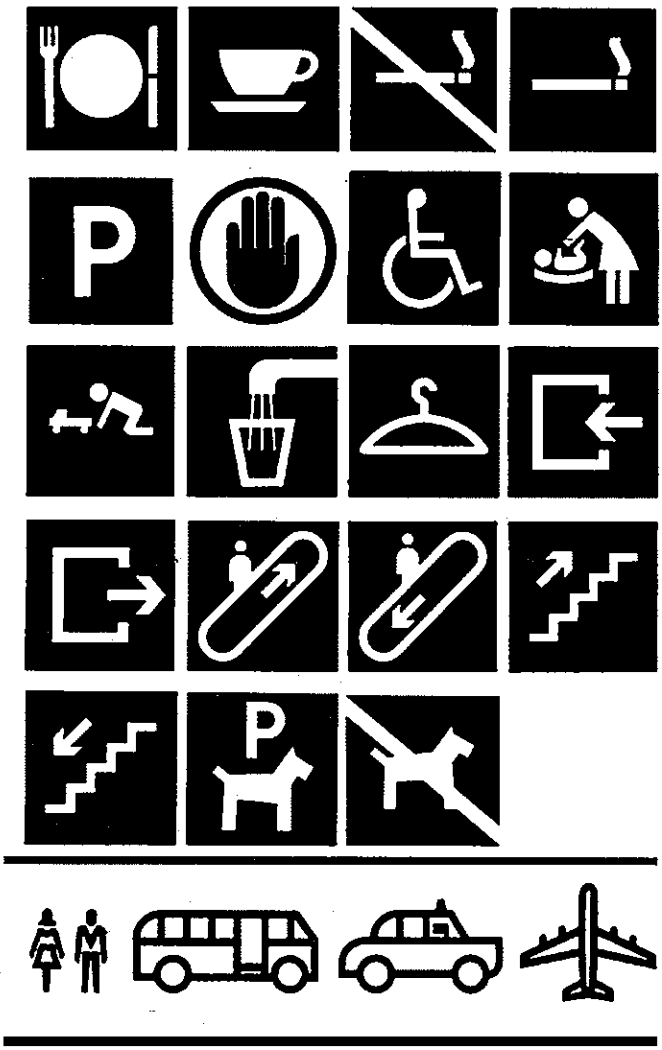
ICONS

Having discussed ambiguity and multistability, it is now time to analyze a complementary domain that is dominated instead by stability and by completely unambiguous interpretations. We will consider some of the characteristics of a class of graphics that are useful precisely because they are completely stable and unambiguous, immediately recognizable, and free of interference with other figures or the background. This is the class of graphics that form **node 21** in Figure 1.1 and that have been grouped under the rubric of icons. Icons are a relatively recent entry to the world of graphic technology, but their use and practical importance have grown quickly. Visual communication through icons is effective and powerful even if the range of meanings that an icon can convey is restricted. One of the reasons for the pragmatic utility of icons is that they overcome linguistic barriers, a useful feature in a world where the circulation of goods and people has become increasingly fast and pervasive. In addition, icons have proved useful in the context of human-machine interaction and especially in the interaction with those machines that are serve "intelligent" functions.

Icons are signals, and whenever one mentions signals we immediately think of street signals transmitting information about forbidden actions, required actions, and potential dangers to vehicles. The domain of icons exists at the border between language and perception, between abstract concepts and concrete objects. Icons, such as ideograms, pictograms, street signals, and other graphic symbols, are the places where language and perception meet. Consider the patterns in Figures 9.27. It is immediately apparent that these patterns are designed to transmit essential information to a large number of people, even if these people do not speak the same language or receive specific training to interpret the icons (although they may share some social



9.27. *Signals used in public places. Modley R.*, Handbook of Pictorial Symbols, *Dover 1976. (Reprinted with permission)*

and cultural background). If training is not necessary, then the referential properties of these signals is already present in the repertoire of most viewers. This kind of images help us to navigate a number of complicated places, such as railway stations, airports, and hotels, but also to negotiate many daily tasks; signals that accomplish the latter task include the labels that illustrate the recommended way of washing or ironing a garment or the various lights on the dashboard of modern automobiles. Graphics that aim to convey this kind of information are based on rules that are well established but implicit. Their application is based on shared, tacit knowledge. Although antecedents can be found in the coats of arms of the nobility or in graphics such as corporate logos, cattle branding, or railway and marine signage, modern iconographic materials are novel in that they are designed to be understandable to the most people, independent of linguistic and cultural specificities. The less the viewer needs knowledge of specific rules, the more that icons are useful. It seems plausible, then, that a code for designing icons has found its definition gradually, in its interaction with the different societies and cultures of potential users. If this is true, then the mental operations

that create a link between icons and their meaning are especially worthy of investigation.

In a typical picture, one tries to represent an object in its singularity by conveying in the representation all the attributes that define the specific object. In an icon, the opposite need must be satisfied. A picture of a man must stand for all men, thus a photograph of a particular man would not work. A picture that represents an entire set of objects that belong to a given class is not a picture of an object; it is the picture of a concept. It is not surprising, then, that the design of icons has strong analogies to the formation of categories. As Bruner, Goodnow, and Austin noted, "To categorize means to render discriminably different things equivalent, to group the objects and events and people around us into the classes, and to respond to them in terms of their class membership rather than their uniqueness" (20). To design an icon, one must choose those attributes that best fit this communicative goal while minimizing the cognitive effort, and therefore the time required to understand its meaning. Thus, the number of attributes must be kept low. This is done by carefully selecting the attributes that have greater diagnostic power and sometimes recombining them into a single configuration. For instance, a bird has wings, a bill, feathers, and legs that are characteristic of its species. But the whole set of these properties is not necessary for a correct identification of a creature as a bird. If a creature has wings and feathers, one can immediately predict that it will have a bill and legs.

Designing and Reading an Icon

In Figure 9.27, I have offered different ways of achieving an appropriate reduction of properties. For instance, the concept of a taxi is communicated by drawing the profile of an automobile with the characteristic sign on the top; the concept of a bus is communicated by drawing a longer vehicle with windows and a large door. In the upper section of the figure, we find schematic drawings pointing to specific entities, such as a man in a wheelchair, a woman caring for an infant, and a child playing with a toy truck. When these drawings are placed in the context of an airport or a hotel, we understand that they signify a place adapted for people with handicaps, a nursery, or a game room for children. In a different context, such as an art gallery, we might not attribute these meanings to the icons. What happens is that the context of observation influences the interpretation of what is observed. It seems, therefore, that icons presuppose certain conditions of observation and explicitly exploit them to suggest a certain interpretation. Only when viewers are interested in entering or exiting a certain space can they interpret correctly some of the icons in Figure 9.27. In airports, railway stations, hotels, subways, or in an unknown part of town, we experience a sort of cognitive discomfort: We can't mentally connect what is presently under our observation with entities beyond the visual field. This creates a special condition of arousal whereby we are constantly searching for information to guide our decisions and movements in the correct direction.

As I have said below, icons are drawn by applying shared rules for constructing them. The materials presented in Table 5.1 of chapter 5, can help us understand what these rules are and how they are applied. Consider the following:

1. In icons, lines are almost exclusively border lines drawn with mechanical aids. Thus, the expressive qualities of the contours are neutral.

2. Icons are typically drawn in the center of a homogeneous field, and contrast with it is strong.
3. Usually, the drawing is black, and the background is white.
4. The orientation of the depicted objects is chosen to show their most informative side. For instance, a bicycle (Fig. 9.28) will never be shown from the front. In Figure 9.27, some objects are drawn as seen from the top, others from the side, and others from the front.
5. The viewpoint is frontal, central, and at infinity.
6. Icons are devoid of depth cues except for interposition, which is used sparingly and only when required by specific informative needs (e.g., the person ascending an escalator).
7. The chosen objects are usually prototypical of their class (21).

Finally, icons typically contain certain abstract signs that have became part of a minimal vocabulary shared by designers and understood by viewers, thanks to their special expressive properties. Examples from Figure 9.27 include the diagonal bars that express prohibition, the hand palm to push back or forbid entry, and the different arrows used to direct movement. Along with these quasi-verbal signs, icons often also contain words that are almost universally understood, such as TAXI, BUS, or CHECK-IN.

To this list of things that are typically present in icons, it is useful to consider what must not be present in them. Several graphic elements cause icons to lose their functionality as communication devices, for instance, elements that interfere with or slow down the understanding of the meaning. Chief among these are graphic conditions that favor ambiguity or multistability—all the conditions that suggest multiple depth layers. These are the features of graphics that have been treated at the beginning of this chapter: amodal completion, transparency, and multistable patterns. All these are typically absent from icons.

Although designers of icons rarely violate the tacit rules I have described above, the coding system used in icons is not completely rigid. Iconic images tend to serve a single function, but within this function they offer a range of expressive possibilities, and graphic designers choose among them with great freedom. Consider, for instance, the symbols produced for different parts of the Olympic Games. These icons have served specific functions during the games, such as informing about events and their timing and location, but ultimately they have become a trademark for the Olympic Committee (Figures 9.28). This is typical of graphics. Even in productions that are rigidly codified, such as diagrams, maps, or street signals, some room is left for the influence of the graphic styles of the period. Thus, style even infiltrates icons through subtle variations and expressive choices that are evident even if they are difficult to describe.

In terms of the distinction between given and added information, icons may be construed as graphics that have a limited amount of given information compared with the complexity of the represented object. Although this limitation also reduces the potential injection of added information, it also activates top-down interpretative processes. These are inferences drawn by establishing connections between entities and events that the members of a given culture can learn in a largely unconscious fashion. For this purpose, icons represent the most suitable graphic solution.

9.28. *Signals used for the Olympic Games. Modley R.,* Handbook of Pictorial Symbols, *Dover 1976. (Reprinted with permission)*

GRAPHIC INTERFACES BETWEEN MEN AND MACHINES

Cultural and social influences determine communicative styles in all media, including drawings. They have to respond to specific communicative needs, developed at certain times and within certain cultural contexts. For this reason, drawings always provide hints to the culture that produced them. Several examples of such hints have been discussed with regard to perspective, projective geometry, diagrams and scientific graphics, street signals, and taxonomic illustrations. In the domain of icons, a novel and interesting set of graphic productions has been developing in recent years and has created its own modalities of use and design. This is the domain of icons in human-machine interfaces, most typically the icons used in graphic interfaces for computer programs. In the diagram in Figure 1.1, a number of concepts that have been codified by semiotics, such as the concept of pictograms, is grouped under the rubric of icons. In the computer world, however, the notion of icons has taken on a different, more specific meaning. In a computer interface, icons are the figures that appear on the screen that serve the purpose of guiding the user through the information stored in the computer and suggesting potential actions. I realize that the previous sentence uses words usually reserved for social interactions between human beings. People are getting used to the idea that our computers are "friends," and this sense

of friendship has developed in part because of the ways we have to communicate with them. Analyzing in detail the problems of human–machine interaction would go beyond the scope of this book, but interfaces must certainly take human cognition into account to render this interaction as effortless as possible. Nonetheless, the problem of interest for this book is that of icons as media for communication. Why are iconic interfaces more user-friendly, easy to learn, and therefore more productive, than other kinds of interfaces?

A well-designed interface is one that can be used without reading a manual (22). This standard is perhaps impossible to achieve but is useful as a guiding principle. In the communication between a human being and a computer, the optimal result is an interface that allows us to switch on the machine and start our work immediately. The interfaces of the early personal computers were far from meeting this ideal. The interaction with the machine was propositional; communication required special skills and involved the knowledge of formal programming languages. Early interfaces have been gradually substituted with iconic interfaces, which use a "desktop" metaphor to present graphically files, tools, and even a wastebasket. The desktop metaphor works well because it relies on the choice of images that communicate efficiently even without specific instructions. Anceschi, (23) who called them *picto-ideo-logographic monograms,* suggested that icons work because they "maintain an explicit perceptual autonomy, in that they afford actions in a direct way.... They establish a network of relations among all the objects on the desktop, and these relations form a preverbal, natural grammar of the interaction" (24). The idea of perceptual autonomy suggests that the referential link between icon and object is direct, natural, and nonconventional. For the human user, connecting the meaning of the icon to other icons or functions is easily done through analogy.

The icon of an object can be recognized more directly and with less ambiguity than the word that refers to that object. Icons do not require that users understand a programming or scripting language; no translation is necessary. Icons are perceived as a whole, and this promotes fast processing. Language, in contrast, is read sequentially and therefore more slowly. The components of icons are specific to them, whereas words are created by combining the same components—the letters of the alphabet. Thus, words can be visually similar even if they refer to objects that are completely different. The Italian language is full of words that are almost identical, such as *naso* and *vaso* (nose and vase), *treno* and *freno* (train and brake). In English, examples include words such as *tear* and *fear, train* and *brain,* and so on. Icons for noses or vases can be designed with completely different graphic components.

The feature that has developed the potential of iconic interfaces to its full extent is the mouse. As a prosthesis for our hand inside the virtual desktop represented on the screen, the mouse permits direct manipulation of the represented objects. We can thus act on objects in this environment and obtain visual feedback from our actions. Icons can be designed to facilitate these actions, and the consequences of the actions can be planned to provide appropriate feedback. The icons for drawing tools in a graphics program, for example, can be thinner or thicker, depending on the width of the line that will be traced. The wastebasket on the desktop resembles a container, and when the user drags a file onto it, the wastebasket grows larger. The notion that icons can be designed to provide affordances for action is in agreement

with Gibson's theory of visual information as a support for action, even if the environment is virtually rather than ecologically valid.

As providers of affordances, icons have a decisive advantage over words. Imagine a language that uses *XRV2* to mean hammers and *XRVT* to mean screwdrivers. If one read the words, especially without a context, he or she might easily be mislead. But if one sees a hammer and a screwdriver, it is highly unlikely that the person would pick up the screwdriver to hammer a nail. In iconic interfaces, potentialities for confusion are similarly reduced. If one wants to draw a circle, he or she does not pick up the square icon.