ROCKS IN THE AMERICAN LANDSCAPE

by

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INTRODUCTION

While growing up, in an area with many natural rocks, I could not understand why they were not more widely used to enrich landscapes there. Where rocks existed on a building site, they were invariably moved away before construction commenced.

The same disregard for rocks exists on a large and dramatic scale in the region around Blacksburg, Virginia. Some of the most exquisitely sculptured limestone rocks in the country are found there, and to date they have been little used in residential, highway, commercial or campus landscapes. Some reasons they have not been used to a greater extent are: their natural abundance; the fact that their use has not become popularized; and their weight, which makes moving them difficult and expensive.

Rocks throughout history have been the oldest, most abundant and most important raw material used by man. They provided his first shelter (caves), his first tools and weapons, and his oldest places of worship, as found in the engraved, painted caves of Southern France, where he used rock to express his creative needs by depicting magic animal images on the walls of his caves. He used rock in the form of walls and towers to provide defense against his enemies. As he progressed, he built stone houses, churches, bridges and roads. Most significantly, he carved the image of his deity in stone, and still does so today. In the Morbihan district of France are found many megalithic stone monuments, thought to have been places of worship.

They consist of huge upright stones, up to 20 feet tall, which form walls, and capped with one or more horizontal stones. One of them is topped with a single boulder 25 feet long.

Not only does man NOT live by bread alone, but he DOES live because of rocks alone. The earth is a huge ball of rock, partly covered with water and surrounded by gases. The continents are islands of granitic rock floating on denser, darker rocks descending hundreds of miles into the earth. Time has weathered exposed rocks into soil, which supplies the food we must have to live. Plants growing in this disintegrated rock also produce the oxygen without which we could not breathe very long. Spaces between rocks and rock particles store water for our constant use.

Our civilization and way of life would be direly threatened if we couldn't find a constant supply of rocks and minerals to use as raw materials. Coal for fuel, granite, marble and limestone for building, shale and limestone for cement, phosphate rock for fertilizer, and other rocks from which we manufacture rock wool insulation, gypsum board and asbestos shingles are but a few examples of our dependence upon rocks.

In this report I have attempted (1) to trace the use of rocks as natural landscape features in other countries that have used them extensively; (2) to outline a history of rock usage in the American landscape; and (3) to project some ideas on a fuller, more appreciative use of them in the Blacksburg, Virginia, area particularly and in regions of indigenous rock supply generally. This latter projection

has necessarily involved the use of personal opinion and observation, as well as visual presentations.

No attempt will be made to explore the utilitarian uses of rocks as construction materials for walls, unplanted surfacing and buildings, nor their role as a medium for refined sculpture. Instead, rocks will be portrayed as vital, exciting spatial landscape effects in their own right.

REVIEW OF LITERATURE

One of the earliest recorded use of rocks as deliberate landscape features was studied and reported by Osvald Siren (1949). Dr. Siren, formerly on the staff of the National Museum of Stockholm, Sweden, spent many years in China as an expert on painting and sculpture. He wrote his book, Gardens of China, over a period of many years, and published it shortly after the Communist takeover of the mainland. Dr. Siren says that the Chinese were using rocks as sculpture in their landscapes as early as 2000 B.C.

The art of using rocks in landscapes was borrowed by the Japanese from China. According to David Engel (1962), a Landscape Architect who studied garden design and construction in Japan under a grant from the Japanese Government, Japanese pleasure gardens using extensive supplies of rocks were in high style over a thousand years ago. Horiguchi (1963), a Doctor of Philosophy at Meiji University and a noted scholar of Japanese architecture and gardens, listed the main uses of rocks in the Japanese garden from the past to the present. Conder (1964), an English architect, went to Japan as the first instructor of Architecture in the Imperial University. While there, he took a deep interest in Japanese art forms, especially in their gardens. He wrote several books, and his Landscape Gardening in Japan, first published in 1893, has been republished twice. Conder states that the main overall use of rocks in the Japanese garden at that time was as a natural sculptural effect. He described the strong

symbolism attached to different shaped rocks, and how they affected the mood of a garden.

James M. Fitch and Fred F. Rockwell (1956), noted contemporary American gardening authors, say that the English imported rock gardening from the Orient in the 18th century. G. A. R. Phillips (1946), English alpine plant collector, grower and rock gardener, reports that the English developed rigid rules for rock gardens.

E. B. Anderson (1963) wrote after 50 years of experience in growing rock garden plants in England. He says the British were the first to develop screes, or rocky soils suitable for the growth of alpine plants. Reginald Farrer (1948) was involved with rock gardens and alpine plants as an explorer, collector, painter and writer. His book, The English Rock Garden, is a classic on the subject. He described the construction of a moraine, another typically English innovation. The moraine is a rocky site with plenty of subsurface water.

Henry Correvon (1930), a rock gardener and alpine plant nurseryman of Geneva, Switzerland, offered over 7,000 different varieties of rock garden plants for sale. He described the construction of rock gardens and lists the rules pertaining thereto. Sylvia Crowe (1956), an English landscape architect, tells which are the best types of rocks to use in the landscape. She says that the harder ones of geological formations should be obtained as they are most resistant to wear. Fitch and Rockwell (1956) also traced the history of gardens in the United States. They state that formal gardens predominated in

this country until 1800, with little or no attention paid to the natural appearance. Henry Hubbard, Assistant Professor of Landscape Architecture at Harvard University, says that aside from large private estates, done in the formal European manner, there was comparatively little landscape design of any kind in the United States prior to 1850.

Andreas Feininger (1961), son of a famous painter and himself an eminent photographer, has produced several books of photographs of rocks and other natural objects. He delves into the history of rock usage in ancient times, in caves, as places of worship and as defensive material.

Herbert Zim, Professor of Education, Paul R. Shaffer, Professor of Geology, and Raymond Perlman, Professor of Art (1956) at the University of Illinois, describe the rocky makeup of the earth and the types of rocks on it.

Fenton and Fenton (1940) list the uses man has made and still makes of rocks in his everyday life. They differentiate between a rock and a stone. Junius Henderson (1925), a Professor of Natural History and Curator of the Natural History Museum at the University of Colorado, describes the different types of rocks and their visual and physical characteristics. He also tells how they were formed. Ellis Shuler (1945) grew up in Pearisburg, Virginia, and developed a strong and enduring curiosity about the rocks of the Blue Ridge Mountain area. He later became Professor of Geology at Southern Methodist University. He described the types of rocks and formations in the Blue Ridge area.

Dr. Dudley L. Stamp (1953), Professor of Social Geography at the University of London, also lists the various types of rocks and differentiates between rock and stone.

Garrett Eckbo (1950), who did graduate landscape work at Harvard University in 1937, and is now a registered landscape architect, describes the textural and spatial uses of rocks in the present American landscape. David Fahringer (1965) writing for the magazine Landscape Architecture, tells how a house, "Falling Water" was integrated into its rocky site.

George Schenck (1964), a Landscape Designer living in Seattle, Washington, describes the origins, the elements and the nature of rock gardens in America.

Ethelbert Furlong (1952), writing in Landscape Architecture, describes a typical American adaptation of a Japanese garden in the "Garden of 100 Stones."

The Use of Rocks in Other Countries

Rocks have strongly influenced landscape design in several countries, over long periods of history. The use of rocks as landscape features in major countries is discussed in the following sections.

China

In ancient China, garden design reached such a high plateau that it was delegated to great painters, who used rocks, trees, and water as the most essential elements of both pictures and gardens. They

considered mountains as the rocky skeleton and water the life blood of the earth; they admired the towering mountains and creviced, sculptured rocks as the most magnificent symbols of nature's creative force, and therefore sought to bring an air of that force's fantastic wildness and grandeur into the garden.

Garden rocks used in China were of a specifically Chinese character, and have never since belonged to the art of another country. They were essentially artificial mountains made of huge blocks of hollowed and furrowed stone. The stones were carved, either by natural processes or by man, into fantastic, honeycombed shapes, looking on the whole like giant, distorted sponges. The Chinese delighted in placing single rocks in leaning, unbalanced-appearing positions. Similarly, they built rock arches over entryways into their gardens, so that the entire garden gave a feeling of eminent collapse; this feeling undoubtedly lent an air of kinetic excitement to garden spaces. There is no mention in the literature of deaths caused by rocks falling on the people, so it is probable that the rocks were well fixed into place. At their best, these rocks contributed more than any other compositional element to the expressionistic features of Chinese garden art. Rocks were collected from many parts of the country at great expense, and those from one section were called a natural wonder of the world because of their natural, intricate sculpturing. If the furrows of a rock did not exactly suit the garden designer, he would have the rock chiseled out until they did.

Japan

The natural expression of garden art was carried from China to Japan, along with Buddhism and its temple gardens, in the early years of our Christian era. In Japan, the use of rocks became even more extensive and intensive than in China. By the year 600 A.D. Japanese pleasure gardens were in high style. Engel (1962) states that a popular contemporary novelist of that time, Lady Murasake Shikibu, in her novel The Tale of Genji, said, "The stream above the waterfall was cleared out and deepened to a considerable distance; and that the noise of the cascade might carry further, he set great boulders in midstream, against which the current crashed and broke," (Original not seen). The waterfall emptied into a lake large enough for shallow-bottomed boats to navigate, and the boats brought guests in "close under the rocky bank of the channel between the two large islands--- the shape of every little ledge and crag of stone had been as carefully devised as if a painter had traced them with his brush."

Since rocks in Japan were first used in the Buddhist temple gardens, they assumed strong symbolic importance over the centuries. In their rock treatment, the Japanese went far beyond a mere imitation of nature; their aim was an intensification and vivid expression of nature. The garden artist attempted not only to encompass the world in his design, but to include man's thoughts about the world. The Japanese have given various symbolic names to rocks representing such diverse objects as Buddha, saints, hills, mountains, lakes, rivers, cascades, islands, valleys, water basins, and stepping stones. As an

example of the hundreds of different names assigned to differently formed rocks, there are 19 given to stones representing islands, such as "tortoise-head stone", "master's isle", "guest's isle", "seagull-resting stone", "water-fowl rock" and "seat-of-honor stone". To the Japanese, each stone has a personality and is used to suggest something beyond itself. Variously formed stones are placed so as to enliven the imagination. An upright one may symbolize a mountain, masculine force or a deity. A prostrate stone may suggest repose, feminine passivity or a bridge.

Today the garden called Ryoanji, in Kyoto, is the acknowledged perfect example of a symbolic stone garden. It is a large rectangle enclosed by a fence, with five groupings of stones surrounded by a groundcover of white sand. Stone paving and the wall form the boundary of the universe, while the stone groups represent the continents in a vast sea of sand. Asked by a student what in the arrangement represented man, a teacher once said, "Your presence".

The Japanese use stone in the garden in many ways. The main uses are: as sculpture, either singly or in groups; in waterfalls, streams and lakes; as dry streambeds and groundcover; as interplanted paving and steppingstones; and as stone lanterns, pagodas and ceremonial water basins. Rocks are the elemental anchor of a Japanese garden, while water and bamboo represent fluidity, and pines antiquity and veneration. Horiguchi (1963) says, "As in plants, so in rocks do they revere a look and feeling of great antiquity. Rocks are chosen with no angles, but with smooth, many-creviced faces, deeply etched

by the designs of time." An exception to the look of age is found in a pond beside the residence of the present Japanese Crown Prince. In the pool has been placed a large granite block, freshly hewn, plainly showing the marks of the chisel and rock drill. This contrasting rock is felt to connect the iron and concrete residence with its natural forest and garden.

In Japan steppingstones are very common in the garden. There are rigid rules for their placement. The tops should be flat, and until modern times, the height of the stone above ground ranged from six inches for the Emperor's garden to an inch and a half for common folk. Today all steppingstones are raised about two inches above ground, and they are placed about four inches apart.

Symbolic streams with no water reached perfection in Japan's middle ages. A perfectly executed landscape composition using plants may be destroyed by subsequent plant growth or by drouth; a garden designed without plants or water overcomes this problem. In some Japanese stone gardens the depth of perspective is such that, in spite of the utter absence of water, one seems to actually hear the murmur of a stream.

The Japanese have also developed rigid rules for waterfall construction. The fall should be from three to four feet high. The cliff should be of mountain rock with an irregular face, and should be natural looking. Flanking rocks are then set in the ground on both sides of and slightly to the front of the cliff rock. Spaces between the cliff and flanking rocks are filled with mixed clay and

gravel, tightly tamped. Often a pair of rocks are set close behind the flanking rocks. The basin below the fall should be broad, with many rocks in the water. In the absence of a natural stream flow, a recirculating pump is often used today to carry the water back to the top of the fall. It might be thought that these rigid rules of design would cause all waterfalls to look alike, but such is not the case. The natural variation in form and texture between any two rocks, and the differences between any two sites, give individuality to each waterfall.

Stone artifacts are used to humanize the naturalistic Japanese garden. They are placed where they perform a logical function--a bridge to cross a stream, a lantern to light a path, water basins that are accessible, and sculpture that can be viewed from the house. Stone lanterns are set by a water basin, along a path, or anywhere light is needed at night. Usually a rock is set one to two feet from the lantern's base to give it a sense of balance and stability. A stone water basin is usually a round or square piece of stone, with a depression in the top. Such naturally occurring stones are greatly sought after. They link the building to its site, and are used with appropriate low plantings. Stone bridges may be of one or two spans, either flat or arched. A large, deeply imbedded bolster rock is placed under each end of a span for stability. Vertical "anchor" rocks are set beside each end for a feeling of strength. The bridge is set so that the sides are seen at an oblique angle from the main vantage

point. Stone towers or pagodas, which are generally up to three feet tall and often placed at the water's edge for reflection, give a spiritual feeling.

Engel (1962) describes the feeling of a Japanese garden. They "have a slow, almost drifting tempo today produced by a predominance of rock, combined with broadleaf and needle evergreens -- these gardens change little with the seasons." Because of the generally small piece of land in a Japanese garden, and because of its close, intimate relationship with the house and its inhabitants, the garden's tempo has to be slowed down. This is achieved by the simplicity and sparseness of evergreen foliage and few flowers; by placing shrubs openly, with space an important balancing mass; and by proportioning the scale of all related elements so that any garden, large or small, becomes a harmonious landscape with nothing outsized.

In Japan the main overall use of rocks remains as a natural sculptural effect. Garden stones are still considered the highest form of stone art there, while in Europe and American man made stone sculpture is felt to be the most refined. These different viewpoints, as well as the contrasting moods of the static Japanese garden and the dramatically brilliant, seasonally changing western garden, reflect the contrast between the temperament and philosophies of the two races.

Italy

Imperial Romans, like Americans today, borrowed too many landscape elements from too many lands to have a landscape style of their own. As in their buildings, landscapes ran to ostentation, large size

and formality. In a country abounding in the finest-quality metamorphic rocks in the world, especially marble, which has little landscape character, it was natural that statuary should become a main feature of the landscape. It was even more natural in view of the abundant slave labor available, and the tremendous revenues pouring into the Imperial coffers.

With the great awakening of the Italian Renaissance spirit at the beginning of the fifteenth century, landscape artists looked back to the expansive days of the Empire to give them example and inspiration. Extensive gardens were created based on classical elements. These gardens were essentially formal, composed of series of terraces with clipped plant materials and abundant running water. While the main vista of each garden was symmetrical, there was an occasional asymmetrical grouping of trees and rocks off secondary vistas.

The Villa Lante, designed in 1564 at the zenith of Italy's "Great Age" in gardening, combines natural and man made features perfectly. Its theme is a stream arising from a natural rock grotto in the wooded hillside and flowing through a series of terraces, growing in sophistication at each step, to a final opening out into a great formal water parterre at the lowest level. Natural rocks were assigned the role of supporting elements in the rustic fringe areas of the garden.

In many Italian fountains, such as that of the Sea Horses at Villa Lante and the Fountain of Trevi, rocks were used as foundations for the fountain's statuary. In some cases, the artist sculptured

the desired rock form from a block of rock. Here was perfect juxtaposition of man's elegant creations (statuary) and apparently natural objects (rocks).

Grottoes, or dark, rocky caves, were given a place in many baroque Italian gardens. The English later borrowed them as a theme in their Romantic Movement.

England

In England up to the start of the eighteenth century, the formal garden ideas of LeNotre in France, who had been strongly influenced by the geometrical gardens of the Moghuls in India and the Moors in Spain, predominated in the large estates of the wealthy. About 1700, Addison, Pope and the Earl of Shaftesbury started publishing romantic writings extolling the beauties of landscape painting, and satirizing geometric gardening. William Kent looked over the garden wall and discovered all nature to be a garden. He introduced into the garden every sort of picturesque, wild, ruined, romantic, irregular, or pictorial element, whether of man or nature. Grottoes, rocks, dead trees, even artificial tombs were used with great abandon. The climax of this natural movement came with "Capability" Brown, who became "the" landscape designer of England about 1720. He systematically destroyed formal gardens and all boundaries and walls. He methodically and monotonously mass produced clumps and hillocks in every garden, using all sorts of natural objects on them. Brown destroyed some of the best gardens England ever produced, at the whim of a style.

Sir Humphrey Repton followed Brown, and eliminated many of his excesses and extremes. He moved away from the picturesque and pictorial, to the sensible, direct ordering and representation of nature's scenes.

The Romantic revolt was a vital and vigorous movement. It introduced the wealth and wonder of the natural world into the garden, and stressed the continuity of the city with the rural countryside.

Along with the Romantic movement came England's elevation to Empire, and abundant funds for exploration. Being a nation traditionally more interested in plants than forms in their gardens, they adapted Oriental rock garden ideas so that rocks were used as a foil or companion for alpine plants, which came into vogue about the same time.

The English developed unbending rules for rock gardens: paths must always zigzag, and their base must be planted with carpeting plants such as thyme or mint; the rock garden must never be brought to an abrupt end at the base where it meets the lawn or garden path, but must have a narrow border or uneven width, using in it groups of low growing alpines; and nature must not be imitated, but improved upon. The English say further that the rock garden must never be planned, since the stone is so infinite in variety it is useless to conceive anything beyond the broad outline until the stone has reached the site; the only purpose of the rock garden is to provide a home for alpine plants; rocks must be placed to look as if all were part of the same range, and to provide an admirable effect from all angles; and each stone must be buried to appear as if it were the exposed

portion of a larger hidden mass, with stratification in one direction only. Furthermore, the English rock garden must be removed from all symmetry and straight lines; it must have a backdrop of trees and shrubs to blend into the surroundings without distinct lines of demarcation; it must only contain plants that seem to naturally associate with rocks; and the stone must be of only one general type to simulate a natural formation.

The English were the first to develop the scree, which in nature is a pile of broken rock debris at the base of a cliff. The scree is excellent for growing plants which need plenty of moisture, but good drainage and loose soil. The rules of constructing a scree are: (1) excavate the area to 12 inches; (2) place a two-inch layer of small rocks in the bottom, then two inches of a coarse fibrous material such as hay or sod; (3) place large rocks at intervals to be used as steppingstones; and (4) apply eight inches of chipped stone or gravel, about one-half inch size, mixed at the proportion of five parts stone and one part of equal halves of loam and peat moss.

The moraine is another typically English introduction. It differs from the scree by having plenty of underground moisture. Instructions for building a moraine are: (1) excavate a slope to three feet; (2) lay drainage rubble one foot deep; (3) apply one foot of a mixture using one part peat, one part sand and ten parts of stone chips; (4) put in a perforated water pipe; and (5) fill the remaining one foot with the same soil-stone chip mix. Plants should be planted

in a moraine or scree bareroot only, so that the roots will be encouraged to grow down deep between the stones.

Phillips (1946) says that one person must control the use of rocks for harmony in a garden. He advocates excavating the entire rock garden area to 15 inches, then filling the hole with rubble for perfect drainage; on top of the rubble, sod should be laid face down, then soil and rocks placed on it. He states that limestone rocks are the best to use, but if they are unavailable, native rocks of other types can be employed. However, he cautions one to never use granite, flint or slate, as they are too hard and inhospitable looking.

An Account of Rock Usage in the American Landscape

From the first settling in this country until 1700, gardens were mainly utilitarian, used to grow herbs and vegetables. With the Industrial Revolution in the 1700's came the moneyed class in America, with affluence to build homes and gardens of their choosing. From then until early 1800, major gardens were designed after the formal European prototypes, and these set the style for smaller gardens all over the country. In areas with abundant natural rocks, homeowners were more concerned with getting rid of them than utilizing them for decorative effects. A common practice among farmers with rocky fields was to collect the rocks and use them as building materials for fences along their property lines and to divide fields. These rock walls eventually became weathered and blended in well with the surrounding countryside. Today they are still seen in the New England states, and

in scattered instances in many other hilly sections of the country. Although the walls were built with no thought for beauty, they have become conspicuous and attractive landscape elements.

Most Europeans, the majority of American settlers, mentally pictured forests and natural landscapes as being filled with wild beasts, barbarians and monsters. They saw in the formal garden, with its display of man's mastery over nature, the epitome of civilization and refuge from the terrible forces of nature. The Chinese and Japanese gave the Occident two very important concepts; (1) nature is beautiful and good, and (2) if nature's landscapes are the most beautiful, they are to be liberally imitated. These views of nature became popular in the United States only after 1800, and reached a peak about 1830. During this period, there was a great deal of interest in new plants. John Bartram collected native plants and established an arboretum in Philadelphia. George Pierce, first owner of Longwood Gardens near Wilmington, Delaware, strongly influenced the trend to informality. Other ardent horticulturists, such as John Evans and Jacob Painter of the Philadelphia area, established magnificent plantings of rare trees, imitating their natural habitat in the process. Evans specialized in Himalayan plants and therefore used quite a lot of rocks in constructing their habitat. However, except for the efforts of Andrew Jackson Downing to introduce the naturalistic English expression of landscape design into this country during the first half of the nineteenth century, no attempt was made to produce significant examples of garden art before 1850.

In 1858 Frederick Law Olmstead designed and started construction of New York Central Park. His precepts laid the groundwork for the first truly American-style gardens; they were: (1) formality around the house and buildings; (2) informality away from the buildings; (3) walks and drives laid out in wide, sweeping curves; and most important, (4) preservation of natural existing features to the extent feasible. This last rule was a distinct change from English gardens, where the designer tried to reproduce the rolling adjoining countryside. In Central Park, an area of extensive granite rock formations, traffic areas were laid out with due deference to preserving as many rocks and trees as possible. Mr. Olmstead subsequently designed many public and private gardens using these same precepts. Still, designed gardens in the United States remained the property of the rich, who could afford to maintain one or more gardeners, until after World War I, when the mass of suburban homeowners brought a demand for gardens for the average family. During this time, the demand for plants increased tremendously; plant societies were established all over the country, and from then until today the major garden interest has been in plants.

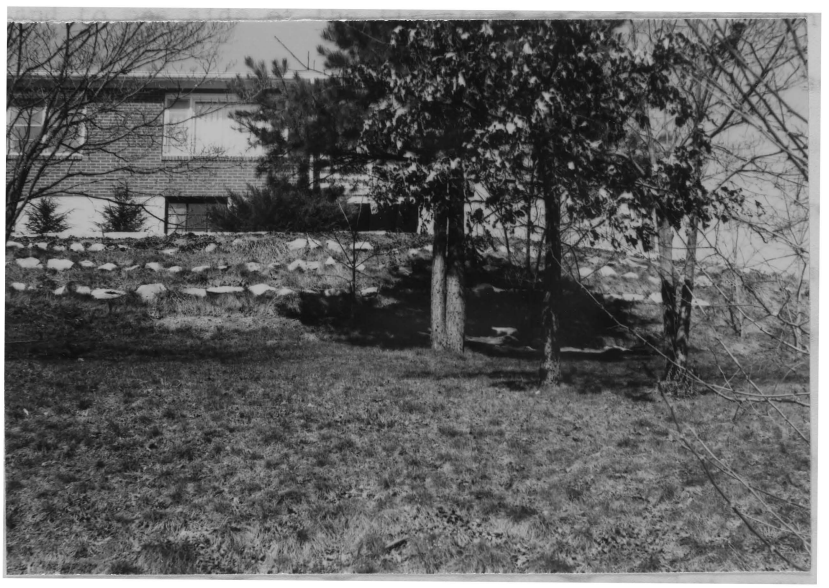
Early in the twentieth century, Edward K. Balls laid out the rock work for Lionel de Rothschild of Exbury in England, totaling thousands of tons; some of the boulders weighed up to five tons each. He also designed one of the finest naturalistic stone compositions in North America for the Rancho Santa Ana Botanic Garden in Claremont, California. Washington State and Oregon have long been considered the rock garden capitals of the United States. Alpine plants grow well there, the

terrain is mountainous and rocks are plentiful. In these states, as well as in California, slopes have been treated as rock gardens for a hundred years. New England and New York, with their magnificent granite outcrops, have inspired regional groups of rock gardens.

Just prior to 1920, a rash of "peanut brittle" rock gardens appeared in this country. They consisted of small round rocks stuck on slopes in a polka-dot fashion, interspersed with patches of phlox, alyssum and candytuft. Sometimes the rocks were painted. This craze fortunately waned as rapidly as it had developed, but such gardens are still seen today (see Figure 1).

During the 1920's an English Landscape Architect named Ralph Hancock staged a series of rock gardens in American flower shows all over the country. They proved to be the greatest impetus to rock gardening the United States had had. Rock gardens came on strongly and stayed into the depressed '30's. They became the fashionable garden for the fashionable home; but the subject generated a fatal over-excitement, and many people grew tired of it. With the exception of some arboretums and a few private gardens of the wealthy, the English rock garden began to seem like a period piece.

Frank Lloyd Wright, the famous architect, strongly favored the "organic" house and surroundings. He used rock abundantly as a building material. He espoused the blending of the house with its natural environment, and used rock as natural sculptural accessories. At his Taliesin Desert Camp in Arizona, built in 1939, he used a huge boulder perched on a concrete pedestal in the middle of the entryway steps.



The "peanut brittle" type of rock garden.

Figure 1

He designed and built a house called "Falling Waters" in 1936. The house is a series of cantilevered concrete trays built on a massive rock ledge and projecting into space over the falls of Bear Run in Fayette County, Pennsylvania. In the living room, Wright imbedded several large flat-topped boulders in the flagstone floor in front of the fireplace. In the Per House in Wisconsin, built in 1940, Wright used a large, flat-sided rock as a focal point in the stone mantel surrounding the fireplace. Another rock, rectangularly shaped, was placed in front of and to one side of the fireplace as a bench. Wright was considered a radical for a long time, and he considered himself so until he died.

The Brooklyn Botanic Garden, the New York Botanical Garden, Longwood Garden in Pennsylvania and the National Arboretum in Washington, D.C., offer outstanding examples of the use of rocks on a large scale in this country. All have a long history of rock gardening.

With World War II, rock gardening and other leisure pursuits were suspended, but out of the war came a strong revival of interest in rocks. Americans in Japan had seen rocks used in what were to them fresh, new and exciting ways, and they were deeply impressed. Since the war, the use of rocks on the West Coast and in desert areas has become highly respectable for home and commercial establishment. On the East Coast they have become popular in recent years in landscaping commercial buildings, where they lend a special air of elegance and affluence.

Since 1939, Garrett Eckbo and a handful of other young landscape architects have fought a successful battle to bring about the sensible arrangement of landscape spaces for living. This has brought rocks into the picture as low-maintenance, sculptural design items. As such, rocks are fast becoming popular all over the country.

Isamu Noguchi has designed many famous landscapes in the United States and around the world, using rocks as tangible, exciting spatial effects. In the round sunken court of the plaza of the Chase Manhattan Bank Building in New York, he placed seven black, naturally sculptured boulders brought from Japan. For paving, he used small, rectangular, whitish granite blocks in a rounded, swirling pattern to simulate the raked sand waves of Ryoanji in Japan. His influence upon American architects and landscape designers has been considerable.

In other countries of the Americas, rocks are being used in dramatic ways. In Mexico, architects and landscape designers have made vivid uses of lava flow areas around Mexico City to create gardens with strong textural and kinetic appeal. They have combined large boulders with sheet flows and tropical plants to produce highly natural appearing scenes (see Figure 2). Luis Barragan, a Mexican landscape architect, has used the black volcanic rock as startling sculptured and textural adjuncts to relate buildings and site. On the divider strip of the main boulevard at Pedregal Gardens in Mexico, he has massed these volcanic boulders in outcrops to tie in with the adjoining countryside.

A garden in the lava flow district of Mexico. (a)

(a) Kassler, Elizabeth B. 1964. Modern Gardens and the Landscape. The Museum of Modern Art, New York. p. 70.

Figure 2

In South America, outstanding young architects are using rocks in many forms and sizes to enrich landscapes associated with their buildings. Robert Burle Marx, a contemporary Brazilian architect, has used rocks liberally as spatial and textural objects. In one instance, in the Museum of Modern Art Plaza in Rio de Janeiro, he has placed roughly hewn rocks of generally rectangular shapes, in different heights and sizes, in rectangular beds surrounded by stone walks. Only low plantings are used, so that the bold patterns and textures can be seen from the upper floors of distant office buildings.

The Nature of Rocks

The main types of rocks are divided into many sizes, forms, textures, and colors.

Rock Types

What is a rock, and what is a stone? Technically and geologically speaking, all stones are rocks, whereas all rocks are not stones. A rock is any solid mineral or organic matter occurring in large quantities, including glass, coal and asphalt. Stone is any mass of rock grains cemented together and hardened, including cement and slag. In the language of the ordinary "man-on-the-street" however, stone has come to have the accepted meaning of any concreted mineral matter OR a specific piece of rock, so that rock and stone are used as interchangeable terms.

There are three types of rock: (1) igneous, formed by the solidification of molten masses within the earth; (2) sedimentary, stratified

rock grains that have been depositied layer by layer, usually under water, and cemented together; and (3) metamorphic, which may be either of the first two types that have been changed by heat, pressure, chemicals or mass movement.

Igneous rocks have no stratification or bonding, and their surface is the same in one direction as in any other. Their texture varies due to different physical conditions under which the rocks solidified; it runs from granular granite to glassy obsidian. The coarser-grained ones hardened far underground, while the finer-grained ones hardened at or very near the surface. Other igneous rocks of general familiarity include porphyry, quartz, basalt, perlite, pumice, volcanic ash and tuff. Granite is probably the most widely used of this group, and also the best known. It is used for buildings, gravestones, walls and especially in the crushed form as road-bed fill and foundation material. Weathered granite assumes a venerable and imposing aspect, and is used in areas of supply in rock gardens and the landscape.

Sedimentary rocks include the major groupings of carbonates, sandstones and shales. The carbonates (limestone and dolomite) are of organic deposition by tiny sea skeletons. The strength of limestone varies with its texture; firm, compact varieties are very strong, while loose, porous ones are weak. Sandstone is composed of spheroidal quartz grains that have been cemented together by iron oxides, calcite or another bonding material. These rocks are stratified as to color, texture, material and thickness. They are layered horizontally, and where they were water deposited under non-turbulent conditions, perfect

strata are found. Shale is too weak to withstand weathering, but it breaks up into some interesting shapes and textures, and has potential as a ground cover.

Metamorphic rocks are igneous or sedimentary ones that have been changed in mineral composition or in texture or both, so as to alter or even efface their original characteristics. They include materials that have been used for man's most imposing and beautiful monuments -- marble, serpentine, quartzite, gneiss, schists, hornblende and slate. These rocks usually have veins and patterns of different colors. The marble of a particular area of the country can be identified by its peculiar markings, which were produced by a unique set of circumstances.

The Forms of Rock for Landscape Use

Rock forms range from the microscopic clay particle to the mammoth boulder. We are not concerned here with the role of dust and soil particles in the landscape, since we usually accept and work with the soil found on a particular site. Probably the smallest rock we might bring into the landscape as an enriching element is sand. In Japan, sand is found as a water substitute in many gardens. It is usually raked into a careful pattern of windblown wavelets each day. In America our temperament doesn't generally allow for anything so time-consuming. However, sand can give us a beautiful color and texture contrast as a ground cover in small areas, especially the larger-grained kinds. It ranges in color from white through browns to black.

Next in size come pebbles, which are pieces of rock that have been water-transported and have been tumbled, worn and rounded in the

process. Pebbles are found in all the colors of the parent rock; whites, grays and browns predominate. Some of the more elegant landscapes of the recent past have featured white round gravel or pebbles as a ground-cover (see Figure 3). Their combined clean color and strong textural effect are very pleasing to the senses. A variation of this theme is to use two different-sized pebbles, either in combination or in two contiguous areas.

Pebbles generally are in the size range of one-half inch to six inches in diameter. Larger sizes of pebbles have been used to create the "peanut brittle" rock arrangements mentioned earlier. Today they are being used as ground cover, especially in the darker shades of grays and browns. They make beautifully textured patterns when used in beds, and are of special value around the foundations of buildings, (see Figure 4). Pebbles should be laid over one or more thicknesses of black plastic sheeting to control weeds. They are piled to the depth required to hide the plastic, usually a minimum of two inches. These naturally rounded pebbles, or creek stones, are also pleasing in any body of water, such as streams, pools and fountains, where they can be seen on the bottom.

Cobblestones are naturally-rounded rocks from six inches to one foot in diameter. These are commonly called "one-man" rocks, meaning that one person can easily move them manually. They occur abundantly in most rivers and in many soils of the Blue Ridge Mountain area. A vast quantity of them was employed in restoring colonial Williamsburg, Virginia, where they were used in the cobblestone streets and gutters.

Boulders and white pebbles used in an elegant, low-maintenance commercial landscape.

Figure 3

Cobblestones used under the eaves
and entryway bridge as groundcover.

Figure 4

Cobblestones have been used also in "peanut-brittle" gardens, but if selected in different sizes and randomly placed, they are effective as textural and spatial objects in any garden. Due to their waterworn roundness, they usually lack individual character and are effective only in masses.

Rocks larger than one foot in mean diameter are called boulders, and these have no limiting maximum size. In this class we find the rocks with the most exciting individual character. For the most part they are too large to have been water-transported for any great distance, and therefore are not uniformly rounded. Their sculpturing has been done by water, temperature, chemicals and pressure. It is with large boulders that a landscape can truly be given dramatic treatment. With rocks as with most other objects, size awes, astounds, impresses. Many large boulders or outcrops of rock are noted in the landscape along the highways; examples of such rocks are seen in Figure 5. These impress us with the sheer force of their physical size, and also with their color and texture. There is also something of a secure and comfortable feeling about such large boulders. A landowner is extremely fortunate to have land containing such a natural outcropping, especially if he is able to take advantage of it when building his home nearby, such as has been done in Figure 6.

Rock Forms and Types in Virginia

Most rocks in Virginia are sedimentary carbonate types. Limestone, the most important of these, is found only in the Blue Ridge Mountain area. It has been used as a building stone in walls, floors and

Views of natural rock outcrops along a Virginia highway.

Figure 5

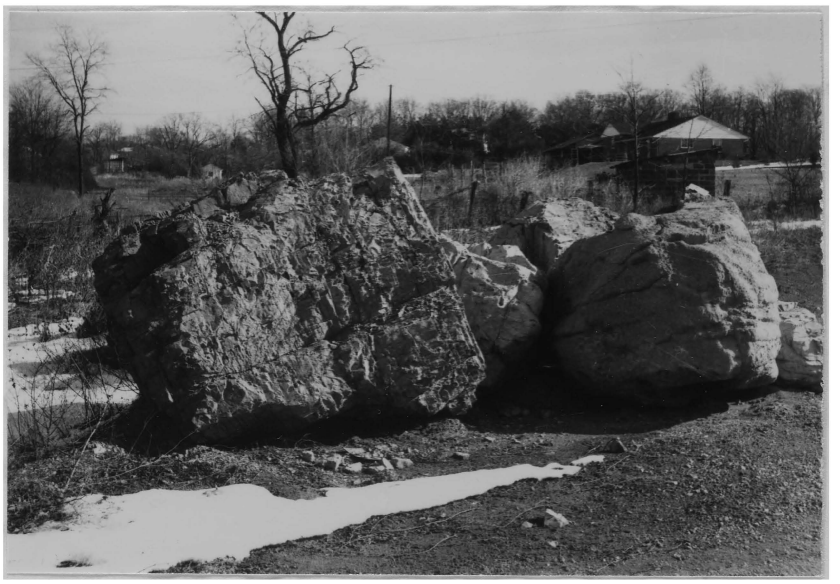
Natural stone outcrop beside a residence.

Natural limestone outcrop with crushed limestone groundcover in driveway.

Figure 6

foundations, although these uses have almost become obsolete. Monuments have been carved from it, and bridges built of it. It is crushed to make cement, to make lime for acid fields, to use in the refining processes of sugar, copper and aluminum ore, and to assist in the manufacture of paper, glass, soap and sulphuric acid. It is turned into rock wool for insulation. The Virginia limestones are among the best rocks to use for purposes of the landscape. They are abundant, inexpensive, and found in a great variety of shapes and sizes; for the most part they are found in beautifully rounded and shaped forms, of a compact, close-grained composition, light gray in color, turning to a deep gray when wet. They are reasonably resistant to temperature extremes, but are acted upon by any mild acid; this includes carbon dioxide, which with water forms carbonic acid. These acids cause a slow, imperceptible erosion of the rock surface, and in combination with water have been the principal agents in carving these beautifully shaped rocks. Many of them are found underground, completely buried, but still having the rounded forms. Some are found with holes going completely through the rock. Many excavations for basements or foundations unearth these sculptured limestones. Figure 7 shows rocks that were unearthed while excavating for new construction in Blacksburg, Virginia; plans are to use them in developing a rock garden area at the Virginia Polytechnic Institute Arboretum, near Blacksburg.

Found to a lesser extent than limestone in Virginia is sandstone, ranging in color from white to pinks and dull browns. It has a coarser, more granular surface than limestone, and is more impervious to attack



Two views of rocks unearthed during
excavations in Blacksburg, Virginia, 1964.

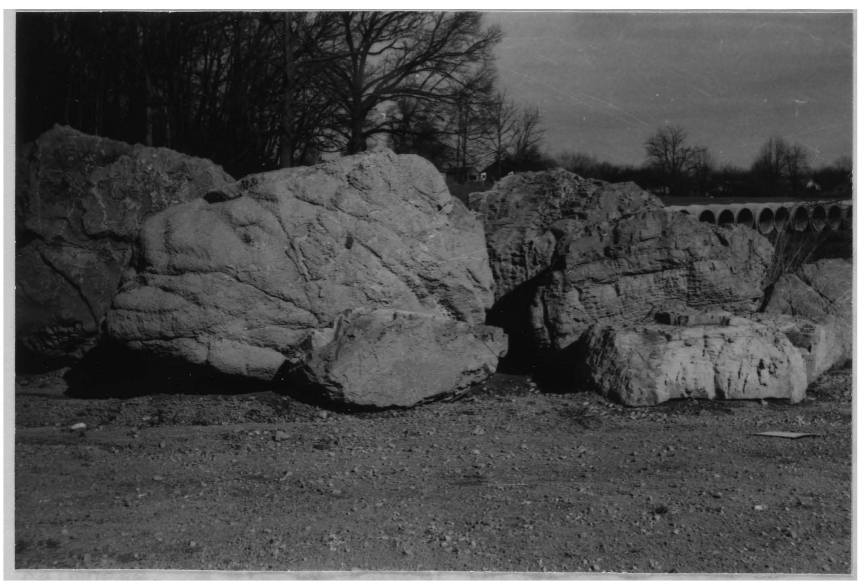


Figure 7

from chemicals, since it is composed mainly of hard quartz grains. It is not found in the great range of sculpted shapes as is limestone, but where it is abundant and well-weathered it makes a very desirable entity in the landscape. Since sandstone has a grainy texture as compared to the smooth, creamy surface of limestone, the two used together give a pleasing contrast in texture and usually in color.

Granite is found in Virginia in isolated instances, along with a great variety of quartz, flint and gemstones. Generally speaking, any rock which strikes the fancy of the designer may be and probably has been used in the landscape. The harder rocks such as quartz, because they resist weathering so well, usually keep a hard, angular appearance. In some instances this appearance may be desirable.

Rock's Design Role in the Landscape

Rocks convey many thoughts to many people. The tall, dark silhouette of a single stone projecting against the still evening sky broods on loneliness and despair. The sparkling green wetness of a brook stone, braking the busy rush of clear, cold water, speaks of happiness and youth, and boundless enthusiasm. The rounded repose of the firmly anchored rock arising from the edge of a quiet lake hints at man's transience, and its reflection in the still water bids calmness. A mighty boulder thrusting up from the very pinnacle of a mountaintop, wrinkled, etched and covered with hoary lichens, defying the elements and sheltering a gnarled pine, whispers tales of indomitable souls, of fierce passions and majestic strivings. As

nature shows us these notes in the various scales of her visual symphony, so we can organize our own landscapes to create living, vital sculptured spaces.

Rock is an important qualitative material in the landscape symbolically, structurally, spatially and sculpturally. Symbolically it reminds us of the basic core of the earth, the source of our soils, which protrudes through the soil layer where it has resisted weathering as in mountains, buttes and irregular outcrops. Rock is part of our experience of the landscape, and as such it is our right to develop that experience to the maximum. Structurally, rock is important for free-standing and retaining walls, fireplaces and paving. Sculpturally, it is important not only as a material for actual sculpture, but because of the quasi-sculptural or object-interest quality of many natural rocks. Spatially, it is important as a continuous link between the structure and its site.

The terms "space" and "sculpture" are tightly interwoven in meaning. All space is separated by sculptures of one form or another, while all sculptures are composed of protuberances into, and/or hollows of, space. The earth as a ground surface is the floor of our outdoor space. Rocks can add richness, sparkle and interest to that space; as such, they become part of the detailed object design within the major organization of the space. The rock is a continuous form or mass that may or may not enclose spatial hollows. Its plastic shapes, from the warped plane and the complex curve to the natural and free forms, are notably gravity-bound. The sculptural use of rocks in groups is one

in which individual rocks are separated from one another in space. The object is both plastic and spatial, that is, a display of specific qualities of form, size, color and texture, and the establishment of mass and space relations between them in terms of tension, harmony and contrast. A rock grouping may have contents of a sentimental, symbolic or scientific nature. Whatever its nature, the expression of that content is strengthened, and its appeal widened, by establishment of the strongest, clearest, most coherent spatial relations between its parts. These relations are developed by application of the design principles of unity and variety, interest and harmony, dominance and contrast, and rhythm and balance.

A flat, treeless desert or the empty surface of the ocean would have little interest to a man suddenly dropped onto either space. For interest, man generally likes variety. If, in walking across the desert, he should come upon an animal's skull, it would be a refreshing change. Over the horizon, a small hill with a few rocks would be even more interesting. Compared to these scenes, the mountain with its profusion of rocks and plants is a landscape rich in spatial objects. Just such a base plane as the desert is the typical building lot of today, after it has been cleared for construction. It is made as flat as possible for convenience. First comes the house or other building, thrusting through space in the interior of this mini-space, which is bounded by invisible vertical planes at its property lines. This is the extent of spatial interest accorded many lots. On others, the owner places various "non-spatial" items on the ground or base plane,

such as paving or a ground cover of grass. These add some slight pictorial and utility interest. Later he might scatter some plant materials around the space, giving contrast to the building and adding to or detracting from the space according to the quality and placement of the plants. The thing to remember is, outdoor space is one of our most important landscape design elements, to be enriched by the boundaries surrounding it and the objects in it. The arrangement of that space, its divisions and limitations, its variety, richness and detail, determine the sensations we derive from it as we view it and travel through it.

Rocks, by their infinite variety of form, color and texture and size, are eminently well-suited to divide, connect and enrich our garden spaces. They must be so arranged that spatial relations are established between themselves, and between them and other objects. Without a spatial concept, the use of materials becomes a collection of objets d'art, with no reason for being. Rocks have importance and character only in relation to other materials and specific situations. They cannot be judged singly in themselves. The quantitative and qualitative relationship established between rocks and other materials around them determines the strength and clarity of expression of the rocks, and their effect upon the space from which they are viewed. Space organized liberally and richly with specific earthy materials like rocks and water, in controlled and balanced contrast to the smooth, plastic elements of concrete, wood, steel and glass, brings out and emphasizes the character of each.

With plant materials, contrasts of dark and light, dull and glossy, fine and coarse, horizontal and vertical, loose and rigid, help each other to richer, fuller and more expressive participation in the general scheme. So too with rocks, contrasting colors, sizes, forms and textures enrich and improve the landscape. Rocks should be used for their beauty of form and texture, not merely to look natural. It has often been said that only rocks indigenous to a particular area should be used in landscapes there, since they would appear to have been there naturally, and that in areas with no naturally-occurring rocks none should be used since everyone would know they were not there naturally. What inconsistent thinking that is; it would be as logical to say that no water should be used in desert landscapes, nor rhododendrons and azaleas in Norfolk, Virginia, since none of these items occur naturally in those places. Rocks are being used in the Tidewater, Virginia, area, where none naturally occur, and they are considerably enriching an otherwise flat plane relieved only by man made structures and plant materials. The demand for rocks there is increasing appreciably, and in the larger sizes a considerable quantity of light, volcanic rock is being used. At the Norfolk Botanical Garden, 40 tons of "Featherock" were put in at one time in 1961, mostly in the form of large boulders.

Some Relationships Between Rocks and Plant Materials

It is easy to observe some natural effects of rocks upon plants growing in the wild. In pastures, Juniperus virginiana is found in

many cases flourishing beside a rock. Here the rock serves a manyfold purpose. It protects the young seedling from the sharp hooves of grazing animals; it may release calcium, phosphates or lime to be used by the plant; it absorbs heat by day and releases it by night to keep the young plant warm; it mulches the roots to hold in the moisture; and it keeps the roots warmer by winter and cooler by summer. An added benefit to man is the aesthetic effect of the large tree with a rock at its base; if the tree clasps the rock with its roots, so much the better.

All of the above benefits are conferred upon plants in the garden that are grown in association with rocks. Should acid-loving plants be placed near limestone rock? Yes, rhododendrons and mountain laurel are found frequently in the mountains in such a situation, thriving luxuriantly. They benefit from all the other functions of the rock, and apparently the lime dissolved from the rock is not concentrated enough to raise the pH to the danger point for these plants. The heavy rainfall in most such areas rapidly leaches the dissolved lime from the soil.

A garden is a living piece of sculpture; whether it is composed entirely of plant materials or architectural forms, or a combination of the two, it is an experience of the mind, a composite of what we see, what we think we see, what we hear and smell, and what we feel as we experience the other sensations. For those who like original sculpture that does not change rapidly nor require maintenance, rocks are the ideal solution. No two are alike; they have infinite variety due to

the play of sun and shadow, moisture and the angle of viewing. Should we use rocks alone, as do the Japanese, or as a foil for plants as do the English? Neither and both; they will be used primarily as suits the fancy of their owner. If he is a plant lover, he will use plants with the rocks. If his spirit soars with the stark, bold outline of a rock standing in solitude, he will not soften that feeling with plants. If he is a little concerned with his "image" as seen by the neighbors, he might feel compelled to use plants, because not to do so is a little radical. What kind of plants should he use? Any kind he desires can be used, dictated only by the confines of climate, space and his penchant for maintenance and installation expenses. In general, plants with a delicate or sparse leaf-pattern give a feeling of lightness and relief to the heaviness of rock. Plants with large or textured leaves add to the feeling of gravity. With the American inclination for more leisure time and less maintenance, coupled with many homeowners' inability or disinclination to give plants steady surveillance, it is suggested that plants be used, in most cases, that will go through long periods of neglect, require a minimum of maintenance, and look good throughout the year. Dwarf conifers and other slow-growing, dwarf woody plants meet these requirements well. While many of them are rare collector's items, there are a great number which thrive in the ordinary garden and are of little initial expense. Among plants recommended in this category are:

Arctostaphylos uva-ursi	Bearberry
Berberis thunbergi atropurpurea "Pygmaea"	Dwarf Japanese red barberry
Berberis triacanthophora	Dwarf evergreen barberry
Berberis verruculosa	Warty barberry
Chamaecyparis obtusa (dwarf varieties)	Hinoki cypress
Cotoneaster dammeri	Bearberry cotoneaster
Cotoneaster horizontalis	Rock cotoneaster
Cotoneaster adpressa praecox	Creeping cotoneaster
Ilex crenata Varieties Helleri, Foster No. 1, Kingsville and Stokes Dwarf	Japanese holly
Ilex cornuta compacta	Dwarf Chinese holly
Ilex cornuta rotunda	Dwarf Chinese holly
Juniperus communis compressa	Dwarf Irish juniper
Juniperus communis depressa plumosa	Andorra juniper
Juniperus conferta	Shore juniper
Juniperus horizontalis Varieties Bar Harbor, Douglasi (Waukegan), Blue Rug, Webberi, Wiltoni, and Procumbens.	Creeping juniper
Lonicera nitida	Box honeysuckle
Mahonia aquifolium	Grape holly
Nandina domestica nana	Dwarf nandina
Pachistima canbyi	Canby pachistima
Picea abies nidiformis	Bird's nest spruce

Picea glauca conica	Dwarf Alberta spruce
Pinus aristata	Bristlecone pine
Pinus mugo	Mugho pine
Pinus strobus nana	Dwarf white pine
Pinus strobus pendula	Weeping white pine
Taxus baccata repandens	English yew
Tsuga canadensis pendula	Weeping hemlock
Yucca filamentosa	Adam's needle

While these plants maintain form and color for most or all of the year, there are also numerous annuals and perennials that are grown with rocks; any reference listed under "Rock Gardens" will give many helpful suggestions as to herbaceous plants and their culture. However, these plants require a great deal more attendance than woody shrubs, and completely change the picture at different seasons, as they bloom, go to seed and die.

PROCUREMENT AND HANDLING OF ROCKS

In Japan rocks are sold in department stores and special rock shops. In America, only the volcanic tuff rocks are sold for landscaping in large sizes. This is due to their light weight, which is about one fifth that of other denser rocks. These rocks, popularly known as "Featherock" or "Lavarock", cooled from boiling lava during ancient volcanic eruptions on the West Coast. While cooling, escaping steam left many air pockets so that these rocks are honeycombed with small pores. They have many areas of use, especially for sculptured and shaped features, and in areas devoid of more durable rock. Although a matter of personal preference, it seems to the writer that these imported rocks, with little natural character, should be used sparingly in areas with abundant natural rocks.

How do we go about finding and moving natural rock? First, commercial sources such as quarries, gravel and stone companies can usually furnish and deliver crushed stone and rounded creek pebbles at modest cost. These include such items as white marble chips, either cut or rounded, and black obsidian pebbles, rounded and polished, with many colors and textures between. The pebbles and crushed stone are used for ground cover or mulching, and as aggregate in concrete items, especially in planter boxes and ground surfacing. Larger size rocks must usually be collected, as their weight prohibits handling them on a commercial basis. Any creek or river-bed in rocky regions will have copious quantities of rounded cobblestones that can be obtained in-

expensively, labor being the main cost. Many roadside cuts display cobblestones that were deposited there long ago. Larger boulders, while abundant, are more suitable if we have spent an afternoon roaming the fields to select the best specimens. Many landscaping firms are now stocking such rocks during periods of slack in the labor force. Their main disadvantage is weight and the labor involved in handling them more than once. For sizes larger than a "two-man" rock, a winch hoist on a truck is usually adequate. Where such an arrangement is not available, a chain hoist with block and tackle, hung from a stout steel tripod, can be used. For very large boulders (up to six tons each) a wrecking service or front end loader can be hired. If the boulder is to be partially buried, the hole should be dug beforehand; then the machine operator can unload the boulder into the hole and position it as desired all in one operation. This service is relatively inexpensive, especially if the rock source is nearby and several rocks are to be moved at once. Those with wrecking services are usually glad to move rocks if it can be scheduled to their convenience.

As has been previously pointed out, the Japanese and British evolved many hard and fast rules as to the forms, kinds and positioning of rocks in the garden. American writers have developed their share of rules on the subject, based mainly on Japanese and British rules. I advocate only ONE main rule for a GOOD display of rocks: let one person select and supervise the placing of the rocks, and let him be a person whose primary concern is getting the proper "feel"

of the composition. This is a work of art, and like any other such work can have no other rule than that it please the creator. Whether this artist lacks any formal training, or whether he has studied all the literature on rocks and rock gardens, experience will still be his best counselor, and he will strive to improve each composition over the last.

SUGGESTIONS FOR THE USES OF ROCKS

The Blue Ridge Mountain area of Virginia is rich in the quantity and diversity of landscape rock naturally available. Although they have been used to some extent in residential and commercial landscaping there recently, their potential has been barely touched. With the given rolling, mountainous terrain of the area, rocks could be advantageously used in many ways not only in home landscapes, but around industrial developments, in parks, on campuses, along highways, in parking lots and around commercial establishments. Following are some recommendations for rock uses in various locations.

Residences

Rocks may be used here either for their beauty, utility, symbolism, or for all three. To many people a stone in the garden is a symbol of security and permanence; coupled with this is the rock's patina of age, its lichens and mosses, and its etched, eroded surface. The attraction these features have for us may indicate our pre-occupation and identification with the passage of time, and perhaps the feeling of transcending time. These old, naturally sculptured stones give a feeling of calm, while a freshly cut rock conveys a sense of the mechanized, contemporary work of man. Figure 8 suggests some uses of rocks in the residential landscape as ground cover, stepping stones, and featured sculptures.

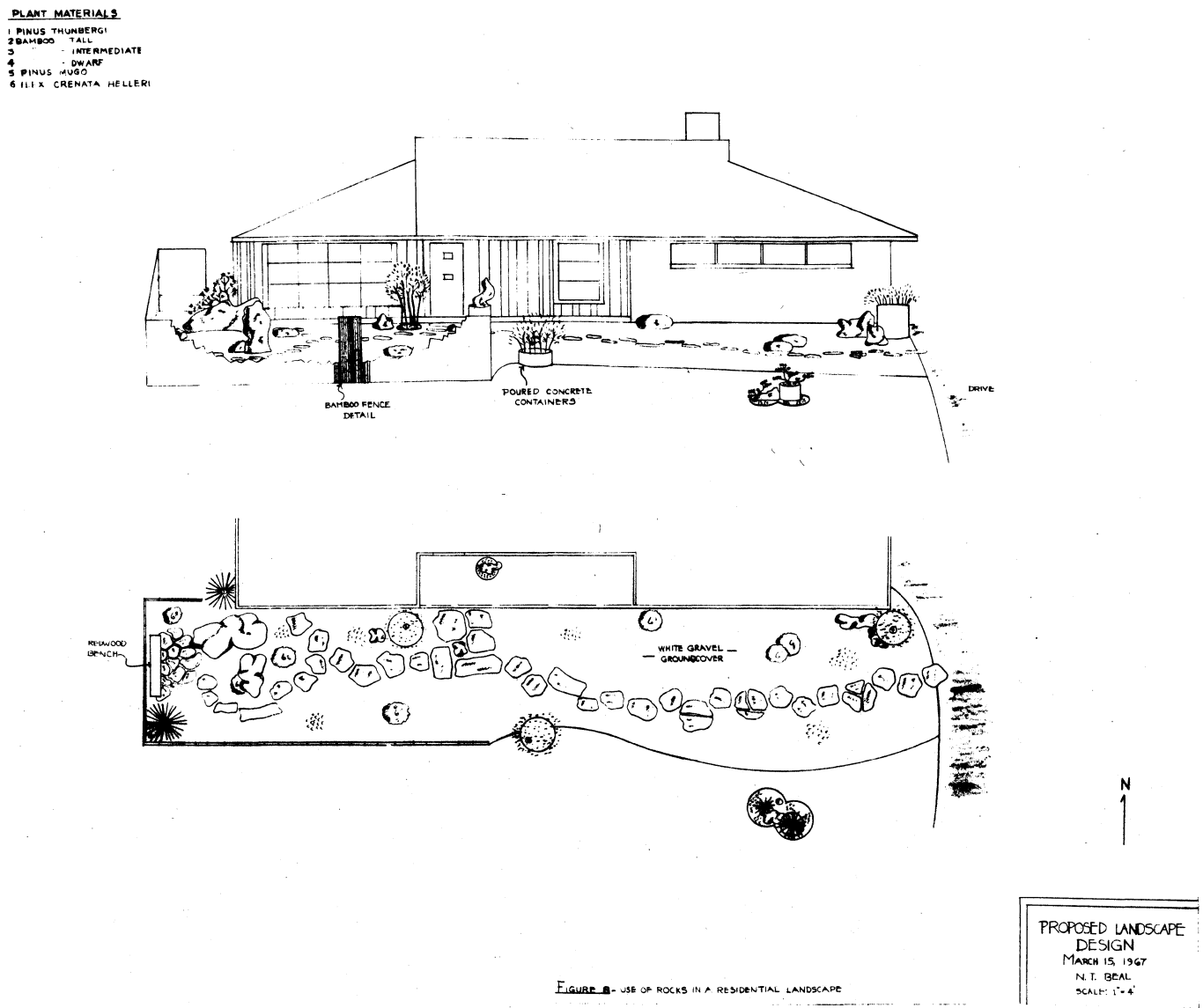


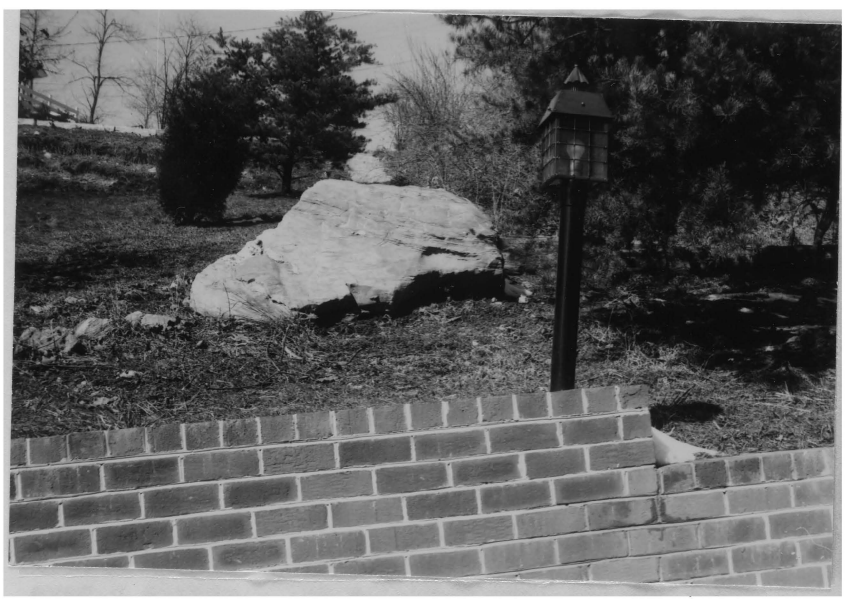
Figure 8. Use of rocks in a residential landscape.

The first consideration in designing most American gardens is ease of maintenance. The second thought is the beauty and livability of the space, so the two concepts must be interwoven into the design. The two planes of the home garden where we might use rocks to great advantage are the ground or base plane, and the vertical plane. In the ground plane there are large areas of the "yard" that must get a ground-cover treatment of some sort. Grass is one of the most expensive and least interesting treatments we can give the ground plane. Ground-cover perennial plants have good textural patterns, but will not endure heavy foot traffic. Paving of asphalt or concrete is expensive and durable, but not very attractive in color or texture. A rock ground-cover has the desirable attributes of good color, interesting form, rich and varying texture (changing with moisture, light and shadows), permanence, minimum maintenance, low cost, and the ability to withstand traffic. Rocks need no pruning, no fertilizing or water, no spraying, and are little affected by temperature or other weather extremes. A pebble ground-cover should be edged with flat paving stones or a similar hard material for ease in mowing around it. The texture of such a cover is created not so much by the individual pebbles, which are generally rounded, but by the play of light and shadow on the spaces created between adjacent pebbles. A mixture of pebble sizes increases textural interest. The larger the individual stones used, the greater will be the textural impact on the observer. One way to use collected large creekbed stones, which may be up to six inches

across, is as a ground-cover around the foundation of the house, extending out to the dripline of the roof as illustrated in Figure 4. For traffic areas, a smaller size of pebble must be used. Pebbles of up to two inches in diameter can be used as ground cover in specially-shaped beds displaying specimen boulders and plants; in planter boxes and containers; in driveways to suggest a dry streambed, with large, flat-topped rocks randomly scattered through them; in planting pockets in the patio; as a functional area under gutter spouts to break the force of runoff water; around and between stepping stones; and in bodies of water. Rocks get exaggerated emphasis in color and texture when they are wet. Pebbles used both in and beside a water feature, such as a pool, waterfall or stream, present the added contrast between dry and wet pebbles. The main limits to the area which might be covered with pebbles will be expense, preference of materials, and desire for variation.

In connection with more or less level areas around the house, which might get a gravel ground cover treatment, the opportunities for sculptural rock forms of many sizes are infinite. These boulders may be of any size from the "one-man" rock and up, limited only by the proportions and scale of the space, the house and the rock. Here one or more large shaped rocks can be used as a retaining wall or as a focal point as in Figure 9; as a contrast to plant materials or smaller pebble ground cover; as a vertical divider between two areas; as featured sculptures as in Figure 10; as a utility such as bench or table; vertically in quantities in a large area for repetition and

Specimen boulders used as a retaining wall.



Single boulder as a focal point in a residential landscape.

Figure 9

Two rocks in a sculptural grouping.

One boulder used as a specimen sculpture.

Figure 10

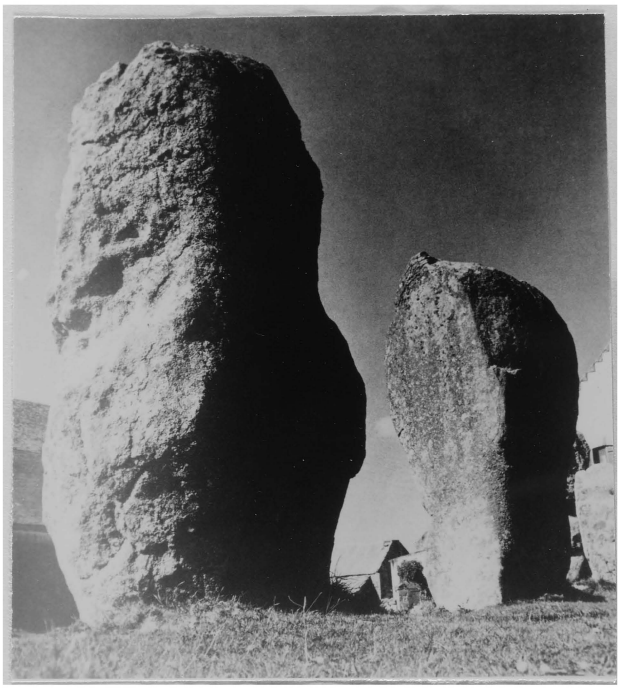
rhythm; on slopes and banks to simulate natural outcrops among a ground cover of plants; thrusting up through a patio, or with part of its mass inside the edge of the patio and part outside within a flight of steps as in Figure 11; as part of a waterfall; in and beside pools or streams; in dry streambeds; perched or imbedded on a pedestal; and in the case of a very large boulder, as a screen, either to hide something, or suggest something mysterious on the other side by the device of curving a path around it. A boulder protruding into the lawn should have either a flat paving around its base for mowing ease, or a weed killer can be applied for a short distance around it to eliminate trimming. Rocks in lawn areas will necessitate slightly more trouble in mowing, but little more than a tree. Figure 12 suggests the feeling conveyed by large vertically placed rocks.

Something special must be said about rocks used with water. In nature the two are very frequently found in association. A rock arising from water is doubly appreciated because of its reflection and the feeling of contrast between the fluid, mobile water and the solid, static rock (see Figure 13). The gushing mountain stream, running amid boulders on a rocky bed with successive changes of level, provides food for the eye and music for the ear. With the aid of recirculating pumps, anyone can have a water feature in his garden, even a stream. The stream should meander, and a large overhanging rock ought to be placed where there is a fall, so the water runs over it to splash with the greater intensity of sound on other rocks below.

Rock placed in a flight of stairs as a natural feature. (b)

(b) Editors, Sunset Magazine, 1965, Landscaping for Modern Living. Lane Book Company, Menlo Park, California. p. 74.

Figure 11



Two views of boulders used vertically as sculpture.

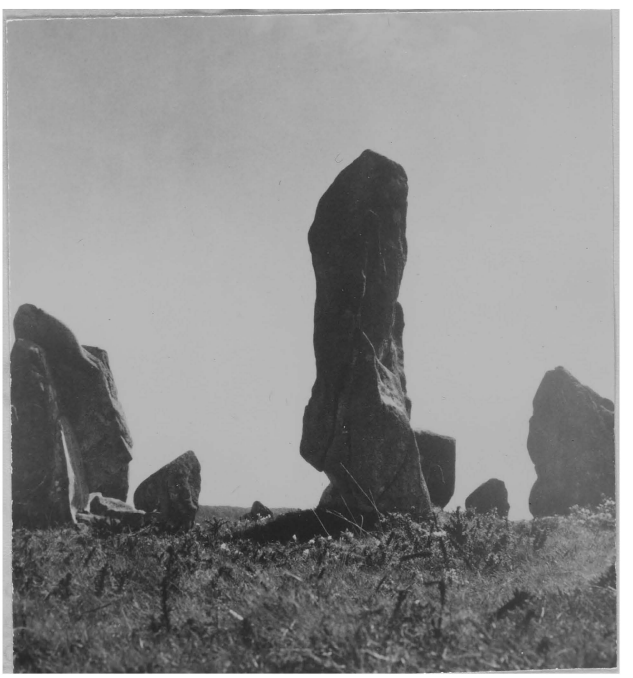
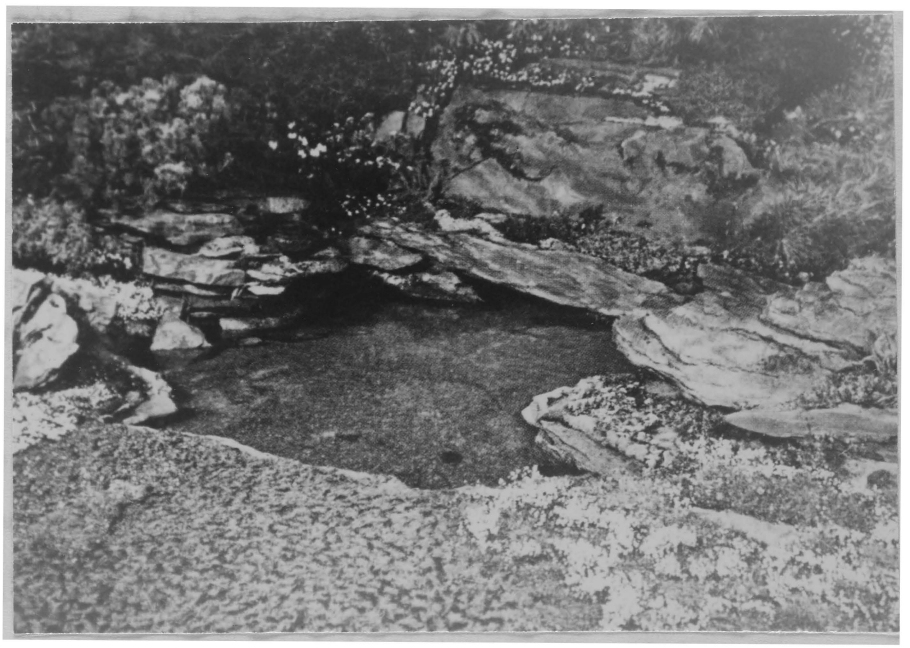


Figure 12



Rocks and water simulating a
natural woodland pool. (c)

(c) Editors of House and Garden, 1955,
House and Garden's New Complete
Book of Gardens. Simon and Schuster,
New York. p. 15.

Figure 13

From Japan we have learned to be more concerned with the moods of water than with its pictorial representation, especially in small spaces. A water body need not be large in order to instill a mood. A hollowed stone full of water can embody the reflective peace of a woodland pool. A tub, sunk into the ground and margined with plants and rocks, can give some suggestion of a stream when the reflective water surface is viewed. Naturally hollowed stones, chiseled-out stones, boulders with one or more incised geometrical basins, stone troughs, concave stone aggregate, and even old mill wheels might be used as water containers in the intimate landscape.

An area near many homes that has little traffic but could present a very pleasing view to the owner is the bank or slope. This is an area that very often is left in a natural state of red clay after building. Eventually some native plants might come in, but meanwhile it is an eyesore, and erosion washes mud from it onto other, more-used areas. An ideal way to treat this slope is to put in groupings and outcrops of layered rocks, and/or, as mentioned before, specimen boulders. These should be imbedded in the slope so that their main mass angles down from the horizontal and into the bank, to prevent their being dislodged by weather or people. For access to the top of the bank, stone steps can be placed at a diagonal angle across its face. Then plants of various ground-hugging and upward growing types can be randomly planted, and the remaining ground surface heavily mulched with pine needles for low maintenance. This type of slope treatment looks fairly well-finished

immediately after completion of construction. The plants should be chosen for hardiness, ease of culture and rich foliage values; bright flowers, if produced, should be considered a bonus. The main idea in designing the arrangement of a slope is to approximate a natural rocky bank like the one shown in Figure 14.

One distinctive American adaptation of a Japanese garden idea is the case of the earth mound. In Japan it is a raised, stylistic structure representing a hill or peak. In this country it is being used in the fronts of some houses to screen the entry from street sights and sounds, taking the place of a fence or other screen. It is usually planned with a ground cover of some carpeting material, with rocks interposed, if desired, and perhaps a few small trees or shrubs. Such a mound treatment is seen in Figure 15, used in a commercial landscape. The above is a valid example of assimilating an art form of another country into the culture of the receiving country. If we are to enrich our gardens in a specifically American way, it must be by absorbing the essence of the garden art of other cultures and adapting them to our increased tempo of life; mere imitation of the Japanese garden, with its symbolism tied to another philosophy and way of life, can only lead to sterility and entrenching of "a style" rather than "style" in our gardens. There is a world of difference between the two terms. The first reflects what has happened in this country for too long, both in gardens and in architecture, where beautiful ideas from the past of other cultures have been faithfully reproduced here, as if in a country as young

A garden built on a naturally rocky slope. (d)

(d) Editors of House and Garden, 1955. House and Garden's New Complete Book of Gardens. Simon and Schuster, New York. p. 82

Figure 14

Adaptation of the Japanese earth mound surrounded by a sea of pebbles in an industrial landscape.

Figure 15

and vigorous and rich in materials and natural landscapes as America there were a great dearth of ideas about how to use them in a manner adapted to our ways. The second term "style" refers to the making of a building or a garden that is distinctive, appealing, and existing for the comfort and edification of those using it. Our gardens can have style only if we design and build them to suit the living habits and temperament of their owners; to put in a "period" garden, whether baroque formal or Japanese pictorial, is to stifle and freeze the space they are in, in much the same way a "parlor" with dainty Victorian antique furniture is frozen.

Rocks can also be brought into the home as functional and sculptural elements, as was done by Frank Lloyd Wright in many of his houses. One suggestion is to build a wall of the basement or other room atop and around a lichen-covered boulder which projects out into the floor; or a large rock might be imbedded in or near the center of a room, to direct traffic in a circular pattern. A mammoth, hollowed, rounded rock might be placed in the center of a room to be used as a fireplace, with a hood in the ceiling above to remove smoke.

Early in the history of film-making in this country, many types of artificial rock were devised, mostly of concrete. A class of skilled artisans arose, and some very creditable rocks were produced. There was a great demand for them to be used for retaining purposes in the hilly gardens of Southern California in the 1920's. However, most of the old artists have now died, and their skill with them.

Today there is one artificial product worthy of mention in the rock field, called "Fibrorok". It is made from fiber glass and plastic impregnated with finely crushed granite. It is a thin, hollow cast of a natural rock, but only weighs one twentieth as much. It faithfully reproduces the smallest creases and knobs, and the color and texture cannot be distinguished from natural granite by any but minute inspection. This product is useful for enclosed patio gardens or indoor gardens where it is impractical to carry in heavy natural stones. However, it is subject to chipping because of its thinness, and does not withstand hard frost well. In the home "Fibrorok" is sometimes used for waterfalls.

Industrial Sites

In and around industrial plants, rocks can be used to the greatest advantage to display their massiveness and individual character. Because of the large physical size of most industrial concerns, huge boulders can be used and still keep within the realms of proper scale and proportion between building, site and rock. They should be employed on such sites as dramatic spatial sculptures, with large areas of gravel ground cover around them for texture and color contrast. Plant materials can be used in association with the individual rocks, but they should be of a foliage sparseness and delicateness that will complement and emphasize the heft and solidity of the rock. Plants, if used, should be placed as definite objects in space, not as shrouds muffling the rock.

Parks

Olmstead set the pace for rocks in parks over a hundred years ago with New York Central Park. People go to a park for many reasons, a major one of which is to return to the repose of nature amid the turmoil of life in the city. The solidity and quiet stability of rocks does much to create this feeling of peace. In a park, rocks probably should be used mainly, more than anywhere else, to look as if they had developed there as natural outcrops so as to contribute to the feeling of nature. Here, gravel ground covers have little place, unless it be in a special Japanese section or in a more formal usage around park buildings. Specimen boulders have a place as vertical space dividers, to direct and divide pedestrian and vehicular traffic, in children's play areas as objects to clamber over, and as objects of contemplation. Otherwise, rocks of varying sizes should be used mainly as counterpoint for plants in natural areas.

Campuses

Most college campuses today are big and sprawling, and likely to become more so. Their large expanses of landscape space, combined with clean-lined new buildings, offer ample opportunity for the display of sculptured boulders and rock outcrops. Since Virginia Polytechnic Institute at Blacksburg, Virginia is close by and well-known, I will suggest ways of using rock there that might also be easily adapted to other campuses.

At V. P. I., as at any campus situated in a naturally rocky environment, rocks could serve two purposes; to reflect and emphasize the grandeur of the surrounding countryside, and to act as textural, kinetic, spatial elements in their own right. Several dramatic boulders might be randomly placed in the divider strip of the ceremonial entryway to the War Memorial. Here, they would act as formal sculptures due to the nature of the straight drive. They might be imbedded in concrete to tie in with the planed limestone memorial, or placed in geometrical beds of pebbles edged with flat rocks for easier mowing. Plants should be used very sparingly if at all with this rock treatment. On steeply sloping banks, such as the one on the North side of Patton Hall, the lawn might be interspersed with outcrops of native stone. Specimen boulders might also be placed near buildings to serve as focal points. Such a rock is now located on the South side of the old War Memorial gymnasium, probably remaining as a feature existing on the site since the dawn of man. The new concrete Coliseum at V. P. I. might also be effectively tied to the earth and surrounding buildings of native stone by the use of rocks. Here I suggest using randomly-placed, different-sized sculptured boulders around and near the base of the supporting concrete arches, which arise from an untreated ground surface and connect with the top of the Coliseum. The arches present an organic and exciting configuration in space when viewed from inside the building, but from the exterior they seem to be unfinished and awaiting more treatment. It is suggested that, in line with the geometric proportions of the Coliseum,

a line be drawn approximately three feet beyond the ground ends of the arches, and the entire enclosed ground area be mulched with pebbles of various sizes, placed around previously positioned boulders.

Boulders unearthed during excavation for new buildings might be profitably used in landscaping on campuses. In areas with natural outcrops of stone, especially where only small surfaces are seen, it is suggested that more surface be exposed by digging away the soil around the rock periphery.

Highways

Along with the national emphasis on landscaping and beautifying our highways, I suggest rock as a material that will require no maintenance, will maintain its form and interest year-round, and will not have to be replaced like plant materials. A unique experiment in landscaping highways is the Upper Reach of the Taconic State Parkway in New York. Built in 1933, it involved a minimum of cut and fill so that the two separated northbound and southbound roadways independently rise and fall along the most favorable contours. Woods, fields, and rock outcrops are preserved as part of the experience of the highway. In rocky areas of highway construction, as on campuses with building programs, many large desirable boulders are likely to be unearthed during the building process. With the front-end loaders and large earth-moving equipment used on highways, it would be a simple matter to put these boulders into place during construction. This would both get rid of the rocks and beautify at the same time. With the untold

miles of highways in this country, opportunity for the variable employment of rock for landscaping is endless. Rocks may necessarily have to be placed at some distance from the highway for safety's sake. Rights of way vary from 5 feet to 160 feet, and generally large rocks would not be placed within them. Since special emphasis is placed on spurs and entries into cities off our main highways, it is suggested that a more intensive treatment of pebbles or cobblestones as ground covers might be used in those places. Due to the high speeds at which most automobiles travel, the larger the size of cobblestones used as ground cover, the more will their textural patterns be appreciated.

Parking Lots

Many cities have become concerned with the unattractive image created by plain, paved, unadorned parking lots and have taken steps to relieve this look. Many plant materials have been suggested and used; however, due to the small surface for rainwater absorption and the reflected heat from the surrounding paved surfaces, plants must make a real struggle for survival in such areas, and many of them don't make it. Here again, large boulders could be profitably used to enrich the space, with ground covers either of pebbles, or plant materials such as Juniperus horizontalis that thrive in hot, dry locations.

Commercial Sites

Today in commercial buildings more than anywhere else we see experiments in the new look, feel and form of architecture. The look is functional, clean, sleek, and perhaps in many cases even aseptic. Steel, glass, marble and aluminum are materials typically of the flat plane, having variations in color but little in texture. Although many commercial structures are in the heart of the city, making it impractical to use rocks around them, many others are in the suburbs or in other locations with ample room for developing sculptural details in rock. A natural boulder and a polished granite wall properly juxtaposed can be of greater mutual aesthetic assistance and reinforcement than any mystical benefits supposed to derive from their absolute separation. Other rocks as spatial elements away from but near the building go further to enhance the feeling of union between man-made structure and its site. Figure 16 illustrates the use of large boulders as landscape sculptures around apartment building complexes. The rocks were unearthed while excavating for the structures. The bold splash of large leaves, and the shadow and substance of mighty boulders, relate the new building to our past and provide a sense of continuity. One or more boulders imbedded in a wide paved pedestrian entryway to a bank or office building could divide the flow of foot traffic or act as a barrier behind which a drinking fountain, bench or small planting might be placed. Rocks inside are elegant and formal appearing, despite their natural look. Their texture and color complement their

Boulder placed as sculptural feature
in an apartment building complex.

Figure 16

original form to greatly enrich and relieve an austere man-made space. Boulders imbedded in the lobby floor might direct traffic flow and act as a focal point. Due to the need for a commercial building to look polished and neat at all times, pebble or cobblestone ground covers outside would greatly reduce maintenance costs and change little in appearance over the years. Very large rocks can be used here to screen and exclude people using sidewalks nearby along the city streets. Here again, waterfalls and pools can be generously displayed, using large rocks to naturalize them.

In some instances the structure has been completely integrated with the rocky site. A good example of such planning is an amphitheater built in a natural rock outcrop of vast proportions, pictured in Figure 17.

At the UNESCO building in Paris, Isamu Noguchi has used rock of many different sizes, shapes and colors for walls, ground cover, stepping stones, paving and natural spatial sculptures. The result is an extremely rich, organic, textural garden.

An amphitheater built in the midst of huge natural rock outcrops. (e)

(e) Kassler, Elizabeth B. 1964. Modern Gardens and the Landscape. The Museum of Modern Art, New York. p. 88.

Figure 17

SOME PREDICTIONS

With our country becoming more intensively populated, mechanized, and conscious of leisure time, the demand for labor-saving, maintenance-free landscapes is increasing. With our expanding national consciousness of art, culture and beauty, our demand for enrichment and more livability in the landscape is also expanding. Both these demands are met by the use of rock, in its infinite variety, as an enriching, low-maintenance material. I predict that the use of rock will materially increase in the near future in landscapes, in all sizes, shapes and colors. Rock is abundant and is part of our heritage; we have the right and the opportunity to use it in numberless ways to enrich our spaces and lives. The day when we will sell non-precious rocks in the department store is far off, but the day when nurseries and landscaping firms will use rock as liberally as they do plant materials is fast approaching.

With the increasing number of articles on rocks appearing in national gardening magazines, nurserymen and landscapers are becoming more aware of demands for high quality "rock-scapes". They are educating themselves about the beauty, utility and vast potential of rocks as ground covers, as individual specimen sculptures, as space dividers, as plant complements and in various other ways as enriching elements in the landscape. Will the use of rocks become overdone, as was the case with the English rock gardens in the U. S. in the Thirties, causing people to lose interest in them? It is probable that many

designers will indiscriminately use rocks to create stereotyped landscapes, and the rocks may be installed in such a way that they become problems. For instance, the gravel ground cover shown in Figure 9A was placed directly on red clay without a covering of plastic. This causes red water to ooze up through the gravel during wet weather, leaving red stains. Also, weeds come up through the gravel. Both problems could have been eliminated by the use of black plastic under the rocks. Also, the use of flat paving blocks around the edge of gravel ground cover areas will eliminate trimming problems when mowing grass. Children may be inclined to throw small pebbles. This will be an individual problem, much the same as a decision on whether to install a pool in the backyard. It is a matter of training and priorities. However, I don't think we will become tired of rocks again because (1) we are using them in so many different ways, rather than as a stereotyped foil for plants only; (2) we have seen what beauty they can bring; (3) they can be used for utility purposes, such as gravel under the downspouts; and (4) they are ideal as minimum maintenance elements when their installation has been properly designed and supervised.

The use of rocks as landscape elements is increasing the world over; young architects are using them as textural, spatial objects in and out of their buildings. Rocks are elegant, beautiful, natural and durable objects; as such, I believe they will become less and less nuisances on the building lot, and more and more utilitarian objects of art in the landscape.

SUMMARY

The Chinese first used rocks as landscape elements in 2000 B. C. Their rocks were of huge proportions, and were hollowed out until they resembled large sponges. They were placed in vertical and leaning positions in the garden.

The Japanese inherited a love of rocks from China, along with Buddhism, at about the dawn of our Christian era. The Japanese developed their own style of using picturesque, natural rocks as sculptural items, as stepping stones, ground covers, water basins, pagodas, lanterns and as enriching elements in water bodies such as waterfalls, pools and streams. Rock usage in Japan has endured and intensified for 2000 years, and there is a national reverence for the feelings inspired by rocks in that country.

The Italians made some use of natural rocks as supporting features around the fringes of their formal gardens in the 16th Century, mainly in grottoes and as bases for their fountain sculptures.

The English borrowed the grotto from Italy and incorporated it into their 18th Century naturalistic gardens. At the same time, they adapted the oriental ideas on rocks to the English passion for collecting horticultural specimens, and produced the typical English rock garden, with natural-appearing rock outcrops studded with alpine plants.

In America, Andrew Jackson Downing attempted to introduce the English natural style of gardening in the early 1800's with modest

success. Frederick Law Olmstead originated the idea, in 1850, of preserving natural site features such as rocks and trees while building. In 1920 the English rock garden began to be copied extensively in America; however, by the mid-Thirties, so many of them had been built, with such monotonous uniformity at so much expense, that people grew tired of them.

Several American designers and architects, notably Frank Lloyd Wright, Garrett Eckbo and Thomas Church, used rocks in new and exciting ways in the Twenties and Thirties. Their use of rocks in the house and landscape were radical and shocking.

After World War II, servicemen returning from Japan brought news and pictures of the use of rocks in strange, exhilarating and sensible ways in that country. There began a period of borrowing Japanese landscapes to reproduce in this country that is still continuing. However, many Japanese ideas are being changed and adapted to the American temperament and way of life, and it is to be hoped the process will continue. Only by developing our own landscapes with an eye to style rather than "a style" can we have truly American gardens.

There are three types of rocks; igneous, sedimentary and metamorphic. They are found in sizes from grains of sand to pebbles, cobblestones and boulders. Any of the above may be and have been used in landscapes.

Pebbles are from 1/2 inch to six inches in diameter, cobblestones are from six inches to one foot in diameter, while boulders have no maximum size. Sand, pebbles and cobblestones can be used as

ground covers. They should be underlaid with black plastic to control weeds and prevent soil from coming up between them. The ground cover areas should be edged with a flat material such as rock, concrete or wood to facilitate mowing. Boulders may be used as specimen sculptures, space dividers, screens, accessories to plants, mass groupings, and in any other situation that the designer might want to use them.

Rocks have vast potential as landscape elements in residential, commercial and industrial developments, on campuses, along highways, in parking lots, parks and around public buildings.

In residential landscaping rocks can be used as ground covers, stepping stones, sculptures, retaining walls or space dividers, in bodies of water and in numberless other exciting ways.

In commercial and industrial developments, the large scale enables us to employ massive boulders as enriching sculptural elements to contrast with the modern new architecture.

In parks, on campuses, along highways, in parking lots and other sites, rocks can be arranged as objects of utility, beauty and low maintenance. Due to the awakening interest in these uses of rock, I predict that their usage will increase substantially in the next few years.

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ROCKS IN THE AMERICAN LANDSCAPE

by Norman T. Beal

ABSTRACT

At the dawn of history, man used rocks for shelter, defense and places of worship. As he became more advanced, he evolved art forms from rock. In China and Japan rocks were used as sculpture with symbolic meaning over 2000 years ago. The English adapted Oriental ideas on the landscape uses of rocks to produce the typical English rock garden.

In the United States, rocks were used very sparingly before 1900 as landscape enriching elements. During the 1920's the English rock garden became popular here, but soon lost its appeal. After World War II national interest was aroused in the Japanese usages of rocks.

Rocks range in size from sand grains to mammoth boulders. They vary tremendously in size, color, texture, stratification and form. They have vast potential as landscape elements in residential, commercial, industrial, campus and highway landscapes, in parks and parking lots, and around public buildings. Naturally sculptured rocks have an aged appearance and a feeling of solidity that ideally qualify them as spatial and enriching elements in the landscape. Their beauty, symbolism, utility and generally low maintenance requirements adapt them to our modern way of life as long lasting, satisfying, usable art forms. In the landscape they may be used as ground covers, stepping stones, natural featured sculptures, retaining walls, space dividers, focal points, screens, in dry streams, in bodies of water, as complements for plant materials and in numerous other exciting ways.