proclaimed that the end-product is not the only thing that should be open to discussion. Instead, we can and should pay close attention to the process that brings it into being. The ultimate way to do so is to expose one's informal sketches, almost as students do when they discuss their work in progress with their studio instructors at architecture school. Preliminary sketches record fragmented images, questions one asks, experiments with shapes and forms, tentative ideas for possible solutions to big and small problems, as well as explorations of precedents and alternative solutions, even random visual patterns and configurations. Sketches do not reflect the design process, they *are* the design process. Their inclusion in a formal presentation of a project is therefore clearly intended to exhibit this process and render it worthy of study and discussion. The editors of *The Architectural Review* welcomed this novel representational approach and wrote in their brief preface to Stirling's report: "The Düsseldorf material in particular was intended as a demonstration of process: it includes conceptual doodles, design drawings, photos of the model and some 'after' drawings (which as a single image try to convey the essence of a project" (ibid., p. 289; see note 2). It seems that Stirling and the editors of *The Architectural Review* were attuned to the subtleties of changing architectural values and sensitivities. In fact, it would not be an exaggeration to claim that Stirling participated in bringing about these changes.

Here we must stress again that these tendencies were not entirely intrinsic to architecture alone. The 1970s were the era of "Conceptual Art," when intentions were of greater significance than artefacts. Cognitive science legitimized rigorous research of mental processes in all fields and new methods were being devised to study problem solving, especially creative problem solving. Newell and Simon published their much acclaimed *Human Problem Solving* in 1972. Arnheim's *Visual Thinking* had appeared in 1969 and contributed to our awareness that graphic expressions are important manifestations of human thinking, and not just externally communicated records of thoughts. Developmental and cognitive psychologists became interested in the act of drawing; attention was paid to children's drawings as mirrors of their cognitive and intellectual development (e.g., Gardner 1980; Goodnow 1977). A decade later the first serious studies of sketching in designing began to appear (e.g., Fish and Scrivener 1990; Goldschmidt 1991; Herbert 1988) and they have since been occupying a growing share of design thinking research. Sketches, we should add, are almost always made in sequences, or series. The reason is not only that a single drawing is forever a partial representation, as Evans (1997) so cogently pointed out. More importantly, designers make series of sketches because they build up and inspect their ideas gradually, and this is a process of trial and error and of dialectic reasoning that proceeds in small steps. Accordingly, many sketching acts are required that normally are spread over several sketches, sometimes an impressively large number of them (Goldschmidt 1991). For the purpose of studying a designer's thinking at the cognitive level, a complete set of sketches is required, preferably accompanied by the designer's commentary (think-aloud exercises are sometimes conducted for this purpose). Needless to say, this was not Stirling's intention in publishing some of his sketches, which he subsequently discarded as he estimated that their mission had been accomplished and they were of no further use. For Stirling, sketches were the first of three interconnected layers of work on the museum projects that he wished to expose together: initial explorations, final plans, and post factum "after" analytic axonometrics.

## Summary: Representation as Reconstructive Memory

The notion of design "reconstruction" was introduced by Porter (1988) who defined it as follows: "By 'reconstruction' we mean a plausible way in which the design or building could be explained on the basis of evidence that it itself presents" (ibid., p. 170). The reconstructive act, according to this view, is carried out "backward from the design." Porter's purpose in undertaking reconstruction was to investigate how sets of ideas concerning place and architectonic type emerge and undergo a process of mutual adjustment. An understanding of this process was believed to facilitate descriptions that could have beneficial implications for computational design assistance.

We borrow Porter's notion of design reconstruction and use it for a different end. We see reconstruction as an after-the-fact interpretative act assumed in order to solidify the representation of a work of design so that it best describes its ideas and qualities, and in which it should be deposited in memory. Unlike Porter, we do not guess the ideas that serve the reconstruction or infer them from a normative set of design drawings. Rather, we look at interpretations made by the designer himself, in which he reconstructs the memory of the story of his designs. We refer to the representations of Stirling's museum designs as submitted by him for publication as acts of reconstructive memory. We postulate that a need for the reconstruction of memory arises when a representation is expected to convey a complex message that goes beyond factual information about a design product. The reconstruction is a design in itself; it is the design of design-image. Typically in such cases, the normative representational mode, through orthogonal projections and possibly perspectives or three-dimensional models, cannot capture the sought-after image in its totality, so that additional explanatory means are required. Such means can be quite diverse; they may include other graphic means as well as text, animation and more.[9]

An acute need to broadcast new messages is often felt during eras of cultural shifts. The means of representation are crafted after the needs they are expected to fulfil and, when culturally based needs change, old means might become inadequate or even inappropriate. In the history of architecture we can point to several examples of such eras with consequent developments in representational modes. Orthogonal projections were invented in Italy during the Renaissance and were instrumental in the gradual separation between design and construction. The designer, now no longer necessarily the master builder, was geographically remote from the site of construction and needed effective means to document his design intentions and communicate them to the builders. More recently, the birth of the Modern Movement around the 1920s brought with it representational innovations, especially where architecture had a close relationship with art. The Constructivists in Russia, for example, started using techniques like collage, photography, and abstract composition (two- and three-dimensional) to express their architectural intensions. Similar developments could be detected in Germany – for instance, in work that came out of the Bauhaus. The use of axonometric drawing was also revived in that period (Klevitsky 1997). It is therefore not surprising that postmodernism, once its ideas started to spread among leading architects and architectural critics, also demanded representational modifications to transmit those ideas. Postmodernism had a multifaceted vision which combined historicism, richness of expression, eclecticism,