

famous chemist Friedrich von Kekule who discovered the ring structure of the benzene molecule while half asleep in front of the fire.

It is not just scientists and mathematicians who report the sudden unexpected emergence of ideas. Painters, poets and composers seem to have similar experiences. Mozart wrote in a letter: 'When I am, as it were, completely myself, entirely alone, and of good cheer – say travelling in a carriage, or walking after a good meal, or during the night when I cannot sleep; it is on such occasions that my ideas flow best and most abundantly.' The poet, Stephen Spender, talks of a 'stream of words passing through my mind' when half asleep. Famously Samuel Taylor Coleridge reported having the vision which led to the extraordinary images of Xanadu in *Kubla Khan*, after having taken opium. So it goes on.

We must, however, not get too carried away with the romantic notion of the creative leap into the unknown. Creative thinkers also characteristically work very hard. True the great geniuses seem to find life fairly easy, but for most of us ideas come only after considerable effort, and may then require much working out. It is generally recognised that although Mozart would write down music almost as he saw it in his mind's eye, Beethoven felt the need to work over his ideas time and time again. Musical scholars have expressed astonishment at the apparent clumsiness of some of Beethoven's first notes, but of course we are all astonished by what he eventually did with them.

Thus great ideas are unlikely to come to us without effort, simply sitting in the bath, getting buses or dozing in front of the fire is unlikely to be enough. This is what Thomas Edison means when he talks of the 'ninety-nine per cent perspiration' in the quotation at the start of this chapter. The general consensus is that we may identify up to five phases in the creative process (Fig. 9.1) which we will call 'first insight', 'preparation', 'incubation', 'illumination', and 'verification' (Kneller 1965).

The period of 'first insight' simply involves recognising that a problem or problems exist and making a commitment to solve them. Thus the problem situation is formulated and expressed either formally or informally in the mind. This period is normally quite short, but may last many years. In design situations, the problem is rarely clearly stated at the outset and this phase may require considerable effort. It is interesting that many experienced designers report the need for a clear problem to exist before they can work creatively. The architect/engineer Santiago Calatrava has produced some of the most imaginative and innovative structures of our time, but all in response to specific problems: 'It is the answer to a particular

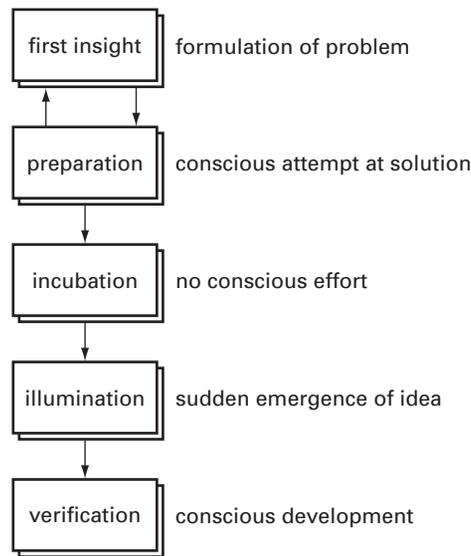


Figure 9.1
The popular five-stage model
of the creative process

problem that makes the work of the engineer . . . I can no longer design just a pillar or an arch, you know I need a very precise problem, you need a place' (Lawson 1994a). A similar statement is attributed to Barnes Wallis: 'There has always been a problem first. I have never had a novel idea in my life. My achievements have been solutions to problems' (Whitfield 1975). Of course Barnes Wallis had many novel and innovative ideas, but he and Calatrava seem to be telling us that they are most creative when the problem is imposed upon them from outside. This might seem in conflict with some recently fashionable views on design education that students should be given free and open situations in order to develop their creativity!

The next phase of 'preparation' involves considerable conscious effort in the search for a solution to the problem. As we have seen, in design at least, there is likely to be some coming and going between this and the first phase as the problem may be reformulated or, even, completely redefined as the range of possible solutions is explored. What seems common ground amongst those who write about creativity, however, is that this period of intense, deliberate, hard work is frequently followed by the more relaxed period of 'incubation'.

We have already heard how Poincaré's incubation came from a journey, but such a possibility does not always present itself to the practising designer. Alexander Moulton is famous for the innovative bicycle which carries his name and the rubber cone spring suspension system employed by Issigonis on the Mini which later gave rise to the Hydrolastic and eventually Hydragas systems. Moulton (Whitfield 1975) advises: 'I'm sure from a creative point of view that