

## CHAPTER 2

# Plants as a Medium for Design

Designers of all kinds share at least some common principles, and those working in three-dimensional media such as landscape, sculpture and architecture share an interest in form and space. However, the qualities and potential of the materials they work with vary, so before considering visual and spatial design principles, we should get to know the characteristics of plants as a design medium.

*Main difference of  
LANDSCAPE to  
architecture*

### Plants as Living Materials

Plants are growing, changing, interacting organisms and plant communities, whether spontaneous (those we commonly call natural) or designed, exist in a state of flux. Even a long-established community, such as a mature forest, is unlikely to be unchanging in its composition. Old trees die back or blow over, allowing fresh bursts of growth in the lower layers of vegetation and seedlings to grow into saplings to begin the next generation.

On a larger scale, environmental events such as landslides, floods, volcanoes, freak weather and climatic change all lead to alterations in plant communities.



Plate 14 The development of a simple tree and shrub planting association over its first ten years: A view one season after planting shows scattered tree and shrub stock of a similar size to when they left the nursery (car park building, Sheffield, UK).



Plate 15 The same area (but viewed from another angle) three years after planting shows a well-established thicket of shrubs and establishing trees.

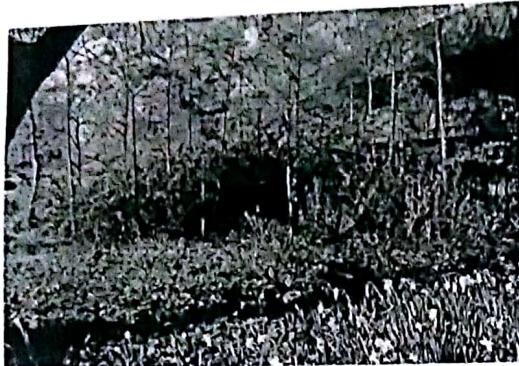


Plate 16 After ten years the trees and larger shrubs have attained a woodland structure at heights of up to 10 metres and have begun to have the impact for which they were planted – the car park building is partly screened and enjoys a woodland setting.

Two examples are the severe storms that, in recent decades, devastated trees and woodlands in south-east England and later in northern France (including the gardens at Versailles); and, in New Zealand, the 1886 Tarawera eruption that destroyed forests, scrub and cultivated land over a large area near Rotorua. In both cases, we can now go and see the natural process of forest creation in full flow. Whether we follow a single plant through its life cycle from seed to senescence, or watch a whole forest develop on cleared land we are experiencing the dynamic, developmental order of the plant world.

### **Environmental Factors**

In addition to the genetically programmed aspects of growth and development, plants are continually interacting with their environment. Environmental factors cause big variations in the growth of plants and some of these can be controlled by design or management, while others cannot. What follows is a brief summary of the environmental factors that are most important in design.

The weather, as it changes from day to day and from year to year, influences growth rate, form, foliage density, flower and fruit production. The elevation,

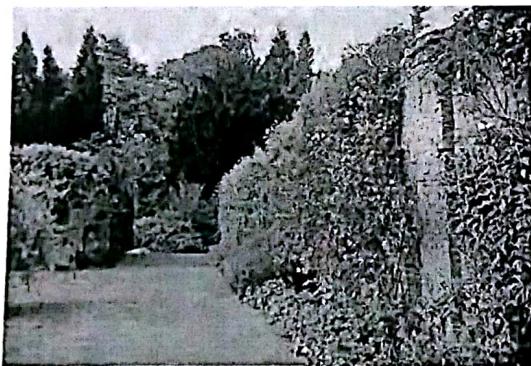


Plate 17 The favourable microclimate provided by a south-facing wall allows the growing of plants which would not survive in the open. *Abutilon* and *Ceanothus* spp. (shown in this photograph), *Fremontodendron californica* and *Magnolia campbellii* are among the shrubs grown successfully in the walled gardens at Newby Hall in North Yorkshire, UK.



Plate 18 The dramatic effects of light can give unpredictable yet memorable qualities to planting (Bodnant Garden, Wales).

aspect and topography of a site and its surroundings can modify the local climate and cause variations in the microclimate of the site. A favourable microclimate would produce taller, extended and more luxuriant growth whereas an exposed or impoverished location would lead to a compact or stunted habit and smaller leaves. On an ephemeral level, the changing qualities of light at different times of day and season, and the humidity and other atmospheric effects can cause subtle or striking visual effects. Regional and local variations in soil also affect growth characteristics such as extension rate, bio-mass production, leaf and flower colour, ultimate height and vulnerability to pests, disorders and weather damage.

The growth of a plant is also influenced by its neighbours. They modify microclimate, tending to increase shade, shelter and humidity, but to reduce precipitation at ground level. Vegetation also affects soil conditions, tending to reduce available moisture and nutrients in the short term but, over a longer period, to increase the humus and nutrient content of the soil.

Certain types of vegetation, for example many conifers and moorland grasses, can acidify the soil reaction by the chemical composition of their leaf litter. This can lead to a build-up of only partly decomposed organic matter and a reduction in available nutrients. Birch, on the other hand, improves moorland soils by returning leached nutrients to the surface in its leaf litter.

Diseases and pests affect the growth and development of planting. In rural locations, animals such as cattle, sheep, deer, rabbits and opossums are selective grazers that restrict the growth of edible species while allowing the spread of others that they find unpalatable. This kind of influence helps determine both individual plant form and the composition of plant communities.

Finally, human pressures are a crucial and often unpredictable biotic factor affecting plant growth and development. In densely populated areas, pollution, vandalism and rubbish dumping can seriously interfere with the performance of plants. For example, erosion by excessive foot traffic, pedal or motorcycle riding can destroy or prevent the development of the lower layers of vegetation and the regeneration of shrubs and trees. In addition to these incidental human influences we can also regard fashion and taste as habitat factors (Gilbert, 1989). They influence the management and make-up of plantings, favouring those that are in fashion and reducing the survival chances of those regarded as 'untidy', 'boring' or 'past their sell-by-date'. Examples include the spread of dwarf conifers through British suburban gardens in the 1960s and 1970s and the 'niche' for mixed native shrub planting that appeared in New Zealand gardens and landscapes in the 1980s.

### Cycles of Plant Growth and Development

Another aspect of plant growth and development that we cannot control or predict with certainty is the time dimension.

The period (length) of different growth rhythms varies greatly, from diurnal rhythms such as the opening and closing of flowers to the annual rhythm of the seasons. The entire life cycle of a plant can, in the case of ephemerals like groundsel or shepherd's purse, occupy a period as short as six weeks. For long lived trees like kauri (*Agathis australis*) in New Zealand, yews (*Taxus baccata*) in Europe and the bristle cone pine (*Pinus aristata*) in North America, it can be in the order of millennia.

As designers, we need to know the distinctive character of the different stages of the plant's life cycle. Young growth, reproductive maturity and senescence are usually distinguished by very different habit and form so, at each stage, the design role the plant can play will be quite different. The New Zealand horoeka or lancewood (*Pseudopanax crassifolium*) provides a classic example of different life stages. The juvenile and adult stages of horoeka are so wildly divergent in



Figure 2.1 Mature tree form.

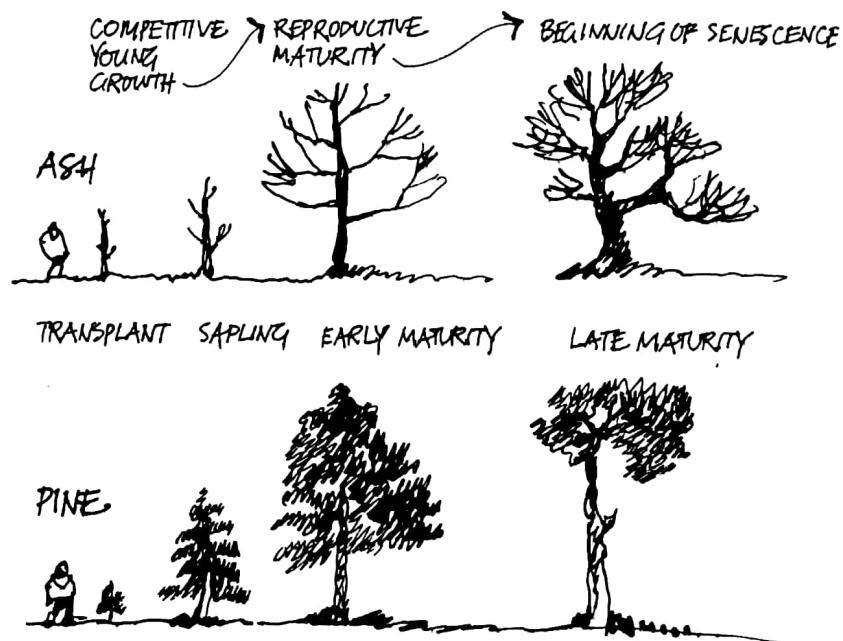


Figure 2.2 Tree form development.

their appearance that the first botanists to classify them (Dr Daniel Solander and, later, Sir Joseph Hooker) actually placed them in different genera! (Kirk, 1889). Growth stage can affect not only a plant's appearance and design role, but also its environmental requirements. For example, some forest dominant trees such as many of the New Zealand podocarps need shelter, humidity and shade to establish, but will tolerate quite harsh exposed conditions when mature.

#### Aftercare

Another distinctive aspect of planting design is the vital role of landscape management. After installation, the young planting needs careful and creative tending for a number of years if the design intentions are to be fully realized. This

TIME SPAN

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CREATIVE MANAGEMENT IS NEEDED THROUGHOUT THE LIFE  
OF A PLANTING SCHEME.

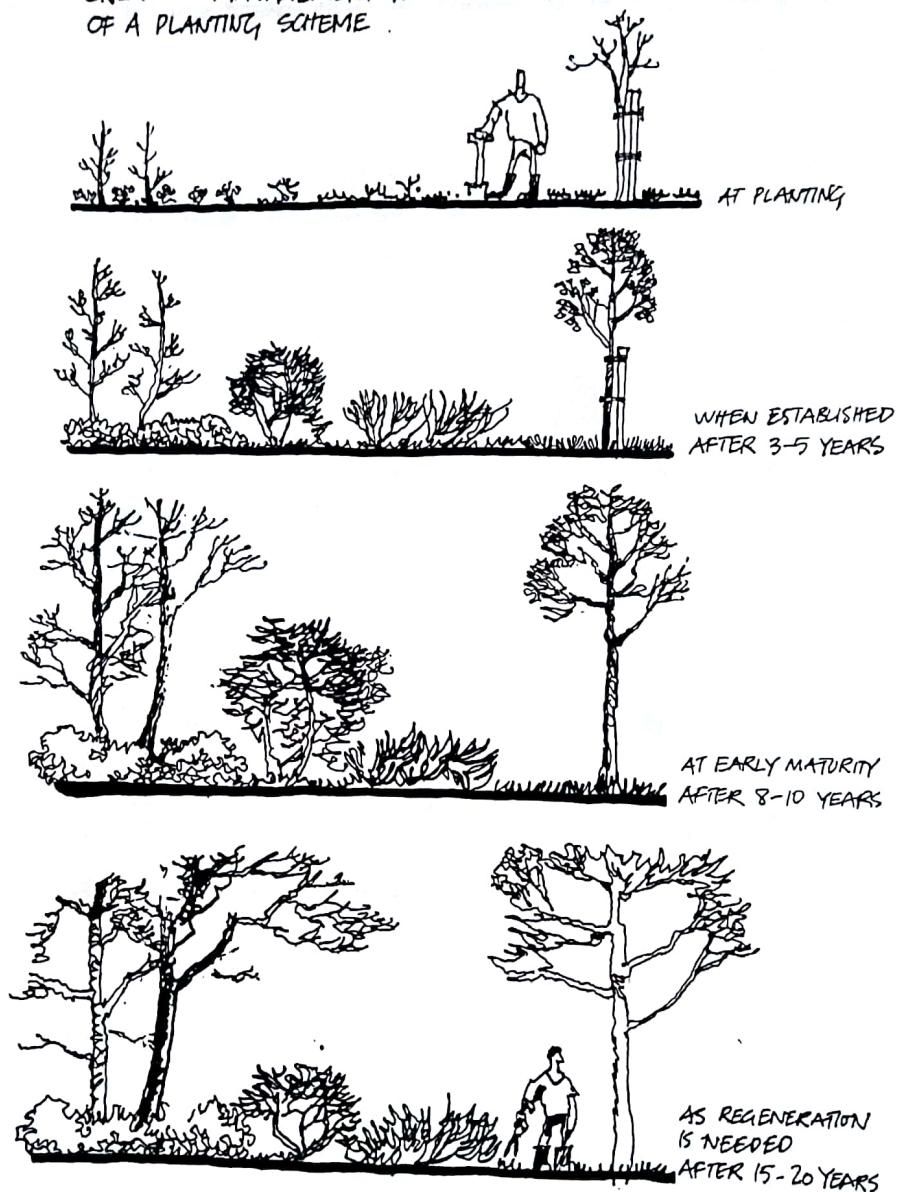


Figure 2.3 Stages of development of tree, shrub and groundcover planting.

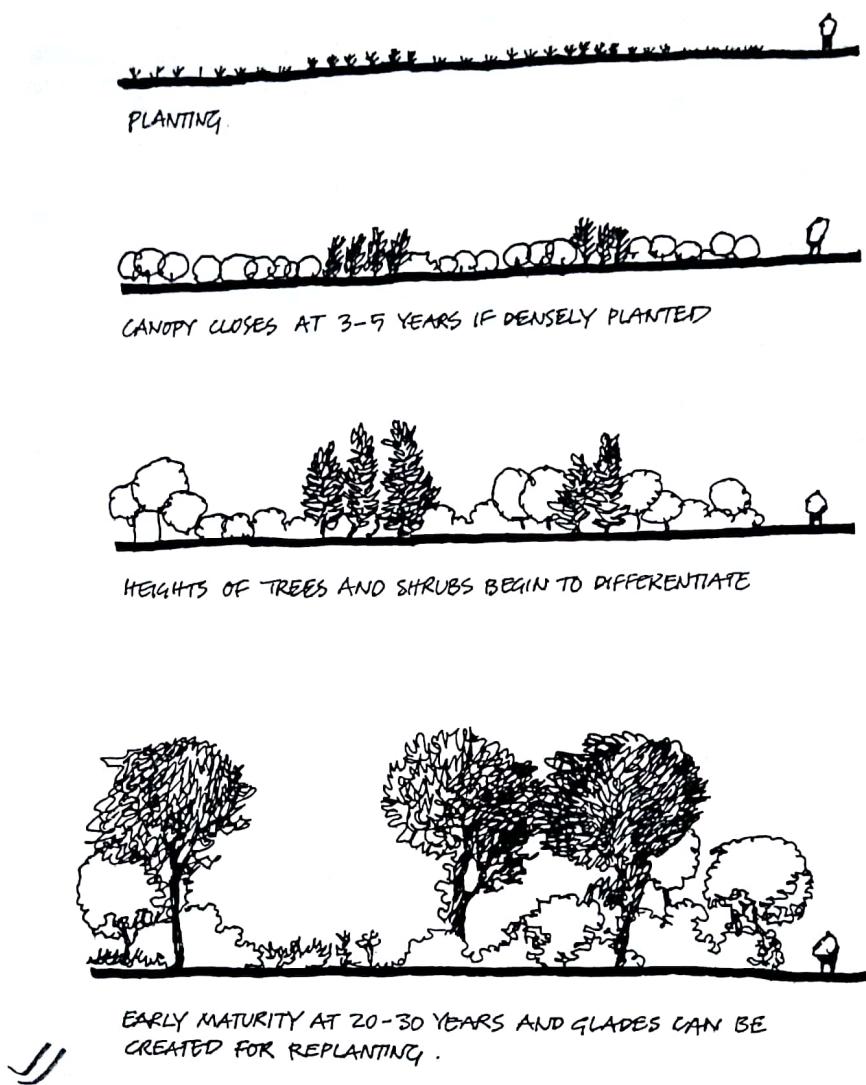


Figure 2.4 Stages of development of woodland planting.

period of establishment and aftercare is the time when the original idea is actually shaped into a finished product. It is a particularly vulnerable period for a planting design because of the risk that a planting scheme suffers from misunderstanding or from misguided maintenance. It is also the most testing time for the designer, because it is when it will become apparent whether their ideas are practical enough to be properly realized. On the positive side, however, creative landscape management provides an opportunity to achieve something

even better than envisaged on the drawing board, thanks to its ability to respond directly and immediately to the vitality and unpredictability of living plants. Serendipity is one of the joys of planting design.

So there are unpredictable elements in many aspects of planting design. They range from the inherent nature of the material, through the vagaries of climate to the difficulties of communicating design subtleties to managers and maintenance staff over a period of many years.

Developing a landscape with plants is not like building a motor car with steel or even a hard landscape with bricks and mortar. Plants cannot be definitively and precisely represented by a scale drawing or model because the appearance of planting after a certain number of years can never be guaranteed. There will always be an element of unpredictability. This can cause difficulty to students and designers at first, but with increasing horticultural experience and understanding, they will gain more confidence in the results of their design proposals.

### **The Landscape Designer's View of Plants**

What is distinctive about the landscape designer's understanding of plants? What makes their approach to plants different from that of a gardener, a botanist, an ecologist and others with an interest in plants?

First, the landscape design approach is broader. The need for breadth of understanding is both a source of frustration – what exactly is it that we do? – and of strength – the ability to take an overview and integrate. As designers we need to understand the essentials of botany, to be familiar with the basics of ecology and to use appropriate techniques from horticulture, agriculture and forestry. On top of all this, we must have a sculptor's eye for form and texture, a painter's expressive hand and, sometimes, a floral artist's sense of occasion.

Alongside this breadth of knowledge, landscape designers develop a specialized knowledge of design, particularly the understanding of spatial and visual composition in the medium of landscape.

### **Plants as Spatial Elements**

To the designer, plants are like green building blocks that can be assembled to form living and changing 'structures' in the landscape. Design is not only about the form of solid structures, however, it is also concerned with the 'empty' space that the solid form defines and creates. The edges and surfaces of a building, for example, or a chair, or sculpture, all limit and define the space around or within it, and this space has both functional and aesthetic purpose.

Plants also define and create space. This space is created around, between, and even within their canopies. By organizing and manipulating foliage canopies, the designer uses plants to build a structure or what we might call a framework that defines and orders space in the landscape. Planting form and outdoor spaces can be seen at a variety of scales. At the largest, belts of trees, woodlands and forest fragments can form a landscape framework within which large-scale uses, such as industry, residential and recreation, can be accommodated without too much visual or ecological disruption. These activities will also benefit from improved microclimate, wildlife conservation and other environmental benefits brought by the enclosing planting. At the smaller scale of individuals and small groups of people, planting continues to play a vital role in structuring the landscape. Facilities such as a play area, neighbourhood park or private garden all require definition, shelter and privacy in varying degrees. This can be provided with

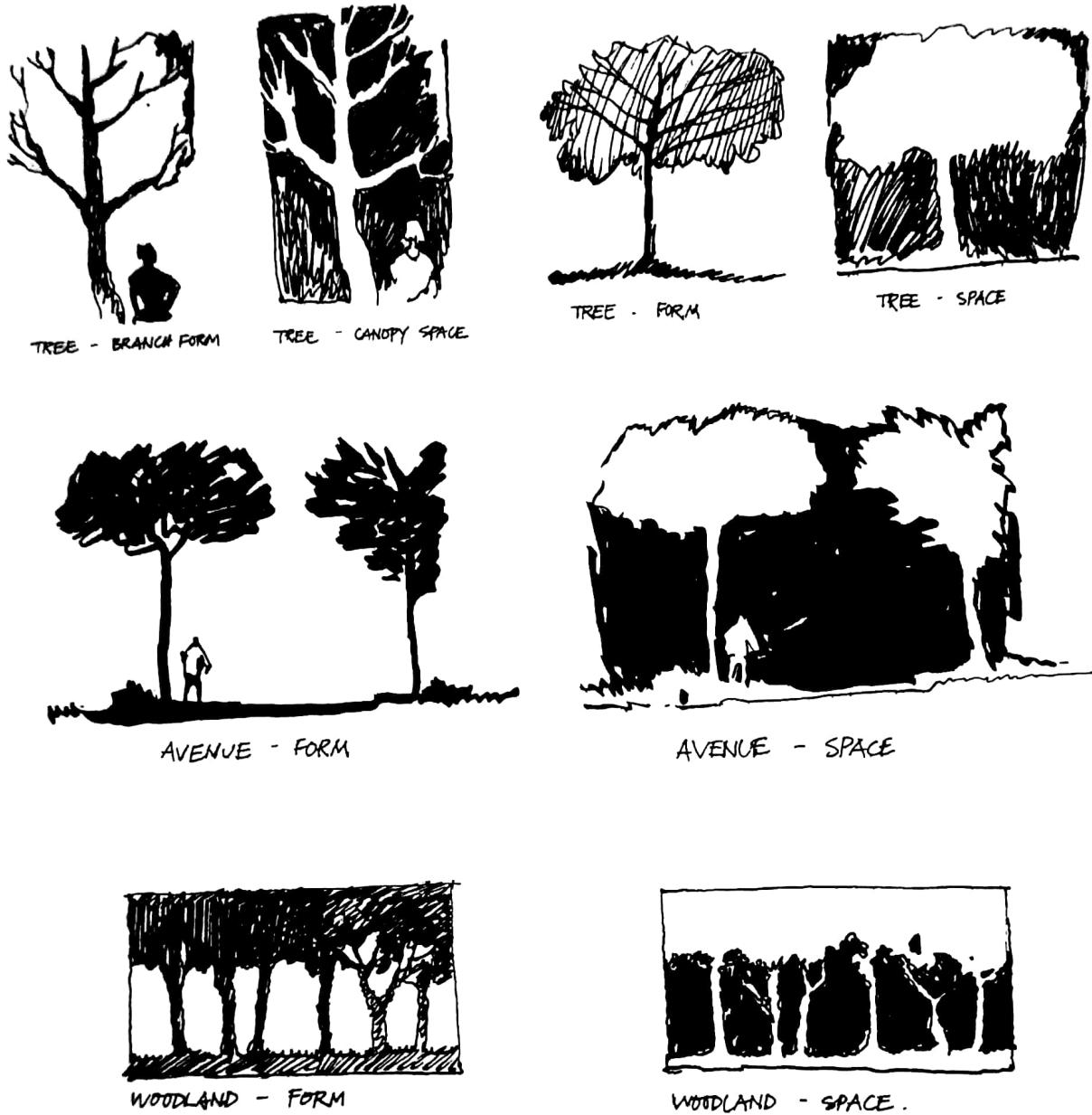


Figure 2.5 Trees: form and space.

Plate 19 The interlocking relationship of form and space within the canopy of this pohutukawa tree in Albert Park, Auckland, New Zealand is emphasized by the presence of the sculpture.



shrubs and trees of the right size and habit. Even a single tree can define a space and identify a place. Its spreading canopy will give containment above and create a domain of influence below.

We see that planting has a structural or framework role in the landscape that is analogous to the space-enclosing envelope of a building and to the combined enclosure of a street or built edge. Planting, however, is used over a much bigger range of scales. The basic language and concept of building architecture offers a spatial vocabulary that can be applied to landscape, including planting design. Rooms, streets, squares, arcades and colonnades, for example, are familiar types of architectural space that can help us to appreciate similar but looser landscape spaces created by plants.

In *Trees in Urban Design*, Henry Arnold summarizes the spatial use of trees with particular reference to the urban environment:

Trees in the city are living building materials used to establish spatial boundaries. They make the walls and ceilings of outdoor rooms, but with more subtlety than most architectural building materials. They create spatial rhythms to heighten the experience of moving through outdoor spaces ... In addition to actually creating discreet spaces, trees are used to connect and extend the geometry, rhythms, and scale of buildings into the landscape. It is this function more than any decorative and softening effect that is of primary importance to architecture. (Arnold, 1980)

Vegetation also creates more complex and fluid spatial form. We find this in so-called 'informal' planting – that is, organic, curvilinear, casual, or seemingly spontaneous in its form. Examples include spontaneous forest or scrub, revegetation and nature-like planting, where tree and shrub masses interweave with glades, paths and open land. Appreciation of the subtleties of this kind of spatial composition tends to come with familiarity. The work of landscape architect, Jens Jensen, in the United States illustrates a high degree of sophistication in such informal spatial expression – his work expresses the poetic quality of the interface between native forest and open land. Indeed, Frank Lloyd Wright described Jensen as a 'native nature poet'.

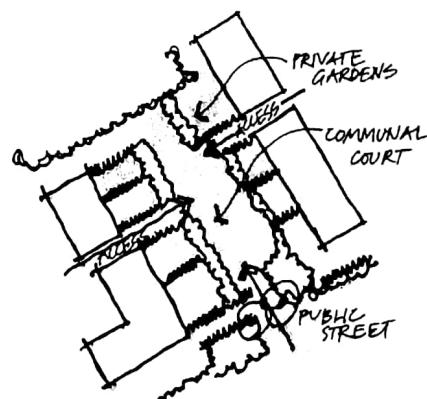
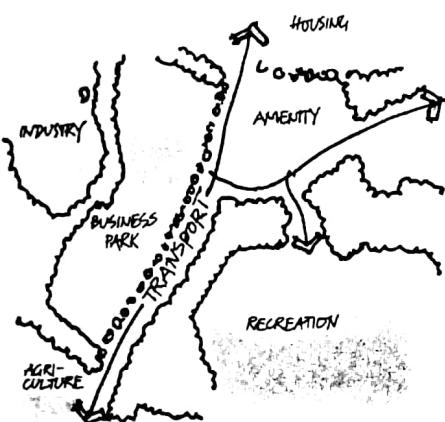


Figure 2.6a Large-scale structure planting of woodland belts creates a framework for various land uses.

Figure 2.6b Small-scale structure planting of trees, shrubs and hedges creates spaces for various people and uses.

Creating spaces is sometimes described as an 'architectural' function of plants (for example, Booth, 1983; Robinette, 1972). This is helpful to the extent that it encourages us to see plants as structural, space-forming elements in the environment – elements that can create 'outdoor rooms', tree-lined squares, avenues and so on – but it is a somewhat limiting analogy. This is because the range of form, scale and character of space that plants can create is greater than can be achieved with architectural elements alone. This potential will be explored further in Chapters 4 and 5.

### Plants as Ornament

Ornamentation or decoration is, like the definition of space, also an architectural function. We will distinguish ornament from spatial structure as we discuss planting design. Like the architect of a building, the landscape designer is concerned with the detailed aesthetic qualities as well as the spatial dimensions

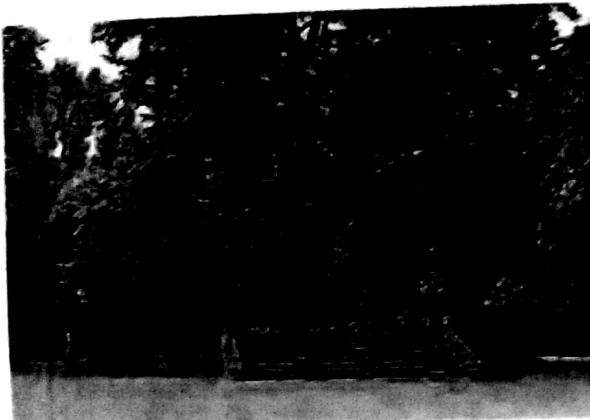


Plate 20 The space beneath the canopy of this single beech (*Fagus sylvatica*) is further delineated by a circular hedge and a change of ground level (Hidcote Manor, Gloucestershire, UK).

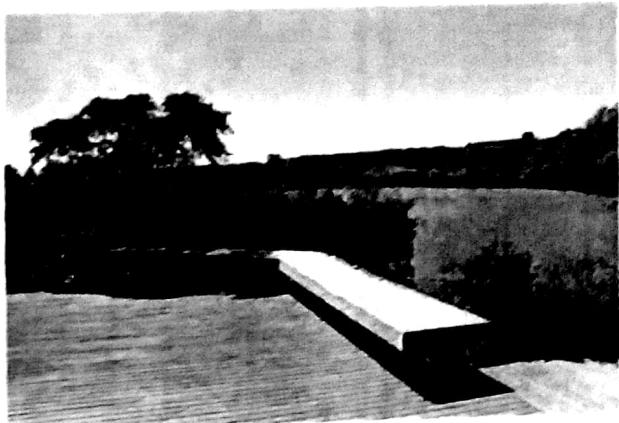


Plate 21 Shrubs and occasional trees define and partly shade the deck space in this garden in Auckland, New Zealand.

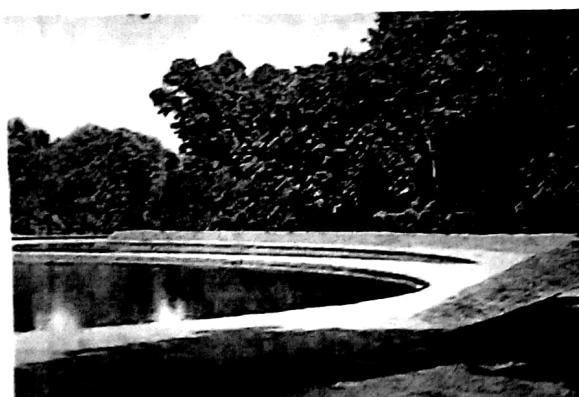


Plate 22 The natural growth of belts of trees and shrubs create informal walls of vegetation enclosing the Moon Pond at Studley Royal, Yorkshire, UK.



Plate 23 Trained and clipped cypress (*Cupressus* sp.) form a wall with windows giving views in and out of a small urban park in Malaga, Spain.

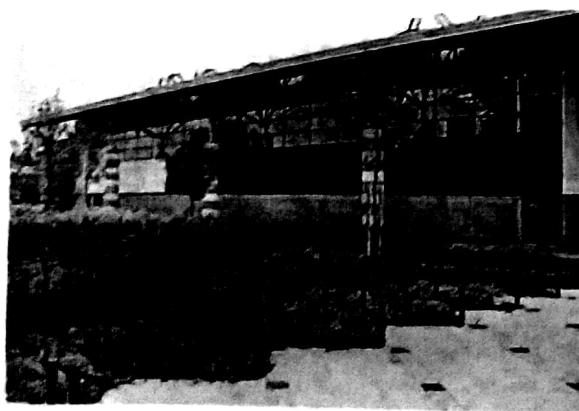


Plate 24 Strips of low groundcover plants form a patterned carpet to the space in front of this recreation centre in Sheffield, UK.



Plate 25 A colourful carpet of floral bedding is kept in precise geometric patterns by the use of dwarf hedging (Rotorua, New Zealand).



Plate 26 *Wisteria* is trained over supports to form a delightful ceiling of foliage and flower above a patio in Majorca.



Plate 27 The naturally spreading canopies of silver maples (*Acer saccharinum*) form a sheltering and screening ceiling above the car park at Leeds University, UK.

of the basic structure, and similarly, can apply planting as ornament to a basic spatial framework, or can rely on the intrinsic visual and other aesthetic qualities of the spatial elements. Planting, whether or not specifically ornamental in its purpose, offers a wealth of aesthetic detail – the appearance of leaves, twigs, bark, flowers and fruit; the fragrance of flowers and aromatic foliage; the physical texture of bark and leaves; the sound when stirred by the wind or beaten by the rain.

Trees and shrubs with special aesthetic appeal are often planted as ornaments to the basic structure planting. This is analogous to embellishing a building façade or decorating an interior and could be thought of as specifically ornamental planting. Another approach would be to employ the intrinsic aesthetic qualities of the structure planting to give surface detail to the space – additional species would not be introduced just to give variety or for ornament alone. The second approach would produce a simpler landscape, one that is more of the modernist tradition. In practice, most design uses the decorative characteristics of both structure planting and specifically ornamental planting to clothe the spatial framework.

There are two common problems with the decorative aspects of planting design. In one case, too much reliance is placed on a limited number of fail-safe species. This leads simply to monotony (this is how landscape designers get a bad name with the public). In the other, the designer is captivated by variety (a kind of aesthetic acquisitiveness) at the expense of restraint and clarity of purpose. The first fault is usually the result of inadequate plant knowledge due to insufficient experience or lack of interest. The second comes from genuine appreciation and enthusiasm without understanding what makes a good design. To achieve successful and enduring planting design we need both knowledge and discretion – we need first to know our medium and, second, to use it with purpose and skill.

### Plant Selection

There is such a diversity of size, habit, flower, foliage, growth rate, soil and climatic requirements among the species and cultivars available, that the task of

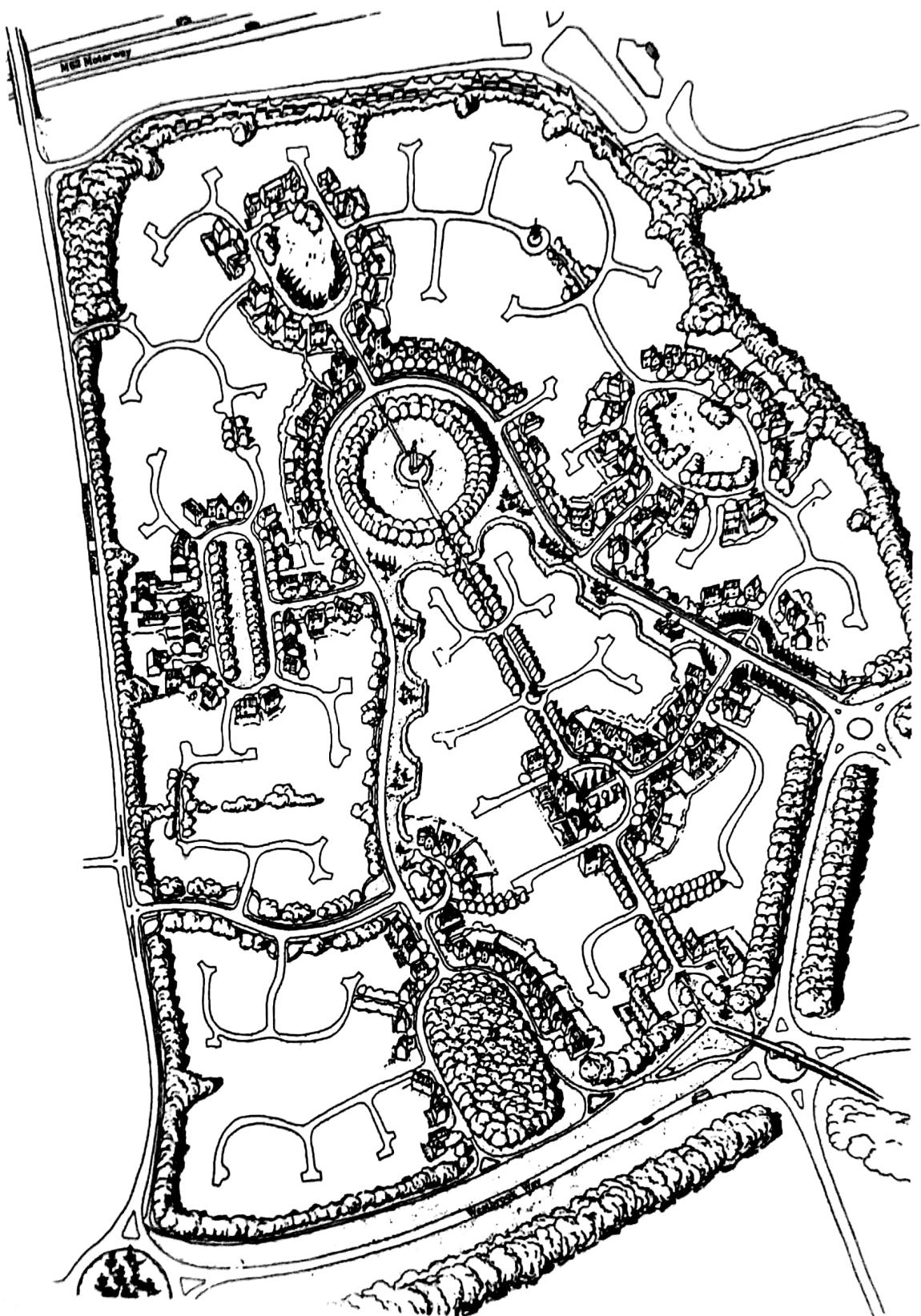


Figure 2.7 This axonometric vividly illustrates how tree planting will form the green spatial structure to a new community.

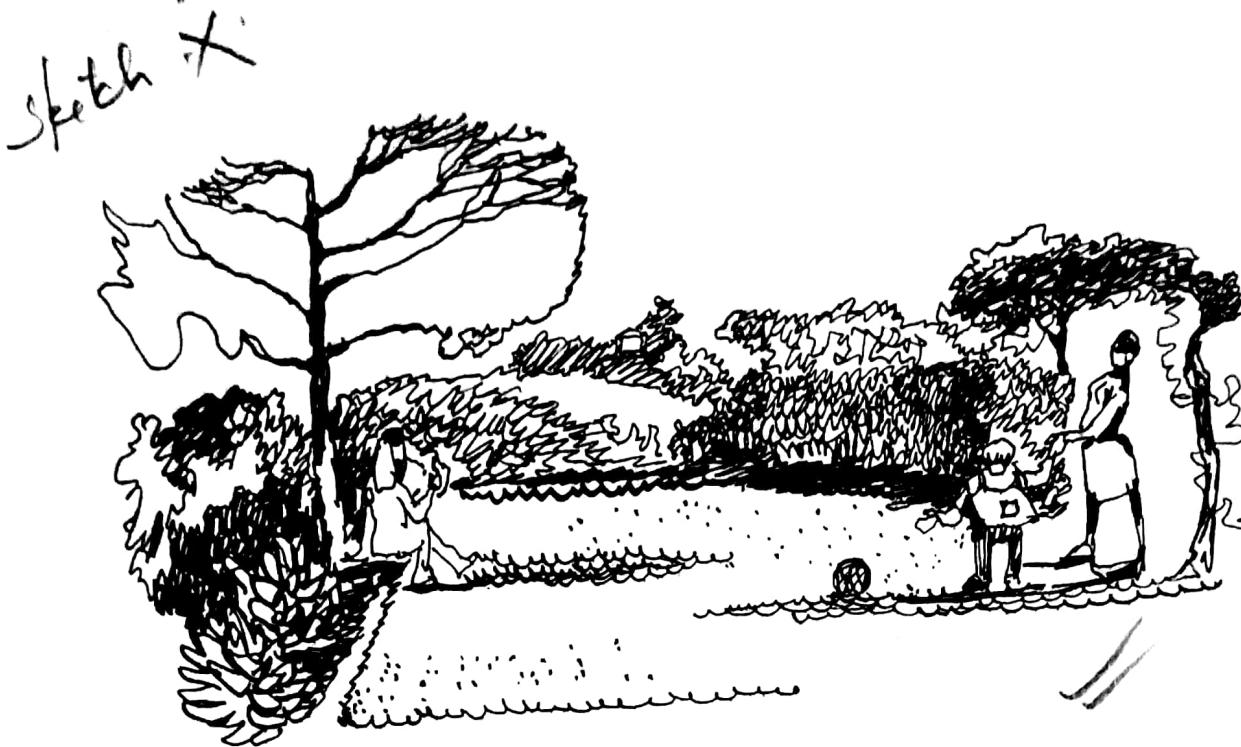


Figure 2.8 Planting can create the floor, walls and ceiling of intimate outdoor rooms.

*How to select plants  
for garden design*

choosing the right plant can seem overwhelming. This is one reason why it is useful to have a system or method for choosing plants.

The most reliable method is to make increasingly fine distinctions between groups of plants on the basis of design characteristics. This is a bit like the binary key system used in plant identification, except that the separating characteristics are those of design rather than botany. These design characteristics can be placed under three headings:

1. Functional and spatial characteristics.
2. Visual and other sensory characteristics.
3. Plant growth habit and cultural requirements.

The functional and structural characteristics allow a plant to perform its working role in the landscape. For example, form and foliage density affect its ability to shelter, screen or shade; rooting habit determines its ability to bind the surface soil and protect against erosion; height affects its barrier function. These kind of characteristics allow planting to produce a functioning landscape, a fit environment for human activities.

Visual qualities are key ingredients in planting designed for sensory interest. The amount of care needed when working with these characteristics also depends on the nature of the site and the visual sensitivity of the location. When we plant a garden or courtyard, for instance, we expect to spend a lot of time and effort on detailed composition and expression. A reclamation site, on the other hand, might be less demanding when it comes to the aesthetic and decorative qualities of plants but to get anything to grow at all would be the main challenge.

Growth habit and cultural requirements determine whether a species can succeed in a habitat or ecological niche. This applies both to spontaneous vegetation communities and to designed or managed planting such as urban street trees or roof gardens. On sites with inhospitable or polluted substrates the

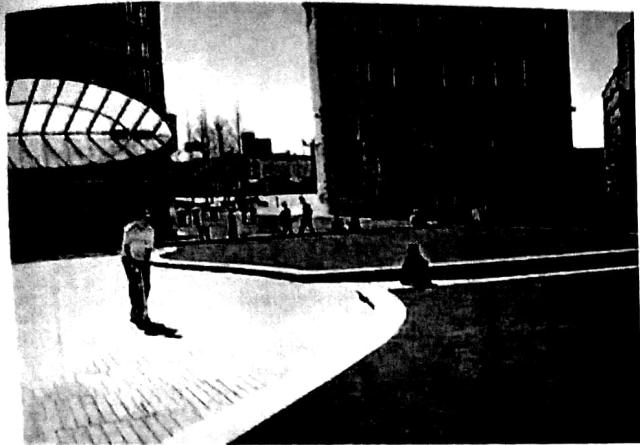


Plate 28 Grass is used with care to provide an accessible ground surface in this public space in Birmingham, UK. The orientation of the slope helps to focus attention towards the centre of the square.



Plate 30 Natural gateways and windows are formed by gaps in otherwise impenetrable vegetation (Buckinghamshire, UK).



Plate 29 Plants such as cypress (*Cupressus* sp.) can be trained to form green gateways of inviting proportions (Generalife, Granada, Spain).



Plate 31 A single row of small trees forms a green colonnade in this residential courtyard in Cologne, Germany.



Plate 32 A carefully spaced and regularly pruned double row of limes (*Tilia* sp.) gives overhead enclosure to form this arcade of trees in France.



Plate 34 Analogies in both the structural and decorative aspects of trees and built form are employed in the work of Antoni Gaudi in Parc Guel, Barcelona.

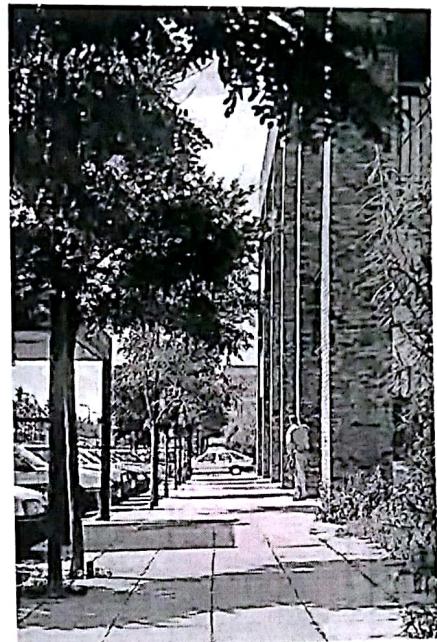


Plate 33 Regular street tree planting echoes the rhythms of adjacent architecture (Milton Keynes, UK).

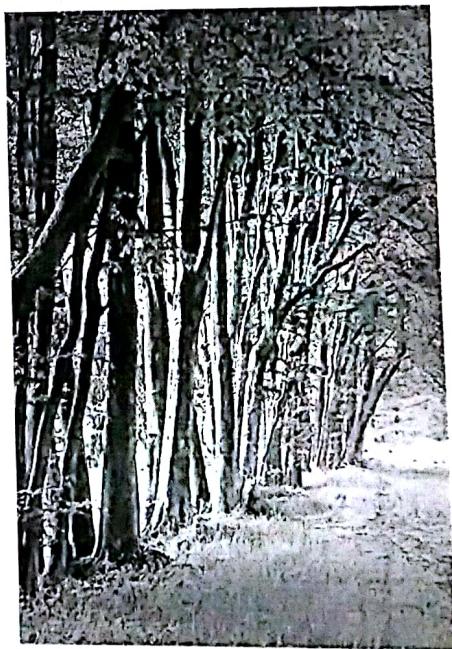


Plate 35 An overgrown beech hedge (*Fagus sylvatica*) creates a curtain of stems at Formakin, Scotland.

technical demands of plant establishment would far outweigh the visual qualities of foliage and flowers when considering species selection. So knowing a plant's habit and horticultural preferences is essential if the designer is to create vigorous and sustainable planting. Unfortunately this information is not readily available in literature on landscape use of plants (in contrast to the vast amount available on planting under garden conditions). Plants in landscape projects are often under greater stress than those in gardens and so personal knowledge of species' preferences and tolerances is very valuable for the landscape designer.

To summarize, a systematic plant selection method is first to establish planting function and spatial form, and then visual character and other detailed aesthetic qualities. Once these design criteria have been decided upon, species and cultivars that are well suited to the site conditions can be chosen to perform those roles. This is the sequence we will adopt in Chapters 3 to 9 that cover basic principles and process.

### Functional and Aesthetic Considerations in Design

Landscape planting has both functional and aesthetic effects. However great the need for a landscape to be easy to use and maintain, the designer must also consider its aesthetic impact. The balance between these two facets varies from project to project, according to the demands of the site and the needs of the users, but both are always present to some degree. We should also note that functional effectiveness and sensual quality are by no means independent. Victor Papanek in his classic book on industrial design, *Design for the Real World* (1985), defined the function of an artefact in the widest sense, identifying six aspects of function that included both use and aesthetic quality:

1. Good **method** in design and manufacture, which employs appropriate tools, processes and materials.
2. Ease and effectiveness of **use**.
3. Design for genuine **need**, not artificially manufactured fads and desires.
4. The **teleic content** of a design, that is, the extent to which it reflects the economic and social conditions of its time and place.
5. The materials and forms employed having appropriate **associations** in the minds of the users (no product is free from association in both individual and cultural experience).
6. The intrinsic **aesthetic qualities** of the materials and forms employed being appropriate to the function.

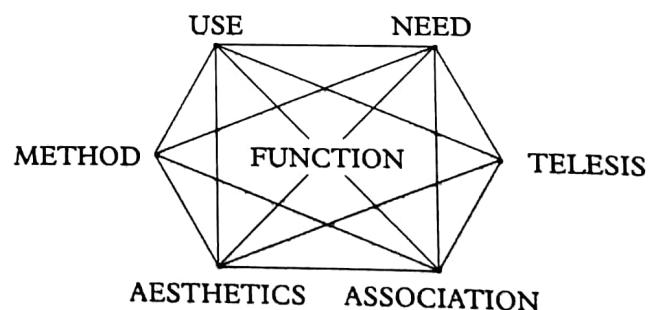


Figure 2.9 The function complex (after Papanek, 1985).



Plate 36 Sculptural organic form and fluid space are created by the nature-like planting of clumps of willows (*Salix*) near the water's edge in a Dutch park.



Plate 37 The rich planting in this courtyard plays a mainly ornamental role, furnishing a space that has been defined by the structures of building and hard landscape. The tree ferns (*Dicksonia squarrosa*), ti kouka (*Cordyline australis*) and palms modulate the space and provide foci (Auckland, New Zealand).

Thus, aesthetic character is an essential part of design for function. This notion is different, in a subtle but important way, from the saying that 'if it works well it will look right'. The implication of Papanek's understanding is that we cannot leave the aesthetic qualities to be the incidental product of a narrowly defined function. There are usually a number of potential solutions to a problem of function, especially in landscape design, and aesthetics should be one of the criteria for choosing the best alternative. The aesthetic qualities of any artefact convey meaning to the users and that meaning should concur with the function and the purpose of the artefact if we are to design honestly and with proper regard for the real needs of the users.

A designed landscape is not only a large artefact but also requires complex integration of different and sometimes conflicting uses. Many different functions can be fulfilled by planting (including visual integration, circulation, symbolic association, business promotion, historical interpretation, wildlife habitat, soil improvement, climatic modification and so on). These functions are design objectives that arise out of the designer's analysis of the brief – from the client's requirements, the user needs and the problems and opportunities of the physical site. In simple terms, design functions are what we want the planting to do.

Although aesthetic effects are always present and need to be considered as one aspect of function, in some landscapes, aesthetic enjoyment is the primary design objective – parks and gardens (both private and public), ornamental courtyards, hospital grounds, for instance.