function? In particular can we identify and separate different types of function and study their effect on the design process?

The purpose of constraints is obviously to ensure that the designed system or object performs the functions demanded of it as adequately as possible. For this reason it is easier to develop models of the function of constraints for specific design fields such as architecture or industrial design. Hillier and Leaman have proposed such a model intended to help organise research in architecture. According to this model (Hillier and Leaman 1972) buildings can be seen to perform four functions: modifying climate, behaviour, resources and culture. Hillier and Leaman (1972) claim that 'buildings have tended to be over designed from the point of view of the relation between activity and its spatial containment, just as they have been under-designed from the point of view of climate modification'. This model has thus been used to argue for a redirection of attention in architectural research and a shift of emphasis in design. The model has been useful in exposing the argument about which functions should be allowed to dominate in the design process and why. Markus provides another example of such function models used for research in specific areas. His Building Performance Research Unit also used a four-function model (Markus 1969b) in appraising the performance of buildings. Markus sees the functions of buildings as divided between: the building system of physical components; the environmental system (which is similar to Hillier and Leaman's climate modifying function); the activity/behaviour system (which is again similar to Hillier and Leaman) and, finally, the organisational system which the building houses. Perhaps because of their very practical emphasis Markus's team failed to see buildings as contributing more widely to culture or even as symbolic entities. Markus considers the cost system not to be independent as do Hillier and Leaman but, rather, prefers to see cost, or resource, implications of achieving each of the other four groups of objectives.

Rand (1970) stresses the importance of both form and content in graphic design. The commercial designer is charged with communicating a message through a piece of two-dimensional design. Clearly then such work has a central symbolic and communicative function, but it is also important for the message, which itself might be quite ordinary, to be striking, unusual, demanding of attention and memorable. The graphic designer deals in two-dimensional composition using colour, texture, form, contrast, proportion, line, shape and so on. The manipulation of these formal materials adds style and character to the message, making it recognisable.

These two functions of form and content are obviously the essence of graphic design but they are also important in any of the environmental design fields. Whatever the designer's intentions might be we inevitably perceive design on these two levels of the formal and the symbolic. The Union Jack flag is not just a pattern of colour and form but it is also inescapably a national symbol. Cathedrals must clearly perform the very powerful symbolic function of expressing devotion to a greater being. Houses need to express the rather less dramatic but possibly just as important, message of domesticity and identity.

Portillo and Dohr (1994) investigated the criteria used by designers working on building interiors and their components. They recorded the criteria used by 41 designers in making decisions about colour and found some 107 criteria were used. Portillo and Dohr also take me to task for confusing constraints with criteria, but I shall persist with that for now and we will come to that debate later. Portillo and Dohr analysed these criteria and found they could be clustered into five categories which they call symbolic, compositional, behavioural, preferential and pragmatic. Clearly their use of 'compositional' is similar to the 'formal' we have just discussed. The behavioural and preferential were to do with the way their designers imagined the users would function and what they would prefer. The pragmatic criteria appeared to relate to cost or to the need to respect existing colour schemes or self-coloured materials which had to be used. Edmonds and Candy, writing about the design of computer interfaces, have expanded this list to include two further criteria which they call performance and contextual. Their performance criteria are to do with the basic needs of the system to deliver performance to match the tasks being performed and are, therefore, right at the root or heart of the whole design. Their contextual criteria, however, seem to belong to our second dimension, that of domain. It seems clear that what Edmonds and Candy mean here are criteria needed to satisfy external constraints such as 'the need for the system to be operable within an engineering workshop' (Edmonds and Candy 1996).

Norberg-Schultz (1963) sets up another distinction between what he calls the 'utilitarian' and the 'monumental' in architecture.

> An architecture which is determined by the need for a physical milieu, may be called 'utilitarian', while an architecture determined by the need for a symbol-milieu could be denominated as 'monumental'.

He goes on to argue for the importance of the symbolic in determining the distinction between architecture and mere building and