



The anatomy of intuition

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Introduction

On 4 October 1957 Russia inaugurated the space age by firing through the stratosphere a 22-inch electronic sphere called Sputnik-I. Though the chairman of the US National Committee for the International Geophysical Year described the achievement as 'fantastic', it was a severe blow to American scientific pride, and it inaugurated a good deal of heart-searching, one of the outcomes of which was the rapid convening of a prestigious conference at Woods Hole, Massachusetts, to analyse the shortcomings of a school system that seemed capable of producing only silver-medal scientists. Out of this gathering of expert minds, four central themes for the regeneration of education emerged (Bruner 1960). Three of them – 'structure of the discipline', 'readiness to learn' and the 'desire to learn' – had significant effects on practice, inaugurating the ideas, for example, of the spiral curriculum, discovery learning and the teaching of 'big ideas'. The fourth sank without trace. It was called the 'nature of intuition' (Fensham and Marton 1992).

The distrust of intuition, and the inability to see how (and even, perhaps, why) it could be incorporated into education, reflect 300 years of European cultural history. The Cartesian slogan *Cogito ergo sum* encapsulated the successful attempt to reduce the human mind only to its most conscious and rational regions, and to persuade people that their fundamental identity resided in the exercise of this explicit, articulate, analytical form of intelligence. The Enlightenment of the eighteenth century picked out just this single way of knowing and, in raising it to a high art, implicitly ignored or disabled any others: those that were not so clinical and cognitive, and were instead more bodily, sensory, affective, mythic or aesthetic – in a word, intuitive.

In so far as intuition was acknowledged at all in late seventeenth-century Europe, it had to be rendered mysterious and transcendental. Deprived of any

conception of *unconscious* cognition, ideas that appeared in consciousness with an aura of truth, or even of profundity, could only have come from one source: God. Descartes himself, having done more than anyone to ablate the notion of unconscious intelligence from human identity, described this mystical interpretation of intuition with complete conviction: 'Intuitive knowledge is an illumination of the soul, whereby it beholds in the light of God those things which it pleases Him to reveal to us by a direct impression of divine clearness in our understanding, which in this is not considered as an agent, but only as receiving the rays of divinity' (Noddings and Shore 1984: 13).

In the nineteenth century, John Stuart Mill claimed that 'the truths known by intuition are the original premises from which all others are inferred'. And this sense of intuition as something both 'higher' and mysterious – knowledge that claims to be true, but which cannot substantiate its claim except by appeal to divine authority – lingers to this day. *Chambers' Twentieth-Century Dictionary* gives intuition as 'the power of the mind by which it immediately perceives the truth of things without reasoning or analysis: a truth so perceived; immediate knowledge in contrast with mediate'; and 'intuitionism' as 'the doctrine that the perception of truth is by intuition; a philosophical system which stresses intuition and mysticism as opposed to the idea of a logical universe'. While in the *Shorter Oxford English Dictionary* we find intuition still rendered as 'the immediate knowledge ascribed to angelic and spiritual beings, with whom vision and knowledge are identical'.

From Spinoza in the seventeenth century, through John Stuart Mill in the nineteenth to Bergson and Jung in the twentieth, there are those who have insisted on intuition as a way of knowing that is privileged and arcane. Two variants of this magical sense of intuition are alive and well in the late twentieth century. The first is the supernatural one. To be 'intuitive', to many people, I have discovered, means to be sensitive to precognition, clairvoyance and divination. A workshop I ran recently on the subject of intuition attracted many people who were deeply disappointed by the scientific tack which I was taking, and who were eager, instead, to share experiences which seemed to them to be self-evidently beyond the bounds of scientific explanation. 'Out of the blue I suddenly had the most intense feeling that something had happened to Dad . . . and sure enough, five minutes later, Auntie Jean was on the phone with news of his accident': that kind of thing. Though the interpretation of such experiences is hotly disputed (e.g. see Blackmore 1993), and I shall remain agnostic here, the prevalence of such paranormal or even 'new age' interpretations of intuition reinforces the scepticism of a rationalist establishment.

The second contemporary variant of magical intuition is the one that John Furlong warns against in his opening chapter: a fuzzy, emotional kind of 'gut feeling' that is credited uncritically with validity *sui generis*. 'I don't care what you say; I just know it, OK?', can be the cry of a kind of humanistic anti-intellectualism, a black and white epistemology in which science and rationality are contemptuously rejected as 'abstract', 'academic' or 'patriarchal', and

is opportunistic, and so the path of exploration cannot be predicted in advance. Given the apparently ad hoc and surprise-full nature of creative design activity, it is not unusual for designers, when talking about design thinking, to refer to the role of 'intuition' in their reasoning processes. For instance, the industrial designer Jack Howe has commented:

I believe in intuition. I think that's the difference between a designer and an engineer... I make a distinction between engineers and engineering designers... An engineering designer is just as creative as any other sort of designer.

Quoted by Davies, 1985.

This emphasis on 'intuition' is perhaps a bit surprising, coming from someone with a reputation for rather severe, rational design work. But I think that the concept of 'intuition' is a convenient, shorthand word for what really happens in design thinking. The more useful concept that has been used by design researchers in explaining the reasoning processes of designers is that *design is abductive*: a type of reasoning different from the more familiar concepts of inductive and deductive reasoning, but which is the necessary logic of design – the necessary but difficult step from function to form (Roozenburg, 1993).

The thinking processes of the designer seem to hinge around the relationship between internal mental processes and their external expression and representation in sketches. As the engineer-architect Santiago Calatrava has said:

To start with you see the thing in your mind and it doesn't exist on paper and then you start making simple sketches and organising things and then you start doing layer after layer ... it is very much a dialogue.

Quoted by Lawson, 1994

Acknowledging the dialogue or 'conversation' that goes on between internal and external representations is part of the recognition that *design is reflective*. The designer has to have some medium – which is the sketch – which enables half-formed ideas to be expressed and to be reflected upon: to be considered, revised, developed, rejected and returned to.

Given the complex nature of design thinking, therefore, it hardly seems surprising that the structural engineering designer Ted Happold should have suggested that:

I really have, perhaps, one real talent; which is that I don't mind at all living in the area of total uncertainty.

Quoted by Davies, 1985

typical ways that designers work led to attempts to provide design methods or guidelines that would encourage designers to work more 'rationally'. Such guidelines generally outline a systematic procedure of first analysing the problem as fully as possible, then breaking this into sub-problems, finding suitable sub-solutions, evaluating these and then selecting and combining them into an overall solution. It is basically a process of analysis-synthesis-evaluation. However, this kind of procedure has been criticised in the design world because it seems to be based on inappropriate models imported from theories of problem solving and 'rational behaviour', and therefore runs counter to designers' more 'intuitive' ways of thinking and reasoning.

Several theoretical arguments have been advanced in support of the view that design reasoning is different from the conventionally acknowledged forms of inductive and deductive reasoning. For example, Lionel March distinguished design's mode of reasoning from those of logic and science. He pointed out that 'Logic has interests in abstract forms. Science investigates extant forms. Design initiates novel forms. A scientific hypothesis is not the same thing as a design hypothesis. A logical proposition is not to be mistaken for a design proposal. A speculative design cannot be determined logically, because the mode of reasoning involved is essentially abductive.'

March argued that the two conventionally understood forms of reasoning – deductive and inductive – only apply logically to analytical and evaluative types of activity. But the type of activity that is most particularly associated with design is that of synthesis, for which there is no commonly acknowledged form of reasoning. March drew on the work of the philosopher C. S. Peirce to identify this missing concept of 'abductive' reasoning. According to Peirce, 'Deduction proves that something *must* be; induction shows that something *actually* is operative; abduction suggests that something *may* be.' It is this hypothesising of what *may* be, the act of producing proposals or conjectures, that is central to designing.

Deductive reasoning is the reasoning of formal logic: if *a* is the same as *b*, and *b* is the same as *c*, then *a* is the same as *c*. Inductive reasoning is the logic of science: you observe all the swans in a given region; you note that each and every swan is white; you form the rule that 'all swans are white' (which you

may find is false when you move to another region and discover some black swans). Abduction is the logic of design: you are asked to design a telephone for mature people; you know that mature people like clarity and elegant forms and colours; you propose a design with a smoothly contoured, soft-white case and clear, black buttons (one of many possible proposals for achieving clarity and elegance).

Instead of 'abductive' reasoning, Lionel March preferred to call designing 'productive reasoning' because the designer has to produce a composition, or product. 'Appositional reasoning' also seems to be a suitable term to use, because the designer makes a proposal for a solution that, when juxtaposed to the problem, seems to be an apposite response. Unlike conventional logic, a design solution cannot be derived directly from the problem, but can only be matched to it. Unlike the scientist, who searches for many cases to substantiate a rule, and then one case to falsify it, the designer can be gratified in being able to produce just one satisfactory case that gives an appropriate result.

A comprehensive analysis of why the classic methods of reasoning in problem solving are inappropriate in design has been provided by Henrik Gedenryd. Working from a cognitive science perspective, and applying it especially in the context of interaction design, Gedenryd argued against the view of cognition as a purely rational, 'intra-mental' (i.e. solely within the mind) activity, and in favour of recognising it as a practical, interactive activity. He concluded that 'the mind working on its own is only a circumscribed portion of the full cognitive system'; the full system comprises mind, action and world, or a combination of thinking and acting within a physical environment. The designer's natural way of working encompasses that larger system through interacting with temporary models of the situation being designed for. The range of design techniques such as sketching, prototyping, mock-ups, scenarios, etc., enable the designer to make 'an inquiry into the future situation of use'. These techniques 'make the world a part of cognition', and provide the designer with a set of 'situating strategies'. Hence, Gedenryd provided a theoretical understanding for the important role of these techniques and strategies in design. He showed that abstract thought alone cannot satisfactorily perform the complex task of designing.