motif, developed through a series of analogue and digital transitions. Initially a series of digital photographs are taken of the artist in a particular pose. She emphasises in the recorded research data that the physical experience of holding the pose herself provides her with vital remembered experience which later informs the drawings she makes from selected photographs. It is her experience of feeling the tension and muscular control that enables her to imbue the drawn line with emotional weight and precision. When she draws the figure her intention is not simply to get everything in the right position but:

*'to embed a mood or feeling about the pose itself and give a sense of movement, sense of life, a caught moment...I really feel it physically — that sense of having your head tucked into your body.'*

The digital photographs are loaded onto the computer where a number are selected, printed onto paper and then translated into line drawings by hand using a pencil and paper. The drawings are scanned back into the computer and traced over manually using a graphics tablet and pen before being manipulated using Adobe Photoshop® software. The key element in the development of the motif is the emotional weight of the hand drawn line; the recognition of the success or otherwise of the drawing is based on the way in which the physical experience of the pose is translated onto paper by hand. The memory of how it *felt* to be in the pose influences line position and composition: the lines have to feel right in a visceral and intuitive way (Figure 2).



Fig 2. 'Figure tumbling' Preparatory sketch in pencil for 'Floating' (Fig.1) Charlotte Hodes, 'Drawing Skirts' 2008

### 3.2 Hand use

Although both hands are used cooperatively and in a co-ordinated manner in most making processes, the left and right hands perform different but complementary functions: the dominant hand executes tasks that are '*micrometric, rehearsed and internally driven or pre-programmed*' whereas the non-dominant hand is responsible for actions that are '*macro metric improvisational and externally driven*' (Wilson 1998 pp.159). These variations between dominant and non-dominant hand use reflect the intricate differences in the way sensory data is communicated and stored in the left and right hemispheres of the brain (Poizner 1995). In the data recorded in the study Hodes describes herself as slightly ambidextrous, confidently making use of both her hands. It is evident however, that she is far more confident in using her right hand (non-dominant hand) to operate the mouse to make selections from menus but prefers to hold a pen to draw in her left (dominant) hand.

The co-operative nature of the hands is crucial in the hand making process (Sennet 2008). Hodes uses a scalpel knife with sharp blade to hand cut sections of digitally manipulated and printed pattern that are later integrated in to the collage. Both hands are involved in the cutting process. Her dominant left hand holds the knife in a *precision grip* (Napier 1956), guiding the pointed edge of the blade by pinching the lower shaft of the knife between the middle, index fingers and opposing thumb. The right non-dominant hand turns and positions the work to be cut and exerts downward force on the paper. Both hands exert pressure due to the resistant nature of the material being cut and the level of pressure is increased in parallel to its weight/thickness. The type of cut line that is created is influenced by the bodily pressure exerted and way the knife glides or is resistant to the substrate; the quality of line that is produced has quite different visual characteristics to drawn, painted or computer generated lines. When working on large artworks the paper cannot be easily repositioned to facilitate the cutting process; Hodes describes how the whole body turns and the right hand '*holds the body in place,*' and she feels '*completely physically engaged with the cutting process*'.

The non-dominant hand exerts finger tip pressure, guiding the paper under the knife and using the fingernails to guide the pointed tip precisely. It is a rhythmic and coordinated action of two parts: different processes with a shared intent (Figure 3).



**Figure 3. The cutting process**

When the artist is sketching with pencil on paper the non-dominant hand also plays an important role in assisting with spatial positioning of the drawn lines. It positions the paper, holds it securely in place and also provides the body with an anchor point from which the eye appears to calibrate the position of marks within the parameters of the paper. Hodes describes how it may take two or three attempts to make a successful line drawing at the beginning of a session; she has to warm up, practice, explore and coordinate eye, hand and body position. Digital drawing by comparison does not enable this element of proprioceptive knowledge of spatial position to be utilised. Whereas physical paper is bounded by its edges, the virtual representation is re-scalable and adjustable using the zoom functions. Although the graphics tablet provides a paper-like surface on which to draw, the physical edges of the device do not necessarily correspond to the position or scale of the graphic representation on the screen. The hand and body interaction with the input device does not provide an anchor point in the same way as when working with physical material (Figure 4).



Figure 4. Drawing using a graphics tablet and pen

When working digitally Hodes describes the non-dominant hand as being '*surplus to requirements*'. The effect of this for the artist is a feeling of depersonalisation; she states that she feels '*less physically involved in the drawing because the right hand is not involved too.*'

### 3.3 Touch

The research data reveals ways in which touch, sensed through the hands, provides vital information to the artist within the creative process. It stimulates thinking and informs the use of tools and materials. Touch is a complex sensory activity and provides a range of feedback that encodes substance, form, temperature and texture (Prytherch 2002). Different parts of the body have varying degrees of sensitivity to touch but the hands have evolved a specific capacity to communicate sensory haptic data to and from the brain (Kemske 2007). According to Sennet (2008 pp.152) touch provides different kinds of sensate information compared to the eye which supplies the brain with images '*contained in a frame.*' Touch on the other hand provides '*unbounded*' data. In hand use touch can be *active*, involving exploration using fingertips or *localised*, providing sensate evidence through the fingertips without movement. Making by hand involves both kinds of touch and hands frequently work independently in active and localised touching activities: one hand holds, supports or applies pressure or control while the other explores, feels and moves over surfaces, edges and objects. This coordinated bimanual process is assisted by vision; this provides additional information to the brain in a feedback loop that coordinates the incoming data received from the exploratory action of the hands with the muscular signals that guide their movement. The anticipatory action that occurs when reaching out to touch, grasp or hold, is developed over time through physical experience (Dormer 1994). Babies learn to reach out and grasp objects drawing them to their bodies to explore with their mouths that

contain a proliferation of sense receptors. With repetition, hand and eye coordination is fine tuned and actions are learnt and remembered tacitly; this is how hand skills are learnt. Practice involves this fine tuning process but requires the challenge of each new experience to compare sameness and difference in order to perfect the similarities and enable the physical action to become automatic (Sennett 2008).

Hodes tacit skills in drawing and crafting with cut and paste have evolved through physical experience gained through this type of unbounded practice. She has embraced the challenges of different materials and tools; exploring and experimenting with lines and cut edges. Different weights of papers *feel* different under the knife and in the hand. 'Feel' is useful for assisting in the many decisions that are necessary throughout the creative process and help define what paper is used and how physical paper edge may appear visually: the thicker the paper, the harder to cut but the more tactile the result producing a different visual characteristic. The *feel* of tools in the hand is also important to the artist. The potential for making different kinds of marks with the pencil (which can be easily used tilted) is compared with the digital pen which responds in a more limited manner when held at different angles. The friction and smoothness of surfaces used for drawing or the pasted surfaces of the collaged artworks are experienced through the artist's heightened tactile sensitivity (Figure 5).



Figure 5. Papercut (right) and detail (left) 'Floating, touch of pink' Charlotte Hodes from *Drawing Skirts* 2007

### 3.4 Emotion

The study reveals how Hodes' highly developed hand skills enable her to combine sensory information from vision, touch and remembered physical experiences of her whole body when she creates line drawings of the figure. It is this combination of sensory data that she believes enables her to express emotion in her work and she finds the computer and its lack of haptic sensitivity limits this. She states:

*'the hand drawn line on the computer doesn't need me to have a physical experience and so you don't imbue the drawing with the same emotional weight as you do when you are pencil drawing...the pencil embodies a different emotional weight'*.

The difficulty many artists find in conveying emotion through digital tools may be attributed to lack of physical connection with the emerging artwork. The technology often gets in the way forming a barrier between the muscular outward expression of the body and the representation created on the graphic display.

Hodes has found that she has had to relearn her drawing skills when using the graphics tablet and pen for her digital work. Not only is the physical feel of the pen in the hand different but the eyes are dislocated from the activity: focused on the screen rather than glancing between the hand, the emerging drawing and the image being represented. The resulting digital line differs in characteristic from the hand drawn pencil line; it is imbued with a digital quality: pixelated and lacking in precision. Depending on the desired outcome, these qualities may be useful and Hodes states that her intention is to embrace these digital attributes of line within her work; to work with the technology and use the qualities that result. Her drawings follow a progressive sequence of simplification resulting in a printed or hand cut line and the digital technology facilitates aspects of this process that could be achieved no other way. By integrating hand and digital processes Hodes is able to retain her means to convey emotional expression in the work.

### 3.5 Time

Hand making processes are slow, meticulous and require a different kind of concentration compared with working on the computer. The repetitive hand skill becomes tacit: semi-automatic and rhythmic. A kind of satisfaction or absorption in the task, described by Csikszentmihalyi (1996) as *flow*, is obtained through the repetitive action. Nevertheless the mind remains alert, *'balancing repetition and anticipation'* of the next action (Sennet 2008 p.176). In the recorded data the artist explains how she uses the mental space afforded her in the hand cutting process to project ahead and consider the next stages needed to make the work. It is a crucial period for decision making and planning. Work on the computer is much more focused and involves intensive memory recall of menu structures and files. It requires frequent decisions to be made at fast pace; these are logical, sequential and convergent (such as selection of a colour, tool or file name) compared to the exploratory and wide ranging

decisions made when working by hand. The case study data reveals that these include decisions about the development of the body of work as a whole or those concerning a specific piece or section. The exception to this occurs when the technology causes the pace to slow down, when saving, opening or manipulating a large file (Figure 6).



Figure 6. Charlotte Hodes: digital image development

## 4. Future: interface design

This case study research adds to the body of research that supports the contention that memory of physical experience influences creative cognition, imagination and making processes (Evans 2005; Ramduny-Ellis, Hare et al. 2008). Handling physical tools and materials helps us to generate and explore new ideas; these experiences help us think by prompting new associations, rekindling lived experience and stimulating novel concepts.

Commonly used digital tools such as mouse, keyboard and graphics tablet, restrict the communication and stimulation of sensate experiences and limit our evolved dexterity and skills in manipulating physical objects (Ishii 2008). However, this is likely to change in the near future. Tangible user interfaces (TUI) already enable a greater level of physical interaction with computer software through hand movement and gesture, for example, haptic tools such as the Phantom Sense-Abel (Figure 7).



Figure 7. Haptic tool: the Phantom Sense-Abel

However a new generation of organic user interfaces (OUI) are being developed which will enable far greater levels of haptic involvement in using technology. These are interfaces that use a non-planar display for both input and output in order to *'seamlessly integrate sensing and display into soft and hard digital/physical material'* (Ishii 2008). New types of light emitting polymer technologies along with advances in organic thin film circuit substrates are making possible thin and flexible displays. Input devices can now be developed that track the position of multiple fingers and twists, pressure and acceleration on any surface due to advances in sensor technologies. It is possible to create displays that actively reshape themselves using *'claytronic'* interaction devices, made from miniature actuators, shape memory polymers and tiny ultrasound motors (Vertegaal and Poupyrev 2008). According to Holman and Vertegaal (2008) OUI's will inspire users *'to be creative rather than merely productive'* and will stimulate the imagination by encouraging haptic experience. In addition OUI's will enable technology to be come more body friendly, reducing the risk of repetitive strain injury from using a mouse or keyboard by enabling spontaneous movement and malleability.

## 5. Conclusion

Findings from this research illuminate the importance of sensate hand use within the hybrid hand making /digital creative process used by the artist Charlotte Hodes. From detailed video observations of hand use it has been possible to identify the co-operative and complementary role played by dominant and non-dominant hands within hand making processes. Touch, finger tip sensitivity and the anticipatory hand actions involved in reaching, grasping and holding have been shown to assist in creative decision-making and to stimulate novel thought. The recorded data reveals how the artist translates memory of past experience through the hands via the muscular control of physical tools and is thereby able to express and communicate emotional qualities in her work. Digital tools were found to be less responsive to haptic muscular control than their physical equivalents and Hodes has had to relearn drawing skills in order to accommodate the differences in control compared with using a pencil. The intensive decision-making demands of digital work were found to contrast with the hand-making processes which provided opportunity to reflect on the work in progress and plan ways in which it might be developed, simultaneously with the crafting process. Digital and physical crafting are combined within Hodes practice and their distinctive and identifiable qualities are used purposefully within the work to create a visual language that embodies the characteristics of both.

The research indicates the vital importance of physical experience in our digital world. As we spend increasingly more time at our computers and interacting with portable information appliances of all kinds we spend correspondingly less time immersed in and interacting through our senses with the physical world. Our hands are our primary collector of sensory information, reaching out from the body to receive and relay information to the brain. If our hands are deprived of physical sensory experiences there is likely to be a reciprocal impact on our perception of the world, how we develop new ideas and our abilities to learn and develop crafting skills. Shneiderman (2002) advocates digital technology as a creativity support tool, however he contends that there will be times when *'low or no technology may be the wiser choice.... The therapeutic benefits of walking in the woods, holding a baby, and talking to your friends should always be respected'* (Shneiderman 2002). Organic user interfaces may in the future be able to provide greater haptic and sensory interaction with technology but the physical experience of cold muddy hands, feeling the bark of a tree, or peeling a juicy orange will continue to be vital in building memories that fuel the imagination and stimulate novel thoughts.

## References

- Csikszentmihalyi, M. (1996). *Creativity: flow and the psychology of discovery and invention*. HarperCollins Publishers, New York.
- Dormer, P. (1994). *The art of the maker: skill and its meaning in art, craft and design*, Thames & Hudson, London.
- Edmonds, E., A., A. Weakley, L. Candy, M. Fell, R. Knott and S. Pauletto (2005). The studio as laboratory: Combining creative practice and digital technology research. *International Journal of Human-Computer Studies* 63, 425-481.
- Evans, M. (2005). Rapid Prototyping and industrial design practice: can haptic feedback modelling provide the missing tactile link? *Rapid Prototyping Journal* 11(3), 153-159.
- Goldin-Meadow, S. (2003). *Hearing gesture: how our hands help us think*. Belknap Press of Harvard University Press, Cambridge, Mass.
- Holman, D. and R. Vertegaal (2008). Organic User Interfaces: designing computers in any way, shape, or form. *Communications of the ACM* 51(6), 48-55.
- Ishii, H. (2008). The Tangible User Interface and its evolution. *Communications of the ACM* 51(6) 32-36.
- Kemske, B. (2007). *Towards the embrace*. New Craft Future Voices, Dundee, Scotland, Duncan of Jordanstone College of Art and Design.
- Napier, J. R. (1956). The prehensile movements of the human hand. *The Journal of Bone and Joint Surgery* 38B(No.4).
- Poizner, H. (1995). *What the hands reveal about the brain*. MIT Press, Cambridge, Mass.
- Prytherch, D. (2002). So what is haptics anyway? *Research Issues in Art, Design and Media* (2).
- Ramduny-Ellis, D., J. Hare, A. Dix and S. Gill (2008). *Exploring physicality in the design process*. Design Research Society Biennial Conference, Sheffield, UK, DRS.
- Shneiderman, B. (2002). *Leonardo's laptop human needs and the new computing technologies*. MIT Press, Cambridge, MA.
- Sennett, R. (2008). *The craftsman*. Allen Lane, London.
- Treadaway, C. (2006). Digital imaging: Its current and future influence upon the creative practice of textile and surface pattern designers. PhD thesis in Art and Design. Cardiff, University of Wales Institute Cardiff.
- Vertegaal, R. and I. Poupyrev (2008). Organic user interfaces. *Communications of the ACM* 51(6), 26-30.
- Wilson, F. R. (1998). *The Hand*. Pantheon Books, New York.
- Wing, A. M., P. Haggard, J. R. Flanagan (1996). *Hand and brain: the neurophysiology and psychology of hand movements*, Academic Press, San Diego; London.