Recognizing Patterns By Touch

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Abstract

In collaborative work, observing and discussing different individuals' everyday creativity can provoke insights and awareness and promote transdisciplinary research. This is an illustrated account of one collaborative project and seeks to show that there may be advantages to recognizing patterns that others' see when engaged in their everyday activities. Keywords: art, collaboration, creativity, drawing, pattern recognition, selective advantage, surgery, video.

Introduction

In previous papers I have discussed the importance of developing a shared language in order for groups engaged in interdisciplinary research to work effectively [1]. This is particularly important when working towards a defined goal [2]. However, observing one another at work, and being immersed in the strangeness of a collaborator's everyday environment [3] can be of equal, or more, value. Verbal communication can be seamlessly and silently augmented, or superseded, by haptic and other forms of non-verbal communication. Recognizing patterns in one another's workplaces, or taking patterns (literally shapes and objects but equally patterns of behavior, ways of touching) from one environment to another can accelerate understanding and facilitate learning and innovation. New insights and ideas can form as patterns that we initially struggle to relate to (such as the form of a heart valve), become recognized as being similar to another pattern that we know well.

Biologist and biomimeticist, Professor Julian Vincent, is interested in creative output, and in his exploration of this, he links art to evolution. He hypothesizes that, if one of the basic concepts of evolution is that survival depends on being that bit better than the rest (having a "selective advantage") then there must be a selective advantage to art. He proposes that art enhances our prediction skills, and hence survival, and that our enhanced predictive ability is based on pattern recognition. "The thesis therefore is that music and the other arts comprise a system for rehearsing pattern prediction skills; the pleasure involved reinforces behavior likely to improve survival." [4].

What I hope to show by discussing one of my collaborative projects, is that both artists and non-artists engaging in problem-solving have a shared interest in pattern prediction. Moreover, that when each of us engage in everyday creativity and allow others to witness and question it, we expand our appreciation of other disciplines, learn to predict previously obtuse patterns, and apply these new pattern recognition skills to our own fields of research and practice.

During my residency with the cardio thoracic surgeon, Francis Wells, I spent time with him at Papworth hospital, immersing myself in his everyday lived experience, observing him at work and discussing my observations with him. This 'immersion' is essential to my work with experts from other disciplines, because I am convinced that knowledge is 'situated'. A surgeon's knowledge (some might say their most highly tuned 'pattern recognition skills') is situated in, and connected to, their everyday tools, materials, routines and behaviours.

I accompanied Wells' to the operating theatre, watched him perform and teach surgery, and witnessed the way he communicated with patients. I was interested in his use of drawing and touch to explain complex procedures to both lay people and fellow professionals. For Wells, training other surgeons in keyhole surgery techniques is as much about laying his hands over theirs (as they use keyhole surgery equipment such as staplers) assisting them in deciphering subtle changes in resistance, as it is about teaching them to watch the remote camera displays above their heads rather than looking down at the patient.

One day while in an operating theatre, Wells asked me how I thought the human heart should be held (the surgeon typically manually squeezes excess air from the heart cavities towards the end of open heart surgery) [5]. At first I felt that I had few skills or experiences that I could draw upon to answer. I wanted to say, "I have no idea". But one does not ignore a question from a busy surgeon, especially when it is asked in the middle of open-heart surgery.

I risked describing the first thing that came into my head (though in fact my initial response to his question was a feeling in my hands). I recounted how, when I was about seven years old, my mother bought me a hamster and taught me how to hold him. She warned me that, if I held him too loosely, he could fall and be badly injured. I clutched him tighter – she told me a tight grip could injure his delicate bones and organs. The perfect grip was learnt by gently testing my grip, watching the hamster's eyes. If they started to bug-out, I relaxed my grip, if he moved through my hands, I increased my grip to find a happy medium.

Francis Wells told me that he thought this

Fig. 1. Holding a hamster (© dashingblue 2009)

was about the same as his grip on the human heart as he de-aired it. I felt less foolish. Importantly, I realized that there were relevant patterns I could draw upon when talking to him, that many of them were about touch and grip, an understanding of materials' qualities through their feel in my hands.

Surgeons like Wells are highly attuned to touch, especially when they are 'in theatre'. Equally important are monitors that display read-outs. Towards the end of a mitral valve repair, the repaired valve is tested before the patient's wounds are closed up. The surgical team gather near a monitor and watch as the heart pumps, looking closely at the action and movement of the repaired valve, such as the way the blood flows and forces the valve shut. The heart and its interior are represented moving in real-time. In medical illustration (both 2D and 3D) the heart has a simplified quality, in particular the detail of the vascular structure is often absent. By contrast, MRI scans of the heart show the

Fig. 2. Heart. Rapid prototype from MRI data in polymer. Silver-plated (© Jane Prophet)

organ in detail, revealing complex branches of veins and arteries. In open-heart surgery the look and feel of the heart is different again. As soon as the chest cavity is opened and the heart revealed, it has necessarily been distanced from the tissue that helps to hold it in shape. The blood that fills the vessels and gives them their distinctive structure is re-routed and they become flaccid. When lifted, the heart and its vessels are subject to gravity and, despite its muscle mass, the heart's 3D form is very different from that of MRIs of the same heart taken pre-operatively. I took MRI data and made a rapid prototyped heart from it [6]. This had much of the detail of the vascular structure and was true to the form of a heart held inside the body. As a standalone object, it was of interest to the surgical team at Papworth, who discussed its surface texture and structure in detail as they handled it. This object was my response to the importance of touch and real objects to the surgical teams', and lay person's understanding of the structure of the human heart.

Wells' ordinary, everyday creativity [7] is expressed in many forms besides the most obvious - his surgical skills in response to particular anatomies and surgeries. One of the most familiar to a visual artist like myself, is the way he draws while explaining disease and surgical remedy to patients and other surgeons. He draws with whatever is closest to hand, often biro on cafeteria napkins and the backs of envelopes. This ordinary drawing process became extraordinary to me when he drew in the operating theatre, with blood on surgical paper. To his surgical teams and his peers, the blood, or 'swab', drawings are extraordinary not for their aesthetic quality, nor for the materials he uses, but for the novel surgical techniques they describe. These techniques are Wells' significant developments in mitral valve repair.

The operating theatre is a context in which blood and surgical paper are everyday materials, close to hand; where surgical swabs are sterile while a pen would not be. What is everyday to a surgical team is what makes the drawings strange, shocking even, to the rest of us.

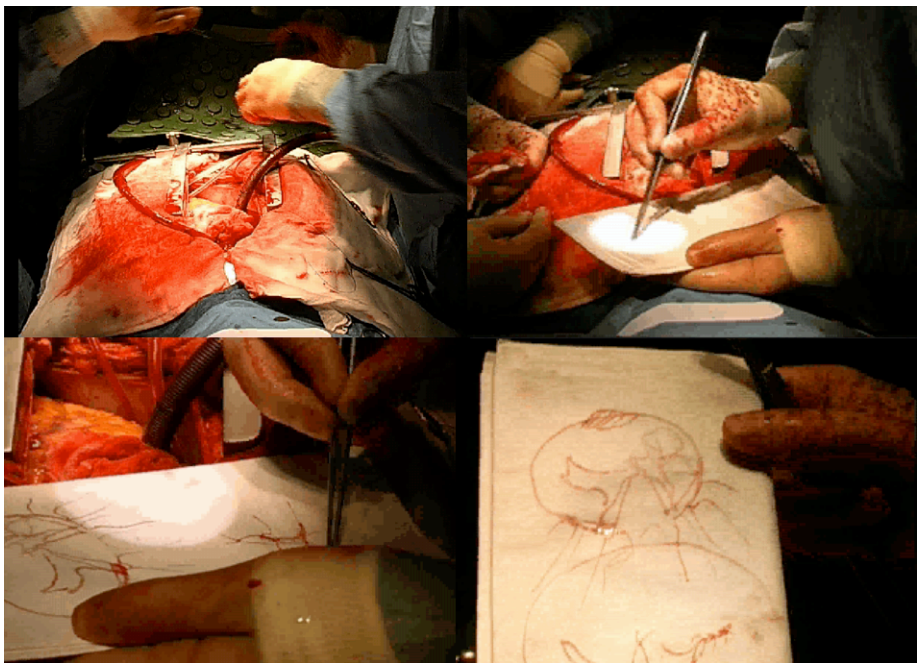
If context is important to the way we define, and make meanings of, art and images then we cannot ignore it in this case. The swab drawings never appear outside the operating theatre, they are thrown away with surgical waste. They function as diagrams, used as an evocative supplement to the surgical process. 'Evocative' because, as Wells draws, dipping his surgical swab into blood in the open chest cavity like an artist dips a pen into ink, he is verbally recounting the procedure he has just completed, and that his drawing refers to. He uses the act of drawing to focus attention, explaining his decision to cut in a specific way, pointing out structural idiosyncracies encountered when operating on that particular human heart, and how he responded.

The audience context is also important: surgeons visit Wells to watch his new mitral valve repair technique and he trains emerging cardio thoracic surgeons [9]. International visitors often have English as a second or third language. The patient's needs are central and the operation will not be slowed so that Wells can explain something in more detail as he goes along. The post-operative drawing evokes the procedure after it is largely finished, acting as a visual prompt, often supplanting verbal language as a tool for communication.

Wells' new technique for mitral valve repair had already been performed on over a hundred patients when I first showed videos of his swab drawings. While his drawing process is another rehearsal for pattern recognition for other surgeons observing his new mitral valve repair, the repair technique itself was inspired when Wells recognised a pattern from elsewhere. Pattern recognition is "the act of taking in raw data and taking an action based on the category of the pattern" [10]. Looking at a series of drawings of hearts and valves by Leonardo da Vinci, circa 1510, inspired Wells. "What Leonardo was saying about the shape of the valve is important. It means that we can repair this valve in a better way." [11].

'Taking in raw data' [10] was observing surgery and remembering the feel of a hamster. My 'action' was to make a detailed heart object from accurate 3D data. Wells 'took in data' in the form of da Vinci's drawings and 'acted' by inventing a novel way of repairing a mitral valve. We both improved our pattern recognition skills.

Fig. 3. Stills from the video, "Swab Drawing Number 1." (© Jane Prophet)



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