way. A new housestyle for a commercial organisation, refitting a shop interior, extending a house, planting trees to form a shelter belt or declaring a housing action area are all design responses in different fields to existing unsatisfactory situations. For this reason design is referred to by many writers as providing a 'fix' of some kind. The designer is seen as attempting in some way to improve or fix something which is wrong. We return to this notion of design as a 'fix' again later where we shall briefly explore the argument that designing technology to fix a symptom only makes more secure the cause of that symptom. For example, designing noise barriers to screen motorways can be seen actually to weaken the case for a quieter, less energy-intensive method of transport than the internal combustion engine. The central theme of this chapter, however, is that a significant part of a design problem often lies in relating to what already exists. The definition of such problems then is a matter of deciding just how much of what already exists can be called into question. Design problems do not have natural or obvious boundaries but, rather, seem to be organised roughly hierarchically. It is rarely possible to discern precisely how far above the stated problem one should begin and how far below one should call a halt. Creatively uncovering the range of the problem is one of the designer's most important skills, and we shall look at some problem identification techniques in Chapter 12.

The multi-dimensional design problem

Design problems are often both multi-dimensional and highly interactive. Very rarely does any part of a designed thing serve only one purpose. The American architect Philip Johnson is reported to have observed that some people find chairs beautiful to look at because they are comfortable to sit in, while others find chairs comfortable to sit in because they are beautiful to look at. Certainly no one can deny the importance of both the visual and ergonomic aspects of chair design. The legs of a stacking upright chair present an even more multi-dimensional problem. The geometry and construction of these chair legs must provide stability and support, allow for interlocking when stacked and be sympathetic to the designer's visual intentions for the chair as a whole. The designer of such a chair is unlikely to succeed by thinking separately about the problems of stability, support, stacking and visual line since all must be satisfied by the same element of the solution.

In fact, the designer must also be aware of other more general problems such as cost and manufacturing limitations, the availability of materials and the durability of finishes and joints.

In design it is frequently necessary to devise an integrated solution to a whole cluster of requirements. We saw in Chapter 2 how George Sturt's dished cartwheel provided such an integrated response to structural, mechanical, and even legislative demands. In buildings the window offers an excellent example of another unavoidably multi-dimensional component (Fig. 4.2). As well as letting in daylight and sunlight and allowing for natural ventilation, the window is also usually required to provide a view while retaining privacy. As an interruption in the external wall the window poses problems of structural stability, heat loss and noise transmission, and is thus arguably one of the most complex of building elements. Modern science can be used to study each of the many problems

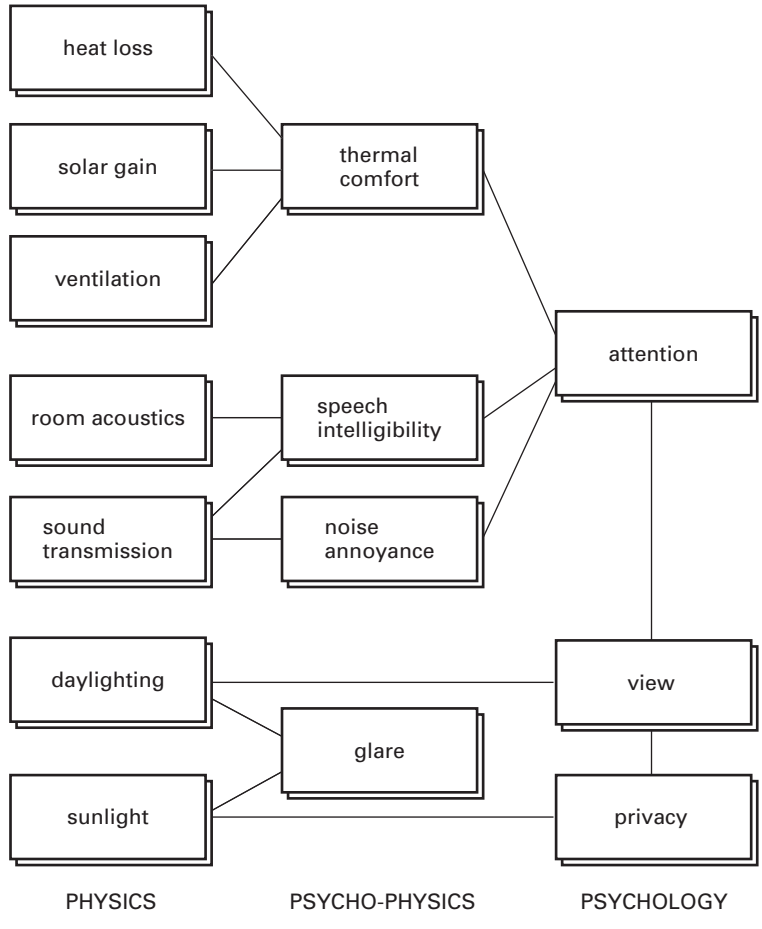

Figure 4.2
Some of the complex array of issues involved in designing a window