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Seeing architecture in action: designing, evoking and depicting aesthetic becoming

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Abstract

This article studies the visibility of creative acts and how the aesthetic experience of future architectural form can be seen in movements of the hands, in concert with speech and bodily conduct. Selected sequences are studied closely in two settings to examine the ways that our human interactional practices organise the depiction of architectural concepts and spaces, which can then be explored in movements of the hands. These fleeting but significant actions are proposed as acts of 'aesthetic becoming' in design settings, as design-relevant 'things' are visibly depicted in an unfolding design situation. Seeing this is remarkable, as this study suggests these acts draw our visual attention to the different landscapes that we move in when designing, where imagining and depicting 'what is becoming' is intricately interwoven with 'what is happening now'.

Keywords: design practice, creativity, architecture, temporality, visualisation, ethnomethodology

1. Introduction

Design creativity is understood as many things, with renewed interest in the study of the social processes and practices of design work conducted in workplace settings and more recent attention to temporality in creative interactions (Bilda, Edmonds et al. 2008; Sonalkar, Mabogunje et al. 2013). To advance our understanding of creative practices further this article will study just how aesthetic qualities of the built form were brought into conversation, and were 'brought into being' in a more substantive sense, at two architectural events. In particular it is the interactional practices that were used to depict design-relevant phenomena at particular moments in time that are studied, and how this involves visible embodied and gestural actions as well as what was said by the participants. An aim is to draw design research attention to some seen and noticed but fleeting actions that represent the aesthetics of future form and experience. The paper also offers a methodological route to account for real-time creative acts, to explicate what has been previously been described as moving, 'living things' (IJDCI Editorial Board 2013). The analyses are organised around a series of sequences, drawn from audio-visual recordings of architects working in practice, to account for how complex representational acts of what are proposed as 'aesthetic becoming' are contingently accomplished in social interaction.

"Imagining a trajectory across perceptible space is the basis for the more complex practice of super-imposing an imagined trajectory on imagined space" (Hutchins 2008)

This paper uses as its starting point a distinction made by Hutchins (2008) between acts of the imagination that involve imagining in a perceptual space (a space that can be perceived and experienced) and the more complicated task of imagining movement and activities in a space that is imagined. Intuitively we may sense that imagining

activities in an imagined setting is something that we do, that this is a human faculty, and also that the study of this might be of interest to design. Indeed, studies of the functions of gestures in design support this view (Detienne and Visser 2006; Visser 2009). However, to date more attention has been given to gestural actions in the use of the design materials (Henderson 1999; Luff, Heath et al. 2009) and less to the study of representational practices that visibly depict acts of the imagination through movement of the hands. Murphy's (2005; 2012) study of 'collaborative imagining' in the interactions between architects makes insightful inroads, where movement is imagined for building elements represented on a drawing. In Murphy's research, 'imagining' concerns "the perception of real world things for imaginative purposes" (Murphy 2005). An example of this is where a drawing acts as an anchor and as an object for discussion, which the architects augment with motion. A point of departure from previous research is the study of the more complex task of evoking and depicting imagined things in imaginary spaces (LeBaron and Streeck 2000; Hutchins 2008), which this article sets out to examine.

People represent the world using the resources they are accustomed to, in their actions and practices, ways of looking and seeing and the use of the materials, to accomplish things in the world (Schön and Wiggins 1992; Goodwin 1994; Bucciarelli 2000; LeBaron and Streeck 2000; Ivarsson, Linderöth et al. 2009). In this article it is how, through some small actions and socio-cultural practices we organise and reveal our design work that is studied in fine-grained detail, in authentic settings where 'live' projects are being designed. Studying design as it happens in the workplace the setting is more than a container for activities, as it interleaves the ways in which the witnessable activities and practices that take place there are understood (Garfinkel 1967 [1984]; LeBaron and Streeck 1997; Luff, Hindmarsh et al. 2000; Koschmann 2011). We study natural language use in its broad semiotic sense where movements of the hands, bodily orientation, gaze, ways of seeing, as well as what is said at particular moments in time, provide an ordered resource to study the participants' accountable practices (Garfinkel 1967 [1984]; Garfinkel and Sacks 1970; Sacks 1992; Streeck 2008; Mondada 2011) informed by conversation analysis and ethnomethodological studies of the workplace.

The argument is structured first introducing several ways that aesthetic experience is represented in architectural practice, to point up the important pragmatic functions that gestural actions serve in design settings and the approach to the study of embodied interaction that is adopted in this research. Some characteristics of design conduct, as a creative activity that happens in the orderly unfolding of actions, are then introduced to draw attention to the temporal landscapes in which design takes place. Details of the method and approach are presented before the accounts of each act of 'aesthetic becoming' are offered up for inspection. Finally we are able to be more specific about the creative acts through which we see architecture in action and offer practical insight into how to study them.

2 Building aesthetic experience

Designing for the experience of space and form is at the heart of architectural practice and pioneers of the design methods movement understood this (Jones 1970; Mitchell 1993). This involves, in the process of design, imagining and anticipating what the experience of a building will be like for the people who will eventually use it (Hertzberger 2000) and design methods have, since their infancy, paid attention to the

subjective, perceptual aspects of space explicitly and encouraged user involvement in the design of environments (Sanoff 1975; Mitchell 1995). While orthogonal representations including plans, sections, elevations and perspectives often augment the discussion of a scheme (Ivarsson, Linderöth et al. 2009) these images do not wholly represent the experience or aesthetics of the built form (Authors). Drawings are ‘read’ and spatial arrangements between the elements shown can be perceived, however this is dependent on a person’s competence at understanding graphic notations and drawing practices. They have also been criticized for prioritizing the appearance of a building’s geometry and the configuration of physical form over other architectural concerns (Jones 1970; Lawson and Loke 1997; Lawson 2005). While graphic depiction techniques and technologies have evolved, and do fulfill many functions, these media accommodate only some of the visual representational practices that feature when designing.

The design of buildings involves more than the production of drawings to use in design settings, for manufacture and then assembly processes. Buildings are material assemblies of walls, doors and other components, but in the discussion of their configuration more is being represented than relationships between physical elements. At times the aesthetic experience of space and form are evoked, and this happens interactionally in various ways. It is visual representation through embodied depiction practices that we draw attention to in this paper. This chimes with Wittgenstein’s observation that it not only what is said in conversation that is important:

“In order to get clear about aesthetic words you have to describe ways of living. We think we have to talk about aesthetic judgements like ‘this is beautiful’, but we find that if we have to talk about aesthetic judgements we don’t find these words at all, but a word used something like a gesture, accompanying a complicated activity”
Wittgenstein (1966 p.11).

The building, crafting and depiction of aesthetic experience are interwoven in speech and bodily conduct. It is with a range of human faculties that we communicate *about* the world, including gestural actions produced *in* the world. Gestures are “actions that accompany, are interwoven with, and occasionally replace, talk” (Streeck and Kallmeyer 2001). Importantly gestural movements of the hands are also projectable in their construction in participation (Goodwin 1995), that is, they are designed for others present to notice as meaningful actions. To illustrate, architects were able to imagine doors swinging open and trucks moving in a delivery yard through a sequence of gestural actions (Murphy 2005).

To see actions of the hands as representing ‘something’ involves disattending to the hands as objects, and instead seeing what is being depicted through the movement of the hands (Streeck 2008). Hands become a medium for depiction, but what is being depicted is seen through the actions the hands make. The depiction categories developed by Streeck (2008) provide a working heuristic for the “description of dynamic gestural actions that represent something in the movements of the hands” (Streeck 2008). The gestural depiction categories are: modelling, bounding, drawing, handling, making, scaping, marking, self-marking and model-world making (Streeck 2008), which will be characterised as these become relevant in this article. These categories are not based on the form of the shape produced, or the function of a gesture, which many other gestural classification system adopt. Gestures are

categorised in a more active sense, by the kinds of movements that depict pictorial representations in micro-actions of meaning-making. Emphasised is a way of describing and accounting for gestures in action, which acknowledge the movements of hands in time, as well as the final form of a gesture. Two examples of these depicting practices follow. In each account we begin to get a sense of how designing for imagined experience takes shape in interaction.

An architect depicts the terrain where he will design a building empathetically with the landscape, sketching a curved path in the air with a *scaping* gestural motion, giving shape to a terrain as if sculpting in a sand-box of air (Streeck 2008). “Stable features of the terrain are described by motion verbs that would describe what would happen to a person moving through it. The movement of the hand depicts the ‘falling off’ of the terrain. Throughout this depiction, the architect holds his left hand in the same position, continually marking the hill-top” (Streeck 2009 p.135-136).

In another situation, this time in an education setting, we begin to get a sense of how movements of the hands are interwoven in the expression of features on an architectural model and the experience of space (LeBaron and Streeck 2000): ‘Examining a student’s model the professor traces the “long bent” form of the model and describes its tactile and visible features and then recasts this as a “linear experience”. The gesture in connection with a material object serves as a springboard for imagined experience in the building. The professor describes seeing “the wall at the back” and extends his right arm fully. Later a student outlines a ‘long bent’ shape with his hands and uses present-tense language to describe the imaginary ‘lived’ experience’ (LeBaron and Streeck 2000). It can be seen that the experiential foundations in activities of the hands in the material world are used to explicate indexical ties to this world (LeBaron and Streeck 2000). These are “gestures designed for particular recipients that appeal to those recipients’ knowledge, knowledge that may be acquired over the course of the current situation, or in a cultural and physical world that is in some part shared” (LeBaron and Streeck 2000).

Noticeably in these architectural situations, and indeed in other settings, conversation can be about contexts that are not currently present. This human communicative faculty is considered especially important when designing and thinking and talking about imagined spatio-aesthetic concepts and experience. Indeed, speakers gesture more when they are describing difficult to conceptualise information, and primarily when expressing spatial information in speech, rather than when silently thinking about spatial information (Hostetter, Alibali et al. 2007). Imagining what a building will be like, and describing this to other people, are characteristic situations when gestures might help pragmatically. The verb and tense of the words spoken when gesturing were part of both previous accounts. This is also noteworthy, as in design conversations often there is a switch in tense between the discussion of ‘what is known’, to ‘what will be’, and ‘what is becoming’ and it is the ability to negotiate temporal shifts when designing that is considered next.

3 Designing as bringing-into-being in interaction

Designers routinely discuss and imagine situations that do not yet exist and work with *what will be* in several senses. In design studies ‘coming into being’ sometimes describes design in terms of what it accomplishes, the designed products and services that are outputs from design processes. The built form is a product of architectural and

engineering design processes, in a synthesis of creative and technical problem solving. Indeed, design is acknowledged as “a creative activity – it involves bringing into being something new and useful that has not existed previously” (Reswick 1965). This observation has more recently been re-phrased, design concerns the “coming into being of an object that could be other than it is” (Fleming 1998) and with this other attributes of design are acknowledged. Firstly, the contingency of design, that had different decisions been made that the designed outcome would be different from what it is. Simply put, this illustrates that design is contingent and is not a determinate activity. Others have noticed this too. Luff (2009) observes the indefinite precision with which architects work, in the ways that design decisions are revised and revisited as what is known changes in the process of designing a scheme. Another attribute emphasised is that design happens in-the-moment as the participants’ understanding of a design situation evolves. *What is becoming* is acknowledged. Indeed, it is through moves made in a design space that the participants’ understanding of a design situation co-evolves on a move-by-move basis (Trousse and Christiaans 1996; Dorst and Cross 2001; Reyman, Dorst et al. 2009). Increasingly studies of the spoken activities in design settings acknowledge talk as a design activity (Dong 2007), that is, as a medium through which the activity of design takes place. An example of this is Medway’s (1996; 2003) description of the semiotic construction of a ‘virtual building’, which acknowledges that an imagined, possible future form is being constructed in conversation, and not a building. The semiotic construction in conversation of *what will be* a building, as this article emphasises, is through embodied as well as spoken actions.

In design settings, drawings are often the materials that are used to reference the design in progress, for example, in engineering and architectural design to point to and index aspects of a building that are being discussed (Henderson 1999; Luff, Heath et al. 2009). While pointing gestural actions are used by participants to maintain their intersubjective understanding of an unfolding design situation (Donovan, Heinemann et al. 2011), drawings mark a design state at a point in time. Significantly, as the participants’ understanding of the design situation evolves in conversation, the drawings become a reference to the past, that is, to anchor and represent *what is known* about the design. It is with reference to what is known (or is revealed to be known in the discussion of the design) that the participants verbally modify the design in conversation. Sometimes the experience of buildings and spaces previously visited are brought into conversation, and salient aspects of an experience known to one person can, to some degree, be shared with other people present. This is also a past tense reference to a previous experience. However, the reference to an experience is brought into conversation at the precise moment when it is of interest and relevance to what is currently being discussed (Sacks, Schegloff et al. 1978). What has happened and *what is happening now* are intertwined.

The different temporal landscapes that people work *in* and *with* when designing are not discrete. There are nested timescales of context and temporal landscapes for actions and activities that are intricately interwoven in design conversations. The switching between what is known and what is becoming often happens in quick succession in design interactions. While a shift in tense is a routine mechanism in conversation, in design interactions a shift in tense between *what is*, *will be* and *is becoming* is profound for making sense in a co-evolving situation. While design is understood as a course of action (where the participants’ concerted actions are

directed towards the design of something) and also as an activity takes place in a conversational medium, there is a more active sense to the study of human action that to date has received less design attention. It is this more active sense, *designing*, as an activity that happens *in and through* the orderly unfolding of sequential actions in time that ethnomethodology and conversation analytic studies of human action emphasise (Authors), and that this article elaborates on. Studied in this article is *what is becoming when designing*. It involves being able to see nested (design) timescales in sequential actions (Goodwin 2002; Streeck and Jordan 2009). This adds complexity to our understanding of design. It also brings us to a closer appreciation of what design as an activity is, and how designing as it *happens observably in and through* social interaction might be studied. The designing that happens *in* the architectural settings reported in this article are proposed as acts of ‘*aesthetic becoming*’, that is, being able to witness the creative acts that ‘bring-into-being’ some aesthetic quality. To study this, next the method and approach taken in the selection of materials are described.

4 Method and approach to study ‘aesthetic becoming’

Architectural design takes place in several settings and at a range of events involving different people. Meetings between architects and users are a perspicuous setting to study how the aesthetics of architectural form are talked about with people without this expertise. These meetings take place at a time when the design of a building is debated and the characteristics of the design for a scheme are still unfolding. This research studies how the aesthetics of imagined space and form are depicted in gesture and embodied actions in two meeting settings. The participants present are not the same in each setting and different buildings are being designed. A commonality is that in each setting an architect discusses future architectural form with building users (with commissioning and user clients). In the selection of materials from different settings, deliberately the depiction practices reported do not merely reflect the gestural habits of one person in a single setting.

The episodes selected for close inspection were chosen because each includes the depiction of aesthetic and experiential properties of what-will-become a building. While numerous instances of this can be seen within the data, the episodes selected are considered to most clearly show representational gestural actions working towards the aesthetic expression of future form, and include particular instances when ‘architecture’ was discussed explicitly. This is, of course, not an exhaustive collection of architectural depiction practices, but selectively illuminates some of the ways that the discussion of building aesthetics are brought into conversation, and how imagined architectural form and aesthetic phenomena are depicted in embodied and multimodal actions in each setting. In order to show this, four data extracts were selected to show progressively more abstract creative acts: that starts by revealing insight into the imagination with reference to real-world objects (drawn graphic representations) and leads to the depiction of imagined aesthetic experience within a space that is also imaged (as described by Hutchins 2008).

From conversation analysis, the local matters of the participants’ are seen in their orientation to an immediately prior action, that is, to what has just been said and done (Schegloff 1992). Movements of the hands are actions in conversation analysis that are regarded analytically in the same way as spoken actions; each action is seen to be context-shaped (intimately organised with regard to the immediately prior action) and

context-renewing (creating the context in which the next action will be seen and understood) (Heritage 1984). Design moves made on a moment-by-moment basis therefore provide a resource to study the participants' recognition of an immediately prior action's relevance. The kinds of actions that are studied are the routine mechanisms we use in everyday conversation: a change in the direction of gaze, bodily orientation and the production of talk in conjunction with gestural actions. These small actions provide ways of seeing and accounting for the participants' actions as they happen moment-to-moment in a setting. The gestural actions studied are fleeting, produced in a short period of time and often in small movements of the hands. Through repeatedly viewing video sequences in slow motion, visible actions are studied in fine-grained, micro-analytic detail. The transcription notation used for the conversations is a simplification of a system developed by Jefferson (2004) to mark sequential turns at talk. A standard orthography is presented, as it is not the vocal sounds produced or overlapping speech that is studied but the production of words in simultaneity with the gestural actions of a speaker. Details of the data, the participants present, the materials at hand and data collection procedures are introduced before the data extracts are presented.

4.1 Designing a crematorium

Designing a crematorium was part of Adam, the architect's job, working for a civic architectural practice. In conversation, at a meeting with two client representatives, Anna and Charles (Figure 1), Adam acknowledges this is special "you know it's a dream come true for an architect to do such a project". Different kinds of spaces and places are designed as part of the scheme that will be experienced by mourners: waiting rooms, a sanctuary and a catafalque space¹, as well as accommodating the apparatus associated with a crematorium that are used by the staff who work there on a daily basis, and intermittently by funeral directors. The design of the crematorium considers both the rare experience of these spaces and their routine use.

INSERT FIG1

Figure 1: Overhead camera view of the participants on the left, and a cross-room view on the right.

The conversation reported is the second time the architect and user clients meet and, as will be seen, what happens in this context is nested and linked to what has happened previously. The meeting took place in the room shown in Figure 2. The participants sat around a table with plans, sections and a concept drawing of the design in progress and other materials at hand: a scale rule, pens and notebooks, the

¹ A catafalque is a platform that supports a coffin during a ceremony and the mourners can view a coffin resting on a catafalque before it is cremated. The 'catafalque space' is the term used in this paper to describe the space in which the catafalque sits, as it is the design of this space that is being discussed.

routine resources associated with architectural practice and note taking in meetings. The meeting was one hour and eighteen minutes in length. The data was collected as part of the DTRS7 Design Thinking Research Symposium by a researcher, just seen in some images. The meeting was video-recorded using cameras fixed in three locations, one above the table and two pointed to record the activities around the table from across the room. Screen-shots from these camera views are presented to show the participants' actions at specific moments in time.

INSERT FIG 2

Figure 2: The setting for the crematorium design meeting.

Data from this meeting has previously been analysed by design researchers with different analytic orientations. It was the rare use of the terms 'architecture' and 'architecturally' that has prompted this re-inspection of old data for new insight (Pink, Tutt et al. 2010) this time to illustrate and explicate some of the participants' aesthetic depiction practices.

4.1.1 Evoking 'architectural' in the scheme

In a setting where the discussion of architectural form is core to the task at hand, and reference to 'architecture' explicitly was rare, these instances are of note to understand what is being depicted that is of 'architectural' interest. In the following example, Fragment 1, it is evoking what is needed 'architecturally' in the scheme that is studied.

Fragment 1

00:27:10:10 – 00:27:21:16

- 1 Adam: last time we spoke Anna (.) (Image A)
- 2 you thought that that the original catafalque design just wasn't bold enough (Image B)
- 3 Anna: here wasn't enough
- 4 Adam: yes
- 5 Anna: yes
- 6 Adam: it's just (.) you know I felt architecturally it needed to be a great deal more bold (Image C)
- 7 to make a statement about it being very important
- 8 Anna: that's in a sense what they are all there for (.) is what's on that

INSERT FIG 3

Figure 3: Image A left, Image B middle, and Image C right.

The episode starts with Adam's formulation of what happened at the previous meeting. The "last time we spoke Anna", acknowledging it is Anna that he is addressing. As Adam does this, he raises his head and looks towards Anna and establishes eye contact. Adam continues, "you thought that that the original catafalque design just wasn't bold enough" claiming it was Anna, at the last meeting, who raised the design of the catafalque as somewhat problematic. This is a design problem that Adam formulates as "just wasn't bold enough" (line 2). Adam maintains eye contact and moves to sit in a more upright position. Adam moves his arms from resting on the drawings on the table and produces a *bounding* shape with his hands, loosely encapsulating a space between his hands, in small movements that oscillate, moving slightly further apart and together. The maximal production of the gesture is at the moment that "bold" (line 2) was spoken, shown in Image B. The figurative component of a bounding gesture is in the space between the hands. Adam's hands are slightly curved and move as if attempting to grasp the boundaries of something, but what 'it' is remains vague and is not clear, although 'something' is being depicted. From what was said simultaneously with the bounding gestural actions, Adam's hands provide visible representation for important but uncertain characteristics of this space in the oscillating motion of the gesture. In this first turn, Adam has established the design of the catafalque space as the topic of conversation and also depicted the imprecise definition to this aspect of the design.

In Adam's account so far, it has been put forward that the design of the catafalque space was a concern raised by Anna at the last meeting. Anna, instead of agreeing or disagreeing responds with a question "here wasn't enough". As Anna answers her left arm moves towards the plan drawing in front of them. Seeing Anna's actions Adam acknowledges this as correct 'yes' (line 4) and Anna in turn acknowledges this 'yes' (line 5). Adam and Anna acknowledge their mutual agreement that the design of the catafalque space, as presented at the last meeting, was somewhat problematic and did need more design attention. Adam starts, "it's just you know" and continues, "I felt architecturally it needed to be a great deal more bold to make a statement about it being very important". "It" being the space that houses the catafalque. At this point in the conversation, Adam understands the catafalque to be a space within a building². It is this aspect of the design that Adam felt 'architecturally' needed to be 'more bold' to emphasise the importance of the space. At the moment Adam says "architecturally" he moves the index finger on his left hand in a circular motion over a precise area of the plan, shown in Figure 4 Image A. Adam's left hand then moves to form a *marking* gestural depiction of a shaped volume that hovers over a location on the plan and encapsulates space. Adam does this as he says "bold" (shown in Figure 3 Image C,

² At a later stage of this conversation, Adam acknowledges he has misunderstood the meaning of the term 'catafalque' (0:26:24:00 "ok I thought the catafalque was the name of the space it's obviously the actual thing you put the coffins on").

and in more detail from an overhead view, Figure 4 Image B). The figurative component of this gesture is the marking of a location on the plan and the shape of the hand as it depicts a volume of space. It is from the co-production of “bold” at the moment that this gesture is produced that the boldness of the catafalque space is depicted in the shape of his hand. In these actions the bold architectural form that will define the catafalque space has visible depiction. In response, Anna agrees and acknowledges the importance of this aspect of the design, “that’s in a sense what they are all there for, is what’s on that” [a coffin].

INSERT FIG 4

*Figure 4: Image A on the left and Image B on the right
('I felt architecturally it needed to be a great deal more bold')*

While ‘architecturally’ and ‘bold’ are abstract concepts that have no obvious form or referent that can be pictorially represented in gesture, in this brief extract the location of the catafalque space was marked and a visible representation for this was depicted. Adam let us see his creative process as it was being mediated by his hands. In doing this, what was visibly depicted was available as a resource for others to see in this setting and also when closely re-examining the data after the event. The expression of the importance of the experience of the catafalque space ‘architecturally’ through its boldness, reveals that ‘architecture’ was evoked as part of the architect’s creative reasoning process. ‘Architecture’ was brought into the conversation as a reason for this space to be ‘more bold’. Noticeably a 3D shape was depicted with Adam’s left hand, which to some degree represents potential architectural form, but the shape of the form lacked specificity. It was the volume of the space that was visibly depicted rather than the details of the architectural form, for example, its height in scale in relation to the area on the plan. With this there was both precision and ambiguity in the depiction. While in other situations bounding actions can depict precise length, width and height to pictorially represent something that becomes recognisable through the gestural actions (Streeck 2008), in this situation although ‘something’ was being depicted, its attributes were not specified or immediately recognisable. The shape and volume depicted were somewhat vague, and the way that ‘bold’ will be physically and materially represented in architectural form was uncertain. These actions are considered to visibly embody what Luff et. al. (2009) has previously characterised as indefinite precision. The architect’s depiction of what was important ‘architecturally’ did have visible manifestation, and through these representational acts we do gain insight into the architectural significance of this space, in whatever future material form it may take. Noticeably, Anna acknowledged the importance of the design and the experience of this space but not in ‘architectural’ terms. At this

meeting the discussion of what will be important experientially to a mourner at the crematorium, once this is built, was seen to be a collaborative design concern.

4.1.2 Evoking a sense of spirituality

The design of the experience of the crematorium, to evoke a sense of spirituality, is interwoven in the design of the built form. In the next extract, Fragment 2, it is how the sense of spirituality that the architect aims to evoke in the scheme is brought into conversation that is studied.

Fragment 2

00:38:00:12 – 00:38:15:02

- 1 Adam: good so in principle you like the idea of its spirituality (Image A)
- 2 being amplified (Image B)
- 3 to make it very calm
- 4 Anna: yes

At this point in time the participants discuss the use of water in the scheme and how reflections will just be visible through glass windows in the sanctuary space, and importantly the aesthetic experience of this. Anna is keen that the design of this crematorium has some unique feature, such as the outside space to sit and watch the water in the pond. Adam acknowledges this “good” and continues, “so in principle you like the idea of its spirituality” producing a *bounding* gesture, maximally at the moment that ‘spirituality’ is said (Figure 5, Image A). Adam’s hands form a curved shape that bounds the space between his hands without pictorially depicting what spirituality is, although representing ‘something’. In the simultaneity of speech and gesture, Adam’s bounding gesture provides visible embodiment for ‘spirituality’. Adam continues, “being amplified” as his hands move apart into a larger bounding shape (Figure 5, Image B). These gestures were produced with a visible adjustment in Charles’ gaze, as Adam increases the size of the bounding gesture, to depict amplification. Then as Adam’s hands begin to move to rest on the table, he says, “to make it very calm”. Adam is doing many things. In this turn he presents the idea of spirituality as something to agree in principle, in a so-prefaced utterance, that in this case suggests the candidate answer to agree (Bolden 2009), which Anna does “yes” (line 4). Adam, in this sequence, establishes the aesthetic concerns of ‘spirituality’ and ‘calm’ as concepts to engage in the design of the crematorium.

INSERT FIG 5

Figure 5: Images A left and B right (‘the idea of its spirituality being amplified’)

The participants have previously discussed the absence of religious connotations in the scheme (unreported). Adam's introduction of the concept 'spirituality' is noted as a non-denominational way of engaging the significance of the experience of the crematorium, without any particular religious association. The discussion of spirituality, as something to be experienced and imbued in space and place, is quintessentially an aesthetic, architectural concern. Here the idea of spirituality being amplified to make it calm may seem bizarre or contradictory. However, from these gestural actions it is inferred that it is not the architectural form that is being depicted at this moment in time, but the idea of spirituality, as a concept, through the visual embodiment of its amplification. Spirituality has no obvious visual referent, yet in evoking spirituality's amplification in the actions of his hands, an abstract concept had representation. The evoking of spirituality was intricately linked to its depiction. Adam was talking about architectural ideas and concepts as 'things' and we can see that they did have visual depiction, in the actions of his hands. It is within, what on first sight may seem to be aimless, vacillating movements of Adam's hands, that we see the imagination of the architect in action.

4.1.3 Depicting architectural ideas of geometric form and experience

Relationships between the built form and how it is perceived and the emotional response instilled are personal, emotive and complex. There is no obvious representational form to evoke a sense of spirituality, yet in the design of the crematorium the architect is imbuing, in architectural form, an expectation or anticipation of how space and form will be experienced. In the next extract, Fragment 3, architectural ideas for the form of the catafalque space are brought into conversation.

Fragment 3

00:27:18:20 – 00:27:23:10

- 1 Adam: ... the architectural idea here is to have a cylinder (Image A)
- 2 which will be top lit at the top (.) perhaps a glass pyramid (Image B)
- 3 something like that so you can get top light pouring down into it (Image C)
- 4 there might be some very nice artificial lighting inside as well (Image D)
- 5 so that [*phone rings*] ...

INSERT FIG 6

Figure 6: On the left is Charles and on the right Adam's depictions, Image A ('the architectural idea here is to have like a cylinder') Image B ('perhaps a glass pyramid something like that') Image C ('so you can get top light pouring down') and Image D ('some very nice artificial lighting').

At this point in time, they are discussing the space in which the catafalque sits (now knowing that the space is not called a 'catafalque'). Adam brings architectural ideas that are not represented on the drawing in front of them into the conversation, first, "the architectural idea here is to have a cylinder". In the course of saying this, Adam's

hands move from resting on the table, to pictorially depict a cylinder shape, as if *making* a cylinder and exploring the roundness of the sides of cylinder in the movements of his hands at face height, Image A. Adam's hands then move upwards as he begins saying "which will be top lit" with the maximal production of the gesture at the moment that he says 'pyramid', "perhaps a glass pyramid something like that" shown in Image B. The apex of a triangle is depicted in the form of Adam's hands, which are now above his head. This gesture is not explored as if making something, but bears some resemblance to the shape of a pyramid. He is *modelling*, "a thing-like embodiment of a thing" (Streeck 2008). Noticeably, Adam has switched from describing what *will be*, "have a cylinder" to what *might be* "perhaps" and with this acknowledges the provisionality with which he is currently improvising and exploring possible architectural ideas. In an adjustment to the triangular shape, Adam moves the fingers on his hands down, keeping his hands above his head as he says "so you can get top light pouring down into it" Image C. This gesture is also inferred to be modelling a likeness to light pouring down. The last movements of note in this sequence are when Adam moves his arms slightly, to face height and his fingers are moving, shown in Image D. This gesture is a dynamic depiction, modelling "very nice artificial lights" shining.

Adam, in a very animated and articulated way, depicts his architectural ideas and the geometric forms the catafalque space might take. The movements of Adam's hands visibly depict his ideas for the design of the scheme and in doing this he lets us see his imagination in action. Adam describes the experience of what it will be like in this catafalque space, whilst making it known that he is moving within an imagined design space. The conversation is not about what is shown on the drawings in front of them, but concerns what is *not* represented, and *what might be*. This depiction of improvised design ideas shows aesthetic becoming as is happening *now*, and we can see this. This is designing, as it is happening *in* conversation, in real-time. This activity involves a shift in the design landscapes in which he is acting, moving within a design space that is imagined, and a temporal landscape of *what will be*. What is happening now and what is becoming in the conversation are intertwined. Adam inhabits and moves within this space as he improvises on his design ideas. What is becoming, now, is visible. Importantly it is not just Adam that inhabits this design space, Charles and Anna participate in this too. It is through gesture and speech orientated to the other people present that Adam depicts his ideas. Adam's actions were designed to be noticed. Charles looks up and can be seen to carefully observe these actions (Figure 6). Charles' participation in this activity is acknowledged in the movement of his eyes, following these gestures (Hindmarsh 2010). This sequence ends when Adam's turn-at-talk was interrupted by his phone ringing.

The depictions of future aesthetic form examined so far have studied the actions of one architect in a single setting. Returning to the starting point for this research, Hutchins' (2008) observation that imagining activities in an imaged space is a complex human activity, there are several aspects to consider. Firstly, to support the proposal that 'aesthetic becoming' is a creative act important to understand the designing that happens *in* conversation, it will be studied in another setting with different participants. This is important to show that it is not only the gestural behaviours of this architect that bring acts of the imagination into being, and furthermore, more to illustrate that imaging activities in a space that is yet to take form is not only an architect's preserve. For the complex conceptual task of

‘imagining movement in an imagined space’ to be considered a human faculty, it is the activities of the users in the next setting that are studied closely.

4.2 *Designing a social housing project*

The design of social housing projects, although more routine in architectural practice than crematorium design, is a field in which some architectural practices have more expertise than others, and are willing and experienced at engaging user groups in the design of dwellings they will occupy (see for example the Participatory Design special issue of *Design Studies*, 2007). The next fragment studied is taken from a meeting where a social housing scheme is being designed. The data corpus includes ethnographic field notes and audio-video recordings of the meetings, workshops and a field trip to the Netherlands that the architectural practice arranged for the user group, data gathered over a five-month period. The data collection in this setting was using a hand-held camera, with a researcher pointing the camera in the direction of where, reflexively, the action was thought to be (Mohn 2006), centring on the table with design drawings that the participants gather around. The participants present are the project architect, Glenn, a client representative, Claire, and the future users of the building, Alice, Carole and Beth.

INSERT FIG 7

Figure 7: The participants at the design meeting.

It is the actions of two of the user clients at the meeting, and not the project architect in this instance that we focus on next. At this point in time the project architect, a client representative and three user clients are gathered around a table with the plan drawings of the scheme in front of them. The drawings are plans of a social housing scheme that show different dwelling configurations. Some dwellings have more bedrooms than others, and on the same drawing four dwelling options, with different rooms arrangements are shown.

4.2.1 *Depicting model-world making*

We join the conversation when the user clients discuss the different dwelling options. The architect, at a later stage, will develop some dwelling layouts as the preferred user options for the scheme, based on these conversations.

Fragment 4

Alice: that's what I was saying (.) where I come down from (Image A)
 at the top you've got the living room and at the back it's the garden (Image B)
 and just as you come in you've got the patio bit then you have (.) so just

before you come in you have the pocket park (Image C)
 Carole: yes

INSERT FIG 8

Figure 8: 'Where I come down from at the top' Image A, Image B and Image C.

In this sequence it is the gestural actions of Alice in particular that are studied in close detail. Alice starts with her hands resting on the table in front of them. As she begins to speak, "that's what I was saying" she starts to move her left hand upwards and continues, "where I come down from". Her left hand moves in a downward direction from shoulder height to the position shown in Image A. This action of the hand is *acting*, as if moving 'down from'. Alice continues speaking, "at the top you've got the living room" as her left hand moves upwards to head height. The maximal height of this gesture is when "top" is said, as shown in Image B. Next, her right hand moves from the table to waist height with the palm of her hand upright as she says, "at the back it's the garden" to depict where the garden is at the back, shown on Image B. Her left hand then tilts into a horizontal position, at eye level (Image C) and this hand remains stationary for the remainder of this sequence. Alice then begins to tilt her right hand as she says "just as you come in you've got the patio bit" and continues "so just before you come in you have the pocket park". Her right hand rests in a near horizontal position when "pocket park" is said, shown in Image C. By keeping her left hand in the same position, this acts as a marker for the living room, as she continues to depict the patio and the pocket park spaces with her right hand. The spatial relationship between the living room and other spaces are depicted. In this sequence the living room is seen to be at a different floor level from the elements outside the imaginary building. It can be seen that these actions are designed for Carole, and indeed are noticed by her, as in the course of this sequence Carole's gaze follows the movements of Alice's hands.

This sequence can be glossed as 'talking-walking through a building' as Alice describes and depicts relationships between spaces through imagined movement in an imaged space. However, this characterisation underplays the representational work that is involved. This sequence of visible actions is complex, as multiple gestures were produced that sequentially depict, as if *acting* out in dynamic motions, the spatial relationships between imagined rooms and outside places in a housing scheme. This is characteristic of *model-world making*, when the depictive acts are designed as gestures in a series, where a compound activity that has many modes sequentially builds-up a depictive act. In this situation it can be seen that the representation of the relationships between rooms and spaces was produced away from and independent of the drawings in front of Alice and Carole. There was no pointing at the living rooms shown on the plans, which may infer that a particular design option is being depicted. Instead Alice builds her own model world. Relative spatial relationships were depicted in 3D. This illustrates an accomplished understanding of spatial relationships

that cannot be represented on a plan drawing and that are not shown on the drawings in front of her. Alice evokes and simultaneously depicts a design space, and describes a configuration of rooms and spaces, as a person moving between these imagined locations would experience them.

A design workshop setting provides a context where the discussion of domestic living arrangements is appropriate. Here Alice was seen to interleave her lived experience as a resident on an estate, with the intricate depiction of spatial relationships for future built form, letting us see her imagination in action. Her model world-making actions provide a visible depiction of imagined movement in imagined space. Noticeably, Alice describes the experience of moving between spaces in the present tense, showing that she inhabits and moves around inside her model world as if it exists.

5 Discussion

In architecture, as in other forms of design, the ability to represent the design work in progress is important for creative collaboration, in situations where design ideas and concepts, as well as the shape and form and experience of what will become a building are discussed. Although drawings often feature in this process and are routinely part of a design project's representational practices (and design drawings were present in each of the settings studied) the participants' interactions with drawings were not the focus of this research. Instead it was gestural actions away from objects (with one exception) that were examined in detail, to study the ways that the imagined experience and the aesthetics of space and form were depicted in these design settings, to work towards what Hutchins (2008) considers to be the complex human practice of imaging movement in an imaged space (a space that cannot be perceived or experienced).

Revealed in these analyses were the representations of 'things' not shown on drawings, that is, things that could not be 'read' or perceived from the design information currently available. Imagined 'things' that have no real-world correlate, including design concepts, such as, 'spirituality', which has no obvious visual form or means of pictorial representation, were seen to be evoked and were depicted, momentarily, in movements of the hands. While these observations support what is already known, that design representations have limitations, more noteworthy is what was depicted in these settings, the speakers' visual embodiments for some aesthetic architectural concerns.

Drawings are often regarded as epistemic artefacts, but in these instances drawing co-participants' attention away from graphic representations, to focus on the movements of hands was part of the task at hand. It is what drawings cannot represent, and what small movements of the hands and bodily conduct can, that were remarkable. It was the ability to see things in actions of the hands, where hands were the momentary focus of epistemic attention that were noticed and accounted for in these situations. This marks a shift in analytic focus to the interactional space in which design activity takes place. With this there were theoretical and methodological considerations to engage, to be able to see, analyse and account for human actions in social interaction.

Being able to see design *in* interaction did not hinge on labelling an action as design. In this study of the routine mechanisms in conversation, there is no action that can be seen as 'design'. It is from observing actions in the sequence in which they were

produced, that we can see how successive actions changed the participants' understanding of a situation over time. This observation reinforces the notion of design as a process, as it evolves over time. It also permits us to be more specific in our description of design as a social process, as it is from the study of an action in close detail, and the response to a just-previous action that we can see how an action has been understood. For example, it was in some small actions that the user clients' participation in 'what is happening now' were seen, in the direction of gaze, as well as what was said in conversation. These were actions that analysis in this close detail brought into focus, yet are sometimes overlooked in the study of design.

Designing was seen to be happening in the unfolding of sequential actions in conversation, and in some movements of the hands design-related 'things' were visibly brought into being. The multiple ways that 'bring into being' features in design were considered in theory. Evident in these analyses were the different temporal landscapes in which this occurs: where the discussion of 'what is known' about a design-in-progress, 'what will be' a designed building, and 'what is becoming *now*' hinge on the moment a design move is made. The intricate interleaving of the landscapes of 'what is happening now' and 'what is becoming', were most clearly evident in these examples. In a switch of tense in speech a design's status was seen to change, for example, describing movement between rooms and spaces as if they exist and can be experienced, although at that point in time they were imagined. It is across different temporal landscapes that we design buildings, and in nested contexts, including the imagined settings where design activities take place.

The episodes selected revealed architecture in action, and specifically its 'aesthetic becoming'. This brings into question what constitutes 'architecture' in these excerpts, and on occasion this was explicitly brought into conversation. Is it the presence of an architect, the setting or doing something building-design related that constitutes this as architectural design work, rather than doing something else? Returning to Mitchell, Sanoff and Hertzberger (1975; 1993; 2000), it is design for the experience in the use of spaces and places that is important (ideally engaging the eventual users of a building in this process)³. This differentiates the design of an assemblage of building components to configure a built form, from the design of the aesthetic experience of space that has form (space encapsulated by physical form). There is a difference. However, the design of the experience of space is interwoven in the design of physical form. Imagined spaces were described, anticipating the aesthetic experience of being in each space. Deliberately one case illustrates that it is not only architects that do this, as Alice imagines moving around and within her own model world. Mies, talking about architecture, said "God is in the details" (van der Rohe 1959). In these illustrations, it is considered that architecture, or the experience of imagined architectural space, was represented in the micro details of interaction.

Seeing architecture in action took another form. The participants in each setting were attentive to each other's actions; noticeably adjusting their gaze to follow movements of the hands and responding, to comment on what was just said and depicted, to then develop the design of the experience of space. There were no instances when actions were ignored. Video-based fieldwork practices come into play to be able to provide an emic, participant's perspective of 'seeing an action as' something. The location of

³ This subject is debated, and there are other views and positions that are versed in architectural theory.

cameras in the first setting meant that clear views of some participants' actions were difficult to see (for example, Anna's face). As Wittgenstein knew, this is important, as it is not only what is said that constitutes an action in response to another person. Slight movements, lifting the head, a change in the direction of gaze for example, were seen to serve important pragmatic functions. There are lessons for design researchers to learn from field-work practices, especially given more recent interest in the study of practice, visual methods and video-based analysis (Rose 2001; Jewitt 2009; Hindmarsh and Llewellyn 2010; Pink 2011). The very act of pointing a camera in a direction constructs a view of where the action is, and thereby constitutes a theory of action. Indeed "any camera position constitutes a theory about what is relevant within a scene- one that will have enormous consequences for what can be seen in that later" (Goodwin 1994). The reflexivity of the researcher's gaze was acknowledged in the second setting, recording 'what matters at that moment in time'. Instead of claiming this as 'where the action is', a camera was pointed in the direction of where the researcher reflexively perceived the action to be, at that moment in time.

These analyses show that some visible actions, which at first glance might appear to vacillate, were pragmatically doing something more profound. Doing something architectural. Movements of the hands were providing visual depiction for the 'aesthetic becoming' then and there, as the built form was being designed. The 'things' evoked and depicted in these actions had no other form of representation. The depictions were fleeting and ephemeral yet, it is claimed in these situations, provide visual embodiment for architectural ideas and concepts.

6 Conclusions

In this paper selected episodes revealed gestural actions that were seen to depict the aesthetic experience of future space and form in conversation. The study of this develops our understanding of the important representational work that gestural actions do in architectural design, and in design settings more generally in several ways. Firstly, to see how fleeting actions of the hands were able, on occasion, to provide visible depiction for the architectural ideas described. These were ideas that had no other form of visible representation in these settings, and some abstract design concepts that have no obvious pictorial form. This was an accomplished conceptual and creative activity. *Architecture in action* was seen to be taking place. Furthermore, it was through the depiction of 'things' in actions of the hands that acts of the imagination, momentarily, had visible representation. The visible depiction of these design-relevant things was seen and noticed as such by the people present at the time, and when retrospectively viewing an event.

Evidently the human activity of imaging movement in an imaged space, which is acknowledged as complex, was taking place. Remarkably in one example, it was a 'non designer' that constructed an imagined model world, in a complex sequence of actions. This shows that the depiction of future aesthetic experience is not always an architect's preserve, nor the idiosyncratic behaviours of one architect, observed in one setting. It was the gestural depiction of the imaged movement of a user client within an imaginary building, in this research, that most clearly marks advance from the study of real-world things for imagined purposes (e.g. when objects on drawings are imagined in motion). To study this it was the aesthetic depiction practices away from drawings, studying what actions of the hands can do that drawings cannot, that were remarkable.

The study of gesture and embodied, multimodal action continues to be a fertile research ground. These accounts show how complex acts of meaning-making in architectural settings were central to the design activities that took place there and, importantly, to how the actions were understood. This observation develops our appreciation of the value of the study of gestures when these are not abstracted from the settings in which they are produced.

To study this, difficulties in accounting for design as an activity that has duration, yet happens in the here and now of a conversation, were engaged both in theory and empirically. The nested timescales of 'what is known', 'what is happening' and 'what is becoming' were introduced as characteristics of design activity that need to be reflected in an analytic account. To address the specific sense in which some creative acts became evident 'aesthetic becoming' was proposed as a way to describe the *designing* that happens *in* conversation. It was designing in real-time, as the participants' understanding of the situation shifts on a moment-by-moment basis that was evident. 'Aesthetic becoming' may prove useful as a descriptor for real-time design creativity in other domains and in other settings.

The analytic approach adopted is beginning to garner interest in the design research community, however the full potential of what micro-analysis of design interactions can reveal about design is necessarily incomplete. With this orientation to the study of social interaction we can be more detailed in accounting for the social ordering of actions that draw our visual attention to the multimodal and embodied practices through which design work is conducted. In these analyses in some small but significant ways the aesthetic experience of future space and form momentarily had visible depiction and some architectural qualities were seen to be evoked. Over longer periods of time the buildings that were being designed will be brought into being too.

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References

- Bilda, Z., E. Edmonds, et al. (2008). "Designing for creative engagement." Design Studies **29**(1): 525-540.
- Bolden, G. (2009). "Implementing incipient actions: the discourse marker 'so' in English conversation." Journal of pragmatics **41**: 974-998.
- Bucciarelli, L. L. (2000). Delta design: seeing/seeing as. Design Thinking Research Symposium 4: Design Representation. G. Goldschmidt and W. Porter. MIT.
- Detienne, F. and W. Visser (2006). Multimodality and parallelism in design interaction: co-designers' alignment and coalitions. Cooperative systems design. P. Hassanaly, T. Hermann and G. Kunau, IOS Press: 118-131.
- Dong, A. (2007). "The enactment of design through language." Design Studies **28**(1): 5-21.

- Donovan, J., T. Heinemann, et al. (2011). "Getting the point: the role of gesture in managing intersubjectivity in a design activity." Artificial intelligence for engineering design analysis and manufacturing **25**(3): 221-235.
- Dorst, K. and N. Cross (2001). "Creativity in the design process: co-evolution of problem-solution." Design Studies **22**(5): 425-437.
- Fleming, D. (1998). "Design talk: constructing the object in studio conversations." Design Issues **13**(2): 41-62.
- Garfinkel, H. (1967 [1984]). Studies in ethnomethodology. Englewood Cliffs, Prentice-Hall.
- Garfinkel, H. and H. Sacks (1970). On formal structures of practical action. Theoretical sociology: perspectives and development. J. C. McKinney and E. A. Tiryakian. New York, Appleton Century Crofts: 338-366.
- Goodwin, C. (1994). "Professional vision." American anthropologist **96**(3): 606-633.
- Goodwin, C. (1995). "Seeing in depth." Social studies of science **25**(2): 237-274.
- Goodwin, C. (2002). "Time in action." Current anthropology **43**.
- Henderson, K. (1999). On line and on paper. Massachusetts, MIT Press.
- Heritage, J. (1984). Garfinkel and ethnomethodology. Cambridge, Polity Press.
- Hertzberger, H. (2000). Space and the architect: lessons in architecture 2. Rotterdam, 010 Publishers.
- Hindmarsh, J. (2010). Peripherality, participation and communities of practice: examining the patient in detail training. Organisation, interaction and practice: studies in ethnomethodology and conversation analysis. J. Hindmarsh and N. Llewellyn. Cambridge, Cambridge University Press: 218-240.
- Hindmarsh, J. and N. Llewellyn, Eds. (2010). Organisation, interaction and practice: studies in ethnomethodology and conversation analysis. Cambridge, Cambridge University Press.
- Hostetter, M., M. Alibali, et al. (2007). "I see it in my hands: representational gestures reflect conceptual demands." Language and cognitive processes **22**(3): 313-336.
- Hutchins, E. (2008). "The role of cultural practices in the emergence of modern human intelligence." Philosophical transactions of the Royal Society B **363**: 2011-2019.
- IJDCI Editorial Board (2013). "Perspectives on design creativity and innovation research." International journal of design creativity and innovation **1**(1): 1-42.
- Ivarsson, J., J. Linderoth, et al. (2009). Representations in practice: a socio-cultural approach to multimodality in reasoning. The Routledge handbook of multimodal analysis. C. Jewitt. Abingdon, Routledge: 201-212.
- Jefferson, G. (2004). Glossary of transcription symbols with an introduction. Conversation analysis: studies from the first generation. G. Lerner. Amsterdam, John Benjamins: 13-31.
- Jewitt, C. (2009). The Routledge handbook of multimodal analysis. Abingdon, Routledge.
- Jones, J. C. (1970). Design methods: seeds of human futures. New York, Wiley.
- Koschmann, T. (2011). "Understanding understanding in action." Journal of pragmatics **43**(2): 435-437.

- Lawson, B. (2005). "Oracles, draftsmen, and agents: the nature of knowledge and creativity in design and the role of IT." Automation in construction **14**(3): 383-391.
- Lawson, B. and S. M. Loke (1997). "Computers, words and pictures." Design studies **18**(2): 171-183.
- LeBaron, C. and J. Streeck (1997). "Built space and the interactional framing of experience during a murder interrogation." Human studies **20**: 1-25.
- LeBaron, C. and J. Streeck (2000). Gestures, knowledge and the world. Language and gesture. D. McNeil. Cambridge, Cambridge University Press: 118-138.
- Luff, P., C. Heath, et al. (2009). Indefinite precision: artefacts and interaction in design. The Routledge handbook of multimodal analysis. C. Jewitt. Abingdon, Routledge: 213-224.
- Luff, P., J. Hindmarsh, et al., Eds. (2000). Workplace studies: recovering work practice and informing systems design. Cambridge, Cambridge University Press.
- Medway, P. (1996). "Virtual and material buildings: construction and constructivism in architecture and writing." Written Communication **13**: 473-514.
- Medway, P. and B. Clark (2003). "Imagining the building: architectural design as semiotic construction." Design Studies **24**(3): 255-296.
- Mitchell, C. T. (1993). Redefining designing: from form to experience. New York, Van Nostrand Reinhold.
- Mitchell, C. T. (1995). "Action, perception, and the realization of design." Design Studies **16**(4): 4-28.
- Mohn, E. (2006). Permanent work on gazes: video ethnography as an alternative methodology. Video-analysis: methodology and methods. H. Knoblauch, B. Schnettler, J. Raab and H.-G. Soeffner. Oxford, Peter Lang: 173-182.
- Mondada, L. (2011). "Understanding as an embodied, situated and sequential achievement in interaction." Journal of pragmatics **43**(2): 542-552.
- Murphy, K. (2005). "Collaborative imagining: the interactive use of gestures, talk and graphic representation in architectural practice." Semiotica(156): 113-145.
- Murphy, K., J. Ivarsson, et al. (2012). "Embodied reasoning in architectural critique." Design Studies **33**(6): 530-556.
- Pink, S. (2011). "Multimodality, multisensoriality and ethnographic knowing: social semiotics and the phenomenology of perception." Qualitative research **11**(3): 261-276.
- Pink, S., D. Tutt, et al. (2010). "Enthnographic methodologies for construction research: knowing, practice and interventions." Building Research and Information **38**(6): 647-659.
- Reswick, J. B. (1965). Prospectus for an Engineering Design Center. Cleveland Ohio, Case Institute of Technology.
- Reyman, I., K. Dorst, et al. (2009). Co-evolution in design practice. About: designing analysing design meetings. J. McDonnell and P. Lloyd. London, Taylor and Francis: 67-82.
- Rose, G. (2001). Visual methodologies: an introduction to the interpretation of visual materials. London, Sage.
- Sacks, H. (1992). Lectures on conversation vols. 1 and 2. Oxford, Blackwell Publishers.

- Sacks, H., E. Schegloff, et al. (1978). A simplest systematics for the organization of turn taking for conversation. Studies in the organization of conversational interaction. J. N. Schenkein. New York, Academic Press: 7-55.
- Sanoff, H. (1975). Seeing the environment: an advocacy approach. Raleigh, North Carolina, North Carolina State University.
- Schegloff, E. A. (1992). In another context. Rethinking context: language as an interactive phenomenon. A. Duranti and C. Goodwin. Cambridge, Cambridge University Press: 191-228.
- Schön, D. A. and G. Wiggins (1992). "Kinds of seeing and their functions in design." Design studies **13**(2): 135-156.
- Sonalkar, N., A. Mabogunje, et al. (2013). "Developing a visual representation to characterise moment-to-moment concept generation in design teams." international journal of design creativity and innovation **1**(2): 93-108.
- Streeck, J. (2008). "Depicting by gesture." Gesture **8**(3): 285-301.
- Streeck, J. (2009). Gesturecraft: the manu-facture of meaning. Amsterdam, John Benjamins.
- Streeck, J. and S. Jordan (2009). "Communication as a dynamical self-sustaining system: the importance of time-scales and nested context." Communication theory **19**: 445-464.
- Streeck, J. and W. Kallmeyer (2001). "Interaction by inscription." Journal of pragmatics **33**: 465-490.
- Trousse, B. and H. Christiaans (1996). Design as a topos-based argumentative activity: a protocol analysis study. Analysing design activity. N. Cross, H. Christiaans and K. Dorst. London, Wiley: 365-387.
- van der Rohe, M. (1959). God is in the details. New York Herald Tribune. 28th June New York.
- Visser, W. (2009). The function of gesture in an architectural design meeting. About: designing, analysing design meetings. J. McDonnell and P. Lloyd. London, Taylor and Francis: 269-284.
- Wittgenstein, L. (1966). Lectures and conversations on aesthetics, psychology, and religious belief. C. Barrett. Oxford, Basil Blackwell.