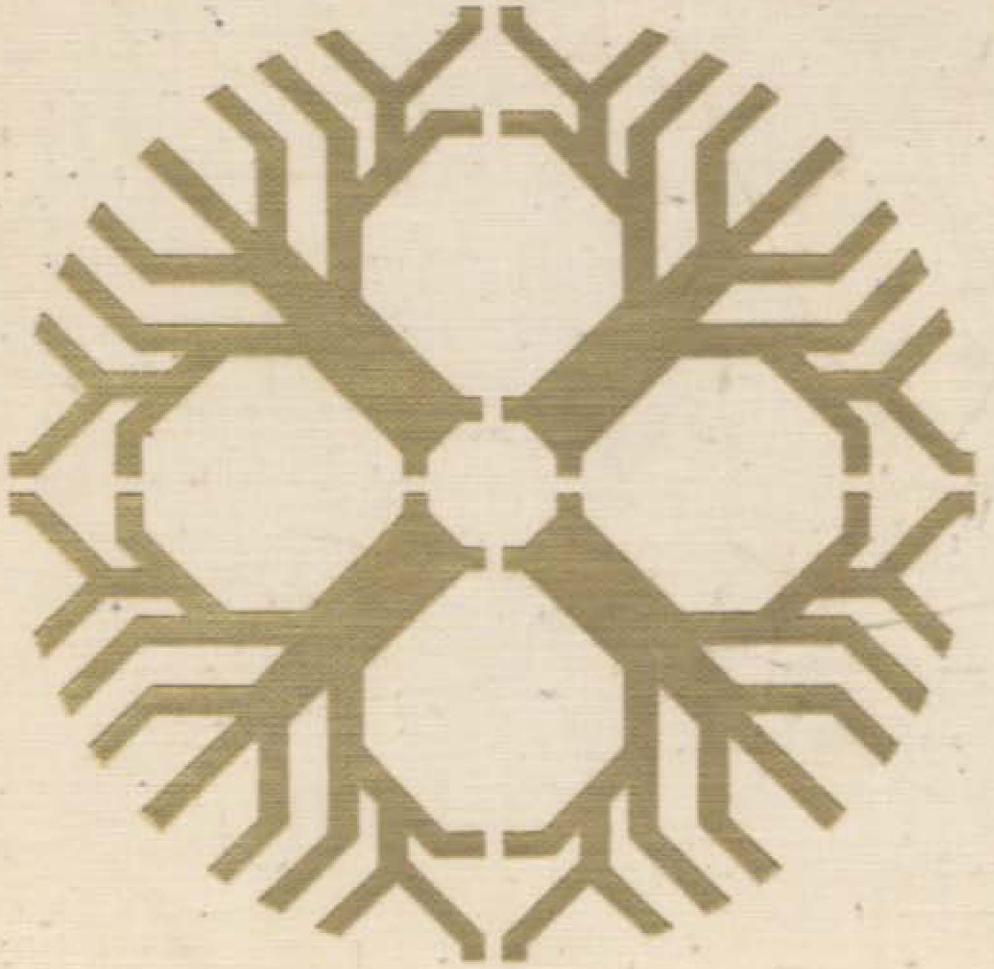

PARDISAN

پردیسان

PLAN FOR AN ENVIRONMENTAL PARK IN TEHRAN

For the Imperial Government of Iran, Department of Environment

The Mandala Collaborative/Wallace, McHarg, Roberts and Todd

1975

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INTRODUCTION

Eskandar Firouz

Man has a living, creative and inseparable link with the environment. To understand the nature and parameters of this relationship, to determine the influence exerted by each on the other, we must learn to understand man and to know his environment. This necessitates familiarity with all the elements of life, including the soil, water and all living things, from the simplest to the most complex of organisms. It implies an awareness that there is "only one earth," and an awareness of this earth's special condition in infinite space.

"Only one earth" was the motto of the World Conference on the Human Environment at Stockholm. We felt that the impact of this motto needed to be somehow captured in a total institution that would propound it as a comprehensive message to the broadest possible public. This institution should embrace the functions of the great museums and zoological and botanical gardens that were built in several countries in previous generations and, indeed, up to the present. However it will also be uniquely different from them in that it is designed according to the environmental and holistic ethos of the last quarter of the twentieth century.

We have sought, therefore, to create a total environmental park. The theme of the park has two dimensions. On the one hand it is concerned with nature—with the history of the earth in its galactic context, and with a range and variety of animals and wildlife, plant life and physical and geological formations. On the other hand, it seeks to place man within this environment, and to represent in various ways the interaction between man and nature. Thus, the diachronic evolution of man's environment, and the present synchronic state of the diversification of species and cultures throughout the world will be presented as a national and international base and center for environmentalist activities of conservation, research, edification, and recreation. The method of presentation is designed to highlight processes of adaptation and change.

It is appropriate that Iran should undertake the creation of such an institution at the present time. It will help us meet our own national role as guardian of a significant number of the world's extant types of ecosystem and cultural adaptation. And it is congruent with our national programs and with the internationalist aims in the field of environmental conservation, which under the leadership of His Imperial Majesty, the Shahanshah, we have pursued during recent years in the creation of the International Park at Arjan as well as the various regional projects we have promoted in partnership with the United Nations Environment Programme. In the internationally oriented institution of PARDISAN Iranians from all walks of life will be encouraged to learn about environmental causes and effects—processes which will be presented to them by means of the most advanced audio-visual and museological techniques available and from the standpoint of the Iranian cultural

1. Color Mosaic of Iran, prepared for the Imperial Government of Iran from 108 Landsat I images, by the Earth Satellite Corporation, Washington, D.C., U.S.A. Copyright 1975

experience. PARDISAN will be experienced in different ways according to the cultural background of the visitor. Non-Iranians will gain from it the more because the presentation from the Iranian cultural viewpoint will be new to them. They will be stimulated by the experience of familiar interrelationships in unfamiliar contexts. For our fundamental aim is to induce such changes in the existing values of society as to demonstrate that the final aim of development must not be technological achievement solely, but the preservation and enhancement of environmental quality for the greatest good of all mankind by means of technological achievement in its broadest sense.

The name we chose for this project—PARDISAN—is derived from the Old Persian word "pardis," from which along with the familiar ancient Greek cognate, it has developed in both Middle Eastern and European languages into the word "paradise." In the time of the Achaemenians, the first illustrious period of Persian history, the word signified a royal garden, where "all good things the earth provides" might be enjoyed.

In order to realize this conception of a total environmental park we sought a combination of the most environmentally conscious and imaginative Iranian and foreign consultants. Our choice has already been shown to be sound by the fact that their first report received a merit award from the American Society of Landscape Architects in its Professional Awards Program for 1974.

We are happy that the newly constituted Department of the Environment is able to promote this project since it embodies in a most comprehensive and visible way the ideals, philosophy and aims of the Department. To give just a few examples:

1) As a multi-functional institution emphasizing the integration of public recreation with edification, research and conservation, it provides an excellent vehicle for disseminating that environmental consciousness which will enable Iranians to make optimum use of their total territory in the coming decades of economic expansion and increasing population.

2) By putting to use the resources and possibilities at its disposal, and by employing and utilizing scholars and specialists in the relevant disciplines, PARDISAN will be the largest and most comprehensive center in the country for research in all scientific fields related to the environment.

3) In the field of zoology for example, PARDISAN will be a living laboratory for the breeding and conservation of rare or endangered species.

4) The Department of the Environment's Laboratories will be established in PARDISAN and, complementing the other scientific activities of the institution, will undertake research into the various problems of the environment, for example the identification of the sources and types of pollution. We expect, therefore, that PARDISAN will provide signal services for the national and international community, and we believe that it is sited most appropriately—outside the largest population center in the region, where institutions of public recreation and edification are urgently needed.

In the realization of this project we shall be dependent upon the cooperation of a broad range of specialists and agencies of the Imperial Iranian Government which are concerned with planning the use of Iran's resources and satisfying her cultural needs. Hence, just as we hope to establish a new and unique institution, so we hope that the implementation of this project will bring the various responsible organizations into a relationship of cooperation and solidarity commensurate with the precepts of our nation's resurgence movement and leading to the achievement of the excellence to which we aspire in this Master Plan.

THE MANDATE

Pardisan is an extraordinary experiment of world-wide significance. It involves the creation of a new institution devoted to educating people in understanding their environment, the better to utilize it for their success. In the words of its originator, Mr. Eskandar Firouz, "it must transform Iranian attitudes towards the environment," "it must help modern Persians to solve modern problems."

The first decision is one of great imagination and audacity which reverses the traditional separatism and reductionism of the sciences and proposes a reintegration of knowledge for human use. Thus institutions which elsewhere are entitled Academy of Natural Science, Museum of Natural History, Zoological Garden, Botanical Garden, Aquarium and Planetarium will be constituted into a single institution where none of these elements will be discernible as such. Moreover, the purpose of this novel institution will be to inform Persians of their environments, their opportunities and constraints, so as to improve the quality of life for the population of the country. The success of Pardisan, then, will be measured not by the millions of visitors, but by the transformation and improvement in the planning, management and development of the resources of Iran.

The history of Iran is the history of civilization. For over two millennia this cradle of history, crossroads of east and west, developed a broad culture manifest in philosophy and religion, language and poetry, architecture and art, uniquely adapted to its land and people. Today this ancient culture is subject to the onslaught of western technology and values. Today is the time for choice. The decisions are many and they are critical. What aspects of tradition remain the most appropriate strategies for today, what aspects of western technology and values can be absorbed with benefit? Tradition is slow to change. It has the merit of long periods of testing, of trial and error. It has the especial value of being a product of people, place and history. Culture is man's most effective adaptive strategy. Western values and technology, developed for other lands and peoples, can be a mixed blessing when transplanted. There are indisputable benefits; there clearly are also great penalties. Iran is rich in resources and Iran can choose. Pardisan is viewed as an important instrument for making crucial decisions on the planning and management of Iran's resources, enhancing the quality of life for Persians of today and tomorrow.

Pardisan is conceived as a uniquely Iranian institution, in the image of the Persian Garden. The Persian Garden is a powerful metaphysical symbol. It represents the revolution in technology whereby irrigation extended the realm of permanent human settlement outside of the well-watered distributaries of the Tigris and Euphrates. The Persian invention of the qanat, which permitted utilization of shallow ground

Model of Pardisan

water for irrigation, made life and settlement possible in the great colluvial systems at the base of the Elburz and Zagros Mountains, all but encircling Persia. The Garden itself was a miracle of technology, an irrigation system, air conditioning and cooling method, a habitable enclosure in an arid landscape. The transforming waters emanated from the ground in the fountain of the blessed and parted into four ways, creating a Paradise in the desert. The Persian Garden became the metaphysical symbol for a new technology, a new pattern of settlement, a novel agriculture, indeed a new way of life. It contains the reasons for the mainstream of Iranian history and culture. It remains today a powerful symbolic expression.

Pardisan is conceived as a continuation of this tradition. But unlike its antecedent forms, when man was puny in the face of an omnipotent and implacable nature, modern man is equivalent to a geological force, able to destroy the environment and himself.

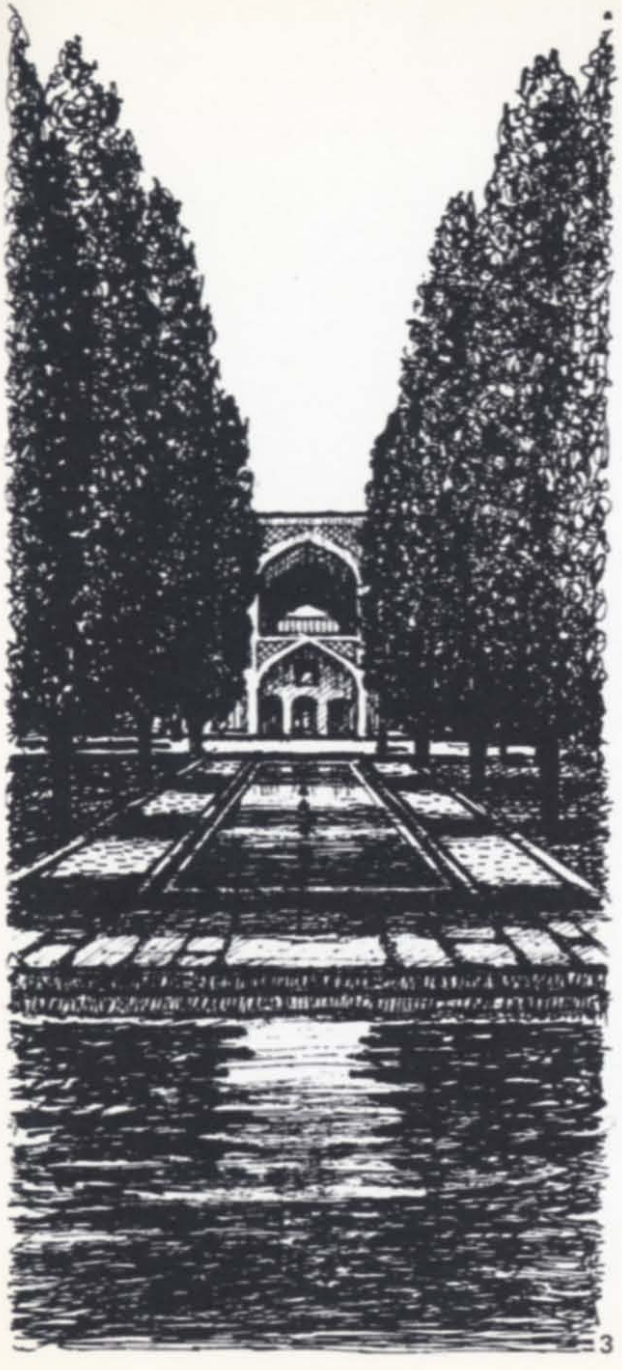
The metaphysical view represented in Pardisan is the unity of man and nature. Its purpose is to understand and celebrate this unity and interdependence. It can invoke modern understandings of man and nature which have evolved over these two millennia. It can employ modern techniques of display and interpretation. Its goal is still in the words of Eskandar Firouz, "to understand man and know his environment."

The implications of this objective are revolutionary; that is, that all of the sciences of the environment, of man and his creative skills are necessary to understand the environment and engage in successful planning, management and design. This proposes that the earth is unitary, divided by science and language, and that knowledge must be reintegrated to solve human problems. Such a conception is entirely consistent with traditional Iranian world views. Implicit in this proposition is a commitment to the understanding of whole systems and thus to the holistic science of ecology. The logic of the objective insists that it be a human ecology, devoted to a diagnosis and prescription of man–environment relationships. The final imperative of the mandate is that Pardisan is overwhelmingly preoccupied with the subject of adaptation in order to assure survival and success of the interdependent creatures, plants, animals, men and institutions composing Iran.

To accomplish this end Pardisan must be composed of the scientific leadership in environmental sciences and management. This staff must be capable of describing, interpreting, and evaluating the natural regions of the country, capable of making predictive statements of the consequences of alternative uses of these resources. They must be capable of transmitting their understanding to both government and peoples with persuasive skill.

Given such a challenging mandate, how can one proceed? It is necessary to design an integrated institution, incorporating the sciences of the man-environment relationship, focussed upon adaptation for the purpose of developing improved adaptive strategies. Clearly the best adaptive strategy for such a purpose is to enlist those minds best qualified to advise. And so, Dr. David R. Goddard was retained to advise on the subject of evolution and adaptation, Dr. Solomon Katz on physiological adaptation in man, Dr. Yehudi Cohen on cultural adaptation, Dr. Brian Spooner on Iranian ethnography and adaptation, R. Buckminster Fuller on epistemological evolution and Dr. Hossein Nasr on the Iranian world view. These investigations were supplemented by intense research, consultations with scientists and visits to renowned institutions in this and other countries.

3. **Persian Garden: Kashan, Bagh-i-Fin**
4. **Ancient Crossroads**
5. **Modern Crossroads**



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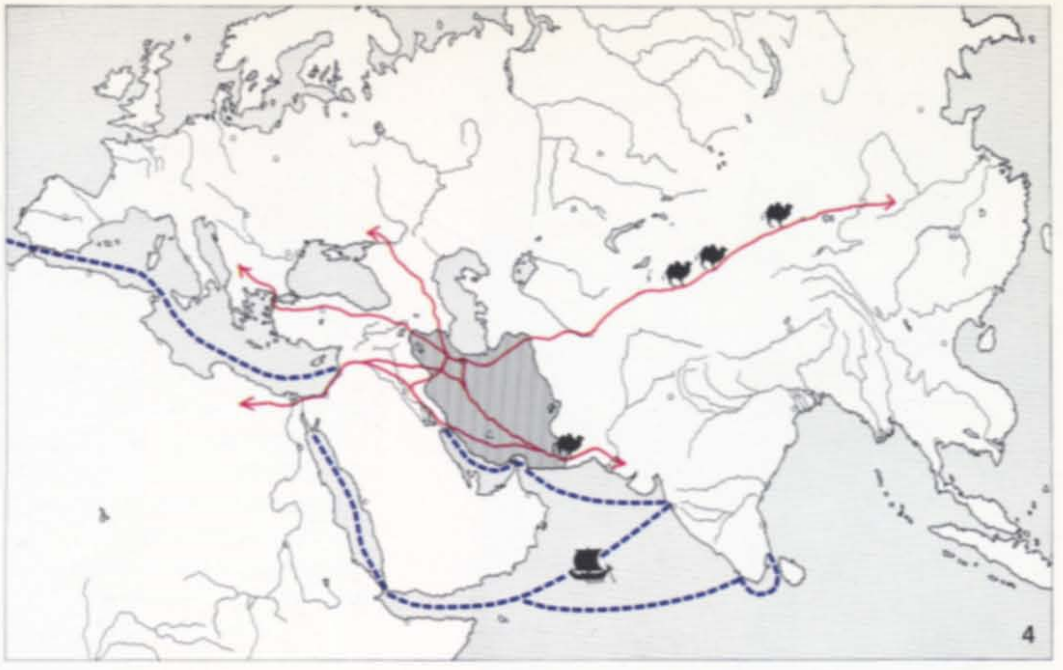

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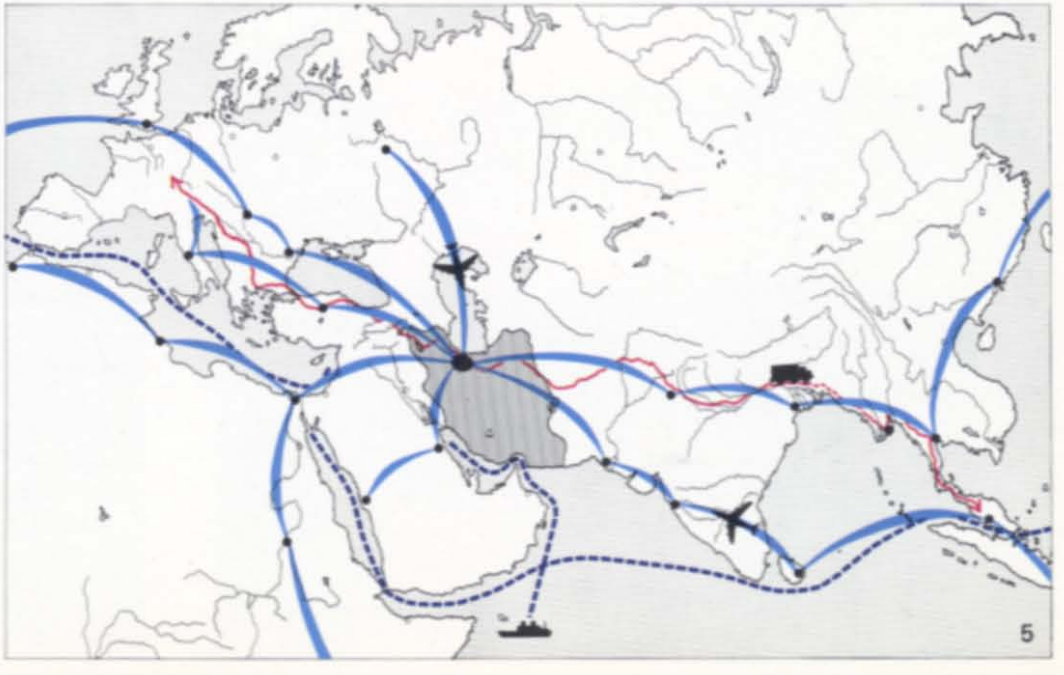

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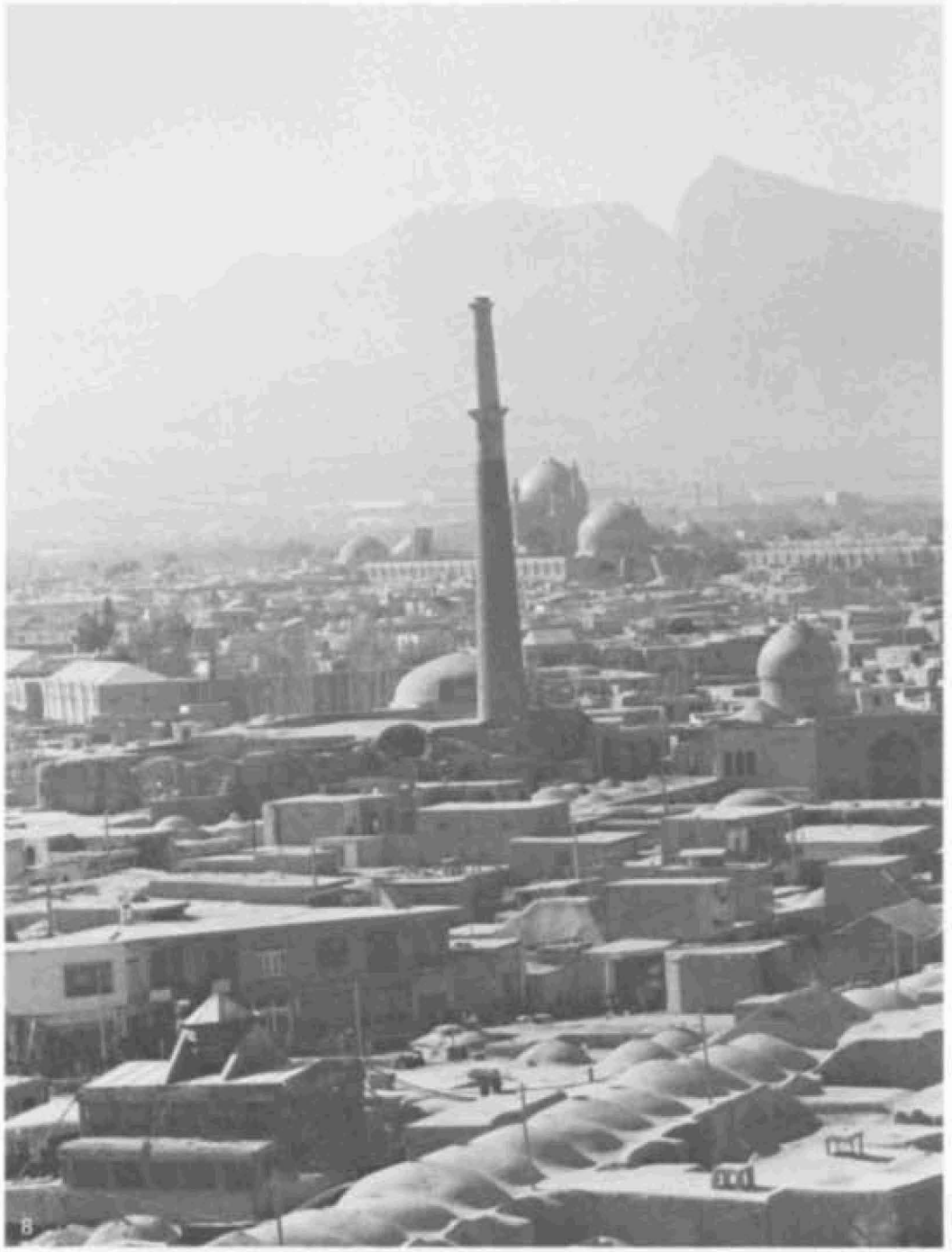

The method selected was to simulate the constituent environments of Iran and represent them as physical, biological and cultural systems, comprehensible through historical evolution, the arena of future decisions. These simulations will provide the basis for understanding environments, adaptations by plants, animals and men to them, and the consequences of alternative courses of action involving the environment. However, Pardisan will not only replicate Iran but will represent selected world environments wherein more dramatic forms of adaptation are to be found. Pardisan will represent the world in microcosm; it will present the world from the vantage of Iran. This window to the world will permit Iranians to examine universal processes as well as national ones, to perceive successful adaptations by plants, animals, men and institutions in Iranian past and present and to compare these with adaptations in other environments.

The selected world environments also must be portrayed as cultural bio-physical systems, comprehensible through historical processes of evolution, presenting alternative modes of adaptation to modern Persians.

If Pardisan must examine the environments of Iran in terms of the world, what of the larger context, the solar system, the Milky Way Galaxy, the cosmos? What of the physical and biological laws that obtain for all matter and all life? These must be presented in universal exhibits where the evolution of matter, cosmos, the solar system, planets and earth would be represented? This would lead to an investigation into the characteristics of life, the evolution of plants and animals in the ocean, the emergence of terrestrial plants and amphibia, the evolutionary succession of reptiles, and plant evolution. The presentation of universal themes and historical evolution would precede entry into the simulation of modern Iran and other world environments.

Yet each of the universal themes would be discussed at the scale of the simulated environments of Iran and the world—the orogenesis of geologic history, the advances and recessions of glaciers, the inundations by ancient seas and their desiccation, the migrations of plants, animals and men, the beginnings of civilization and its shifting centers of power, technological innovations and present circumstance.

Pardisan is, then, a selective representation of the world in microcosm but because it is faithful to geography, it can permit investigation of innumerable themes employing the entire institution.

This employment of adaptation as the essential challenge confronting all creatures is itself a powerful integrative device. Adaptation occurs in a physical environment; this involves the appropriate physical sciences; it also occurs in a biological world and is a biological process. So the sciences of life must participate. Yet we are primarily concerned with successful human adaptation, so then the sciences of man must be represented. While adaptation in plants and animals occurs by mutation and natural selection, in man, cultural adaptation is the most significant adaptive strategy. Thus the social sciences must contribute their insights. But the major instruments of cultural adaptation are the institutions whereby the environment is adapted—so that persons skilled in planning, managing and building must be participants. The measurement of successful adaptation may engage economists and political scientists, but it must also concern medical doctors and epidemiologists. Yet, finally all of cultural adaptation is motivated by values and this engages the concerns of philosophers and theologians. These values, in turn, are profoundly determined by traditional views of the environment and man. So this unifying view returns us to the basic environments with the assurance that a concern for adaptation can integrate

6. The Mountains of Iran
7. The Desert of Iran
8. The Plateau City of Iran

knowledge and focus such understandings.

The mandate and the program elements have determined the form of Pardisan. It will contain simulations of all Iranian environments and will illustrate problems and opportunities of adaptation for plants, animals and man. The Iranian exhibits will constitute the core of Pardisan and will be located within world environments in a manner faithful to geography. The world, and Iran, will be subdivided into bioclimatic zones with comparable environments and problems of adaptation. Universal themes will be concentrated at the entrance to Pardisan and these themes will be elaborated throughout the park in a myriad of story lines illustrating adaptive strategies.

Pardisan will contain a botanical garden where plants are arranged, not by species, but in natural associations with characteristic topography and soils. Pardisan will also contain a zoological garden where animals will exist in social groups of species with naturally occurring species together in the context of the appropriate vegetation. There will be no bars. Pardisan will have an aquarium, not as a single exhibit, but diffused throughout the site in many different expressions representing aquatic life throughout the world. The Academy of Natural Science and Museum of Natural History will also be diffused. Where universal topics are discussed, these institutions will be concentrated in the area of Pardisan devoted to universal subjects. Otherwise, the functions of education and research will be distributed throughout Pardisan, utilizing every exhibit. Thus, principles are developed in the universal exhibits and demonstrated in regional displays throughout Pardisan.

The Department of Environment is actively engaged in managing deserts, rehabilitating range lands and reforestation. Pardisan will create environments. The lessons to be learned by creating these simulations and managing them should contribute to the Department's programs and to enhanced management of the nation's resources. Pardisan must introduce various irrigation systems, and treat water and sewage; it will employ energy; it will contain many buildings. In every case the Pardisan example should demonstrate the most effective techniques available. In sum, in its design, construction and operation, Pardisan should be an example of successful ecological planning and design, notably in recycling, energy conservation and adaptive architecture.

One of the most valuable contributions to management and planning of natural resources is satellite technology. The U.S. ERT satellite passes over Iran every eighteen days. Its four spectral images may be employed in the form of photographs with a discrimination of 100 acres. These images can also be represented with a resolution of 1 acre. It is proposed that Pardisan should present to visitors the image of Iran viewed from the satellite. These images can also be displayed as time lapse photography revealing the country through changing seasons. It is also recommended that this technique be used for planning inventories, for forecasting, monitoring and, most valuable, for interpretation, research and education.

The Persian Garden symbolizes the transformation of the desert into a habitable and delightful environment. Pardisan is its successor but its concerns extend to include the Caspian and the Persian Gulf, Zagros and Elburz Mountains, the plants, animals and men who seek survival, success, delight and fulfillment. Pardisan should speak to all of these quests in modern terms. Persians have long held that education is a form of pleasure. Pardisan should satisfy this attitude. The Persian Garden was the arena of delight. So must Pardisan be. But, most of all, it must help modern Persians solve modern problems.

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THE EXPERIENCE

The site of Pardisan is in the west of Tehran on the edge of a great colluvial plain at the foot of the Elburz Mountains. To the north and east Mount Damavand, the volcano, and other high peaks dominate. To the south Tehran fingers out into the vast central desert of Iran. The site of 300 hectares is strongly dissected by deep north-south valleys. Once covered by an open woodland of wild almond and pistachio trees, the site now lies barren and stony because of centuries of overgrazing and misuse. Over the next years, however, this land will be transformed so that from the great expressways which strike west from Central Tehran the realized Pardisan will appear as an immense green oasis, a broad belt of woodlands silhouetted against the arid south face of the Elburz range. Pardisan will be Tehran's largest park and will add immeasurably to the recreational resources of that city. Within several years it will be engulfed in the dense urbanization of one of the world's fastest growing cities. An oasis in the desert at its inception, it will in time become an oasis in the city.

For the visitor to Pardisan arriving by public transportation or private vehicle the first impression will be of great bowered terraces stepping up from the roadway to the broad arcaded facades of the entrance complex.

Cool shadowed spaces and the sound of water flowing through small channels along terrace banks will greet the visitor as he alights into Pardisan. These terraces will accommodate both parking and picnicking in response to the unique Iranian commitment to the social event of a group sitting on a carpet under a tree.

Imposing arches at the entrance building will give access to a great balconied space which can accommodate visitors at several levels. From the balconies in a darkened space visitors will see the entirety of Iran from the vantage of a satellite. They will view the satellite's traverse of the entire country. These images will follow one another in an 18-day sequence revealing the changing seasons, snow on the mountains, melting, rivers running like mercury, the greening of forests, ranges and foothills, the gradual desiccation of the summer, the autumn and winter rains and snow. The image can be focused to emphasize different localities.

The orientation pavilion will instruct the visitor in the possibilities and choices available in Pardisan. Close at hand there will be introductory exhibits and in areas adjacent to the entrance, films will give the visitor a distillation of the basic theme of Pardisan—the ways in which plants, animals and men adapt to and change their environment in order to survive. So that before he actually enters into the environmental park, the visitor will see that the processes of adaptation are continuous and that an understanding of them is essential to safeguard our natural and cultural resources and to solve the problems of the future.

9. The Site for Pardisan
10. The Location of Pardisan

The entrance expands into the maidan, a large open courtyard filled with trees and fountains. Here performances of traditional dance and song from the provinces of Iran will be staged. Storytellers and musicians will perform and diverse exhibits will further reinforce the theme of Pardisan.

At this point there will be several choices. There will be the opportunity to extend from Iran to the world and the cosmos in the planetarium and space exhibits. There will be the option of proceeding into the environments of Iran. There will be the possibility of overviewing the entire park or traveling to specific world environment destinations on the monorail system. The choices available are presented on a plan of Pardisan.

The plan will show the park to be subdivided into continents within which there will be regional exhibits, such as the Great Rift valley of Africa, the pampas of South America, and the Mulga of Australia. In the center of the park will be a geographic representation of Iran and its natural environments. A lake at the north will represent the Caspian Sea, while one at the south of this area will be symbolic of the Persian Gulf. Between the two will be a linear connection of buildings, terraces, and walkways which will form the core of Pardisan. It will extend across the Persian Gulf to the entrance complex via an arcaded causeway, beneath which will be a major aquarium.

Grouped around several courtyards at the entrance will be an orientation pavilion, a planetarium and universal exhibitions, an outdoor amphitheatre and a park administration facility. From the roof level of this complex, which will extend as a great promenade along the lake shore, a monorail will give connection to diverse and distant parts of the park. There will also be two broad pedestrian malls, traveled by mini-buses and trackless trains as well, which will reach east-west across the site.

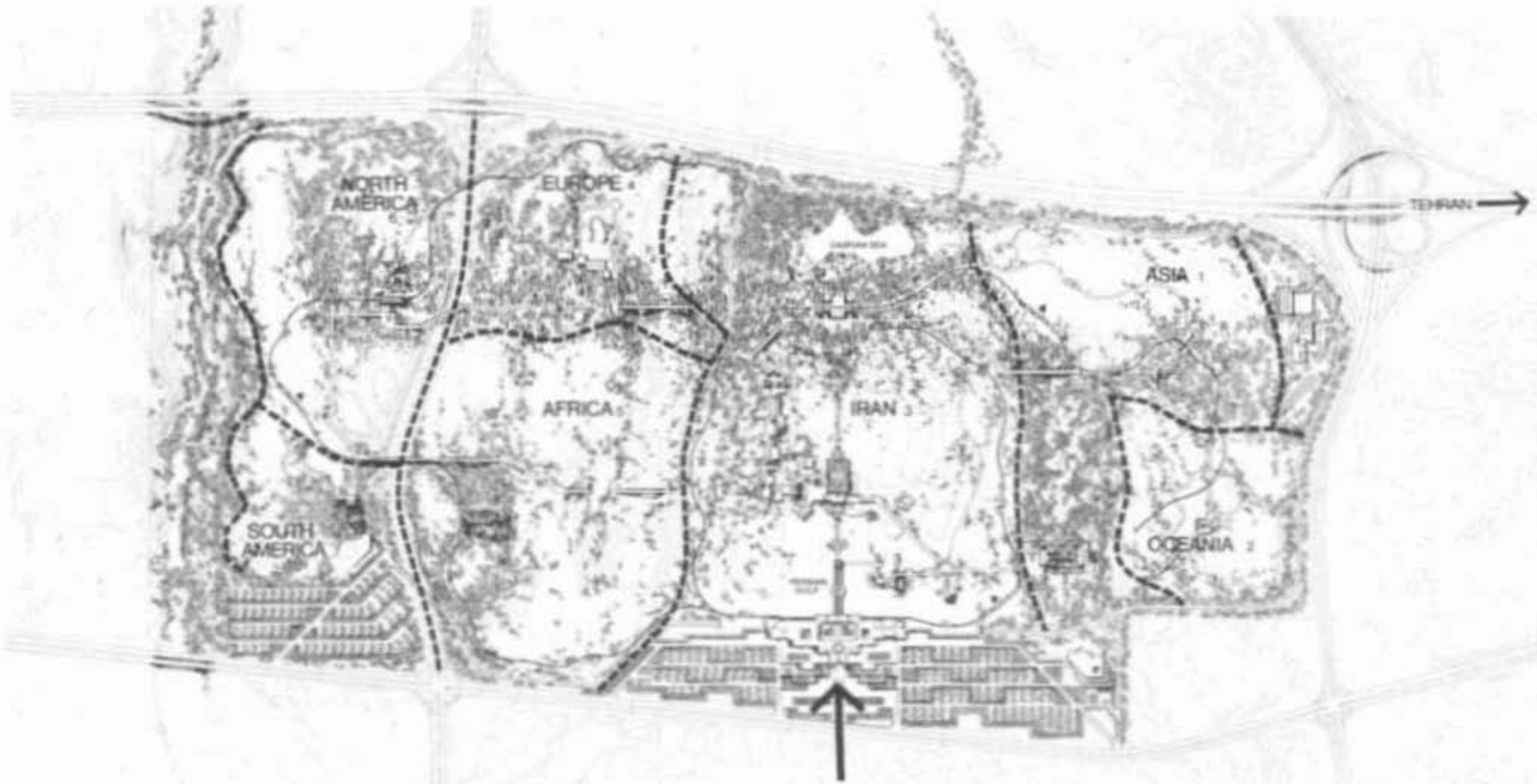
Together with the monorail they will link the major exhibits and buildings of Pardisan, including the four great glass structures which will house tropical and coniferous forests.

The visitor will be able to follow three distinct routes. The first will lead from the maidan between two great waterfalls under a lake, a symbolic replication of the Persian Gulf, and through a linear aquarium. With the sensation of being under water, one will see great seaweeds, the ancestral algae; squid, clams and oysters will follow, representing some of the most ancient animals. Cartilaginous fish, the sharks, will next represent another step in the evolution of life. At this point the aquarium will expand into a large community tank to present the diversity of marine life. The adaptations of protective coloration, schooling, mutualism and stratum feeding will be readily apparent. The aquarium will return to its linear form and amphibia will be presented, followed by reptiles and, as the visitor reaches land he will see the most ancient land plants, the Psilipods. This short trip will have transected two hundred and fifty thousand million years.

On shore the visitor will move along estuarine marshes inhabited by wading birds, and into a re-creation of a Persian Gulf city and fishing village. One will see the boats, nets and fishing techniques which have traditionally been used to harvest the resources of the Persian Gulf. In this reconstruction of traditional architecture along small streets one will enter a series of building exhibits and open spaces which will form the structural spine of Pardisan, representing the traditional bazaar. The visitor will proceed through various desert exhibits to the caravanserai, encounter the Persian Garden and the replication of the Plateau City, and move northward, literally and metaphorically, towards the Elburz Mountains dominating the view, toward the pass to the Caspian Sea.

11. Terraces for picnicking and parking
12. Approaching Pardisan from the Southeast
13. Gateway to Pardisan
14. Entrance
15. Maidan

16. Plan for Pardisan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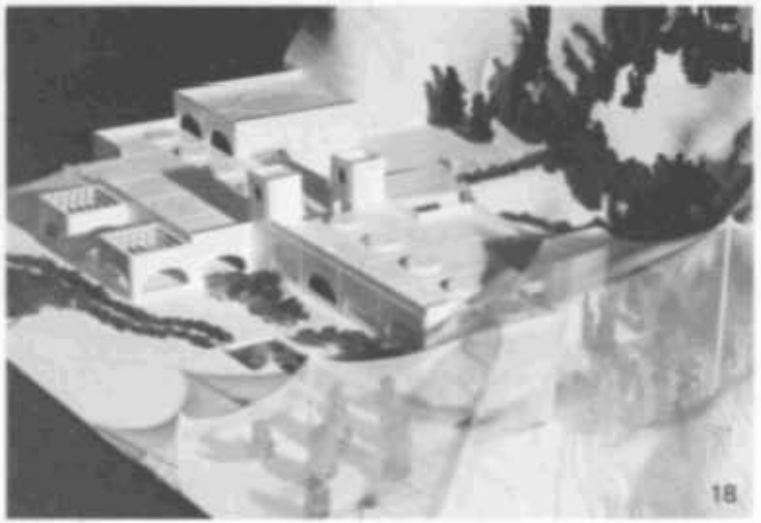
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The bazaar will be so arranged that from south to north, the visitor moves along a route symbolic of the mainstreams of Iranian culture through the major environments of Iran. The experience will offer many opportunities to dine on regional delicacies, examine crafts using native gems and metals, inspect traditional carpets, listen to the music of the santouri and to the tales of storytellers; indeed to savour the rich regional traditions of Iran. Along the way there will be views of onagers and snow leopards, the tiger and Persian lion, the great birds of prey and the secretive rodents of the desert. The visitor will move through the great Hyrcanian forest of the Caspian littoral, replicated with oak, beech, shrubs and wildflowers; along the slopes of the Zagros mountains covered by open woodlands of pistachio and oak; across the stony steppes of the plateau desert, shaded with the pale greens of the artemisia and into the salt deserts of the kavirs with their highly specialized flora of halophytic plants. He will be engaged in discussions of problems, such as zinc and cretinism, goitre, advancing deserts and diminishing forests, and methods for their solution. And always the visitor will be close to terrace gardens, restaurants and sitting places in shade beside water.

Leaving the bazaar, the visitor will be able to take a second route through Pardisan, traveling out beyond 'Iran' into the environments of the world. We can imagine this second visit on a hot summer day when the prospect of spending some time in a forest proves to be the most attractive option. Our visitors will take their 'passports,' which serve as map, guide and ticket, and board the monorail on the eastern loop of the system, bound for 'Manchuria' in the northeastern corner of Pardisan. They will alight in the rich deciduous forest of northern Asia where the greatest diversity of temperate vegetation in the world is to be found. Here azaleas, rhododendron, and maples will provide a brilliant array. At the transit station the visitor will find models and exhibits to orient him to this unfamiliar landscape inhabited by serow, sika deer and tiger. Cultural displays will be integrated with plants and animals relating the story of the ancient cultures of the Far East. One is impressed with the adaptive agricultural techniques, a language, poetry, painting and architecture of extraordinary power and economy and a conspicuous reverence for nature. In Japan, as in Persia, the ultimate metaphysical symbol was the garden.

The visitor, moving westward, will follow the silk routes that joined China to the Mediterranean into the Hyrcanian Forest of Iran. This will permit an understanding of the historic migration of animals and men which has followed this path over immeasurable time. Still traveling in the forest belt the visitors will pass into Europe, where the beech-oak forest provides deep shade, and post-glacial migrations between Europe and Iran can be recollected. Symbolically crossing the Atlantic, the visitors will then enter the deciduous forest of North America, the only temperate environment as rich as that of China. Here the forest will reveal the American beeches, oaks, maples, the beautiful cherries, dogwoods, rhododendrons and the jewel-like herbs—bloodroot, trillium, orchis and much more. If the day were indeed hot, perhaps its culmination might be in the cold house, the coniferous forest exhibit which requires refrigeration. Spruce and fir, pine, birch and alder will dominate a forest populated with elk and bear, mink and otter, mountain lion, and wolverine.

The deciduous forest has a great diversity of species. Neither too hot nor too cold, neither too wet nor too dry, saved from extreme oscillations and, in many cases, having avoided the destruction of glaciation, the deciduous forest presents a great richness of flora and fauna. Moreover, this benign environment has been selected for the

17. Plan View of Model
18. Portion of the Bazaar with Birds of Prey Aviary
19. The Gateway with Maidan, Planetarium, Amphitheatre, and Persian Gulf
20. Detail of replicated world environment
21. View of Pardisan to the North

22. Congo Rain Forest Exhibit
23. Iranian Alpine Exhibit
24. Iranian Marsh Exhibit
25. Monorail

greatest concentrations of human settlement, both in Europe and North America.

Thus this route permits examination of the origins and development of culture in Europe and North America. Ancient agriculture and early commerce, the beginnings of human settlement, urbanization, development of science and technology. The bioclimatic zone of the deciduous forest is also a cultural zone, it transpires. In Pardisan it can be experienced as a walk in the forest, a comparative examination of variable adaptation by plants, animals and men to a uniform environment or a walk through the cultural history of man.

Yet another trip, calculated to please a family with young children, would be to visit the largest animals of the world. With a few exceptions —the whale, elephant seal and caribou being notable—these great creatures are the herbivores of the grasslands. And so, a circuit of Pardisan through steppe, grassland, prairie, plains, pampas, and savanna will reveal the herbivores—yak, horse, sheep and goat, ancestral cattle, elk, bison, llama, buffalo, wildebeest, gazelle, antelope, eland, giraffe, kangaroo, hippopotamus, rhinoceros—and their predators: lion, tiger, leopard, cheetah, jackal, jaguar, wolf, mountain lion. But this tour of some of the world's most dramatic creatures is instructional too. The domesticated animals—horse, cattle, goat, sheep, yak, llama—came from the grasslands. Here too originated the most extensive agriculture of grains—wheat, barley, oats, corn—on steppe, prairie and pampas. And all this was in turn based upon the explosion of the flower in geologic time. In that period when this zone was occupied throughout the world by the flowering grasses, concurrently there emerged the great herds of herbivores to dwell upon them.

The organization of Pardisan as a simulation of the earth in which the continents and countries are related to each other in a way faithful to geography provides many advantages. It permits an examination of the relationships between creatures and environments which persist in the actual world. The value of this is apparent when we consider the illustration of specific themes. One theme might be the adaptation of fish to salt and fresh water. Here the examples would not be continuous but the gradient of fresh water to the brakish Caspian, to the brine of the Persian Gulf provides a fascinating study of the twin problems solved by fish of controlling water and salt concentrations in their tissues in extrèmes of both conditions. It can encompass the range from brine shrimp to fresh-water trout and consider the problems of anadromous fish which move between ocean and streams.

Locomotion is yet another subject which can connect many points in Pardisan and provide illumination of a single theme. The immobile creatures, many at the margin of the sea, present one extreme, the migratory birds, some of which circumnavigate the world, present the other. The different modes of locomotion by plants, animals and man—from airborne seeds to space travel, movement in water, in air, on land, below ground, locomotion by walking, running, crawling, flying.

Isolation is yet another theme which could well be focused upon in the Australian exhibit where on one continent monotremes and marsupials occupy roles held by mammals elsewhere in the world. This could provide the basis for a presentation on population dynamics, genetics, speciation and the entire theme of evolutionary biology.

Still another major theme is represented by communication which can encompass the songs of whales and birds, the calls of animals, and the communications between plants through chemi-

26. Picnic in Pardisan

27. View within the Bazaar


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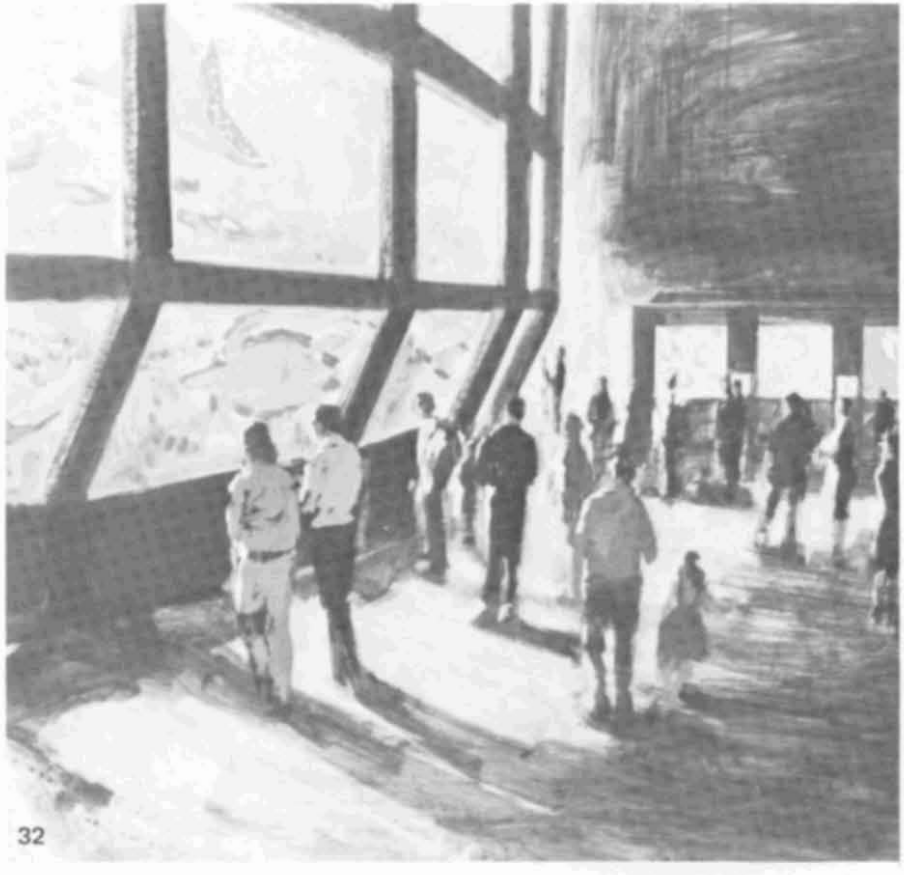

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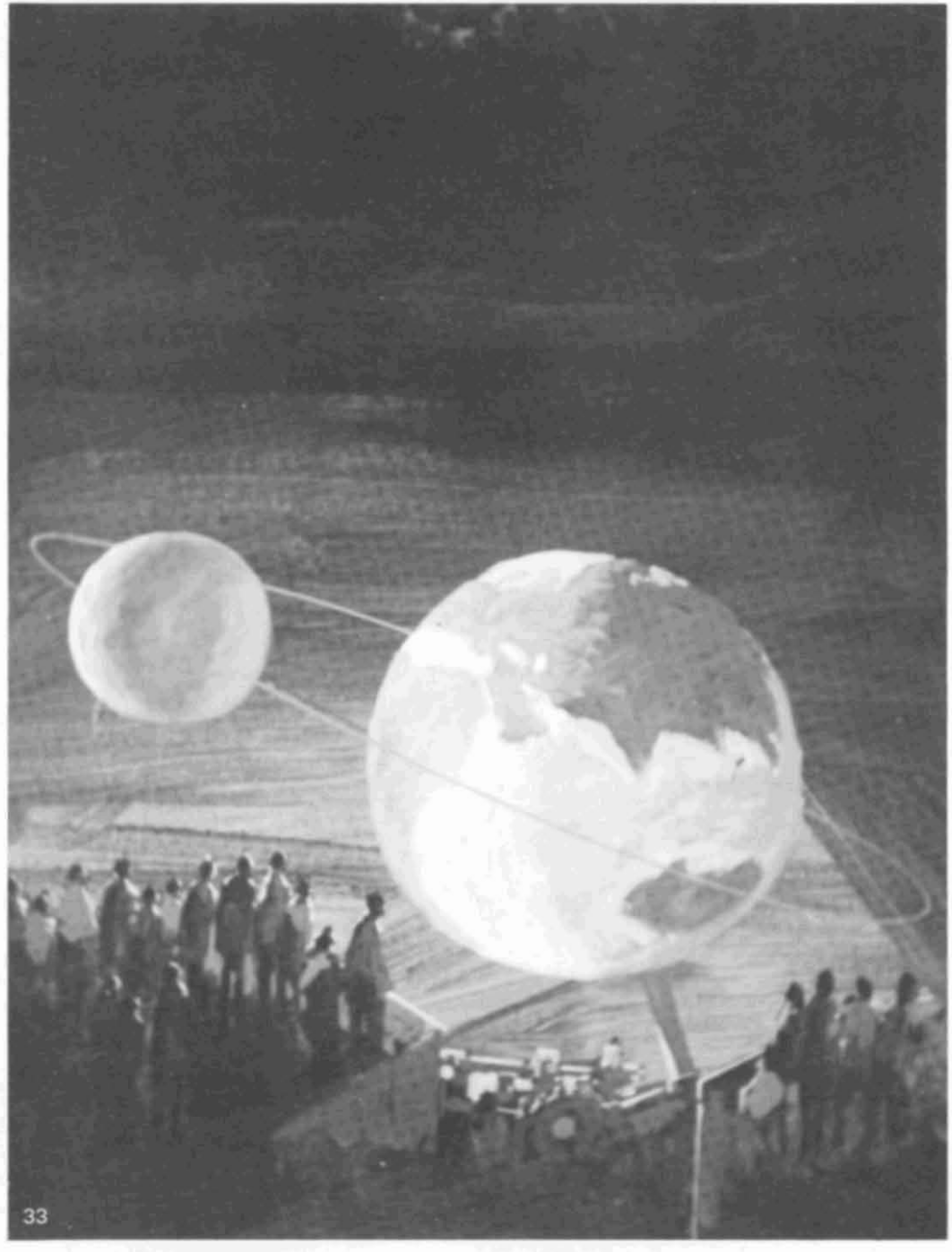

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cal excretions from roots and decomposing leaves. It leads to an examination of evolving special organs for communication, the bat's sonar, color and pattern, camouflage and mimicry, the emergence of language and its organs, ear and mouth. This can draw upon exhibits throughout the park united in a single story line.

Yet another prospective experience for the visitor would be to concentrate upon the universal themes presented in the assembly of buildings at the entrance. Here are discussed the laws that pertain to matter and to life. Here are presented the principles which can be seen to be applied throughout Pardisan. One interpretive device will be to follow the story of the evolution of matter and life. This could begin with subatomic particles, atoms, the periodic table of elements, and compounds. It could then proceed through a demonstration of gravity, gravitational fields, acceleration, the conservation of energy and the law of entropy. It could then follow with themes of cosmic evolution, the evolution of matter, the creation of galaxies, stars, planets, the solar system and the earth. Then would follow the study of compounds, polymers, and emergent life forms which would lead to the primaeval plants, photosynthesis and chloroplast, the proliferation of plants in the oceans, the emergent animals, and the procession of evolution to the present. This would employ elements of conventional planetaria and musea of natural history but interfused into a single presentation. The lineage of animals would proceed through fish, reptiles, amphibia, mammals and then selectively to the tree shrew, tarsier, lemur, primate, australopithecus to man. At this point the theme would emphasize erect locomotion, binocular vision, opposing thumb and fingers in man's evolution. Then cultural evolution—hunting-gathering, horticulture, agriculture, navigation and commerce, the city-states and nation-states—would lead to the present.

The exploration of space could employ the planetarium. Atomic technology could invoke cosmic themes and the application of the atom in peace and war. The earlier discussions of the human organs of eye, ear, brain and hand could proceed to a demonstration of modern prothesis, enlarging the power of these organs—telescope, microscope, satellite, microphone, amplifier, sonar, the computer as an extended brain, the powerful hands of earth-moving equipment, tractors, bulldozers, high explosives and, at the other extreme—miniaturization in radio, television, calculators and computer circuits. Here in the journey through the history of time there are innumerable lessons, but perhaps the most topical is the energetic test of evolution.

The emphasis for all themes should be that understanding the environment leads to better management and an improved quality of life. However, it might be advantageous to select the theme of relevance to demonstrate the utility of Pardisan to the solution of modern Iranian problems. This could well begin at the entrance with the display of Iran from satellite imagery. This could be employed to demonstrate the values of monitoring and prediction. Snowfall, snow melt, the discharge to rivers and streams and the recharge to groundwater could be illustrated for the entire country and its several regions. This could permit predictions of water availability during the forthcoming growing season. Similarly, the incidence of intense storms could permit a prediction of flooding; the observed occurrence of earthquakes could permit the prediction of land slides. The success of crops, reforestation and range management could all be observed from satellite imagery and predictions could be made as to the nature of the harvest. This same system could be employed in all regional exhibits with greater detail. Here again, monitoring of the natural systems and predictions of the prospect of natural calamities

28. Restaurant terrace overlooking exhibits
29. Indoor and outdoor exhibits along the Bazaar
30. Persian Garden in Pardisan

31. Science and technology exhibition
32. Community tank of Aquarium
33. Universe exhibition

could be made. It would also be possible to monitor agriculture, grazing, even urban growth, with this technique.

The entire subject of health and disease has immediate relevance, and certain aspects of this subject are particularly appropriate in Pardisan. Environmental and related occupational diseases are of great significance. The abundance of zinc, silenium, cadmium and lead in Iran have distinct pathologies. In the case of zinc, the herb astragalus is a specific indicator. Goitre, associated with an excess of aluminum in soils, can easily be prevented with iodine. Schistosomiasis is another environmental disease of considerable importance. Presentation of the problems of geopathology can contribute towards the solution of these problems. Occupational diseases are often linked to environments, particularly when these are related to exploitation of valuable minerals. Lead, beryllium and asbestos all produce industrial disease but can be remedied. There is also congenital disease, and this too is often amenable to diagnosis and treatment. The diseases of malnutrition constitute another important category and these could well be presented in regional exhibits which address local dietary traditions. Waterborne disease is another realm of pathology. Cholera, typhus and typhoid are examples of these deadly diseases. It may well be advantageous to offer x-ray diagnosis and blood tests to visitors. The latter can be automatically analyzed very swiftly and inexpensively.

Morphological adaptation to specific stress is one of the simplest yet most dramatic of themes. Adaptation to heat and cold, to a surfeit of moisture, and a paucity, allows examination of many strategies. Surface-to-volume ratio, evaporative cooling, size, coats of hair, feathers, fat layers, pigmented skin, and, for man, clothing and shelter, constitute another integrating theme to be employed in the exhibits in Pardisan as part of a discussion of subjects of significance to modern Iranians.

But, of course, all themes are interlocked in "only one world." Unlike the puritan western tradition, where it is assumed that education is a form of work as distinct from leisure, in Iran education is associated with leisure. So, let us hope that our visitors, delighted by the beauty of the environments they have transected, will have been informed on their travels.

A primary objective of Pardisan will be that visits should be memorable, and for a variety of reasons. Each visit should provide a delightful experience, rich, diverse and gratifying. Exploiting the Iranian belief in education as pleasure, each visit should be instructive—"the study of nature, of the heavens, and the earth is enlightening for men of understanding." But such study can be for its own delight, the enrichment of life by the increase of knowledge of its order, its diversity, its evolution. But study can also do work, and it is hoped that for a large number of visitors, Pardisan becomes a place where important matters will be discussed and where solutions will be provided for problems. Visitors should perceive that, not only will Pardisan be the home of the Department of Environment, but it will also be the national brain devoted to solving problems of the environment. Indeed, if Pardisan succeeds, the number of foreign visitors will give testimony to the belief that not only is Pardisan a national institution of incomparable value, but it is also an international institution. Pardisan will be the first institutional response to the Stockholm commitment to "only one world" and thus a challenge to the rest of the world. No discussion of the experience of Pardisan would be complete if it failed to invoke the meaning of its name, Pardisan, "where all good things which the earth provides might be enjoyed."

THE CONCEPT & PLAN

Pardisan is a concept, a metaphysical symbol, a presentation of world order. It is a uniquely Iranian concept, congruent with Iranian history and world view. It is an Iranian window on the world which can also permit others to view Iran. It must reflect the Iranian sense of the unity of man and nature, the unity of learning and pleasure. Moreover, it is an artifact with specific functional objectives which, nonetheless, do not inhibit it from being a work of art. Its morphology comes from its functions. It must first enhance Iranian understanding of Iranian environments, to better adapt to them for greater health, success and gratification. So Iranian environments must be replicated in such a way as to permit discussion and education on adaptation to them, by plants, animals and man. But what are the environments of Iran? Geographers have defined physiographic regions as being homogenous with respect to geological history, land forms, hydrology, soils and climate. Ecologists have defined bio-climatic zones which are homogenous with respect to environmental stresses and opportunities. But men have also defined regions using both criteria while adding cultural history. So the definition of Iranian regions utilized all possible criteria in a disciplined way. The various climatic regions were identified, as were those of geology, physiography, hydrology, soils, vegetation and wildlife. Next, Dr. Brian Spooner, the ethnographer, delineated the cultural regions of Iran. These separate regions were then grouped to form twenty-one distinct regions, environments relatively homogenous with respect to cultural and biophysical factors. Each presents characteristic opportunities and constraints, means of production, settlement patterns and future options. The names given reflect the definitions of constituent regions—they derive from their physiography, climate and vegetation. The Caspian littoral, the Khuzistan Plain, the Seistan Basin, the Gurgan Plain, the Jaz Murian Basin, and so on.

Since the mandate required that Iran be seen in the context of the world, it was next necessary to link the selected Iranian environments to analogous world environments. The first conclusion was that the major structure should be geographic, Iran should be flanked west and east by Europe and Asia, constituting Eurasia. Iran would be placed centrally in a planar representation of the world. It was also necessary to employ a structure which permitted comparative analysis of Iranian environments with foreign analogues.

The conception of the bioclimatic zone was employed to facilitate this comparison. Bioclimatic zones or major biome-types are groupings of terrestrial ecosystems which share major features of the environment and are similar in vegetation structure and physiognomy and in some characteristics of their animal communities. Eight zones were designated: tundra, coniferous forest, deciduous forest, grassland, dry scrub and woodland, desert, savanna, and tropical forest.

34. View south into the replicated plateau desert basin of Iran with Caravanserai, Persian Garden, and Bazaar. In the distance is the Persian Gulf and The Gateway

The world is thus generally represented in a gradient from the Arctic to the Equator with anomalies responding to physiography, continental, and marine climatic influences. Since the discrimination used to define the Iranian environments was greater than that employed for the world analogues, it was possible to locate all Iranian environments within world bioclimatic zones. Thus the schema for Pardisan emerged. It would be a planar simulation of the world with Iran in the center. It would include the continents Asia, Europe, North America, South America, Africa and Australia. It would be bisected by the Equator. North and south of this would fall seven distinct bioclimatic zones. Because it is a replication of relationships which exist in the actual world, this scheme has a structural logic. It provides a gradient of available energy from the poles to the Equator. It also provides a gradient of environmental stresses from maximum in the Arctic and Antarctic to a minimum at the Equator. These conditions are reflected in the numbers of species, the morphologies of plants and animals in a gradient of stresses. The horizontal bands, in contrast, offer comparisons of adaptations by different species of plants and animals and human cultures to similar environments. Thus a comparative analysis is proffered of many adaptive strategies employed throughout the world to meet the problems and opportunities exhibited by single bioclimatic zones.

World climate has changed over time. Orogenies have changed land forms, environments and habitats. Plants, animals and man have migrated. Their present existence, abundance and relative success can be understood only in relation to historic migration. The geographic fidelity of the Pardisan scheme facilitates the presentation of this factor. The movements of continental plates, the advances and recessions of seas and glaciers, the rise and fall of mountain ranges, the varying corridors of rivers and streams have affected the pattern and distribution of creatures in time past, and these dynamic processes are affecting people today and will continue to do so tomorrow. Earthquake activity in Iran today is linked with the tendency of the Indian subcontinent to push into Iran. Changing world climates are extending deserts south of the Sahara and may have more widespread effects. Small average annual changes in precipitation can transform regions from desert to grassland and vice versa. These can be presented and studied in Pardisan.

Given a schema which includes the world, it becomes necessary to be selective of these environments to be replicated in Pardisan. What criteria define selection?

The first criterion is of those environments of the world which are analogous to those constituting Iran. These would range from the alpine tundra found in the peaks of the Elburz mountains, to the lush Hyrcanian deciduous forest on the northern slopes of the same mountain range, to the dry Zagrosian oak woodland, and scrub of pistachio and almond to juniper, to the desert and Makran thorn savanna. What comparable world analogues should then be selected?

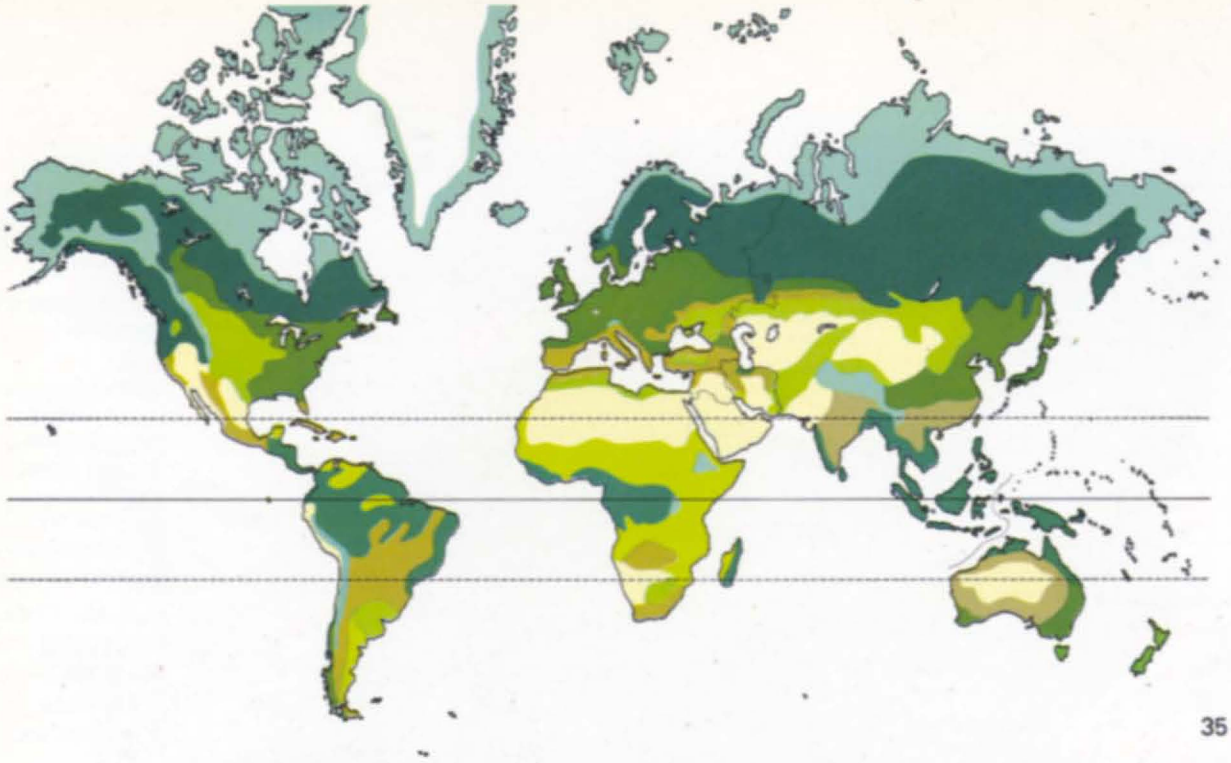
The alpine tundra of Iran has analogues in the European Alps and the North American Rockies.

Analogues to the Hyrcanian forest are the mixed mesophytic forest in the Appalachians of North America, the West European oak forest, and the Manchurian forest of Northern Asia.

The Mediterranean maquis and the Australian mulga shrub are analogous to the dry scrub and woodland associations of Iran—the Zagrosian oak woodland, pistachio almond scrub, and juniper scrub.

35. Bioclimatic Zones of the World
36. Matrix of Bioclimatic Zones and Geographic Areas
37. Climate of Iran
38. Physiography of Iran
39. Aquatic Environments of Iran

40. Soils of Iran
41. Existing Vegetation of Iran
42. Wildlife of Iran
43. Human Adaptations of Iran in Historical Perspective



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	North America	Europe	Iran	Asia
Tundra				
Coniferous Forest				
Deciduous Forest				
Grassland				
Dry Scrub & Woodland				
Desert & Semi-Desert				
Savanna				
Tropical Forest				
Savanna				
Desert & Semi-Desert				
Dry Scrub & Woodland				
Grassland				
Deciduous Forest				
Coniferous Forest				
Tundra				
	South America	Africa		Oceania

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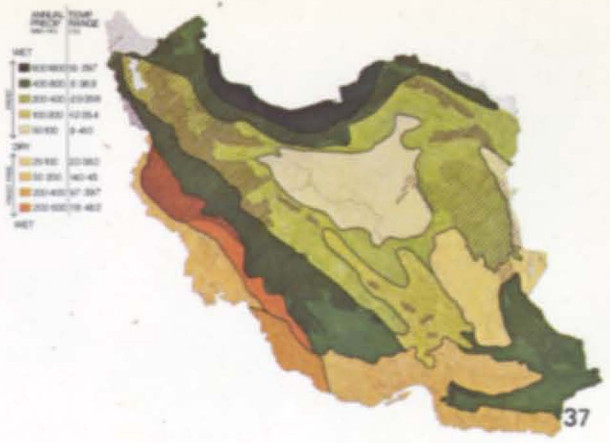

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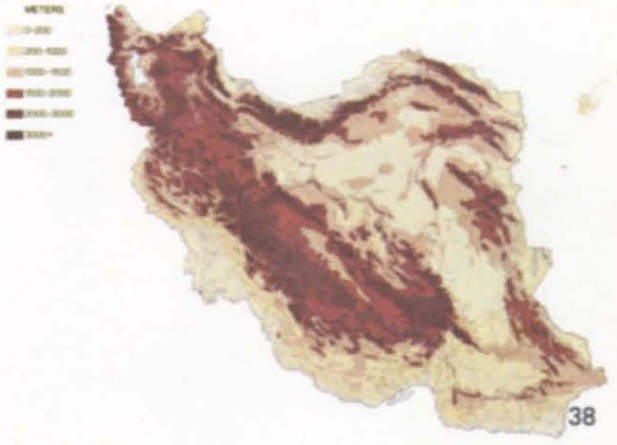

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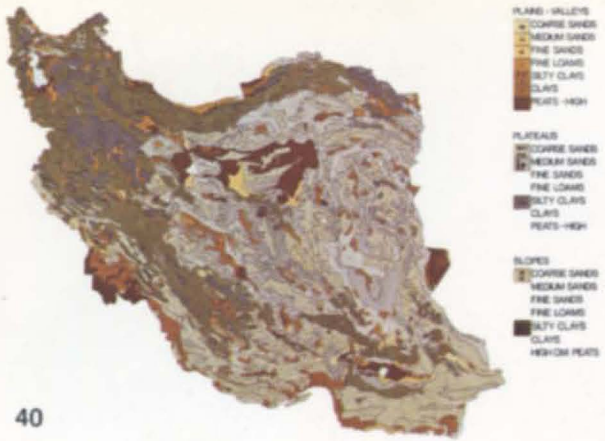
PLAINS - VALLEYS
COARSE SANDS
MEDIUM SANDS
FINE SANDS
FINE LOAMS
SILTY CLAYS
CLAYS
PEATS - HIGH
PLATEAUS
COARSE SANDS
MEDIUM SANDS
FINE SANDS
FINE LOAMS
SILTY CLAYS
CLAYS
PEATS - HIGH
SLOPES
COARSE SANDS
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FINE SANDS
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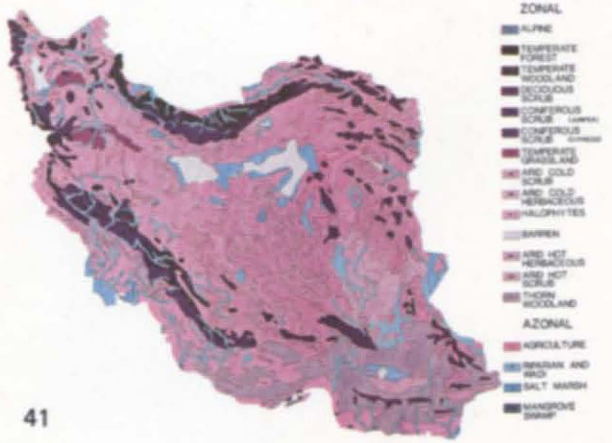
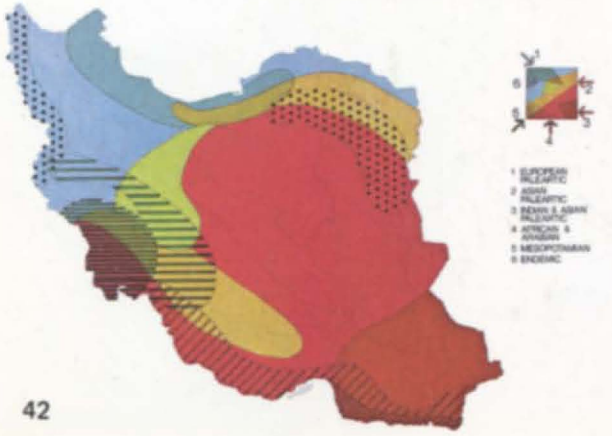
SILTY CLAYS
CLAYS
HIGH (OM PEATS

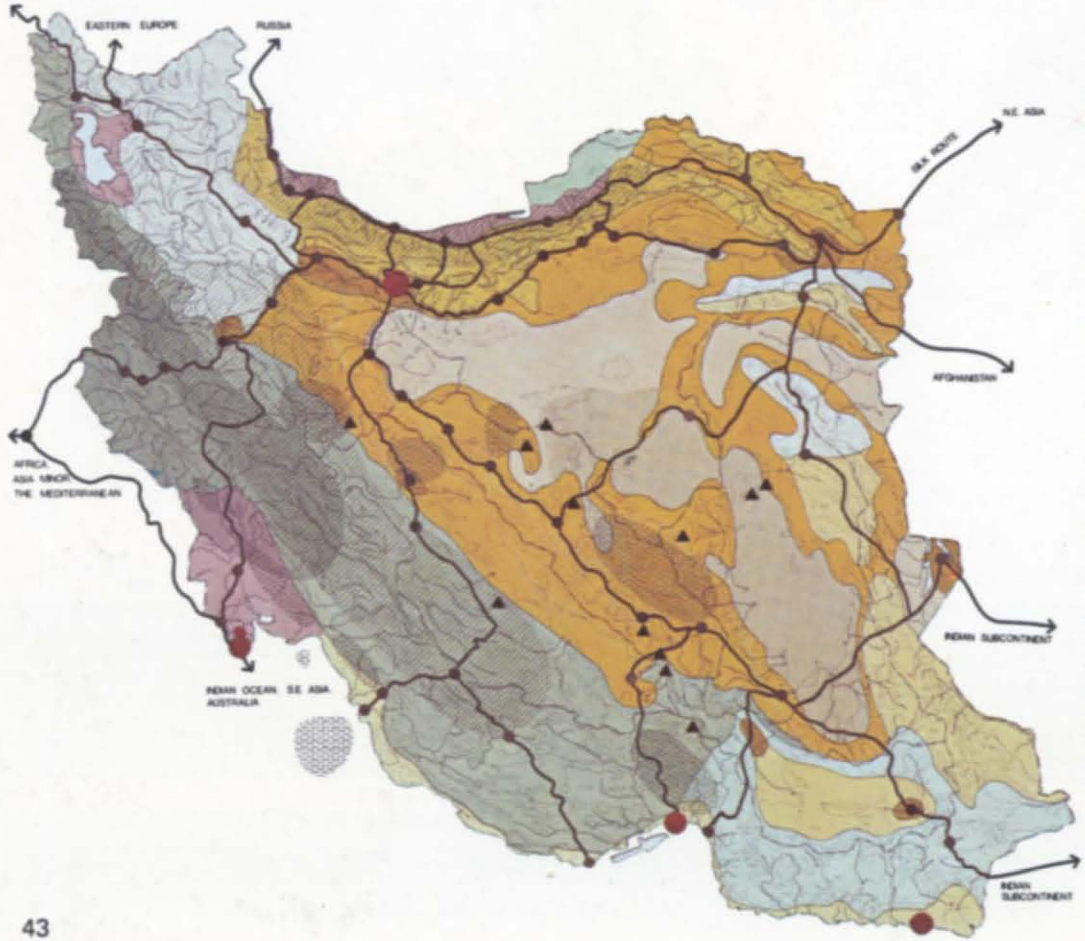
40


ZONAL
ALPINE
TEMPERATE FOREST
TEMPERATE WOODLAND
DECIDUOUS SCRUB
CONIFEROUS SCRUB
CONIFEROUS SCRUB
TEMPERATE GRASSLAND
ARID COLD SCRUB
ARID COLD HERBACEOUS
HALOPHYTES
BARREN
ARID HOT HERBACEOUS
ARID HOT SCRUB
THORN WOODLAND
AZONAL
AGRICULTURE
SWAMP AND WADI
SALT MARSH
MANGROVE SWAMP

41

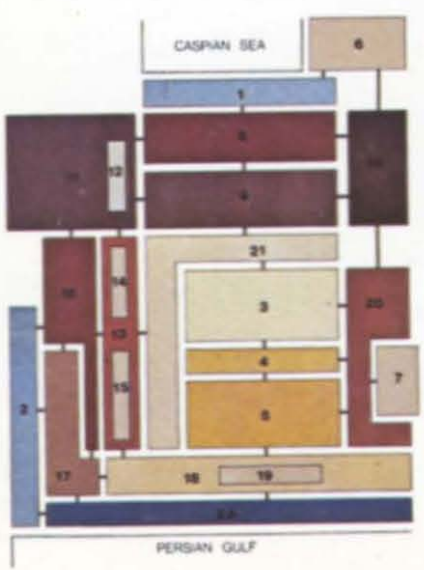

1 EUROPEAN PALEARTIC
2 ASIAN PALEARTIC
3 INDIAN & ASIAN PALEARTIC
4 AFRICAN & ARABIAN
5 MESOPOTAMIAN
6 ENDEMIC

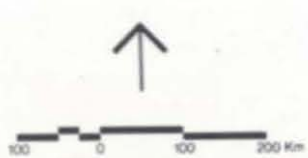
42

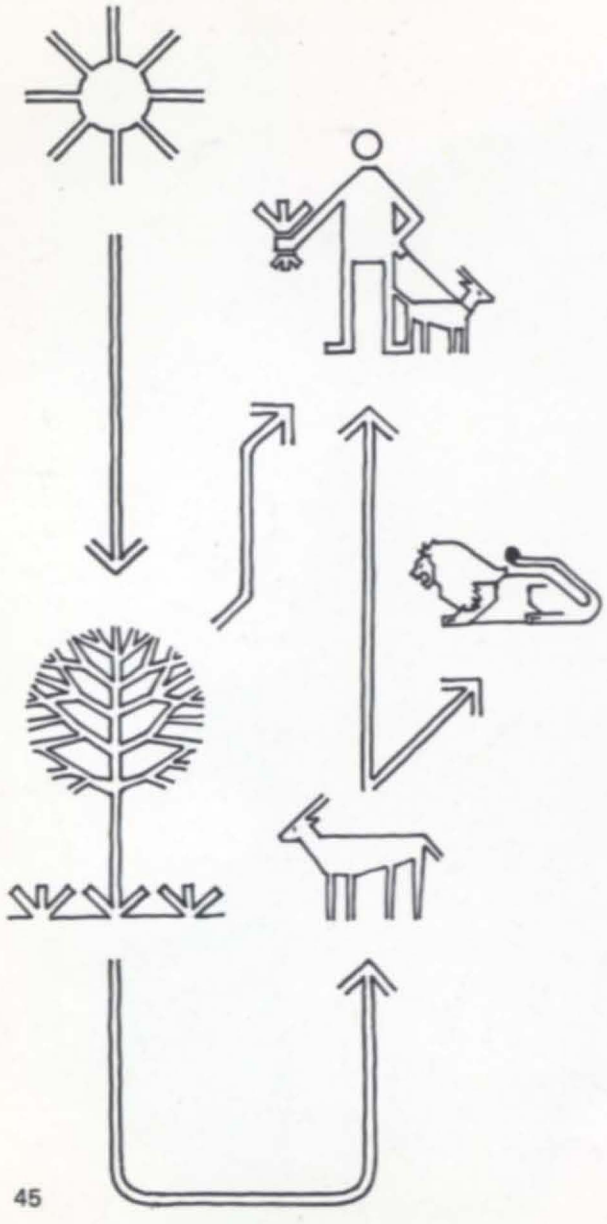

EASTERN EUROPE
RUSSIA
N.E. ASIA
SILK ROUTE
AFGHANISTAN
AFRICA
ASIA MINOR
THE MEDITERRANEAN
INDIAN SUBCONTINENT
INDIAN OCEAN
AUSTRALIA
S.E. ASIA
INDIAN SUBCONTINENT
HUNTER-GATHERERS
PALEOLITHIC
HORTICULTURALISTS
NEOLITHIC
PLOW AGRICULTURALISTS
DRY FARMING
OASIS FARMING NO DATES
OASIS FARMING DATES
WELL IRRIGATION
"BAND" IRRIGATION
TERRACE FARMING
QANAT IRRIGATION
PASTORAL NOMADS
SPECIALIZED PASTORALIST
MARGINAL PASTORALIST
STEPPE PASTORALIST
NON-INDUSTRIAL STATES
INTENSIFIED AGRICULTURE
CITIES
ARTERIAL AND HISTORIC ROUTES
HISTORICAL MINING SITES
INDUSTRIAL STATES
MECHANIZED FARMING
EXTRACTION - FOSSIL FUELS AND PRIMARY MATERIALS
METROPOLIS / NEW TOWNS / PORTS

43

1 CASPIAN LITTORAL
2 KHUZESTAN PLAIN
2A GULF COASTAL PLAIN
3 NORTHERN DESERT BASIN
4 CENTRAL DESERT BASIN
5 SOUTHERN DESERT BASIN
6 GURGAN PLAIN
7 SISTAN BASIN
8 NORTHERN ELBURZ
9 SOUTHERN ELBURZ
10 EAST ELBURZ EXTENSION
11 NORTHERN ZAGROS
12 REZAIYEH BASIN
13 INNER ZAGROS
14 HAMADAN BASIN
15 ISFAHAN BASIN
16 OUTER ZAGROS
17 ZAGROS PIEDMONT
18 MAKRAN REGION
19 JAZ MURIAN BASIN
20 EASTERN HIGHLANDS
21 PIEDMONT ALLUVIAL PLAIN







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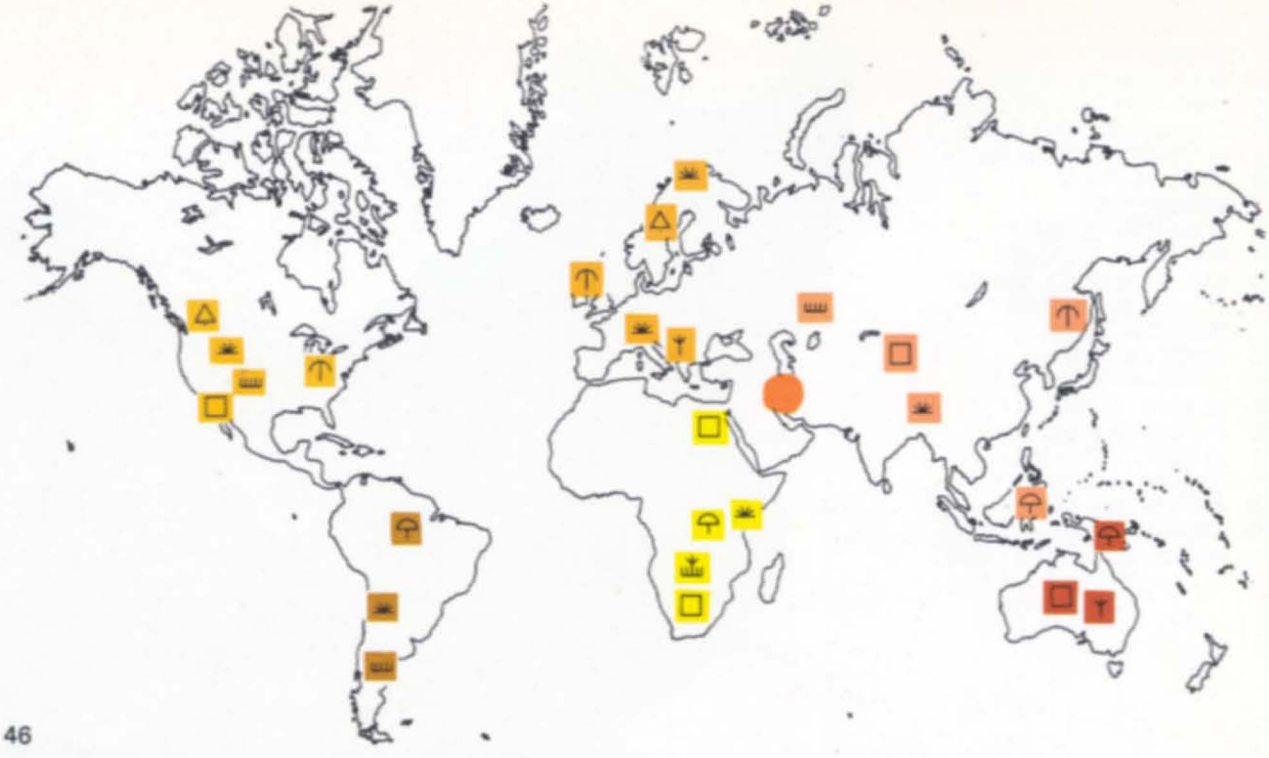

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	North America	Europe	Iran	Asia
Tundra	Rocky Mountains	Arctic/Alps	High Elbruz/Zagros	Tibetan Plateau
Coniferous Forest	Pacific Coniferous Forest	Scandinavian Coniferous Forest		
Deciduous Forest	Appalachian Forest	European Oak Forest	Hyrcanian Forest	Manchurian Forest
Grassland	Great Plains		Lake Rezaiyeh	Russian Prairie
Dry Scrub & Woodland		Mediterranean Maquis	Zagrosian Oak/Pistachio-Almond	
Desert & Semi-Desert	Sonoran Desert		Kavir/Lut/Gulf Coast	Gobi Desert
Savanna			Makran	
Tropical Forest	Amazon Rain Forest	Congo Rain Forest		Sunda Rain Forest / New Guinea Rain Forest
Savanna		Great Rift Valley		
Desert & Semi-Desert		Sahara/Namib Deserts		Great Sandy Desert
Dry Scrub & Woodland				Mulga/Eucalyptus Forest
Grassland	Pampas			
Deciduous Forest				
Coniferous Forest				
Tundra	Andes	Ruwenzori		
	South America	Africa		Oceania

47

A major exhibit in Pardisan will be the desert. Analogues to the Iranian desert include both cold and hot deserts: the Gobi of Asia, the Great Sandy Desert of Australia, Africa's Namib and Sahara deserts, and the Sonoran Desert of North America.

Having then selected an appropriate range of analogues for inclusion in Pardisan, it was thought wise also to include examples not represented in Iran but demonstrating dramatic examples of adaptation. For this reason the tropical rain forests of Asia, South America, Africa, and Oceania were selected, as were the arctic tundra and coniferous forest of Northern Europe. The rain forests constitute an important lesson in species number, diversity, productivity and, also, recycling of nutrients in the system. They can also produce the most beautiful illustrative exhibits.

The mandate produced this schema and the conception of world analogues. Accepting this imperative it remained to determine how to present the story of adaptation in each of these exhibits. What creatures in which environments would best transmit the necessary information? What examples of cultural adaptation should be selected? Many factors affected decisions. The general theme of adaptation by plants and animals had been developed for the study by Dr. David R. Goddard. The subject of adaptation through physiology was presented by Dr. Solomon Katz, cultural evolution by Dr. Brian Spooner, epistemological evolution by R. Buckminster Fuller and the Iranian world view by Dr. Hosein Nasr.

Each prospective exhibit was thus described in terms of its climate, physiography, plants, animals, and human components. The decision to combine the plants, animals and human cultures characteristic of a selected environment in one exhibit area multiplies their educational value.

Similarities in adaptations to the same stresses and opportunities may be perceived in many different organisms. By viewing each organism in relation to its total environment, the theme of adaptation is readily communicated. Relationships among plants, animals and man may be explored and the story of the food chain introduced. Themes of mutualism and cooperation may be explored. Animals must adapt to plant type and structure for food or shelter, and many plants rely on animals for pollination and seed transport. Man propagates plants for food, and domesticates, breeds, and hunts animals. Relations among plants, animals, and man are rich and varied and the possibilities for profitable study are infinite.

Certain adaptive strategies are either invisible or visually insignificant. For these and other reasons, the total number of prospective exhibits was subject to a process of elimination. For the selected environments a complete description was formulated which defined total area, area of enclosure, the nature and extent of the plant, animal and cultural exhibits. This was accompanied by a description of the environment and the problems of adaptation presented. The organization of each exhibit culminated with a description of the modes of presenting the various environmental stresses and adaptive strategies by plants, animals and man.

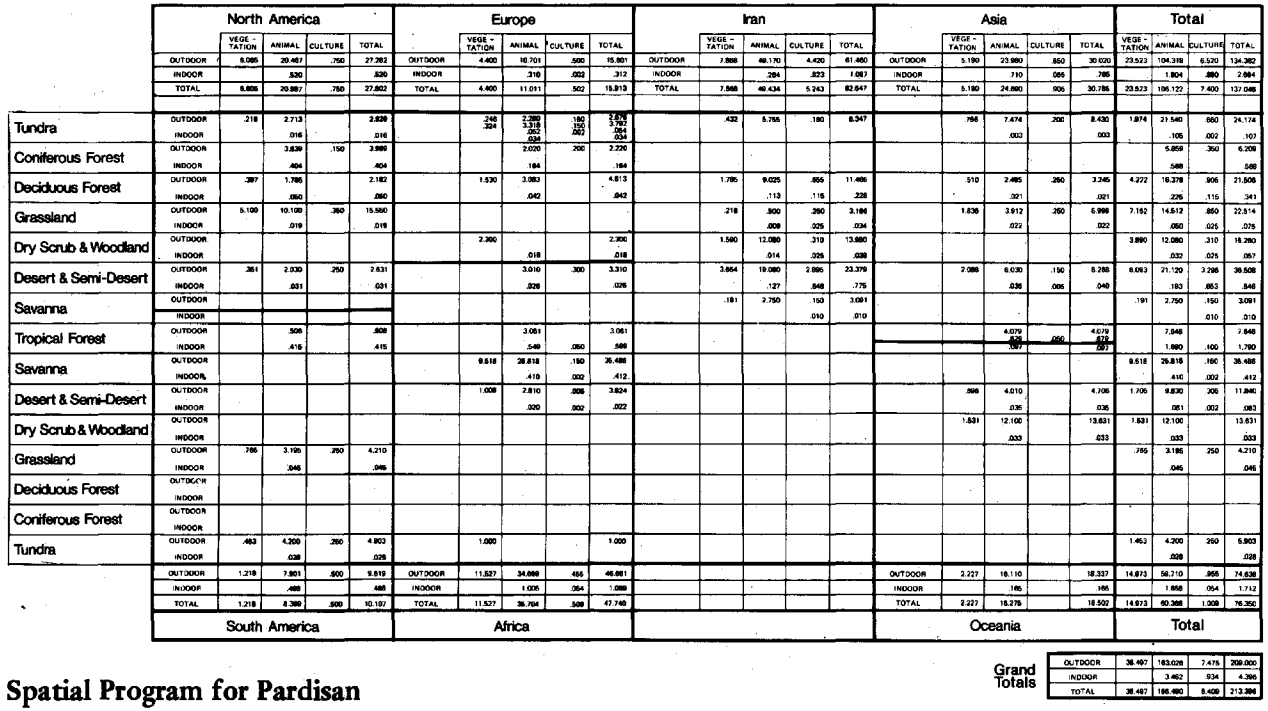
Upon completion of the selection process, each Iranian and world environment was allocated a part of the total site, within which it is to be replicated. The goal is to establish authentic environments within which land-form, vegetation, animals, and cultural expressions functionally interrelate, producing a plausible and educational experience for the visitor. The amount of the site required for each environment in Pardisan is the accumulation of the area requirements of its vegetation, animal, and cultural components.

44. Synthesis: Life Zones of Iran

45. Environment as Process

46. World Map with selected environments for replication in Pardisan

47. World Matrix with selected environments for replication in Pardisan



	North America				Europe				Iran				Asia				Total			
		VEGE - TATION	ANIMAL	CULTURE	TOTAL		VEGE - TATION	ANIMAL	CULTURE	TOTAL		VEGE - TATION	ANIMAL	CULTURE	TOTAL		VEGE - TATION	ANIMAL	CULTURE	TOTAL	VEGE - TATION	ANIMAL	CULTURE	TOTAL
	OUTDOOR	5.085	20.487	.750	27.282	OUTDOOR	4.400	10.701	.500	15.601	OUTDOOR	7.868	48.170	4.420	61.460	OUTDOOR	5.190	23.980	.850	30.020	23.523	104.318	6.520	134.362
	INDOOR		.520		.520	INDOOR		.310	.002	.312	INDOOR		.264	.823	1.087	INDOOR		.710	.055	.765		1.804	.880	2.684
	TOTAL	5.085	20.987	.750	27.802	TOTAL	4.400	11.011	.502	15.913	TOTAL	7.868	48.434	5.243	82.547	TOTAL	5.190	24.690	.905	30.785	23.523	106.122	7.400	137.046
Tundra	OUTDOOR	.218	2.713		2.930		.248 .324	2.280 3.318 .045 .034	.150 .150 .082	2.678 3.792 .084 .034		.432	5.755	.180	8.347		.755	7.474	.200	8.430	1.874	21.540 .105	.880 .002	24.174 .107
Coniferous Forest	OUTDOOR		3.839	.150	3.989			2.020	.200	2.220												5.859	.350	6.209
	INDOOR		.404		.404			.184		.184								.003		.003		.588		.588
Deciduous Forest	OUTDOOR	.397	1.785		2.182		1.530	3.083		4.613		1.785	9.025	.855	11.466		.510	2.485	.250	3.245	4.222	16.378	.905	21.506
	INDOOR		.050		.050			.042		.042			.113	.115	.228			.021		.021		.226	.115	.341
Grassland	OUTDOOR	5.100	10.100	.360	15.560							.218	.800	.260	3.186		1.838	3.912	.260	6.998	7.152	14.812	.880	22.514
	INDOOR		.019		.019								.009	.025	.034			.022		.022		.050	.025	.075
Dry Scrub & Woodland	OUTDOOR						2.300			2.300		1.580	12.080	.310	13.880						3.880	12.080	.310	16.280
	INDOOR							.018		.018			.014	.025	.039							.032	.025	.057
Desert & Semi-Desert	OUTDOOR	.361	2.030	.250	2.631			3.010	.300	3.310		3.864	19.080	2.895	33.379		2.088	6.030	.150	8.268	6.093	21.120	3.295	30.508
	INDOOR		.031		.031			.026		.026			.127	.648	.775			.036	.006	.040		.193	.653	.846
Savanna	OUTDOOR											.191	2.750	.150	3.091						.191	2.750	.150	3.091
	INDOOR													.010	.010								.010	.010
Tropical Forest	OUTDOOR		.508		.508			3.061		3.061								4.079 .629 .087	.050	4.079 .679 .087		7.648		7.648
	INDOOR		.415		.415			.549	.050	.599												1.980	.100	1.790
Savanna	OUTDOOR						9.518	26.818	.150	36.486											9.518	26.818	.150	36.486
	INDOOR							.418	.002	.412												.418	.002	.412
Desert & Semi-Desert	OUTDOOR						1.008	2.810	.006	3.824							.596	4.010		4.706	1.706	9.830	.306	11.840
	INDOOR							.020	.002	.022								.036		.036		.081	.002	.083
Dry Scrub & Woodland	OUTDOOR																1.531	12.100		13.631	1.531	12.100		13.631
	INDOOR																	.033		.033		.033		.033
Grassland	OUTDOOR	.785	3.195	.250	4.210																.785	3.195	.250	4.210
	INDOOR		.045		.045																	.045		.045
Deciduous Forest	OUTDOOR																							
	INDOOR																							
Coniferous Forest	OUTDOOR																							
	INDOOR																							
Tundra	OUTDOOR	.453	4.200	.250	4.903		1.000			1.000											1.453	4.200	.250	5.903
	INDOOR		.028		.028																	.028		.028
	OUTDOOR	1.218	7.901	.500	9.619	OUTDOOR	11.527	34.669	.466	46.661						OUTDOOR	2.227	16.110		18.337	14.973	58.710	.966	74.638
	INDOOR		.488		.488	INDOOR		1.005	.064	1.069						INDOOR		.166		.166		1.868	.064	1.712
	TOTAL	1.218	8.389	.500	10.107	TOTAL	11.527	35.704	.508	47.740						TOTAL	2.227	16.276		18.502	14.973	60.388	1.008	76.350
	South America					Africa										Oceania					Total			

Grand Totals					
	OUTDOOR	36.497	183.028	7.475	209.000
	INDOOR		3.462	.934	4.396
	TOTAL	36.497	186.490	8.409	213.396

Spatial Program for Pardisan

Every plant community, animal species, and cultural manifestation is allocated an area sufficient to sustain its life functions and to give it visual credibility.

The areas selected for animal exhibits, in all cases, exceed the minimum standards and are responsive to the requirements of a social group of the animals and that setting which can display their specific adaptive strategies.

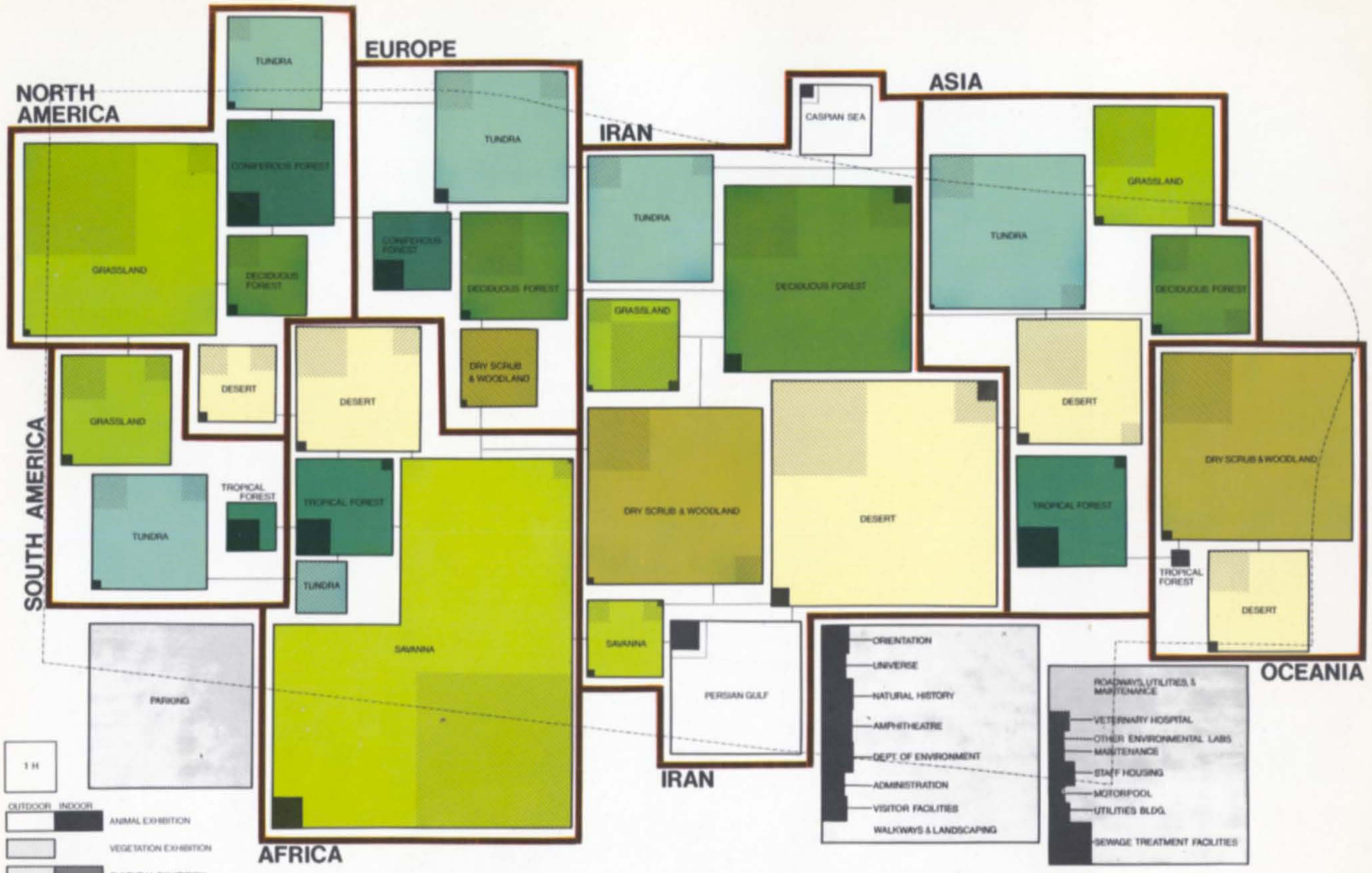
Because animals will always be seen with their associated indigenous vegetation, the space allocated to animals includes their plant environments. Often areas are allocated exclusively for vegetation, particularly where plant communities must be separated from animals in order that they may sustain and regenerate themselves.

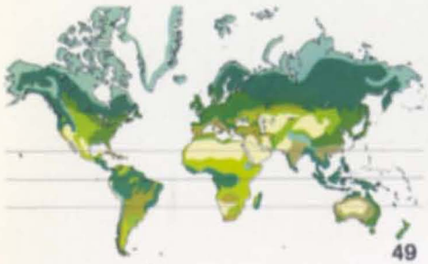
The cultural component of environments is integral with the areas for vegetation and animals, with additional space apportioned to extensive exhibits.

This done, the exhibits were next arrayed with an identification of their total area, the vegetation component, animal and cultural components and the necessary volume and area of building. The exhibits were then organized within bioclimatic zones and within continents. This deforms the original conceptual geometry of uniform parallel zones as the areas of exhibits vary in dimension, but it does not affect the basic structure of geography and bioclimatic zonal organization.

The spatial program reflects the interrelatedness

48. Graphic display of spatial program
49. Bioclimatic Zones of the World
50. Bioclimatic Zones in Pardisan


NORTH AMERICA
EUROPE
IRAN
ASIA
SOUTH AMERICA
AFRICA
IRAN
OCEANIA
TUNDRA
CONIFEROUS FOREST
GRASSLAND
DECIDUOUS FOREST
DESERT
DRY SCRUB & WOODLAND
TROPICAL FOREST
SAVANNA
CASPIAN SEA
PERSIAN GULF
PARKING
1 H
OUTDOOR INDOOR
ANIMAL EXHIBITION
VEGETATION EXHIBITION
CULTURAL EXHIBITION
OTHER USES
ORIENTATION
UNIVERSE
NATURAL HISTORY
AMPHITHEATRE
DEPT OF ENVIRONMENT
ADMINISTRATION
VISITOR FACILITIES
WALKWAYS & LANDSCAPING
ROADWAYS, UTILITIES, & MAINTENANCE
VETERINARY HOSPITAL
OTHER ENVIRONMENTAL LABS
MAINTENANCE
STAFF HOUSING
MOTORPOOL
UTILITIES BLDG.
SEWAGE TREATMENT FACILITIES



of plants, animals, and man and,by its allocations, insures that the visitor to Pardisan will experience the full ambience of natural environments.

The next major determinant of the plan was intervisibility. It was thought destructive to view, for example, kangaroos and onagers together. Continents should be separated visually. Any view should encompass compatible exhibits, associations in fact found in nature. The site consists of many north-south ridges with deep intervening valleys. It was therefore decided to employ these as continental divides and to contain the range of exhibits within any continent in the valleys. Thus the areal and zonal definitions of continental and regional exhibits were reallocated in response to this physiographic requirement.

The mandate produced the schema, the schema gave structure and location to the parts, the physiographic requirements for containment followed and the plan form resulted. The plan is a lucid expression of function.

The next requirement involved the provision for experiencing the exhibits. The comparative examination of adaption within a single bioclimatic zone embracing the earth was provided for by east-west routes. The corollary requirement of being able to perceive variable adaptations in a gradient of changing environments could only be satisfied by north-south routes. It had been decided that continental exhibits should be contained within valleys. It was further determined that one side of a ridge and the valley bottoms should be reserved for plants and animals with public access, and buildings located only on one of the two slopes containing a valley. Moreover, it was held that access and buildings should be located at mid-slope to permit viewing down into valleys, where appropriate, and up to ridge tops where animals like goats and sheep could be seen in silhouette. This located north-south routes at mid-slope on one side only of each valley. The east-west routes needed to connect with mid-slope north-south routes, but the east-west connection had to transect ridge and valley across the site. The resolution of this problem was to have these routes on a bridge or viaduct over valleys, and in a tunnel or cut through ridge tops. The tunnel will provide an appropriate device for the passage from continent to continent. The viaduct and bridge will afford a marvelous overview of continental exhibits. The intersections of these two route systems will offer appropriate locations for monorail stations and suitable transfer points to the minibus system.

Perhaps the single most dramatic experience of Pardisan is traveling through it by monorail. While generally elevated, these routes usually cross continents in tunnels. There are two circuits, each circumnavigates hemispheres, east and west. Both begin at the entrance. The Oriental Circuit parallels the Iranian spinal bazaar, thence east through the Hyrcanian forest, the Gobi Desert, Tibetan plateau and Russian steppes to the Manchurian Forest. Passage through a tunnel leads to Oceania and the Australian mulga shrub with a view of the Great Sandy Desert. The route proceeds through the Sunda rain forest and back to Iran and the maidan. The Occidental route also transects the Iranian exhibit through the Makran savanna, through the Iranian Alps, in a tunnel into the European Alps, tundra and coniferous forest. It then crosses into North American coniferous and deciduous forests and prairie to the South American pampas, crosses into Africa, the Congo rain forest and savanna, and back to its origin in Iran.

The accompanying plan reveals Pardisan's deserts, forests, grasslands, physiography and water bodies. It locates the major structures, external and internal circulation systems, entrance and parking.

51. Plan for Pardisan

The Iranian exhibit occupies almost one-third of Pardisan, it constitutes the core of the environmental park, it is the most important element and the justification for the entire investment.

There are many ways in which it can be experienced; these can vary with the preference of the visitor,but for the purposes of this account we can accompany a visiting group who wish to experience the entire Iranian exhibit.

This begins with the Persian Gulf simulation, near the entrance, with its coastal marshes, the Persian crocodile and the major exhibit of waterfowl. The first exhibit on land is the Persian fishing village which introduces the subject of specialized hunting-gathering, navigation, the connection with Gulf ports and those of East Africa. The modern Gulf story introduces oil, its exploitation, gas storage, refineries, petro-chemical industries and new towns.

From the Gulf fishing village the visitor proceeds to the Baluchi village of beehive huts and encounters the first presentation of nomadic pastoralism. The Baluchi are semi-nomadic, practicing agriculture, using band irrigation on ephemeral streams between Iran and Pakistan when climate is propitious,and living as nomads when it is precarious.

The next theme is that of adaptation to the desert,and this journey proceeds through a desert simulation on a causeway, over a bridge, on a route identified with historic columnar route markers to a caravanserai containing a cistern. Using these elements, the technology of life and travel in the desert can be elaborated,as can be the modern problems of adaptation which the desert provides. In the desert setting occurs the next exhibit, the oasis village. Here can be seen the oasis; the water sources of such settlements are discussed. The subject of adaptive architecture is introduced—mud plastered stone walls, flat roofs as living rooms, small apertures in walls and desert cooling employing wetted brush over windows. This permits development of the irrigation theme with a discussion of social structure and water rights.

The visitor crosses the desert to arrive at the next exhibit which is located on the foothills of the mountains. This consists of a presentation of the mainstream of Iranian culture which developed in the colluvial piedmont. It invokes Persepolis and Isfahan, Kashan and modern Tehran. This exhibit takes the form of a bazaar linking the vital institutions—the mosque; palace; garden; Madrasseh, religious school; Hammam, public baths; and the House of Strength, Zorkhaneh. It presents the history, the culture and art of Iran. It also provides opportunities to savour this culture including regional food, music, works of art, dancing, story telling, all set in indigenous architecture.

Appropriately, in contrast to this high culture, the next theme is of nomadic pastoralism. This vertical transhumance, passage of livestock and their owners between mountain and plain, following the seasons, described the way of life for Kurds, Bakhtiari, Lurs, the Khamseh Federation, the Qashqai and others. The Bakhtiari are presented here with a black tent encampment, attendant animals, exhibits of horizontal looms and carpets and a discussion of this important, historic mode of adaptation to arid and semi-arid lands.

The next exhibit occurs on the wooded slopes of the Zagros where a still older story can be told, for here persist the two ancestral grasses from which modern wheat evolved, which in turn, accounted for the great historic wealth of the fertile crescent. The story of hunter-gatherers and horticulturists is appropriately discussed

52. Part of plan showing Iran
53. Caspian Littoral, Iran
54. Mountain Valley, Iran
55. Plateau Desert, Iran

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here as is the crucial matter of domestication of animals.

At this point in the Iranian transect there is represented the junction of the Zagros and Elburz Mountains. Here the story of the geologic history of Iran can be presented, the enthralling story of plate tectonics, the implications of this history in terms of oil and earthquakes today.

The Elburz Mountain simulation houses an aviary where the great raptors are displayed. Associated exhibits reveal the gradient from desert to Juniper forest into the alpine tundra on the ridges and the Hyrcanian forest on the northern slopes. Set in the Juniper scrub is the next exhibit, a mountain village. In this region, the northwest Zagros, modern mechanized agriculture can be discussed—the tractor and diesel pump.

A tunnel under the simulated Elburz Mountains symbolizes a pass through the Caspian side of the mountain range and leads to the Caspian littoral. A thatched village with attendant rice growing reveals a dramatically distinct environment. The adjacent Caspian city reveals open bazaars and an adaptive architecture with buildings raised on stilts. Silk manufacture, exploitation of Caspian fishing and modern recreation are all presented. From the Caspian city one can proceed east to the Gurgan plain, the land of the Turkomen, the ancient horsemen and herders with the yurt tents. This demonstrates the third type of nomad.

We can proceed eastward towards the Mashad exhibit which presents this religious center and the Persian theme in Iranian history. The silk route proceeds towards Afghanistan and India, but the Iranian traveller can continue south to the Sasanian exhibit where irrigation was developed to the highest degree of sophistication.

From the Sasanian exhibit the traveller proceeds past the southeast highlands and returns eastward to the Persian Gulf, having concluded his tour through Iran, its national and cultural history, hopefully entertained, enlightened and wiser, with a greater understanding of Iran, better able to solve the problems of today.

The central theme of Pardisan is that it will describe and illuminate the constituent environments of Iran, but in addition, it will permit a comparative examination of analogous environments elsewhere in the world. All environments within a single bioclimatic zone present comparable environmental stresses and opportunities. All organisms must adapt to these by anatomical, physiological and behavioral means. The visitor may pursue examination of such adaptation in each of the bioclimatic zones represented. The main lesson will be of convergent evolution of distinct species or peoples to similar environments.

One lesson to be learned along similar environments is that of convergent evolution resulting in ecological equivalence. Adaptation to grasslands, for example, presents many similar strategies, perhaps the most important being the development of the rumen in which herbivorous animals ferment and digest grasses.

Speed of movement is another characteristic strategy. Grasslands provide little protection; speedy movement is the response to predators. Jumping and erratic movement is yet another strategy—the characteristic Z-shaped legs of jackrabbit, Patagonian hare and jerboa provide examples of ecological equivalence. Other examples of ecological equivalents in different grasslands are the prairie dogs of North America and the marmot of Russia, all of whom burrow to escape predators and maintain humid, temperature-controlled shelter.

56. Traditional Village, Iran
57. Modern Tehran, Iran
58. Urial Sheep, Iran
59. Artemesia Steppe, Iran
60. Rooftop Wind Catchers, Iran
61. Cistern, Iran

Another lesson which is profitably investigated within a single bioclimatic zone is the effect of isolation on the plant and animal communities of a region. Since Darwin's observation of the Galapagos finches it has been observed that isolated species will adapt to fill vacant niches in the natural habitat not normally occupied by that species. Several species can evolve from a single species with each new species more specialized to occupy a different niche. Australia provides the most extensive and extreme examples of adaptive radiation of eucalyptus to many and widely varied environments and the similar radiation of marsupial species. Here ancient premammalian animals occupy niches elsewhere preempted by mammals.

However, in selecting a single bioclimatic zone to investigate similar and alternative modes of adaptation, analogous to the Iranian experience, it is appropriate to select the desert. So the imaginary visitor will traverse three deserts: the Sonoran Desert of North America, the Plateau Desert of Iran and the Great Sandy Desert of Australia. All deserts share similar attributes of aridity, extreme daily and seasonal temperature fluctuation and intense solar radiation. The striking similarities of morphology are revealed in accompanying illustrations.

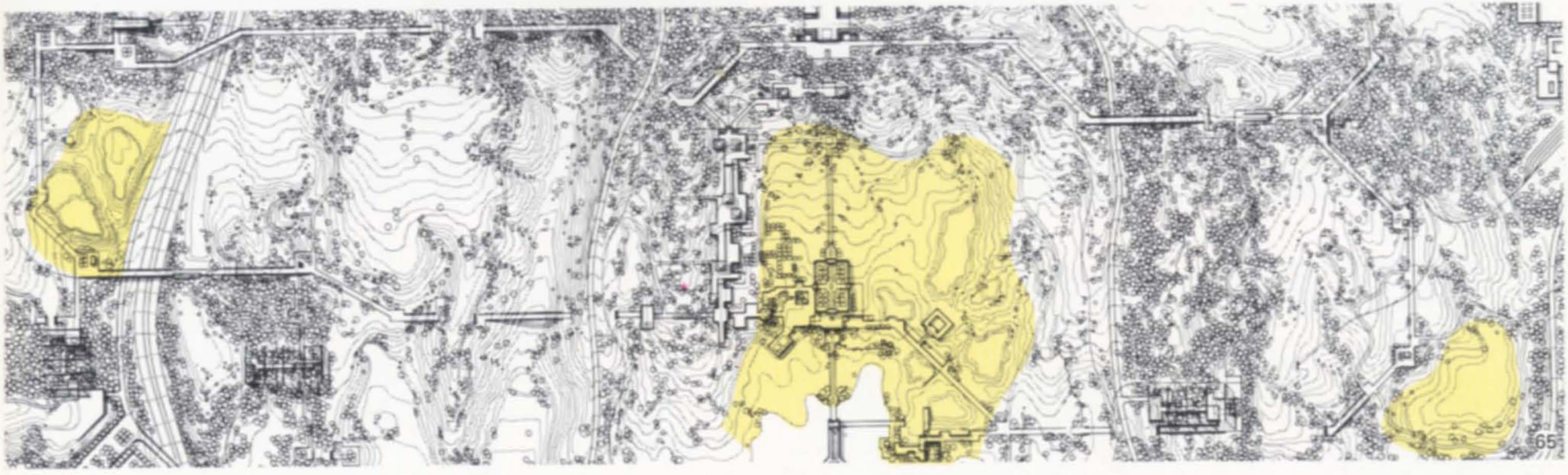
Desert organisms have adapted to the extreme conditions of this environment by either avoiding periods of high stress or by evolving means of coping with them. Some men and many animals avoid stressful periods by migrating to a more favorable environment during the hottest and driest season. Plants cannot leave the desert during this season, but some herbaceous species survive this period as seeds. These seeds can persist in the soil, sometimes for years, until a rainfall, when they burst into bloom and turn the desert into a brightly colored garden. After the rain they quickly return to seed to await future glory. Other organisms avoid the hottest and driest period in the daily cycle by remaining inactive during the day. Examples are nocturnal blooming in plants, the cereus in the Sonoran Desert; nocturnalism among animals—kangaroo rat in Sonoran Desert, jerboa in Plateau Desert of Iran and marsupial mouse in Australia's Great Sandy Desert, and nocturnal activity among men, the caravans in Iran travelled through the desert at night and rested during the day. Other organisms have evolved ingenious methods of storing water and food or providing shade, in some cases allowing them to remain above ground in the hottest, driest season.

The first exhibit on this desert trip, the Sonoran Desert, has by far the densest vegetation. The succulents dominate with the cacti conspicuous among them. The most dramatic of these are the saguaro, the skyscraper of the desert, prickly pear and concertina cactus. The shrubs mesquite and ocotillo are also present, and ephemeral annuals and bulbs or tubers are common among herbaceous plants. The animals of the Sonoran include the desert bighorn, kangaroo rat, the desert cottontail, kit fox, many snakes and lizards. The Papago Indians of the Sonoran are hunter-gatherers and horticulturists who irrigate fields.

The problem of adaptation to a paucity of water is well illustrated by the saguaro cactus. This fleshy succulent may grow to fifty feet, and weigh four tons, 80 percent of it water, a considerable reservoir. They can live to be 200 years old. The radius of the shallow root system may extend to a hundred feet in diameter. After a rainstorm the saguaro can absorb and store several hundred gallons of water. Both animals and man utilize its size and water reservoir. It is used by the Papago as a water source, the fruit is eaten, it is used to produce alcohol, the seeds make a butter, giant stems are used for lodge

62. Desert: North America, Sonoran Desert
63. Desert: Iran, Plateau Desert
64. Desert: Oceania, Great Sandy Desert
65. Site Plan Detail: Sonoran Desert, Plateau Desert, Great Sandy Desert
66. World Key Map
67. Site Key Map

68. Desert: North America, Sonoran Desert
69. Sonoran Desert Exhibit
70. Sonoran Desert Adaptations



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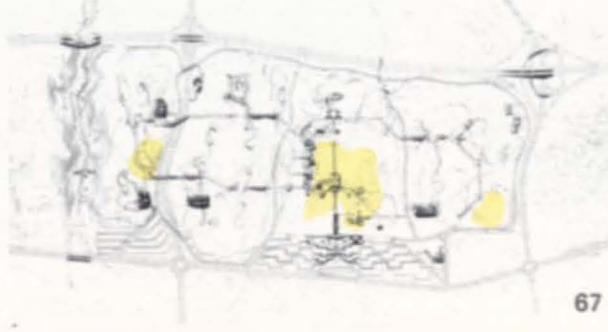

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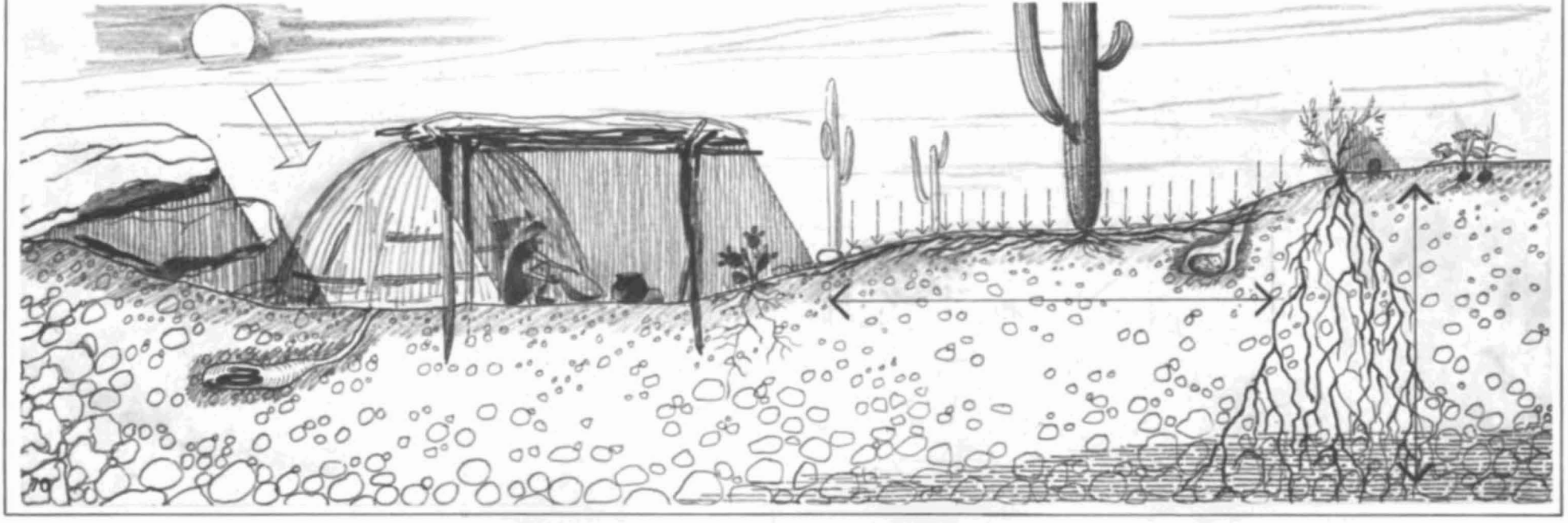

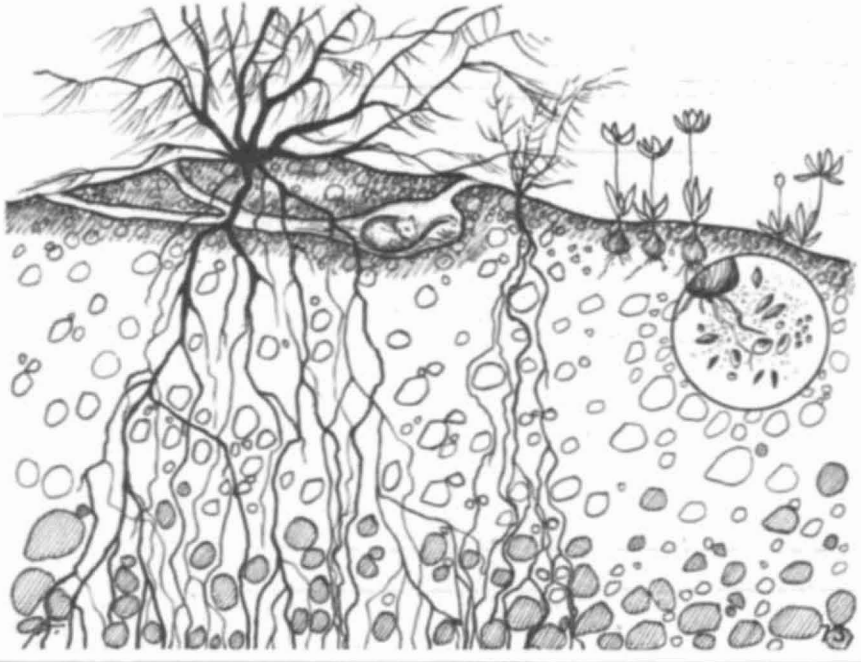

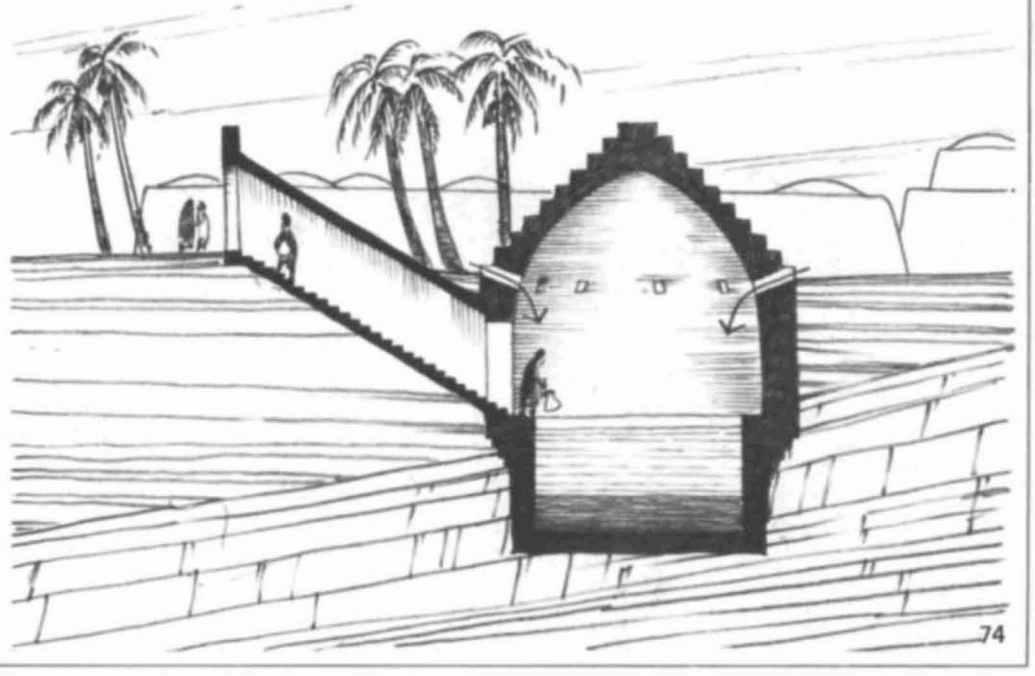


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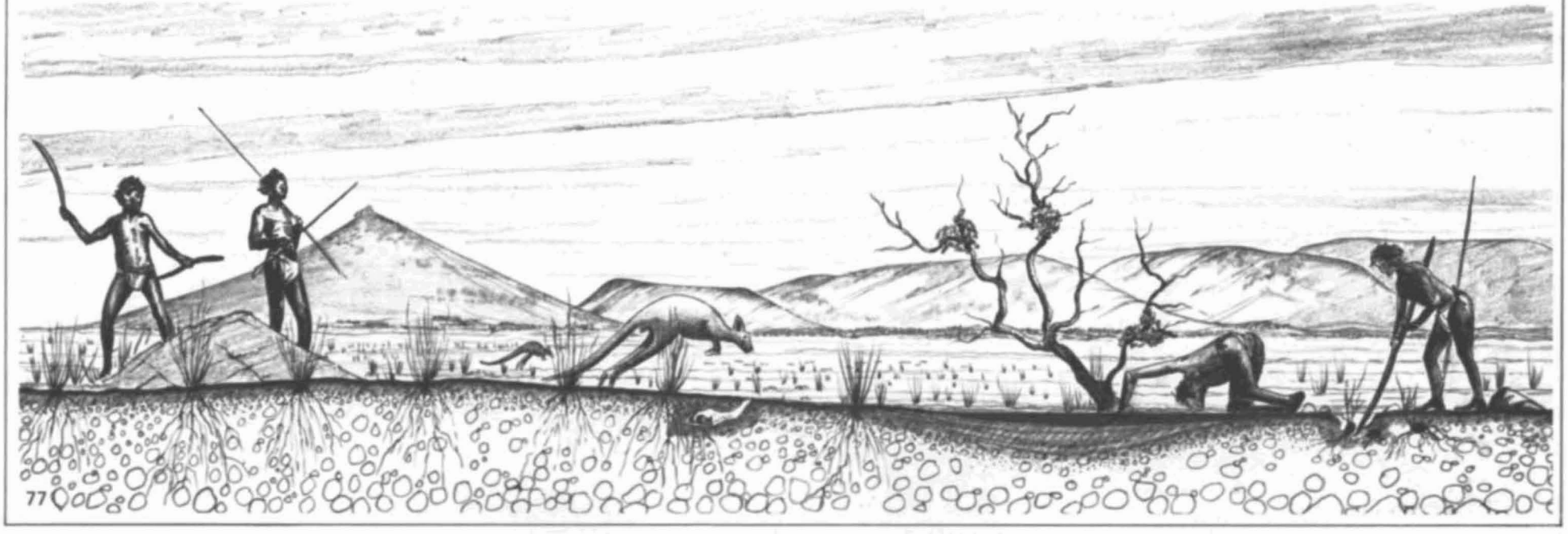
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poles, lesser limbs for fuel. In contrast to the shallow rooted saguaro, the mesquite has a tap root which can extend one hundred feet below ground. These two dramatic examples of adaptation by root structure can be elaborated to include all Sonoran plants in a three dimensional mosaic of root patterns.

The next exhibit on the desert trip, the Iranian Plateau Desert, supports a less dense vegetation. Artemisia is a characteristic shrub. Also prevalent are ephemeral annuals and perennial bulbs. As in the Sonoran Desert, the ephemerals respond to erratic rainfall with an abbreviated life cycle, while bulbs store energy and moisture underground during the driest season.

The sheep, dromedary camel, jerboa, onager, hamster and various reptiles are all creatures of the desert. Both camel and fat-tailed sheep store food and moisture in localized tissue. Hamster and jerboa burrow and plug their holes to conserve humidity, reduce water loss by concentrated urine and dry feces. Burrows are remarkably efficacious as climate control. A surface temperature at 66 degrees centigrade compares to 16 degrees centigrade within a burrow. Iranian adaptations to the desert include everything from traditional dress, skin pigmentation, shelter, and the caravanserai with its cistern and subterranean building, but the major cultural adaptation to the Iranian desert has been the technological innovation of the qanat and the irrigated agriculture which resulted.

The distinction of the Australian Great Sandy Desert is most evident in its marsupial fauna including kangaroo, marsupial mouse, hare wallaby and in its many poisonous snakes and spiders. Marsupials are not genetically adapted to deserts but Australian marsupials reveal the same fat and moisture concentration of specialized tissue observed in camels and sheep of the Iranian desert. While the cacti of North America and the euphorbia of Asia fill respective desert niches, these roles in Australia are occupied by eucalyptus and acacia. Here too ephemerals are found. This is the most severe of the three desert examples and this is revealed in the low density of vegetation. Cultural adaptation to the desert by the Bindibu aborigines includes highly developed capability of sensing water, a mobility related to rainfall, elaborate memorizing of water holes, skin pigmentation and nomadic hunting and gathering. Australian aboriginals also have a highly developed voluntary temperature control mechanism.

At the conclusion of such a trip the visitor could compile a list of adaptive strategies and contemplate the lessons they provide. Within the realm of physiological adaptation, reduction of water loss is paramount. It can be accomplished by dry feces and concentrated urine, by reduced skin and lung evaporation. Nocturnal activity reduces desert stress, impermeable skin, protective coloring and hair are all protective devices responsive to desert stress. Water and fat storage in local tissue is an efficacious strategy in animals.

Behavioral adaptations include nomadism or migration, food storage in caches, hibernation, burrowing, eating organisms with high water storage, drinking of dew, inactivity during daytime, reproduction linked to rainfall. In man the desert city based upon the qanat and irrigation reveal the most successful human adaptation in all of the deserts examined. However, one prospective adaptive device is technological—the production of photoelectric cells to produce direct electric current. This is one new adaptive device to capture the abundant insolation.

It would be a major omission to exclude one specific human adaptation to the desert—mysticism and religion. Is it an accident that

71. Plateau Desert Subterranean Exhibit
72. Desert: Iran, Plateau Desert
73. Plateau Desert Adaptations
74. Plateau Desert Adaptation: Cistern

75. Desert: Oceania, Great Sandy Desert
76. Great Sandy Desert Exhibit
77. Great Sandy Desert Adaptations

Mohammed, Jesus and Moses were of the desert?

Human adaptations to the desert follow plant and animal adaptations almost exactly—nomadism, migration, subterranean dwelling, water storage, nocturnal activity, use of shade. Man has actively modified the desert environment. Indeed this is the lesson of Iran to the world. The Persian Garden is testimony to the men who made the desert bloom.

The transition of a gradient of environments from tundra to tropical forest is a more dramatic experience and because the replication is compressed in Pardisan, the various environments and changing adaptation will be clearly visible within a single visit.

The factors defining this gradient are a complex interaction of three conditions: temperature, available moisture and fluctuation in both conditions, diurnal and seasonal. Generally the gradient of average temperature increases from a minimum at the poles to a maximum at the Equator. Precipitation follows a similar gradient but in tundra it is unavailable as ice and snow. From coniferous to deciduous forest, grassland to scrub woodland and desert there is a dramatic decrease in available moisture. However, the savanna is wetter than desert, the rain forest wetter still.

Several general themes are prominent as one traverses bioclimatic zones. Individuals of animal populations in cold climates tend to be larger, Bergmann's rule. Animals in cold climates, according to Allen's rule, have shorter appendages than related animals in warmer climates. The Canadian hairy woodpecker is larger than the Costa Rican one; the arctic hare has very short ears. The desert jackrabbit has very long ones. Larger bodies and shorter appendages have proportionately less surface area from which to radiate heat and are therefore advantageous in cold climates where conservation of heat is essential for survival.

As one moves from tundra to tropics an increase in species diversity is observed. This pervasive pattern occurs in virtually all groups of organisms and breeding land-birds provide a typical example. There are 49 species of breeding land-birds present in the Alaskan tundra, 113 species in the Appalachian forest, and 1000 species in the Amazon rain forest. The most dramatic examples are offered at the extremes. The tundra has few small cushion-like and prostrate plants, mosses and lichens predominate. In contrast the gigantic tropical rain forest has the maximum number of species and a great diversity of these.

The gradient in available moisture produces a characteristic structure in the plant community from forest to grassland to desert with intermediate gradations of scrub and savanna. Animals have adapted to these structural differences in the plant community, for example, mammals in forests have smaller bodies than mammals in more open environments such as grasslands.

A transect of environments in Pardisan might begin with the tundra in Alaska, proceed to the Pacific coniferous forest in that same region, thence to the deciduous forest of North America and the Great Plains of that continent. The next location, in Europe, would be the scrub woodland of the Mediterranean maquis—followed by three African examples: the Sahara Desert, the Rift Valley savanna, and the Congo rain forest. Progression down the gradient is quite dramatic. The rocky tundra with its sparse, low vegetation grades into willow, alder and occasional stunted conifers. These increase in density and size to culminate in the great coniferous forest. Occasional hardwoods gradually proceed to dominate

78. Site Plan Detail: Alaskan Tundra, Pacific Coniferous Forest, Appalachian Deciduous Forest, Great Plains, Mediterranean Maquis Sahara Desert, Great Rift Valley, Congo Rain Forest
79. World Key Map
80. Site Key Map

81. Tundra North America, Alaskan Tundra
    1. Human adaptation to extreme cold: heat retaining shelter
    2. Human adaptation to extreme cold: subcutaneous fat, use of animal fur for clothing
    3. Animal adaptation to extreme cold: subcutaneous fat, thick waterproof fur
82. Coniferous Forest, North America, Pacific Coniferous Forest
    1. Plant adaptation to short growing season: photosynthesis above 0° Celsius
    2. Animal adaptation to short growing season: food storage
    3. Human adaptation to short growing season: food storage
83. Deciduous Forest, North America, Appalachian Forest
    1. Plant adaptation to seasonal cold: dormancy and deciduous leaves
    2. Animal adaptation to seasonal cold: hibernation

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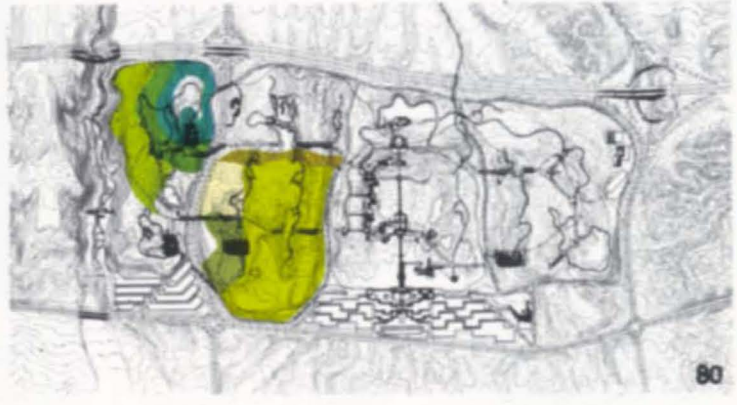

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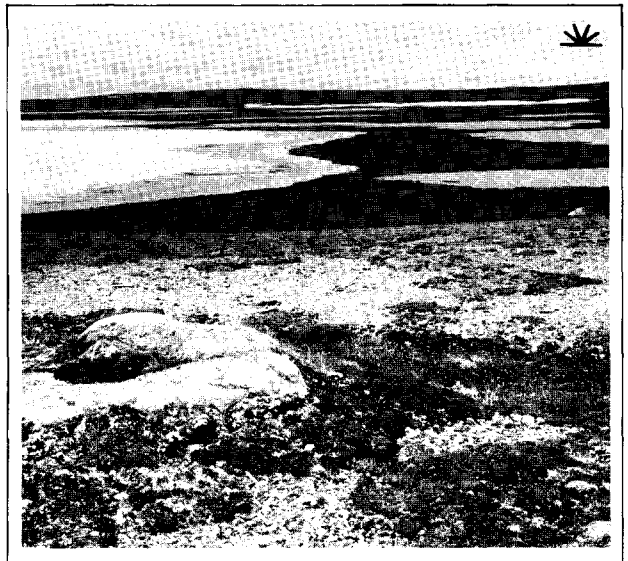

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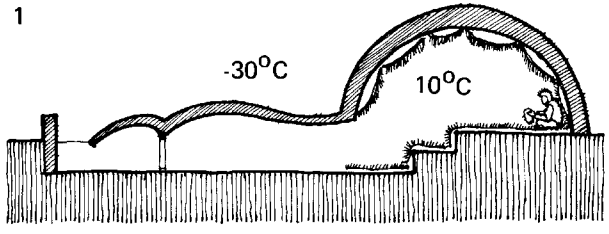

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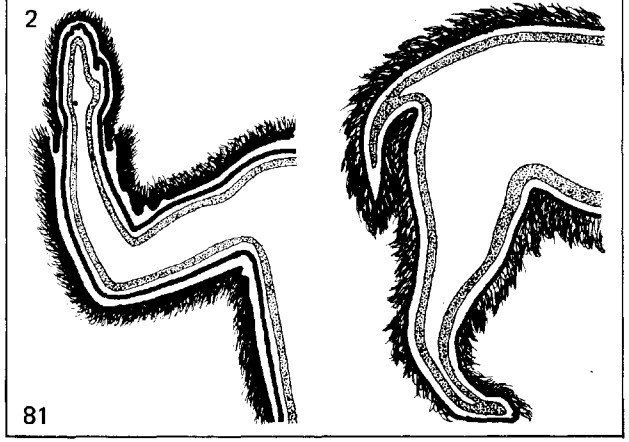

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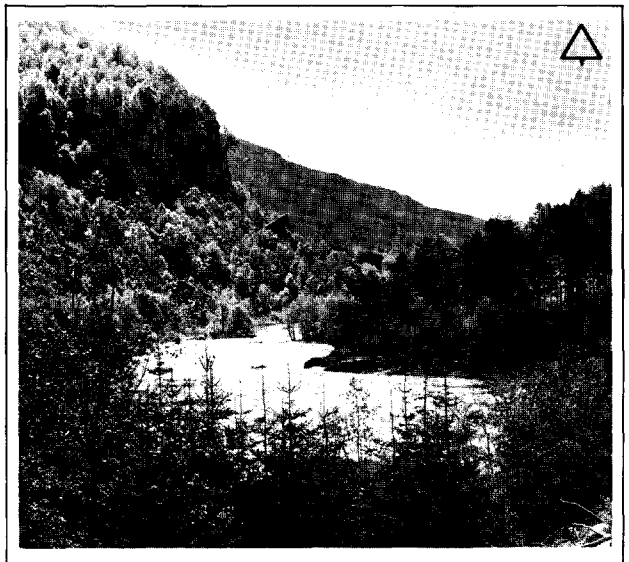

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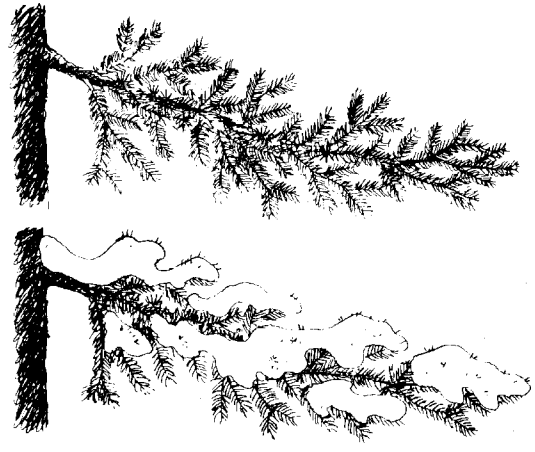

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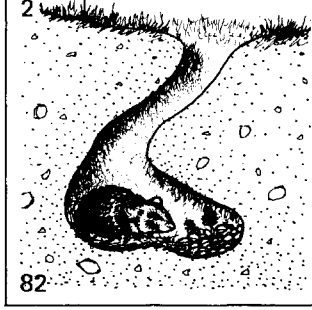

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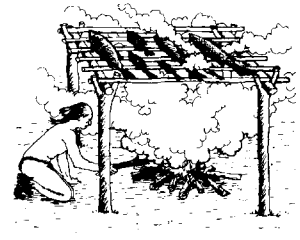

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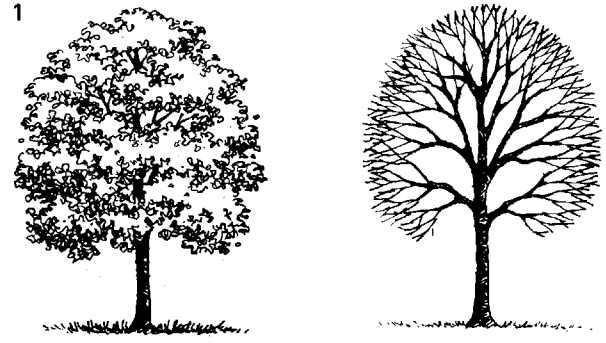

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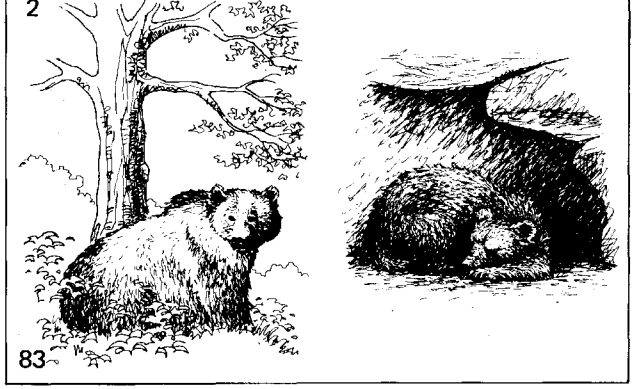

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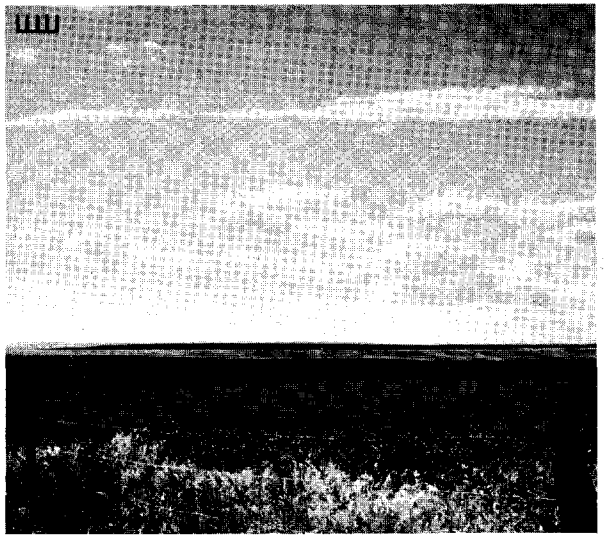

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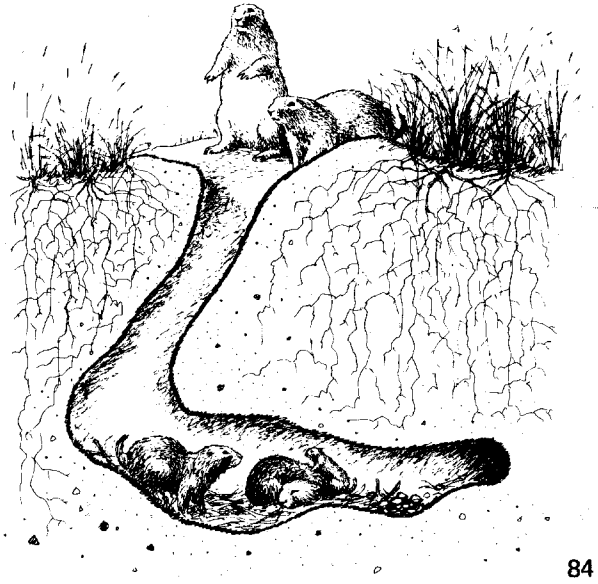

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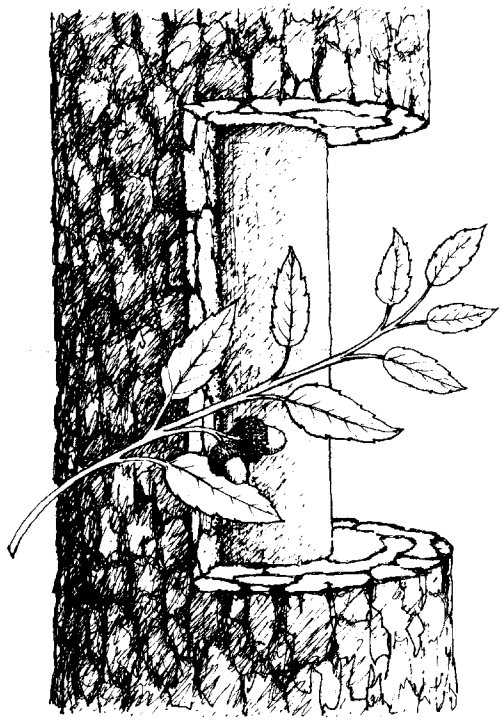

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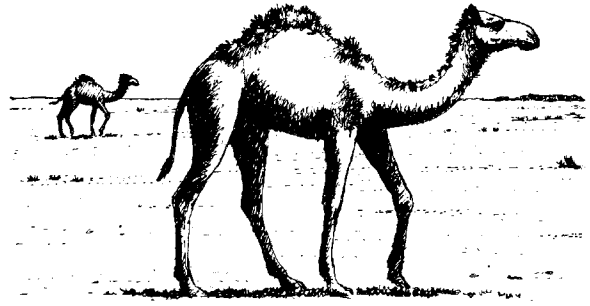

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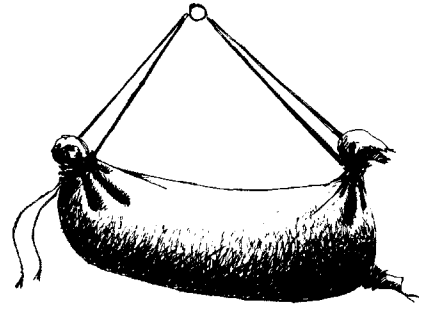

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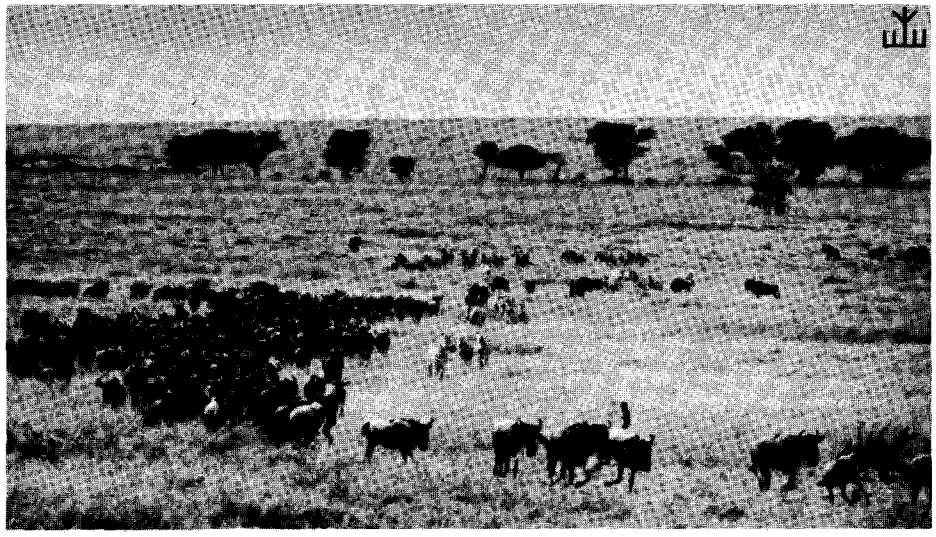

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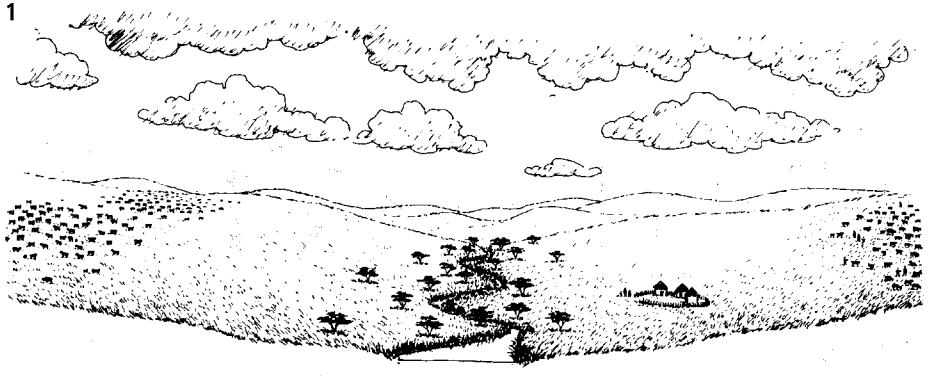

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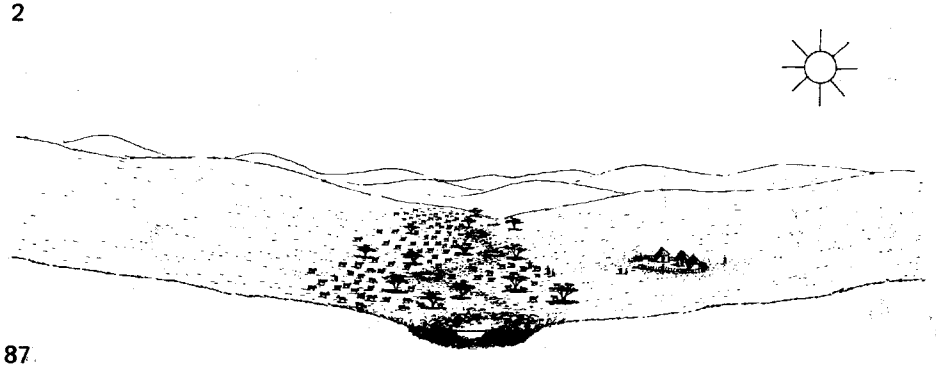

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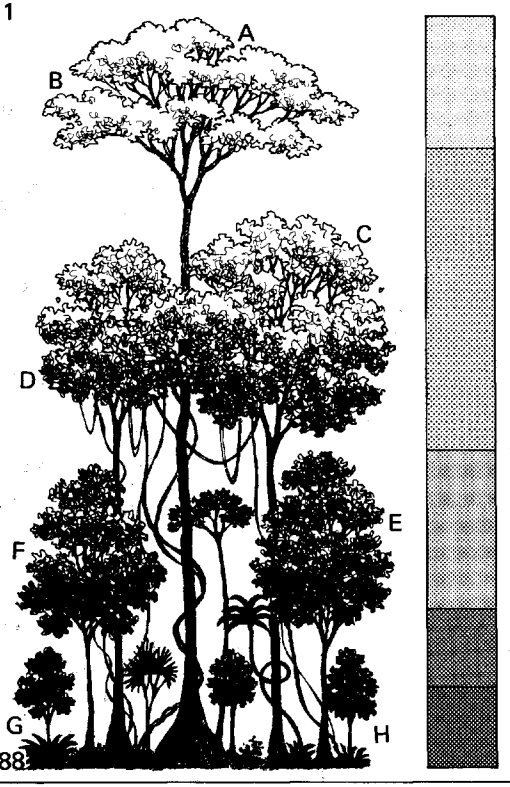

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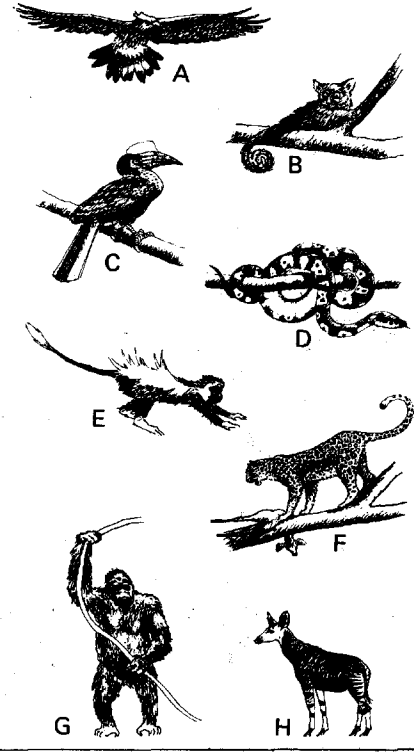


84. Grassland, North America, Great Plains
    1. Plant adaptation to seasonal drought: extensive subterranean root system
    2. Animal adaptation to seasonal drought: burrowing
85. Dry Scrub and Woodland, Europe, Mediterranean Maquis
    1. Plant adaptation to seasonal drought: water conservation by thick bark and hard leathery leaves
86. Desert, Africa, Sahara Desert
    1. Animal adaptation to aridity: water conservation and water retention
    2. Human adaptation to aridity: water storage
87. Savanna, Africa, Great Rift Valley
    1. Animal and human adaptation to season drought: migration to upland for wet season
    2. Animal and human adaptation to season drought: migration to lowland for dry season
88. Tropical Forest, Africa, Congo Rain Forest
    1. Plant adaptation to continuous growing season: continuous photosynthesis, stratification of plants
    2. Animal adaptation to stratification of plants: stratified niches
        a) African crowned eagle, b) Dwarf galago,
        c) Yellow-casqued hornbill, d) Python,
        e) Colobus monkey, f) Leopard, g) Gorilla,
        h) Okapi

until climaxing in the great oak-beech-chestnut Appalachian deciduous forest. As precipitation declines, the deciduous forest becomes localized in riparian lands and steep valleys and the tall grass prairie dominates. We then cross to Europe, where, with increasing dessication, scrub woodland appears. As the dry scrub becomes more open and arid it grades into desert. Further south, increasing rainfall accompanies the savanna with sparse acacia trees and scrub mixed with grasses. As available moisture increases this develops into the luxuriant tropical rain forest.

The limiting factors in the Alaskan tundra which apply to plants and also constrain both animals and man include the stress of extreme cold, high winds and seasonal unavailability of moisture which is trapped in ice, snow and permafrost. Most animals are omnivorous, since food is scant. Other animals migrate. Remaining animals employ white coloration adaptation. The ermine and varying hare both turn white in response to the shortening days of winter. Tundra animals are insulated from extreme cold by subcutaneous fat and thick waterproof fur. Most tundra animals burrow below snow. Eskimos have taken advantage of these adaptive devices and utilize animal fur for clothing and as insulation for igloos. The igloo is a marvelous heat-retaining shelter which can maintain interior temperatures at 10 degrees Centigrade when outside temperatures fall well below -18 degrees Centigrade.

Alpine tundra is a physiographic anomaly in the gradient from the poles to the Equator. High altitudes reproduce similar stresses to those of the Arctic tundra, thus producing similar adaptations.

The coniferous forest is a less harsh environment than the tundra plains, and the Pacific coniferous forest is tempered by a coastal climate. This environment provides rich and dramatic fauna—lynx, bear, moose, deer and, in the marshes of this region and the tundra, there are the nesting sites for many of the world's waterfowl. Cold winter, a short growing season, and unavailability of moisture in snow are the stresses of the coniferous forest for which continuous photosynthesis and evergreen scales and needles are specific adaptations. Survival through the winter also constitutes the greatest problem for animals and man. Some animals hibernate, others migrate, while others store food for the winter. The Tlingit of the Pacific coniferous forest depend on an abundant fish supply to survive the long winter.

The rich deciduous forest of Appalachia reveals the maximum species diversity of both plants and animals in temperate climates, and here food chains, herbivore, carnivore and predator-prey relationships can be expounded. A great fauna of birds, fish, mammals and reptiles can be presented. The mesic condition of this forest presents only modest environmental stresses. The deciduous forest, long a human outpost in cultural history, progressively became the locus for the most concentrated human settlement on both sides of the Atlantic as it did in Asia.

Seasonal drought and seasonal cold are the most stringent constraints in the grasslands of North America. Grasses require less water than trees and many long, fine roots quickly absorb water. A thick mat of dead grasses in the upper soil layer also retains moisture long after rain, and retards dessication in the soil beneath. During the cold season most plants die back to the ground, their reproductive parts protected from weather extremes. Much animal activity in the Great Plains is also subterranean. Little cover is afforded by the open prairie and many small mammals live in burrows which moderate temperature and conserve humidity. There is safety in numbers, and the large social groups common in the grasslands are another adaptation to lack

of protective cover. Colonies of prairie dogs and pocket gophers live in vast interconnected tunnels, while herds of bison and pronghorns are prominent on the plains.

The Mediterranean maquis is a scrub woodland which extends from Italy and Greece to the coasts of Lebanon and the northern shores of Africa. In many places it has been transformed into arid semi-desert. Groves of olive trees, cork oaks, and vineyards are common sights in this grazed, domesticated landscape. Summer drought and warm rainy winters characterize this environment. Plants respond with strategies for water conservation and retention. The fauna is very modest, birds being more conspicuous than other creatures. However in human terms, the Mediterranean contained the great powers of Ancient Greece and the Roman Empire.

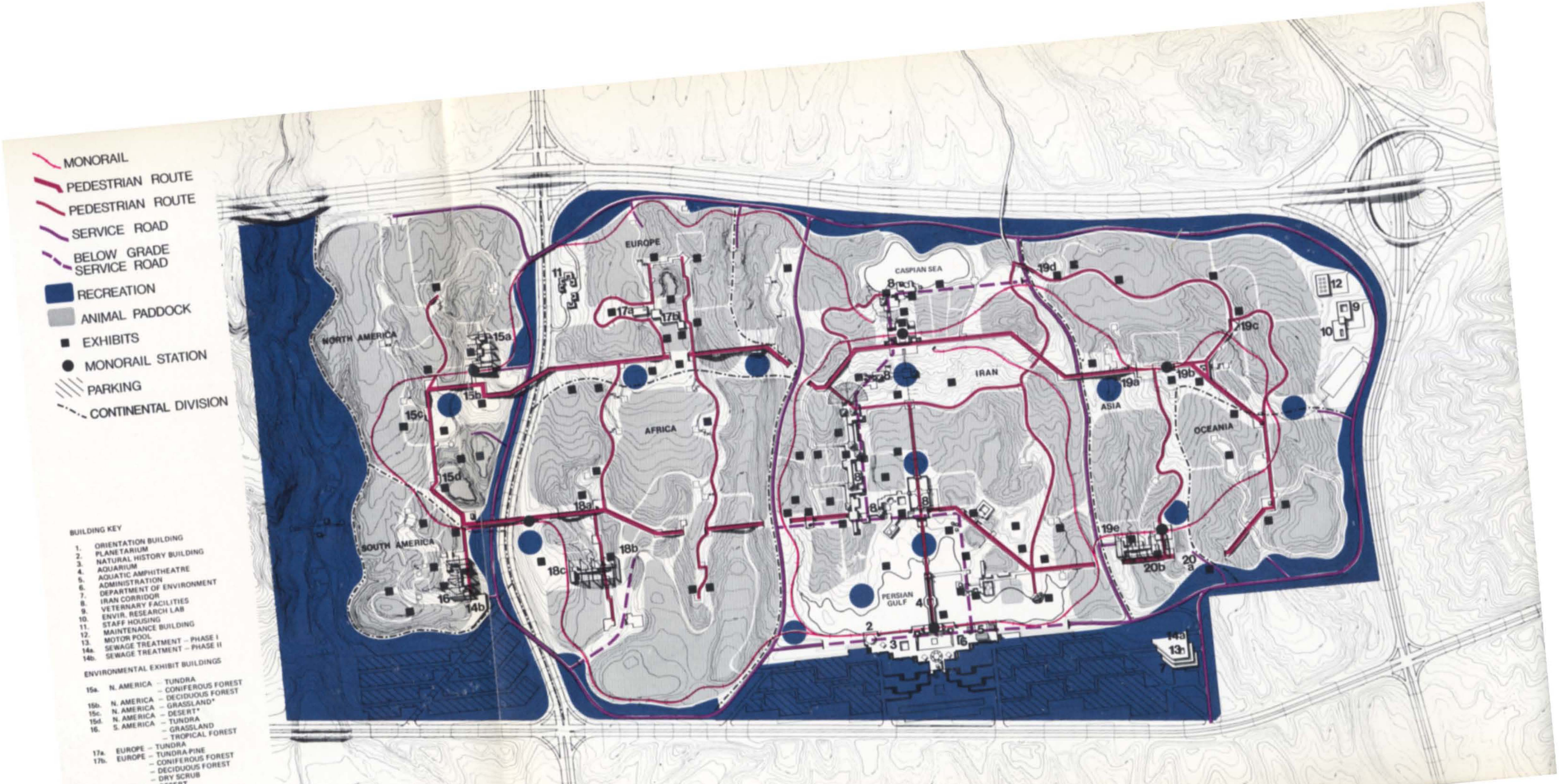
The Sahara Desert is analogous to other deserts exhibited at Pardisan. Much has been written on these and need not be repeated.

The Great Rift Valley savanna in Africa supports a rich fauna of herbivores and carnivores. Indeed, it is this exhibit which provides the dominant attraction in most of the world's zoological gardens. Animal communities are characterized by large social groups, and individuals cooperate in hunting, eating, and for protection. A hot climate and long growing season provide a more favorable environment than temperate grasslands, but seasonal drought and fires are stresses to which all savanna organisms must respond. Plant structure and physiognomy, animal reproduction and migration, and human settlement and nomadism follow the seasonal cycles of rainfall. The savanna is characterized by short grass on dry uplands and long grass with scattered acacia trees in the wetter lowlands. Huge herds of herbivores migrate to the uplands for the rainy season, followed by many of their predators. The young men of the Karimojong, pastoral nomads of the savanna, also move their herds to the uplands. Water is abundant and the animals reproduce. As the rains recede, wild and domestic herds return to the lowlands in a massive, dramatic migration.

The luxuriant Congo rain forest, rich with giant butterflies, sloths, monkeys in profusion, and an incredible aerial fauna, is a fitting climax to this tour. The climate is hot and humid, permitting continual photosynthesis. Plants are highly stratified in response to decreasing light levels, and animals have specialized to exploit an increased number of more narrow niches. The rain forest is not amenable to intensive or mechanized agriculture, but affords a bountiful food supply to hunter-gatherers such as the Mbuti Pygmies.

Environmental conservation, epitomized by Pardisan, is one supreme mode of adaptation. Perhaps the earth bestows no greater treasure than its genetic inheritance embodied in the diversity of its creatures. Their preservation is vital but the precondition for success in this venture is the preservation of the habitats which maintain them and which they maintain. This is a central role of the Department of Environment and a central theme for Pardisan.

Such is the concept and its development. Its beginnings are in the mandate—"only one world," a single institution devoted to problem-solving for today, addressing the problem of continuous adaptation as the essential mechanism for managing the environment of Iran to enhance the quality of life for its people. It begins from Iran and its environments, extends to embrace the world and the cosmos and returns through time to the here and now. Its structure permits an infinity of interpretation of adaptation by plants, animals, men and their institutions. It should provide delight, provoke thought and help modern Persians to solve modern problems.



BUILDING KEY

1. ORIENTATION BUILDING
2. PLANETARIUM
3. NATURAL HISTORY BUILDING
4. AQUARIUM
5. AQUATIC AMPHITHEATRE
6. ADMINISTRATION
7. DEPARTMENT OF ENVIRONMENT
8. IRAN CORRIDOR
9. VETERNARY FACILITIES
10. ENVIR. RESEARCH LAB
11. STAFF HOUSING
12. MAINTENANCE BUILDING
13. MOTOR POOL
14a. SEWAGE TREATMENT – PHASE I
14b. SEWAGE TREATMENT – PHASE II

ENVIRONMENTAL EXHIBIT BUILDINGS

15a. N. AMERICA – TUNDRA
– CONIFEROUS FOREST
15b. N. AMERICA – DECIDUOUS FOREST
15c. N. AMERICA – GRASSLAND*
15d. N. AMERICA – DESERT*
16. S. AMERICA – TUNDRA
– GRASSLAND
– TROPICAL FOREST

17a. EUROPE – TUNDRA
17b. EUROPE – TUNDRA-PINE
– CONIFEROUS FOREST
– DECIDUOUS FOREST
– DRY SCRUB

18a. AFRICA – DESERT
18b. AFRICA – SAVANNA*
18c. AFRICA – TROPICAL FOREST

19a. ASIA – TUNDRA
19b. ASIA – DECIDUOUS FOREST
19c. ASIA – GRASSLAND
19d. ASIA – DESERT*
19e. ASIA – TROPICAL FOREST

20a. OCEANIA – DRY SCRUB
– DESERT

20b. OCEANIA – TROPICAL FOREST

*–SUBSURFACE EXHIBIT FACILITIES

THE PROGRAM

Ecological planning involves the fitting of the environment and the needs and desires of consumers. The environments of Pardisan have been structured to realize a national policy whereby education in environmental dynamics will enhance resource planning and management. But what of the principal consumers, the visitors—who will they be, how many and, most important of all, what services will they require? The other category of consumers includes, of course, the plants, animals, and people constituting Pardisan, all of which also require services. The demands for the latter can be computed from the plan. The number of visitors and the services they require must be predicted. It was possible to use attendance figures for the Asian Games and Trade Fairs as a basis for prediction. It was also possible to ascertain attendance at Zoos and Botanical Gardens elsewhere in the world and relate these to the populations of the cities in which the institutions were located. Such figures could then be adjusted to the presence of competing facilities and the availability of open space. Tehran is conspicuously deficient in the latter. As a result, estimates were made of prospective attendance. It was predicted that the peak attendance may be thirty-five thousand in a three-hour period on a summer Friday afternoon. Such a day may have a total visitation of seventy thousand people. It has been estimated that weekday visits will attract between twenty-five to thirty percent of Friday visits and that the lowest levels of attendance will fall during winter-time. This leads to a prospective annual visitation of four million.

The sum of users, occupants and visitors is reflected in program elements. Over three million cubic feet of water will be required annually; over two and a half million cubic feet of water for irrigation will be provided from municipal water and reclaimed waste water. The dimensions of the water supply, sewer and sewage treatment systems have also been derived and designed. Three thousand two hundred parking spaces have been allocated. The circulation system has been designed to carry anticipated loads, both by wheeled vehicles and monorails. Facilities and user populations give dimension and location to all mechanical systems, notably for heating and cooling. The electrical and communication system will be provided by the town of Farahzad with an internal primary and secondary distribution. Storm drainage will be integrated with the entire water system while solid waste disposal will, with sewage sludge, be utilized in soil formation and fertilization. The entire program emphasizes energy conservation and recycling.

The preceding deals with large systems but these summations were derived from meticulous calculations for each exhibit. Let us examine the exhibit of the Rift Valley of Africa. Here in a subtropical savanna of grasses, golden, green and brown by season, mixed herds of springbok and

89. Land Use Plan

gazelle, hartebeest and gnu browse in the shade of spreading acacia. A matriarchal group of elephants and hippopatami bathe in a shallow pond left from last season's rains. A tranquil scene, but for the threat of pacing predators and the mischievous play of baboons.

How does this scene come to be? How is it sustained through the life time of an institution? Detailed programmatics have not only itemized representative plants and animal species and cultural elements as well as the proper number of these things, but have also prescribed the methods for establishing and managing these plant and animal communities.

Hoof stock requires flat sites. These animals cannot negotiate steep and uneven terrain. The giraffe in particular must be placed on flat ground. The predators, on the other hand, often dwell among rocky outcrops making forays into the grassland after their prey. The lion is generally an exception, remaining in thickets on the grassland floor.

Landforming and planting must be used to structure the extensive plain into several visual areas in order that rival animals and groups of animals may break eye contact with one another, thereby avoiding territorial confrontations. Duplicate spaces are provided for the accommodation of single species such as the cheetah in order to insure production of offspring. Because of the sharp and heavy hoofs of the herds of ungulates, animals must be rotated in order to sustain vegetative cover. Animal location within the total area can be strongly influenced by the availability of water and feed in different locations. In perpetual random cycle, water holes will dry up as other springs begin to flow.

By varying feeding and watering locations and times stereotyped animal behavior can be avoided.

To further avoid a semblance of domesticated behavior, visitor viewing should be from at least partially screened locations. While animals may become conditioned to the sight of the monorail, the sight of crowds ought naturally to trigger a defensive alertness. In no case should animals be looked down upon where the animals are aware of the visitors' presence. Similarly, predators cannot be too close to their prey. Resultant stress may manifest itself in animal pathology.

Health inspection will occur frequently, allowing treatment at the first sign of symptoms. Veterinary care for all but the smallest and most critically ill will be rendered in the animal's living area. Animals will return to outdoor quarters each night, a form of conditioning which is necessary for climatic reasons during the winter and proper management year round. Horticultural specialists will maintain a regular schedule of inspection of the botanical component of the environment. The areas allocated for vegetation have been apportioned on the basis of tolerance; the degree of impact by cohabitating animals, high with hoofstock, low with predators; and the dimensions of vegetative areas necessary to insure regeneration and give visual credibility. The scene described above will require 1.276 meters of water per year to be applied by moveable spray heads. This will be applied at night to reduce loss by evaporation and to avoid a visual incongruity during visiting hours.

General maintenance will be done after visiting hours. Each day in excess of three tons of manure must be removed from the African savanna, the product of more than three tons of feed which will be consumed. These chores will be done via the peripheral service road, which gives easy access, segregated from the public paths.

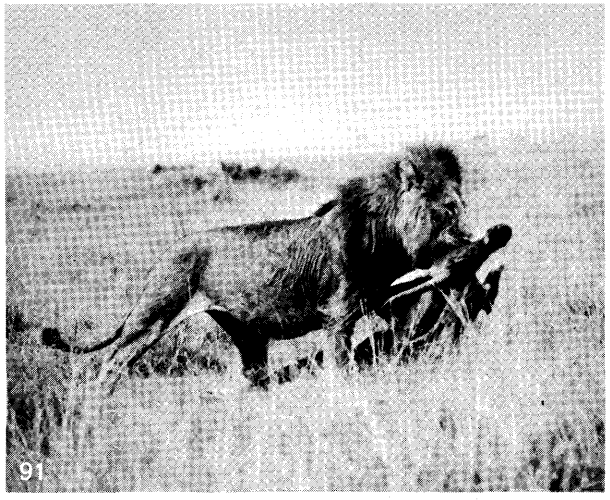
The vegetation, animal and cultural programs in-

90. Vegetation Program
    1. Water demand
    2. Bioclimatic zone
    3. General description of bioclimatic zone
    4. Major characteristics of plant community
    5. Major adaptive strategies
    6. Vegetation exhibits

91. Large Predator: Lion
92. Vast Mammal: Elephant
93. Primate: Chimpanzee
94. Small Mammal: Prairie Dog
95. Insect: Butterfly
96. Fish: Angelfish
97. Bird: Albatross
98. Reptile: Chameleon
99. Hoof Stock: Bighorn Sheep

100. Animal Program
    1. Shelter needs
    2. Bioclimatic zone
    3. General description of bioclimatic zone
    4. Major characteristics of animal community
    5. Major adaptive strategies
    6. Animal exhibits

1								
2	**TUNDRA**	**CONIFEROUS FOREST**	**DECIDUOUS FOREST**	**GRASSLAND**	**DRY SCRUB & WOODLAND**	**DESERT & SEMI DESERT**	**SAVANNA**	**TROPICAL FOREST**
3	Cold Very short growing season High winds	Cold Short growing season Heavy snowfall	Seasonal cold Humid	Seasonal cold Seasonal drought	Warm Seasonal drought	Arid Extreme daily and/or seasonal temperature variation Intense radiation	Hot Seasonal drought	Hot Very humid Continuous growing season
4	Unstratified low vegetation Few species	Dense evergreen forest canopy Sparse understory	Stratified forest of deciduous trees and shrubs Diverse species	Unstratified Grasses and other herbaceous species	Widely spaced trees or dense shrubs Sclerophyllous species	Widely spaced sparse vegetation Predominantly herbaceous species	Open grassland with scattered trees or dense thorny woodland	Dense, highly stratified forest Many species
5	Reduced size Food storage Prostrate form	Continuous photosynthesis Water conservation	Dormancy Tall upright form	Dormancy Annual life cycle Water retention	Dormancy Water conservation Reduced size	Dormancy Abbreviated life cycles Water conservation Food storage	Water retention Reduced size Water conservation	Continuous photosynthesis Specialization Increased size
6	**NORTH AMERICA** **Alaskan Tundra** Salix spp., Betula spp. Cladonia spp., Polytrichum spp., Sphagnum spp., Carex spp., Eriophorum spp., Poa spp., Lazula spp., Ranunculus spp., Pedicularis spp., Erigeron spp. **Rocky Mountains** Cladonia spp., Polytrichum spp., Trifolium nanum, Erigeron spp., Ranunculus spp., Saxifrage spp., Geum Rossii **SOUTH AMERICA** **Paramo** Espeletia gigantea, Espeletia alba, Culcitium sp., Puya raimondii, Stipa jehu, Festuca spp., Ariachne pulvinata **EUROPE** **Scandanavian Tundra** Salix spp., Betulus spp. Cladonia spp., Polytrichum spp., Sphagnum spp., Carex spp., Poa spp., Eriophorum spp. **Alpine Meadow** Gentiana spp.,Geum montanum, Leontopodium alpinum, Trifolium alpinum, Primula spp., Narcissus poeticus, Linaria alpina **AFRICA** **Ruwenzori Alpine** Senecio adnivalis, Lobelia keniensis Helichrysum spp., Alchemilla spp. **IRAN** **Elburz and Zagros Highlands** Acantholimon spp., Astragalus spp., Acanthophyllum spp., Onobrychis cornuta, Festuca spp., Poa spp. **ASIA** **Tibetan Plateau** Eurotia ceratoides, Artemesia skorniakovii, Tenacetum peniricum	**NORTH AMERICA** **Pacific Coniferous Forest** Picea sitchensi, Pseudotsuga taxifolia, Tsuga heterophylla, Thuja plicata Gaultheria spp., Berberis spp., Ribus spp., Sambucus spp. Pteridium aquilinum, Blechnum spicant, Sphagnum spp. **EUROPE** **Scandanavian Coniferous Forest** Picea abies, Abies sp., Larix sp., Pinus spp., Betulus spp., Populus spp. Empetrum nigra, Vaccinium spp. Cladonia spp., Lycopodium spp., Polytrichum spp., Sphagnum spp.	**NORTH AMERICA** **Appalachian Forest** Quercus rubra, Quercus alba, Carya spp., Fagus grandifolia, Tilia americana, Liriodendron tulipifera, Magnolia sp., Fraxinus app., Carpinus caroliniana, Cornus florida Amelanchier spp., Lindera benzoin, Viburnum spp. Trillium spp., Erythronium sp., Hepatica sp., Anemone sp., Viola spp., Panax quinquefolium **EUROPE** **West European Oak Forest** Quercus robur, Quercus sessiliflore, Fraxinus excelsior, Populus spp., Betula spp., Ulmus spp., Alnus glutinosa, Prunus spp., Crataegus spp., Acer sp. Taxus baccata Hedera helix **IRAN** **Hyrcanian Forest** Quercus castaneefolia,Fagus orientalis, Carpinus betulus, Acer insigne, Fraxinus spp., Ulmus spp. Crataegus spp., Buxus sempervirens Smilax excelsa, Hedera sp., Rubus sp. **ASIA** **Manchurian Forest** Quercus mongolica, Tilia spp., Betula spp., Acer spp., Juglans mandshuricum, Ulmus spp., Phellodendron amurense, Carpinus spp., Malus spp. Sambucus spp., Syringa spp., Ribus spp., Rosa spp. Clematis spp., Vitis amurensis, Lonicera spp., Panax ginseng	**NORTH AMERICA** **Great Plains** Populus deltoides Andropogon gerardi, Andropogon scoparius, Sorghastrum nutans, Buchloe dactyloides, Bouteloua gracilis. Senecio spp., Gaillardia spp., Helianthus spp., Rudbeckia spp., Ratibidia, Aster spp., Solidago spp. **SOUTH AMERICA** **Pampas** Stipa brachychaeta, Stipa trichotoma, Melica sp. **IRAN** **Lake Rezaiyeh** Poa sp., Stipa sp., Aristida sp., Bromus sp., Agropyrum sp., Festuca sp. **ASIA** **Russian Prairie** Amygdalus nana, Salvia nutans, Carduus uncinatus, Spirea spp. Stipe pennuta, Stipa lessingiana, Stipa joannis, Festuca sulcata, Festuca ovina, Agropyrum cristatum, Koeleria cristata, Carex stenophylla, Leucanthemum millefoliatum, Kochia prostrata, Ranunculus polyrhizus, Anemone spp. Tulipa sp., Paeonia sp., Iris sp.	**EUROPE** **Mediterranean Maquis** Quercus ilex, Quercus coccifera, Quercus suber, Pinus pinea, Pinus pinaster, Pinus halepensis Olea europaea, Cistus spp., Viburnum sp., Rosa sp. Arbutus unedo, Erica spp., Ulex spp., Genista spp., Myrtus communis, Rosmarinus officinalis, Lavandula latifolia **IRAN** **Zagrosian Oak Woodland** Quercus persica, Quercus libani, Ulmus sp., Acer sp., Pistacia spp. Prunus spp., Daphne spp., Lonicera spp. Anemone spp., Iris sp., Viola sp., Carex sp. **Pistachio Almond Scrub** Pistacia mutica, Pistacia vera, Amygdalus reuteri, Crataegus sp. **Juniper Scrub** Juniperus excelsa **OCEANIA** **Australian Eucalyptus Forest** Eucalyptus diversicolor, Eucalyptus ficifolia, Eucalyptus marginata, Eucalyptus regnans, Castanospermum australe Alphitonia excelsa, Acacia spp., Bauksie spp., Hakea spp., Kingia australis **Australian Mulga Scrub** Acacia aneura, Acacia pendula, Drimys aromatica, Sterculia sp.	**NORTH AMERICA** **Sonoran Desert** Carnegiea gigantea Larrea divaricata, Franseria dumosa, Cercidium spp., Agave spp., Fouquiera splendens **AFRICA** **Sahara Desert** Acanthyllis sp., Haloxylon sp., Tamarix sp. Aristida sp., Euphorbia sp., Ephedra sp. **Namib Desert** Welwitschia sp., Acanthosicyos horrida, Eragrostis spinosa, Aristida brevifolia, Augea capensis **IRAN** **Plateau Desert** Pistacia spp., Amygdalus spp., Tamarix spp., Haloxylon sp., Calligonum sp., Artemesia spp., Astregalus spp. Salsola spp., Aristida spp. **Artemesia Steppe** Artemesia spp., Astragalus spp., Stipa sp. **Gulf Coastal Plain** Haloxylon sp. Aristida sp. **ASIA** **Gobi Desert** Artemesia maritima, Artemesia pauciflora Atriplex spp. **OCEANIA** **Great Sandy Desert** Casuarina decaisnea, Acacia aneura Zyglochloa paradona, Triodia pungens	**AFRICA** **Great Rift Valley** Acacia spp. Penniserum sp., Andropogon sp., Imperata spp., Hyparrhenia spp. **IRAN** **Makran** Zizyphus spina-christi, Acacia spp. Salvadora persica, Calotropis procera, Stocksia brahuica, Prosopis sclcigera, Euphorbia carica, Periploca aphylla, Capperis sp., Nannorhops sp.	**SOUTH AMERICA** **Amazon Rain Forest** Hevea brasiliensis, Theobroma cacao, Musa spp. Astrocaryum jawari, Attalea excelsa, Leopoldinia pulchra, Mauritia spp., Berstholetia excelsa, Paullinia sorbilis Smilax spp., Epiphyllum spp., Orchidaceae spp. Arundo saccharoides, Dioscera amazonum, Drosera brevifolia **AFRICA** **Congo Rain Forest** Funtumia elastica, Landolphia owariensis, Khaya senegalensis, Piptadenia africana, Staudtia gabonensis Elaeis guineensis, Raphia vinifera, Coffeia liberica Erythrina excelsa, Aframomum melegueta, Begonia oxyloba **ASIA** **Sunda Rain Forest** Gnetum macrostachyum, Nepenthes ampullaria, Stypheila suaveolens, Trochocarpa fearmonthiane, Lavanthus estipiratus **OCEANIA** **New Guinea Rain Forest** Gnetum macrostachyum, Nepenthes ampullaria, Eucalyptus deglupta, Dianella caevula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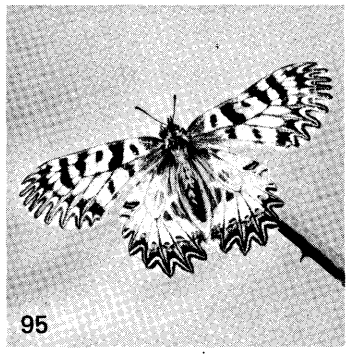
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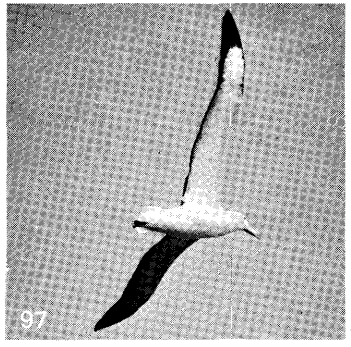
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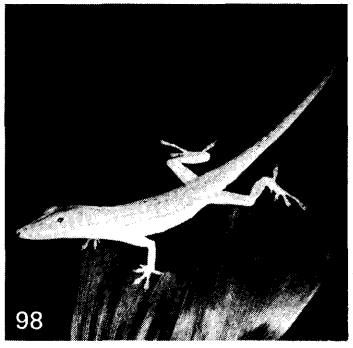
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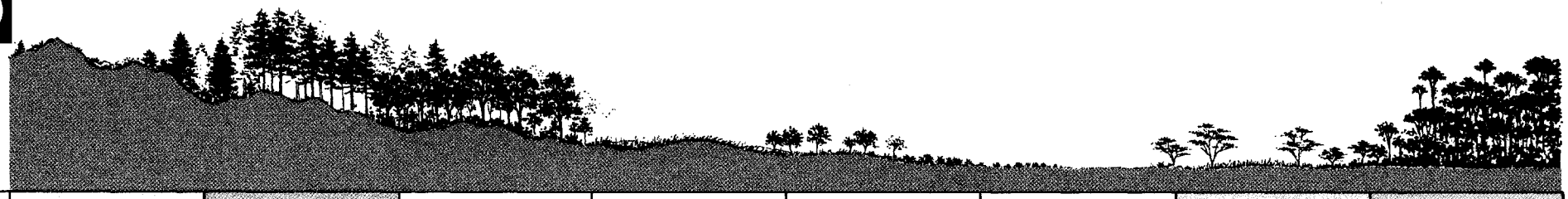

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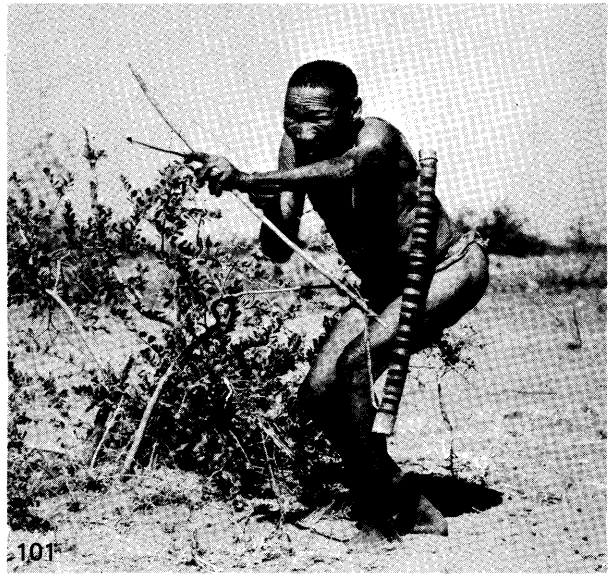
2	**TUNDRA**	**CONIFEROUS FOREST**	**DECIDUOUS FOREST**	**GRASSLAND**	**DRY SCRUB & WOODLAND**	**DESERT & SEMI DESERT**	**SAVANNA**	**TROPICAL FOREST**
3	Cold Very short growing season High winds Difficult terrain Unstratified low vegetation	Cold Short growing season Heavy snowfall Evergreen forest with sparse understory	Seasonal cold Humid Stratified forest of deciduous trees and shrubs	Seasonal cold Seasonal drought Unstratified grasses and other herbaceous species	Warm Seasonal drought Widely spaced trees or dense shrubs	Arid Extreme daily and/or seasonal temperature variation Intense radiation Widely spaced, sparse vegetation	Hot Seasonal drought Open grassland with scattered trees or dense thorny woodland	Hot Very humid Continuous growing season Dense, highly stratified forest
4	Sparse fauna Large carnivores Herds of large hoofed stock Rodents	Sparse fauna Large carnivores Herds of large hoofed stock Rodents	Diverse fauna Forest hoofed stock Many small mammals Birds Rich insect life Arboreal species	Limited fauna Herds of hoofed stock Colonies of rodents Birds of prey	Limited fauna Hoofed stock (Marsupials in Oceania) Birds of prey	Impoverished fauna Hoofed stock Small mammals Reptiles	Rich fauna Large herds of hoofed stock Groups of carnivores, scavengers, primates, vast mammals Birds of prey	Rich speciation Limited populations Arboreal species Many birds, small mammals, primates
5	Insulation Hibernation Food Storage Migration Specialized hoof development	Insulation Hibernation Food Storage Migration Omnivorous diets	Insulation Hibernation Food storage Migration Moulting Climbing and swinging	Hibernation Migration Group formation Cellulose digestion Burrowing	Water conservation Migration Omnivorous diets	Water conservation Aestivation Nocturnalism Migration Ranging Burrowing	Migration Ranging Group formation Cellulose digestion	Specialization Climbing and swinging
6	**NORTH AMERICA** **Rocky Mountains** Dall Mountain Sheep, Rocky Mountain Goat Timber Wolf Pika, Rocky Mountain Marmot, Meadow Vole, Bobcat Reptiles Birds Insects **SOUTH AMERICA** **Paramo** Llama, Vicuna, Alpaca Spectacled Bear Chinchilla, False Paca Reptiles Birds Insects **EUROPE** **Scandanavian and Alaskan Tundra** Musk Ox Polar Bear Arctic Fox, Arctic Hare, Arctic Ground Squirrel, Norway Lemming, Ermine Reptiles Birds Insects **Alps** Chamois, Alpine Ibex Lynx Lynx, Alpine Marmot, Snowy Vole, Alpine Shrew Reptiles Birds Insects **IRAN** **Elburz and Zagros Highlands** Persian Wild Goat Timber Wolf, Snow Leopard Blanford's Fox **ASIA** **Tibetan Plateau** Chiru, Wild Yak, Musk Deer, Argali Wolves Black Nosed Pika, Tibetan Sand Fox, Hares Reptiles Birds Insects	**NORTH AMERICA** **Pacific Coniferous Forest** Mule Deer, Elk Grizzly Bear Canadian Lynx, Beaver, Muskrat, Wolverine, Snow Shoe Hare, Mink, American Marten, Porcupine Hunting Fisher, Grey Squirrel, American Flying Squirrel, Bog Lemming, Meadow Vole, Northern Red Backed Vole Reptiles Birds Insects **EUROPE** **Scandanavian Coniferous Forest** European Elk, Waipiti Northern Lynx, Wolverine, Siberian Chipmunk, European Flying Squirrel, Red Squirrel, Siberian Weasel, Sleek Pine Marten, Wood Lemming, Sable, European Varying Hare, Seals Reptiles Birds Insects	**NORTH AMERICA** **Appalachian Forest** White Tail Deer Cougar, Black Bear Grey Fox, Raccoon, Woodchuck, Cotton Rabbit, Porcupine, Opposum, Skunk, Bat spp., Mouse spp. Reptiles Fish Birds Insects **EUROPE** **West European Oak Forest** European Wisent, Red Deer, Roe Deer, Wild Boar European Wildcat, European Pole Cat, Red Fox, Brown Hare, European Hedgehog, Shrew spp., White Footed Mouse, Edible Dormouse Reptiles Fish Birds Insects **IRAN** **Hyrcanian Forest** Roe Deer, Red Deer Siberian Tiger Jungle Cat, Lynx, Otter, Weasel, Pine Marten, Badger, Crested Porcupine, Edible Dormouse, House Mouse, Vole spp., Mediterranean Mole, Shrew spp. Fish Waterfowl, Forest Birds **ASIA** **Manchurian Forest** Serow, Manchurian Roe Deer, Sika Deer Manchurian Tiger Siberian Squirrel, Raccoon Dog, Short-Eared Hare, Chinese Feret Badger, Talloned Shrew, Dwarf Hamster, Mole Reptiles Birds Insects	**NORTH AMERICA** **Great Plains** Bison, Pronghorn Coyote Black Footed Feret, Jack Rabbit, Prairie Dog, Pocket Gopher, Ground Squirrel, Badger, White Footed Mouse Sage Grouse Reptiles Insects **SOUTH AMERICA** **Pampas** Guanaco, Pampas Deer Cougar, Manned Wolf Colpeo Fox, Pampas Cat, Patagonian Cavy, Viscacha, Rhea, Great Anteater, Patagonian Hare, Tucotuco, Patagonian Weasel Reptiles Birds Insects **IRAN** **Lake Rezaiyeh** European Hedgehog, Long Clawed Ground Squirrel, Bicolor White-Toothed Shrew, Lesser Shrew, Common Vole, Mole Vole, Great Jird, Wood Mouse Waterfowl **ASIA** **Russian Prairie** Prezewalski's Horse, Saiga Antelope Pallas Cat, Pika, Steppe Lemming, Mole Rat, Bobcat Marmot, Jerboa Reptiles Birds Insects	**IRAN** **Zagrosian Oak Woodland** Fallow Deer, Wild Boar Syrian Brown Bear, Lion, Leopard European Hare, Persian Squirrel, Red Fox Fish: Zagrosian Stream, Cavefish **Pistachio-Almond Scrub** Sheep spp., Domesticated Goat, Auroch, Donkey Jackal, Manul Cat, Wild Cat, Marbled Pole Cat Birds **Juniper Scrub** Birds of Prey **OCEANIA** **Australian Mulga Scrub** Great Grey Kangaroo, Red Necked Wallaby, Rock Wallaby, Wallaroo Dingo Tasmanian Devil, Common Wombat, Australian Native Cat Emu Reptiles Insects	**NORTH AMERICA** **Sonoran Desert** Desert Bighorn Collared Peccary, Woodrat, Kangaroo Rat, Desert Shrew, Kit Fox, Desert Cottontail, Ringtail, Coatimundi Reptiles Aquatic Birds Insects **AFRICA** **Sahara Desert** Oryx, Addax Fox sp., Hedgehog sp., Jerboa, Rat sp. Reptiles Birds Insects **Namib Desert** Gemsbok, Hartman's Zebra, Klipspringer, Rock Hyrax, Rock Hare, Meerkat Reptiles Birds Insects **IRAN** **Plateau Desert** Onager, Gazelle spp. Cheetah, Striped Hyena, Caracal Sand Cat, Jerboa spp., Jird sp. **Artemesia Steppe** Bactrian Camel Fox sp., Marten sp., Hedgehog sp., Hare sp., Pika sp., Squirrel sp., Hamster spp., Jird sp. **Gulf Coastal Plain** Dromedary Camel Mongoose spp., Hare sp., Palm Squirrel, Honey Badger, Hedgehog spp., Fox sp., Bat sp., Gerbil spp., Jird sp., Jerboa sp., Rat sp. Crocodile, Dugong Waterfowl Insects **ASIA** **Gobi Desert** Bactrian Camel, Gazelle, Wild Ass Marmot sp., Hedgehog sp., Jerboa spp. Reptiles Insects **OCEANIA** **Great Sandy Desert** Red Kangaroo, Echidna, Bust Tailed Possum, Marsupial Mouse, Rat Kangaroo, Placental Rodent, Hare Wallaby Reptiles Fish—Freshwater Pool Birds Insects	**AFRICA** **Great Rift Valley** White Rhinocaros, Nile Hippopotamus, Elephant, Giraffe Springbok, Thompson's Gazelle, Grant's Gazelle, Hartebeest, Brindled Gnu, Eland, Impala, Red Lechwe, Great Kudu, Zebra, Warthog, Cape Buffalo Lion, African Hunting Dog, Cheetah, Serval, Jackal, Hyena Baboons, Patas Monkey Banded Mongoose, Two Striped Field-mouse Crowned Crane, Kori Bustard, Ground Hornbill, Secretary Bird, Ostrich, Duck spp., Goose spp., Stork spp. Reptiles Insects **IRAN** **Makran** Asiatic Black Bear Sand Fox Waterfowl	**SOUTH AMERICA** **Amazon Rain Forest** Tapir Ocelot, Jaguar Golden Lion Marmoset, Cottontop Marmoset, Howler Monkey, Wooly Spider Monkey, Capuchin Pygmy Anteater, Capybara, Kinkajou, Orange Rump Agouti, Vampire Bat, Tamandua, Prehensile Tail Porcupine, Two Toed Sloth, Mouse Opposeum, Grey Fanned Eyed Opposum Caiman Fish: Amazon River Birds **AFRICA** **Congo Rain Forest** Duikers, Royal Antelope, Dwarf Musk Deer, Bushpig, Okapi Leopard, Golden Cat Gorilla, Colobus Monkey, Mandrill, Mona Monkey Civets, Forest Genet, Checkered Elephant Shrew, Dwarf Galago, Bosman's Potto, Fruit Bat Crocodile Birds Insects **ASIA** **Sunda Rain Forest** Elephants Asiatic Water Buffalo Clouded Leopard, Sun Bear Siamang, Orangutang, Gibbons Flying Squirrel, Binturong, Slow Loris, Tarsier, Fruit Bat, Palm Civet, Tree Shrew, Pangolin Reptiles Birds Insects **Southeast Asia Mangrove** Crab Eating Macaque Painted Stork, Chestnut Kingfisher Reptiles Aquatic: Mudskippers **OCEANIA** **New Guinea Rain Forest** Tree Kangaroo, Fruit Bat, Cuscus Phelanger, Sugar Glider Reptiles Birds Insects



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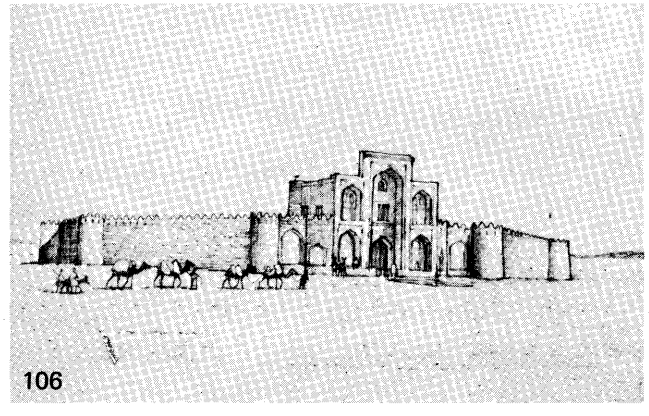

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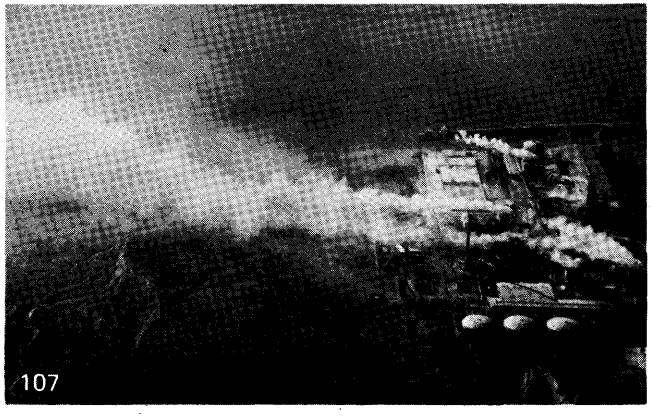

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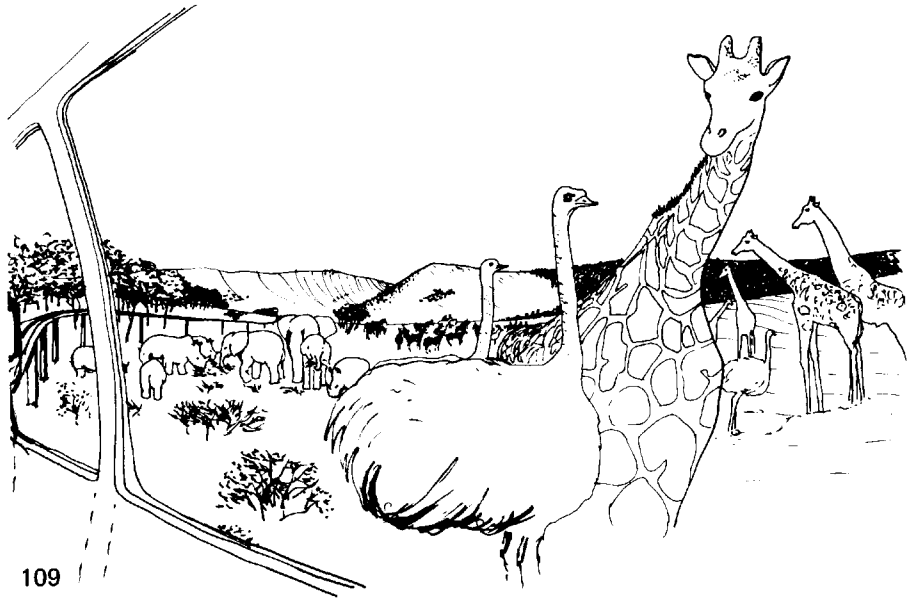
1	TUNDRA	CONIFEROUS FOREST	DECIDUOUS FOREST	GRASSLAND	DRY SCRUB & WOODLAND	DESERT & SEMI DESERT	SAVANNA	TROPICAL FOREST
2	Cold Very short growing season High winds Difficult terrain Unstratified low vegetation Sparse fauna	Cold Short growing season Heavy snowfall Dense evergreen forest with sparse understory Sparse fauna	Seasonal cold Humid Stratified forest of deciduous trees and shrubs Diverse fauna	Seasonal cold Seasonal drought Unstratified grasses and other herbaceous species Limited fauna	Warm Seasonal drought Widely spaced trees or dense shrubs Limited fauna	Arid Extreme daily and/or seasonal temperature variation Intense radiation Widely spaced sparse vegetation Impoverished fauna	Hot Seasonal drought Open grassland with scattered trees or dense thorny woodland Rich fauna	Hot Very humid Continuous growing season Dense, highly stratified forest Rich speciation
3	Hunting and Gathering Plow Agriculture Nomadic Pastoralism Intensive Agriculture and Urbanization	Hunting and Gathering	Plow Agriculture Intensive Agriculture and Urbanization Industrial Nation State	Hunting and Gathering Nomadic Pastoralism Industrial Nation State	Hunting and Gathering Horticulture Plow Agriculture Nomadic Pastoralism Intensive Agriculture and Urbanization Mercantilism	Hunting and Gathering Horticulture Plow Agriculture Nomadic Pastoralism Intensive Agriculture and Urbanization Industrial Nation State	Nomadic Pastoralism Industrial Nation State	Hunting and Gathering Horticulture
4	**NORTH AMERICA** **Alaskan Tundra** Eskimos: Hunting and Gathering **SOUTH AMERICA** **Paramo** Incas: Intensive Agriculture and Urbanization **EUROPE** **Scandanavian Tundra** Lapps: Nomadic Pastoralism **Alps** Swiss: Plow Agriculture **ASIA** **Tibetan Plateau** Tibetan Nomads: Nomadic Pastoralism Tibetans: Intensive Agriculture and Urbanization	**NORTH AMERICA** **Pacific Coniferous Forest** Tlingit: Hunting and Gathering	**EUROPE** **West European Oak Forest** Traditional European Farming: Plow Agriculture English: Industrial Nation State **IRAN** **Hyrcanian Forest** Caspian Rice Village and Caspian City: Intensive Agriculture and Urbanization **ASIA** **Manchurian Forest** Historical Chinese Dynasties: Intensive Agriculture and Urbanization	**NORTH AMERICA** **Great Plains** Plains Indians: Hunting and Gathering/ Nomadic Pastoralism Modern American Farming Industrial Nation State **SOUTH AMERICA** **Pampas** Modern Argentine Ranching Industrial Nation State **ASIA** **Russian Prairie** Scythians: Nomadic Pastoralism Modern U.S.S.R. Collective Farms: Industrial Nation State	**EUROPE** **Mediterranean Maquis** Greek City States: Intensive Agriculture and Urbanization Phoenicians: Mercantilism **IRAN** **Zagrosian Oak Woodland** **Pistachio Almond Scrub** Paleolithic Hunter Gatherers Neolithic Farmers: Horticulture Black Tent Nomads: Nomadic Pastoralism Traditional Iranian Agriculture: Plow Agriculture Plateau City: Intensive Agriculture and Urbanization **OCEANIA** **Australian Mulga Scrub** Bindibu: Hunting and Gathering	**NORTH AMERICA** **Sonoran Desert** Papago Indians: Hunting and Gathering/Horticulture **AFRICA** **Sahara Desert** Early Egyptians: Plow Agriculture Historical Egyptian Dynasties: Intensive Agriculture and Urbanization **Namib Desert** !Kung Bushmen: Hunting and Gathering **IRAN** **Artemesia Steppe** Turkomen: Nomadic Pastoralism **Plateau Desert** **Gulf Coastal Plain** Caravans: Nomadic Pastoralism Modern Iran: Industrial Nation State **ASIA** **Gobi Desert** Mongols: Pastoralism **OCEANIA** **Great Sandy Desert** Bindibu: Hunting and Gathering	**AFRICA** **Great Rift Valley** Karimojong: Nomadic Pastoralism **IRAN** **Makran** Baluchi: Nomadic Pastoralism Modern Iran: Industrial Nation State	**SOUTH AMERICA** **Amazon Rain Forest** Jivaro: Horticulture **AFRICA** **Congo Rain Forest** Mbuti Pygmies: Hunting and Gathering **ASIA** **Sunda Rain Forest** Hanunoo: Horticulture **OCEANIA** **New Guinea Rain Forest** Gahaku: Horticulture
5	**Hunting and Gathering:** Foraging, usually in small wandering groups. An abundance of food may permit settlement. **Horticulture:** Subsistence agriculture using simple hand tools, such as a hoe or digging stick. **Plow Agriculture:** Settled cultivation with heavy investment in the land. Irrigation, terracing, fertilization, crop rotation and the reliance on plows and domesticated animals ensure permanent production from a single piece of land.	**Nomadic Pastoralism** Nomadic groups keeping herds of domesticated animals. Pastoral products are augmented by hunting, gathering, cultivation, or barter. **Intensive Agriculture and Urbanization:** Highly organized agriculture dependent on large scale hydraulic works and investment in the land for the production of a large food surplus capable of supporting adjacent urban centers. **Mercantilism:** Highly organized commerce between urban centers with investment in goods, fleets of ships or caravans.	**Industrial Nation State:** Large populations organized in nation states using industrial technology in food production and in the extraction and production of fossil fuels. Mechanized farming is dependent on machines for sowing, fertilizing, and harvesting, and upon a complex system of finance, communications, transport, and distribution.					



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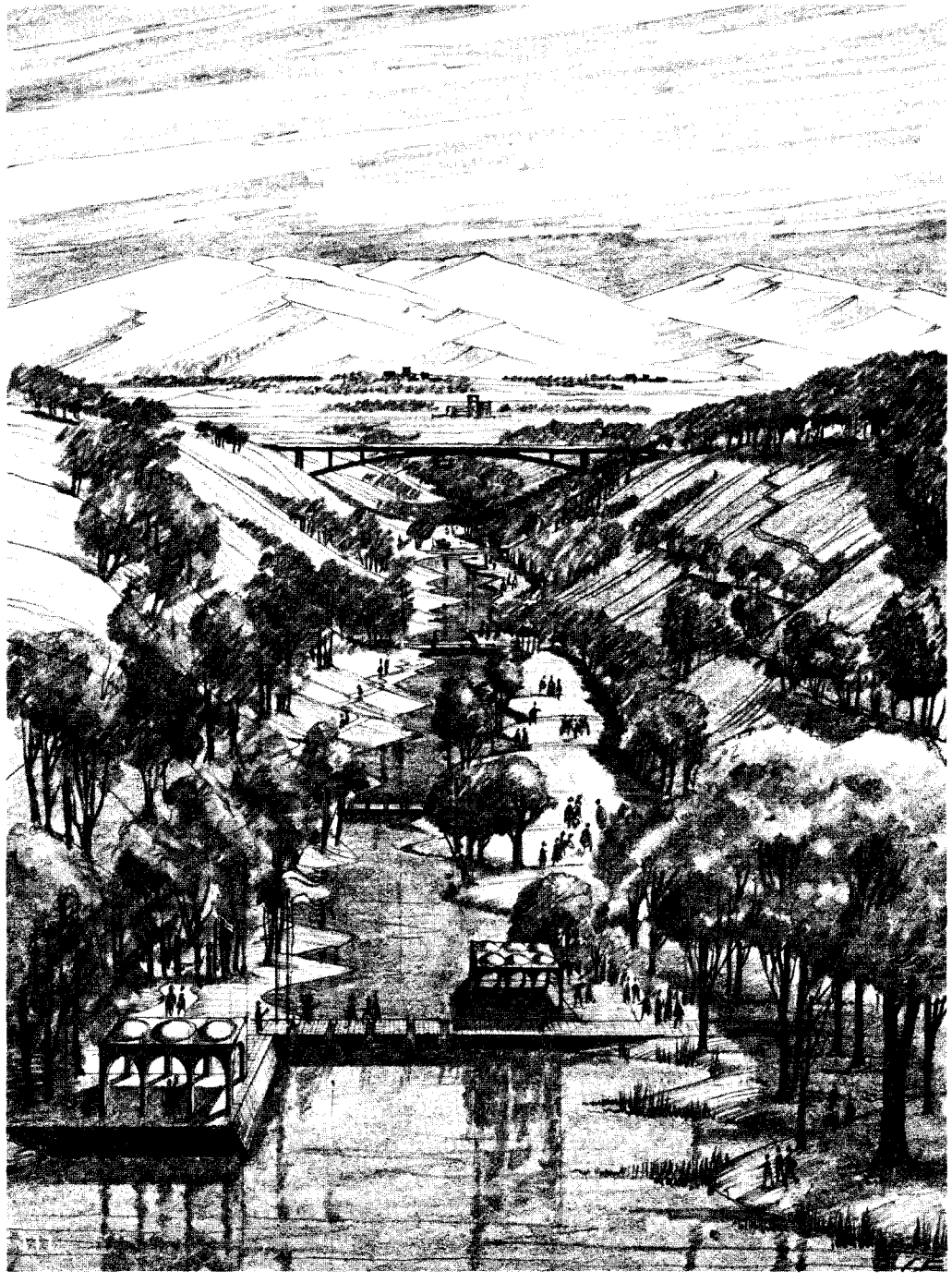


clude representatives from thirty-six selected world environments. Vegetation exhibits will reproduce characteristic structure with species imported from their place of natural occurrence. Many will require special siting and management, including wind and sun protection and irrigation, fertilization and soil development.

The animal inventory for each environment was compiled from an exhaustive species list for every vertebrate class: mammals, birds, reptiles, amphibians and fish, and from all environmental strata—aquatic, subterranean, ground level, high terrain, arboreal and aerial. Preference was given to species displaying conspicuous adaptations, success in captivity, and display potential. In this process, a major emphasis was given to the size of social groups of animals. It transpires that white rhinoceroses live in groups of not less than fourteen, while the black rhinoceros is solitary. The next matter was compatibility of natural associations of animals—wildebeest, eland, Thompson's gazelle, and giraffe. Animal behavior, diurnal, seasonal and environmental requirements were reflected in six basic animal enclosure types, from indoor to outdoor.

The cultural program presents examples of seven major cultural adaptive strategies—hunting and gathering, horticulture, nomadic pastoralism, plow agriculture, intensive agriculture and also urbanization, mercantilism, and the industrial nation-state. These adaptive strategies can be viewed as historical, for all men were once hunter-gatherers, and the industrial strategy has been available for only two centuries. They can also be viewed as a progression of investment and environmental modification. While hunter-gatherers leave the land practically untouched, science and machine tools have transformed twentieth century man into a geologic force. This capability constitutes man's greatest adaptive strategy and the greatest threat to his future.

In Pardisan the opportunities for recreation are pervasive. However, the demand for passive recreational facilities, traditionally provided by urban parks, is urgent in Tehran so Pardisan makes a significant contribution to this need. The great valley and its ridges which define the western boundary have been allocated exclusively to passive recreation and have been planned as an urban simulation of Darband. In addition, marginal areas on the boundary of the park have also been reserved for free, public recreation. Here, broad bosqued terraces will step up from the valley floor. Openings among the trees will also accommodate active games. Parking spaces have been allocated for over three thousand automobiles. On average days these spaces will not all be occupied. The parking area is arranged on terraces with trees at twenty-foot intervals. Thus such areas can accommodate family picnicking, either associated with the automobile or independent of it. Overflow parking spaces, similarly designed, are located in the southwest area of the site. This too provides a large area for family picnicking.

Another accommodation for recreation is the peripheral green belt which embraces Pardisan with access from the two parking areas along the south of the site. This four and a half kilometer long roadway, which also accommodates intra-site service connections, will offer the opportunity for a leisurely drive in an automobile with glimpses into the replicated environments in the park. Places alongside the road will permit stopping for pleasing vistas and for picnicking.

Within Pardisan proper the entire environmental park can be considered as a recreational facility, to be experienced at many levels. The Iranian bazaar is conceived as a celebration of Iran and should provide rich entertainment for Iranians as well as foreign visitors. Each of the regions of Iran will be represented with its architecture,

101. Hunting and Gathering: Bushmen
102. Horticulture: New Guinea Horticulturalists
103. Nomadic Pastoralism: Lapps
104. Plow Agriculture: Swiss Alps
105. Intensified Agriculture and Urbanization: Iran
106. Mercantilism: Caravans
107. Industrial Nation State: Iran

108. Cultural Program
    1. Bioclimatic zone
    2. General description of bioclimatic zone
    3. Adaptive strategies exhibited at Pardisan
    4. Cultural exhibits
    5. Description of adaptive strategies

109. Participation exhibit
110. View of African savanna from the monorail
111. Major recreation area

art, crafts, dress, its food, music and dance in this mile-long processional. Although it may be difficult to avoid being informed, it will be impossible to avoid being entertained.

It is likely that one of the most popular attractions at Pardisan will be the monorail trips circumnavigating the world of Pardisan. Travelling at fifteen miles per hour in treetops, over herds of animals grazing in grasslands and prairies, the visitor will have a splendid overview of the entire project.

In zoological gardens and marine parks around the world the displays of dolphins, porpoises, killer whales, seals and sea lions prove to be an enduring attraction. The whale family may be among the most intelligent of creatures but they certainly can be most entertaining.

Among all the exhibits the creatures of the African savanna are the most popular. They can be enjoyed for their beauty, their strength or their grace as well as understood as members of a complex ecosystem. This holds true for all of the animal exhibits and their settings.

Recreational facilities will be located throughout Pardisan. There will be many shaded sitting areas, greensward for picnicking, sites in forest beside streams and lakes. There will be many opportunities to dine, formally or informally, modestly or expensively. There will be opportunities for children to play, opportunities for people to watch animals or people.

However, the recreational value of Pardisan will be a composite of many experiences but as it is a replication of the world and a concentration in one place of many of the wonderful creatures that populate the earth, this new oasis, like the Persian Garden of old, should permit savouring the good things which the earth provides.

Aside from passive recreation, walking, and picnicking, the entire park will offer a multitude of entertaining educational pursuits. These will range from a dramatic presentation of the cosmos in the Planetarium to a stroll through the tree tops of the simulated Sunda rain forest.

Exhibits, films, and amphitheaters will be concentrated in the Gateway complex. The entrance to Pardisan will be through the great domed space of the Orientation and Theme Building. Structures with more specialized functions such as the Natural History and Science Exhibit Building, the Planetarium, and the Aquarium will be located off the entrance court, the maidan.

At the Orientation and Theme Building the visitor will receive an introduction to Pardisan, its central concepts and major themes. Exhibits, films, and lectures will provide an enticing smorgasbord which may be sampled selectively. Those who wish may purchase a ticket here and proceed directly to the Planetarium, monorail, restaurant or major exhibit area of their choice.

The Natural History and Science Exhibit Building will be located at the west end of the maidan. Exhibit space in this building will consist of galleries and an auditorium. Exhibits will be arranged in thematic sequence and designed to involve visitors as participants in the act of discovery. Themes which are not related to specific environments, such as locomotion, will be introduced here. This will provide the visitor with the introduction needed to discover additional examples on his own, and the stimulus to follow alternative storylines through the geographic environments reproduced at Pardisan. The central Administration Building for the park will be located at the opposite end of the maidan. Offices, research labs, seminar rooms, and a library will be provided here for the anthropologists, botanists, ecologists, ethnologists, physiologists,

112. Special Functions Program
1. Gateway
2. Aquarium
3. Natural History and Science Exhibition
4. Tropical Rain Forest Building: Southeast Asian Sunda and Mangrove
5. Planetarium


1
2
3
4
5
Service Space
Office Space
Administration Space
Exhibition Space
Public Space
Star Theater


ANIMAL & VEGETATION EXHIBITS
CULTURE EXHIBITS
OTHER
1/16 H
IRAN
DECIDUOUS
CASPIAN SEA AQUARIUM
DECIDUOUS
DRY SCRUB & WOODLAND
DESERT
SAVANNA
DRY SCRUB & WOODLAND
GRASSLAND
GRASSLAND
EUROPE
DECIDUOUS
CONIFEROUS
TUNDRA
TUNDRA
DRY SCRUB & WOODLAND
NORTH AMERICA
CONIFEROUS
DECIDUOUS
TUNDRA
GRASSLAND
DESERT
AFRICA
SAVANNA
SAVANNA
DESERT
DESERT
TROPICAL
TROPICAL
DESERT
PERSIAN GULF AQUARIUM
ASIA
DECIDUOUS
GRASSLAND
DESERT
TUNDRA
TUNDRA
TROPICAL
TROPICAL
STAFF HOUSING
UTILITIES
MAINTENANCE
VETERNARY HOSPITAL
ENVIRONMENTAL RESEARCH LABS
OCEANIA
DRY SCRUB & WOODLAND
DESERT
TROPICAL
SOUTH AMERICA
GRASSLAND
TUNDRA
TROPICAL
SEWAGE TREATMENT
PLANETARIUM
NATURAL HISTORY MUSEUM
VISITOR FACILITIES
ORIENTATION
ADMINISTRATION
AMPHITHEATRE
MOTOR POOL
DEPARTMENT OF THE ENVIRONMENT

geologists, zoologists, and other scientists involved in research, exhibit design, and planning.

The Planetarium and Aquarium will be located off the maidan. The lobby and waiting space for the Planetarium will double as exhibition space to entertain visitors during the wait between performances. It is estimated that a maximum of 3000 people can be accommodated each day. Shows will emphasize the earth as part of the awesome universe, and programs will simulate orbits around the moon, the earth, and the planets. This will be accomplished by a pinpoint star projector driven by an analogue computer. Unidirectional tiered seating will face a tilted dome ceiling, and the viewer will be enveloped in three dimensional images and sound.

The Aquarium will be in a long pedestrian spine which bridges the Persian Gulf and provides an underwater link between the maidan and the exhibits of Iran. Aquatic displays will simulate natural habitats with a particular emphasis on zoogeography in response to changes in water depth and salinity. Specimens will be grouped to illustrate such themes as adaptation, behavior, and convergent and divergent evolution.

The Sunda Rain Forest Building is typical of the specialized structures needed to house exhibits unsuited to the climate of Tehran. This building will be sited in a valley to utilize the visual and climatic protection of the natural landform. It will be an unobtrusive glass envelope twenty-five meters high, enclosing the magnificent teak, palm, and mahogany trees of the Sunda rain forest. Animals such as the Asiatic water buffalo, the clouded leopard, Simiang tree shrew, and crab-eating macaque will also be exhibited here.

For the visitor the exhibits are the critical transfer points of information where new insights and understanding of the environment may be gained. Broadly speaking there are two classes of exhibits, one which presents actual phenomena and one which uses media such as film, the written and spoken word. Both must accommodate the purposes of education, recreation, and research, but it is the presentation of actual plants, animals and cultural elements which constitutes the critical mass of Pardisan. The visitor will experience the full ambience of natural environments with all of his senses. Exhibits will allow the visitor to see not only organisms of interesting shape, size and behavior, but also the context within which they exist. Genera must be seen within appropriate bioclimatic and geographic areas; species must appear in the habitats they occupy and the niches they fill; and individuals must be seen within the associations and social groups to which they belong. The first proposition of exhibit design states that all of the components of the environment must be present. Discussion of the tents of the North American Plains Indians will not occur in some remote museum, but within the grassland environment of the plains within view of the buffaloes from whose hides these tents were made and the ponies with which the great beasts were captured.

The second proposition requires that phenomena be seen in the environmental strata where they naturally occur. There are basically six strata which can be discriminated as the basis of exhibit design. These are aquatic, subterranean, on-grade, high terrain, arboreal and aerial. Many peculiarities of morphology are only comprehensible by visual association of organism and habitat. The otter must be seen from above and from below the shoreline of the bogs and lakes it inhabits in order to appreciate the marvel of its adaptive fit to a water environment.

Finally, exhibit design must permit the visitor and researcher to observe the association of

plants and the social behavior of animals; the interaction of flora and fauna and the trophic levels and niches of ecosystems.

These goals are met by careful composition of environmental components and the most sophisticated techniques of display and animal containment. The vantage from every viewpoint along and through environments of Pardisan must be anticipated and composed. Vegetation of the different zones meets in a continuum, boundaries are indistinct. Incongruities of service and monorail are reduced by design to the minimum. Service facilities will be peripheral while many exhibit buildings will be underground. The visitor will look at animals through foregrounds of vegetation, will look into open environments from wooded ones, will see herds and groups of animals before seeing individuals, and will observe natural landscapes from the vantage of men who have always inhabited them. The totality of environments will be appreciated before the parts, the obvious before the obscure. Experience precedes explanation as illustrated by the two great east-west routes across Pardisan. Along these malls from viaduct to tunnel to viaduct, the visitor will move from panoramas of extensive landscapes to intensive indoor explanatory exhibits, back to natural environments and so forth in a progression of understanding.

While animals must be separated from visitors, bars will not be employed. These engender feelings of dominance and separation from nature. Far better to use the ha-ha of eighteenth century English parks, the moats which Hagenbeck pioneered in the Hamburg Zoo, and the most recent understanding of animal psychologists. In Pardisan, necessary divisions between man and nature will be subtle and unobtrusive. Man is part of nature and in Pardisan, he will feel so.

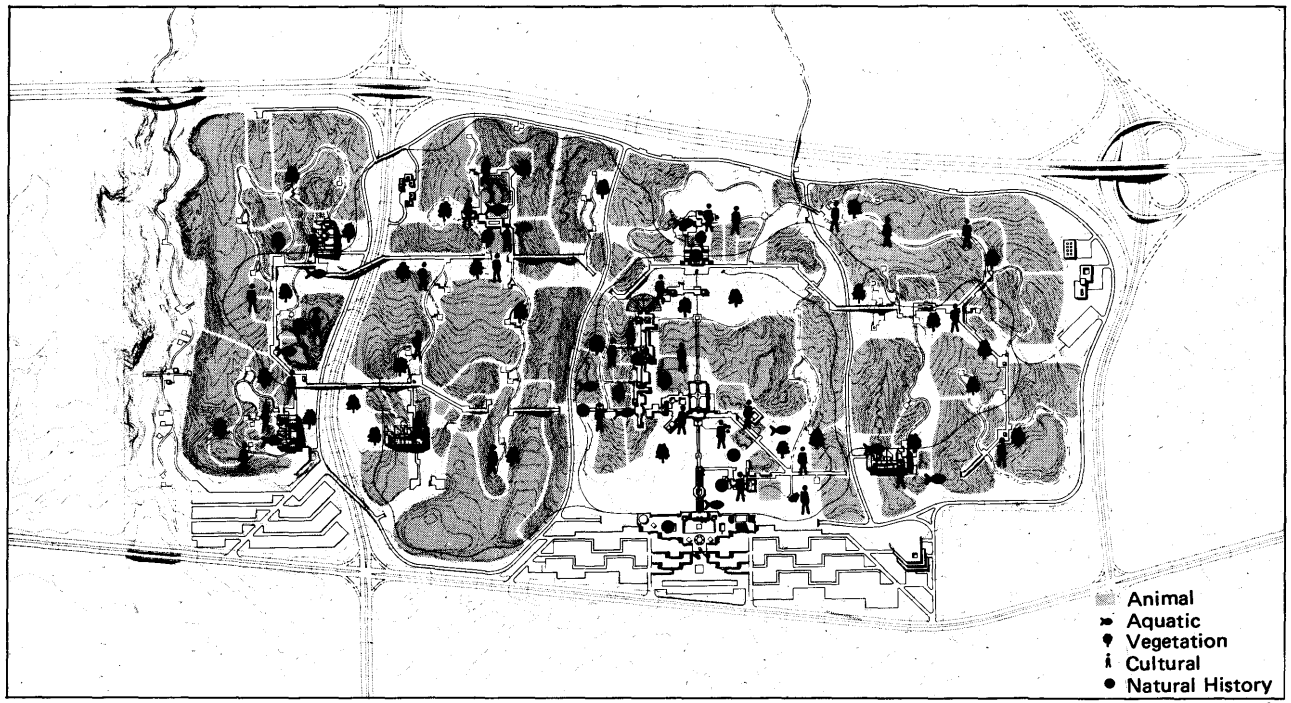
The purposes of Pardisan require that the site be transformed from a stony desert into a wide range of environments. Longitude, latitude, elevation and climate are given. What variables can be manipulated towards the proposed realization? The most important is control of the amount of water in the system. While temperature is frequently a controlling factor, and the incidence of freezing eliminates a wide range of plant associations, the variation of water, in simulation of precipitation, can provide a powerful control mechanism. Deciduous forests require two meters of rainfall, one point five meters support scrub forests and short grass prairie, one meter or less is associated with grasslands, declining through deserts to no precipitation. The next important variable is, of course, the reduction in effective temperature through evaporation and shade. The former can be accomplished both by evaporation of water surfaces and through evapotranspiration. Direct shade can be provided by trees, structures and also by aspect and slope of the ground. Northern and eastern facing slopes receive less insolation than do southern and western aspects. So maximizing for the former will produce relatively lower temperature microclimates. These modifications have a cumulative effect, the introduction of water supports vegetation which reduces temperature by direct shade and transpiration. As vegetation grows both shade and evapotranspiration are increased with consequent temperature reductions. Distinct bioclimatic zones can be realized employing these principles.

However, Pardisan requires that the physiographic components of environments also be replicated—buttes and foothills, plains of desert, savanna and prairie, rocky tundra and coastal marshes. This requires the existing physiography to be appropriately modified.

All of the sites originally considered for Pardisan were in the colluvial foothills, all were character-

114. Exhibits
115. Aerial Exhibit
116. High Terrain Exhibit
117. Subterranean Exhibit
118. Aquatic Exhibit
119. On Grade Exhibit
120. Arboreal Exhibit

121. Aspect
122. Major Grading Plan
123. Diagram of Aspect
124. Existing Physiography
125. New Grading
126. Continental Divisions on New Grading



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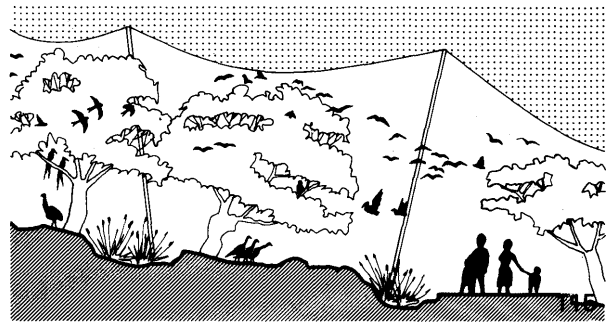
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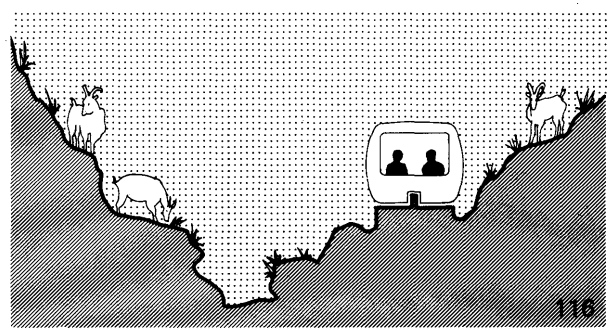
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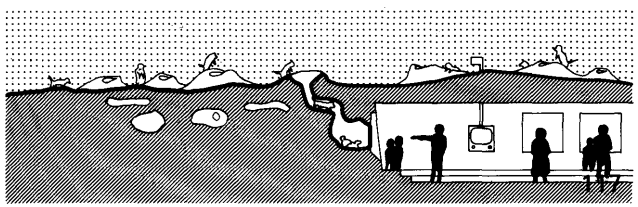
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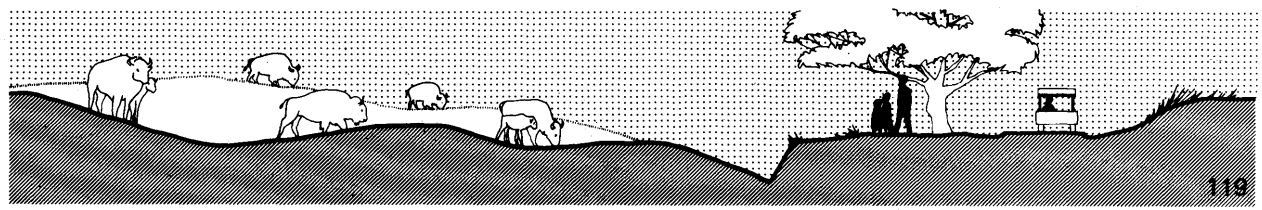
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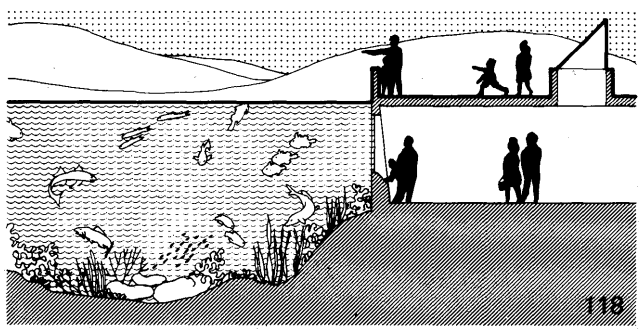
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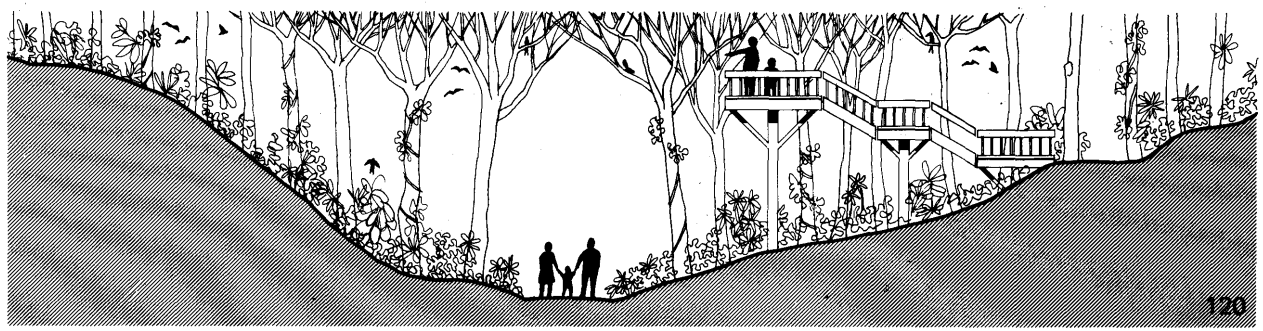
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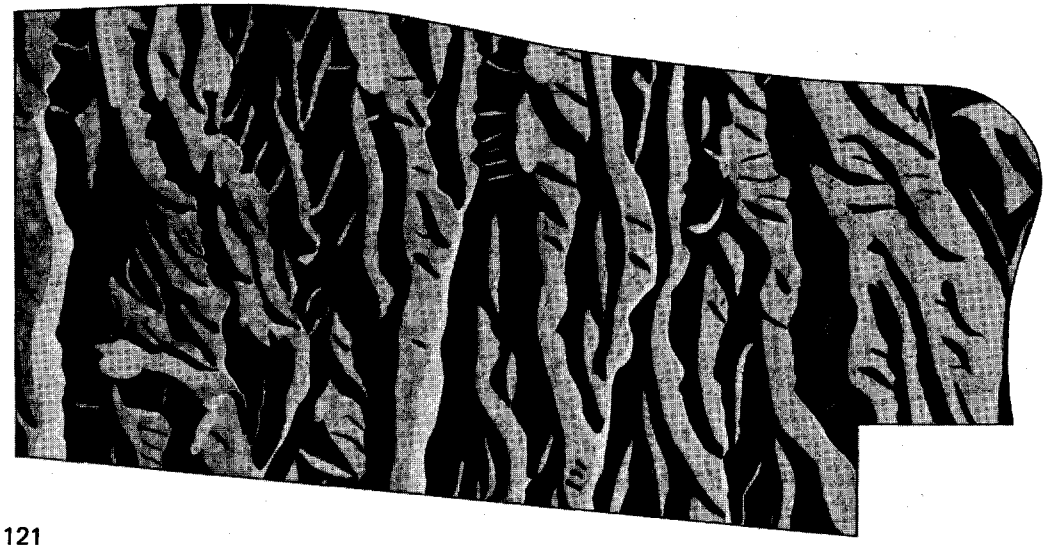

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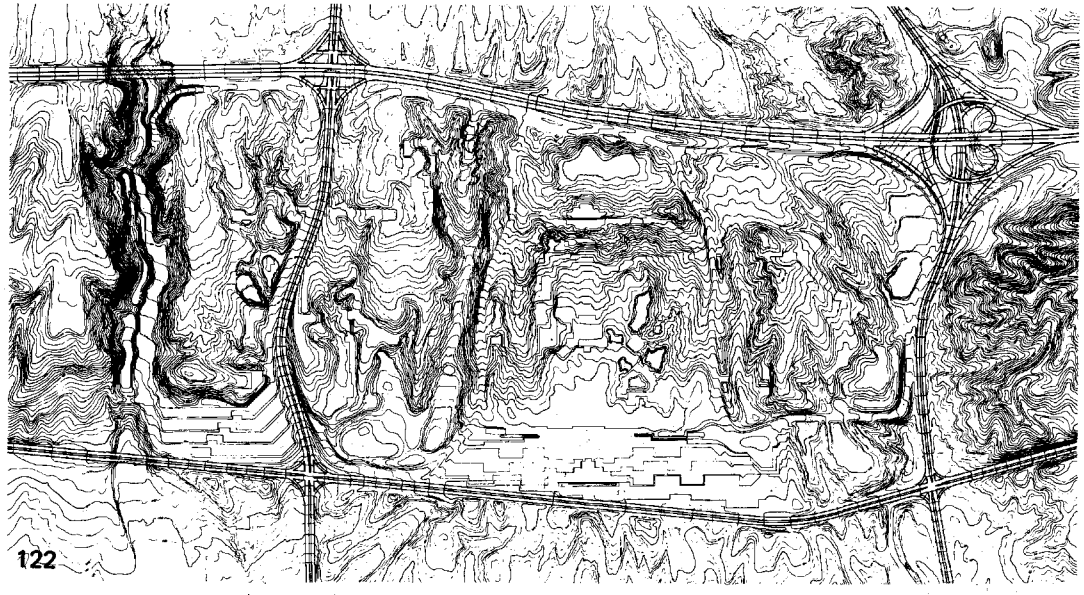

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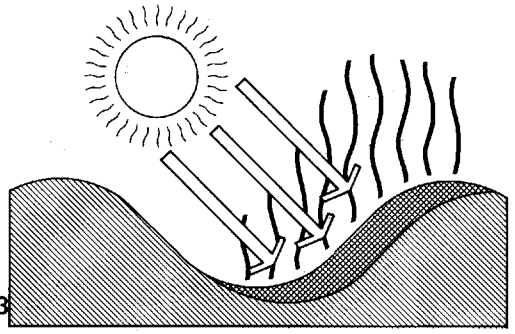

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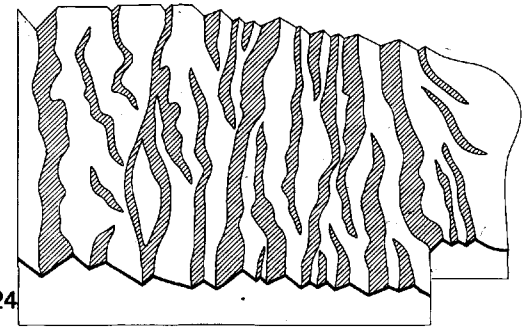

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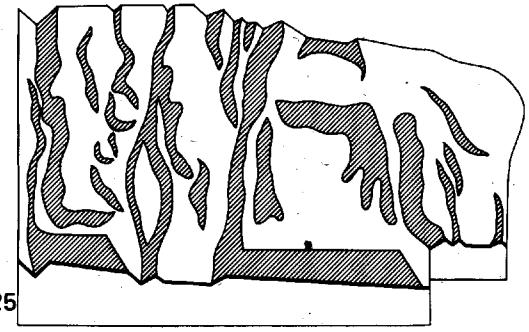

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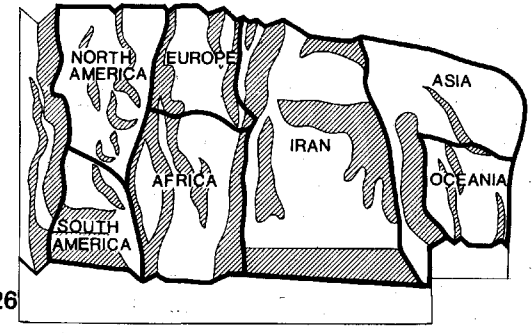

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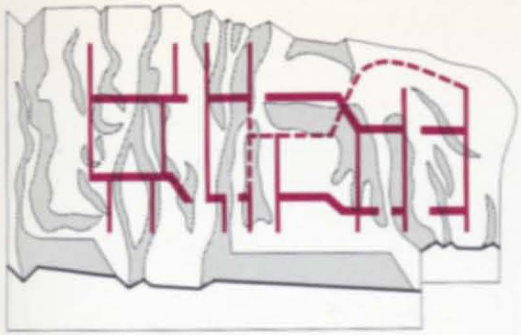

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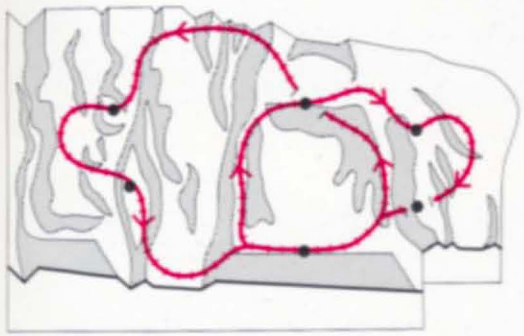

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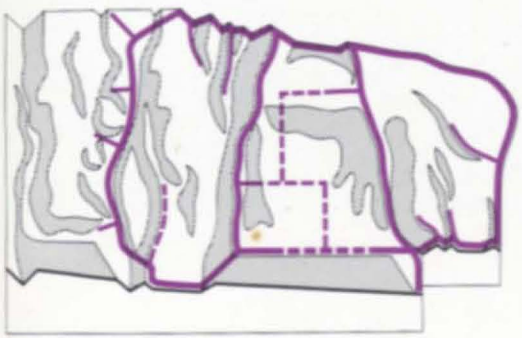

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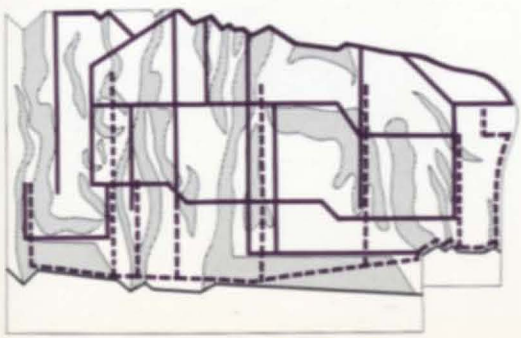


130

PEDESTRIAN ROUTES

FOREST-SCRUB

DESERT-SAVANNA

ENVIRONMENTAL GRADIENT ROUTE

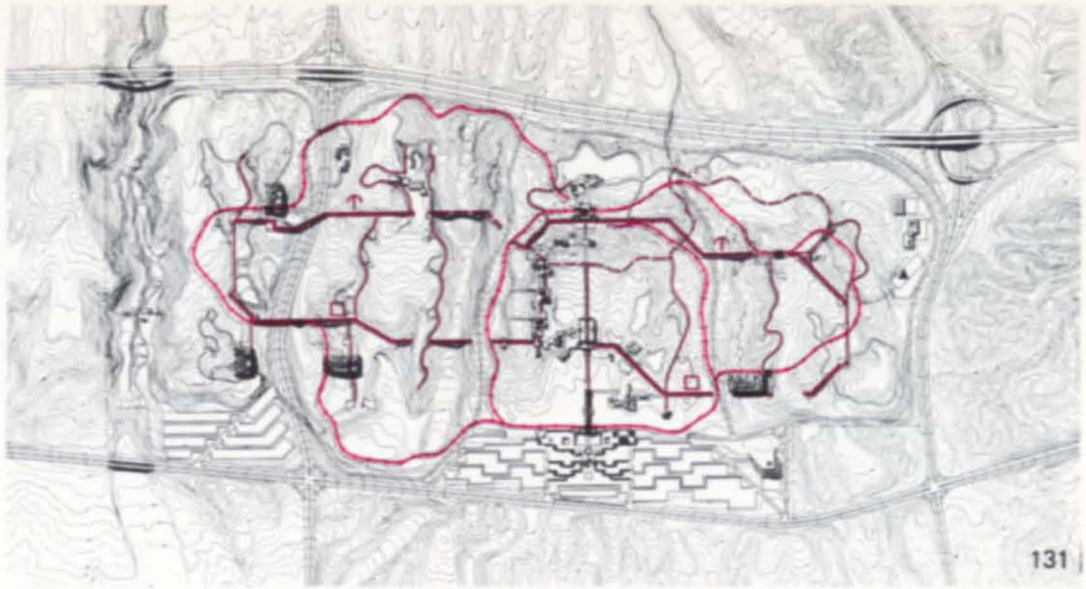
HISTORIC

PASSENGER ROUTE

MONORAIL

MONORAIL STATION

MONORAIL YARD



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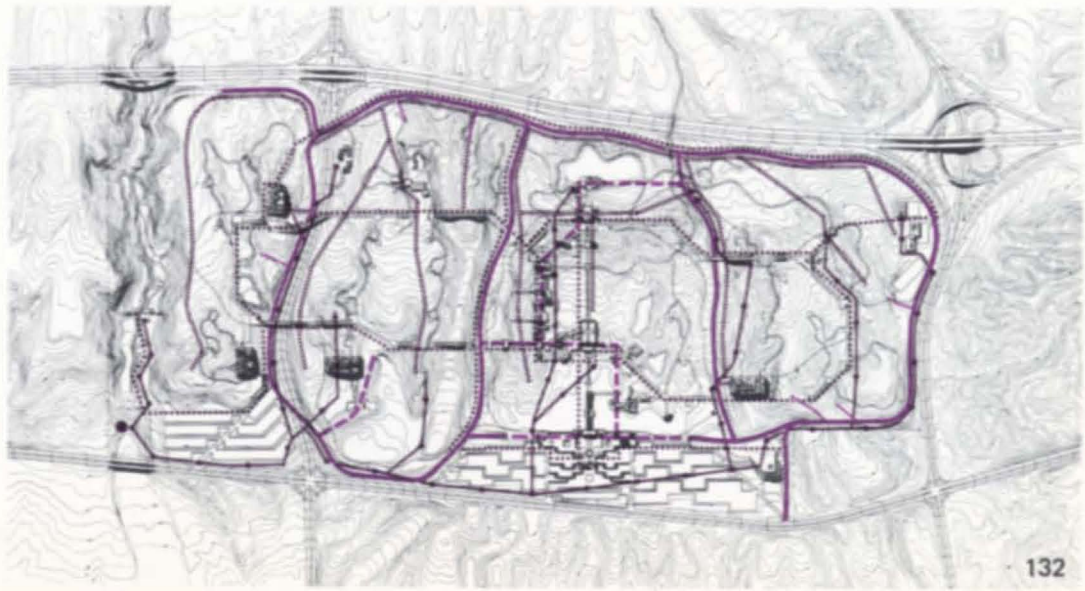
SERVICE ROAD

BELOW GRADE SERVICE ROAD

IRRIGATION WATER

POTABLE WATER

SEWER



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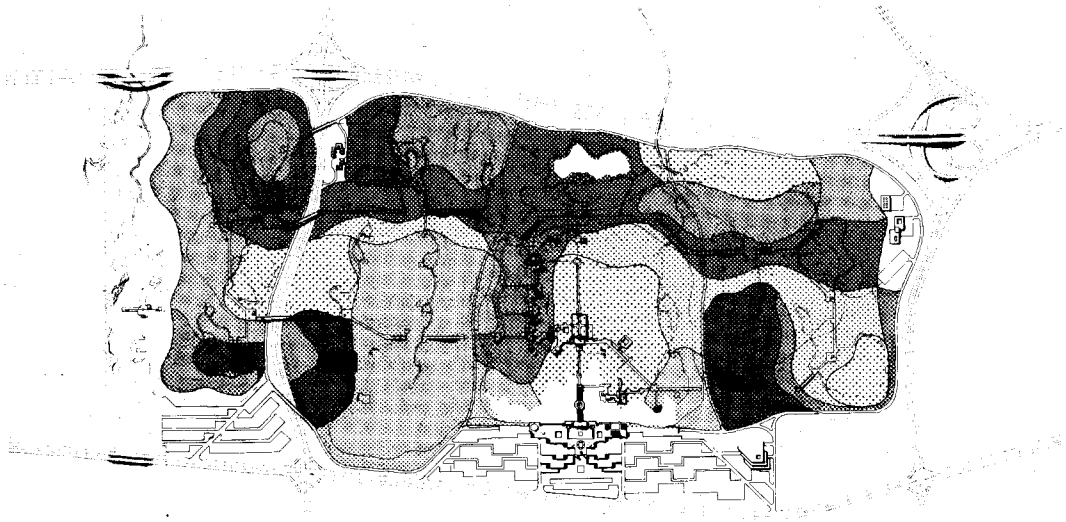

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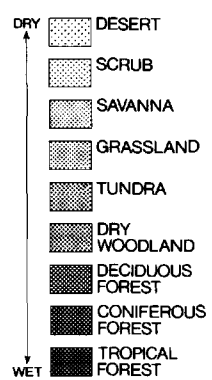
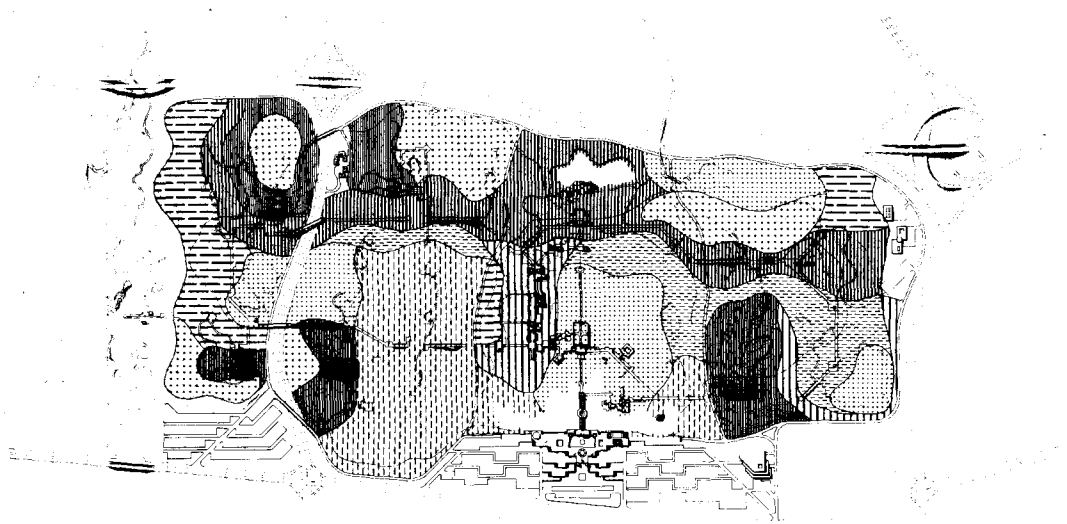

DRY
WET
DESERT
SCRUB
SAVANNA
GRASSLAND
TUNDRA
DRY WOODLAND
DECIDUOUS FOREST
CONIFEROUS FOREST
TROPICAL FOREST


135



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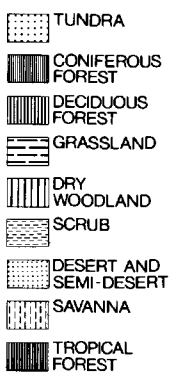

TUNDRA
CONIFEROUS FOREST
DECIDUOUS FOREST
GRASSLAND
DRY WOODLAND
SCRUB
DESERT AND SEMI-DESERT
SAVANNA
TROPICAL FOREST


136


137

ized by washboarding of north-south ridges with steep intervening valleys. This physiography was remarkably appropriate for the schema of Pardisan permitting continental divisions on ridges and continuous gradients in valleys. Moreover, the entire site slopes almost one hundred meters from the north to south boundary and this provides the possibility of a gravity water gradient corresponding to the bioclimatic zones. But, considerable earth moving is required. Two dams are necessary to create the simulation of the Persian Gulf and the Caspian Sea. An east-west ridge has to be created to simulate the foothills of the Elburz Range, and grading is necessary to create the extensive exhibits for grassland, prairie and desert.

The procedure for realizing Pardisan will begin with rough grading to create dams, parking area terraces, roads and the environmental analogues. This will occur in conjunction with the digging of trenches and the laying of utility pipes. As soils must be manufactured and spread to varying depths, it will often be possible to lay both drains and irrigation pipes upon rough grades to be covered with topsoil. This done, the appropriate types and depths of soils can be laid in all environments. At this point planting can begin.

The creation of the forest is one of the most dramatic transformations to be accomplished in Pardisan. It is also the most time consuming. It may require the passage of ten to fifteen years to achieve a forest aspect. This suggests that the forest be planted at the earliest possible date. It also suggests that ecological principles be applied and that fast growing, early successional trees be introduced at the onset in the full knowledge that these will ultimately be replaced by the culminating climax species.

Those environments which can be realized most simply and expeditiously are the desert types, dry grassland associations, scrub and dry woodland, aquatic and riparian environments. Given climate controlled buildings, tropical rain forest species make prodigious growth and produce early and dramatic effects.

For animal exhibits, particularly those associated with deserts, grasslands, scrub and aquatic environments, an adequate plant setting can be achieved within a single growing season.

Building, however, presents the greatest opportunity for early realization, and for the first few years it will be buildings and exhibits of Pardisan which must carry the major responsibility. Animal exhibits can be introduced immediately and extended in relation to the realization of the vegetative context.

The realized structure will be seen first in terms of its transportation connections to Tehran. Pardisan will be effectively encompassed by major highways. Primary access will be from the south in the middle of the site. Internal circulation will consist of a series of circumferential systems composed of east-west routes traversing bioclimatic zones and north-south ones transecting gradients of zones. The latter will occur on midslope, the former cross the ridges and valleys maintaining a generally uniform elevation on viaduct and in tunnel. The alternative solution of climbing up and down across ridges and valleys would have posed some difficulties for pedestrians and vehicles alike and would have denied the overview which viaducts provide. It would also have necessitated building syphons for water and pumping sewage. The service system will consist of a peripheral loop circumscribing the site with two additional north-south connections running on ridge tops to create a three loop system. All exhibits will be served from these by culs-de-sac by which method public movement is effectively segregated from servicing.

127. Pedestrian Circulation
128. Monorail Circulation
129. Service Roads
130. Utilities
131. Circulation Systems
132. Service System

133. Water Gradient
134. Bioclimatic Zones
135. General Site View
136. Typical Valley
137. Existing Site Vegetation

The monorail system will have three components which may operate singly or be integrated. The central component will be a loop encircling the Iranian exhibit. The second element will be the eastern loop which conforms to the north, west and south alignment of the Iranian loop but will extend eastward to parallel that eastern boundary. The western loop will follow north, east and south legs of the Iranian loop but will proceed west to parallel the opposite boundary. The monorails generally will be elevated, touching ridge tops at station locations.

In addition to the monorail, several ancillary modes of transportation will be employed including buses, single and double-decked, jitneys, golf carts and small electrically propelled vehicles.

The water system for lakes and irrigation originates on the northern boundary and can employ the Caspian simulation as a reservoir with adequate head to serve the site. Water can proceed by gravity on both east-west and north-south roadways. The Persian Gulf overflow will return to the sewage treatment plant at the southwest corner where, after treatment, it can be pumped back to the Caspian lake. Sewage can similarly employ a gravity system with pipes located in both north-south and east-west roadways culminating in the sewage treatment plant where, depending upon the treatment, it can be used either for lake or irrigational use.

The major parking facility will embrace the entrance with overflow parking in the southwest. This latter facility also will serve the western valley which will be devoted to public recreation. All parking facilities will be designed on a 20'-0" bay. Trees are also planted at this spacing. Thus on peak days the entire parking facility will be used for automobiles. On the majority of days much of the parking area can be used for family picnics, a major recreational resource.

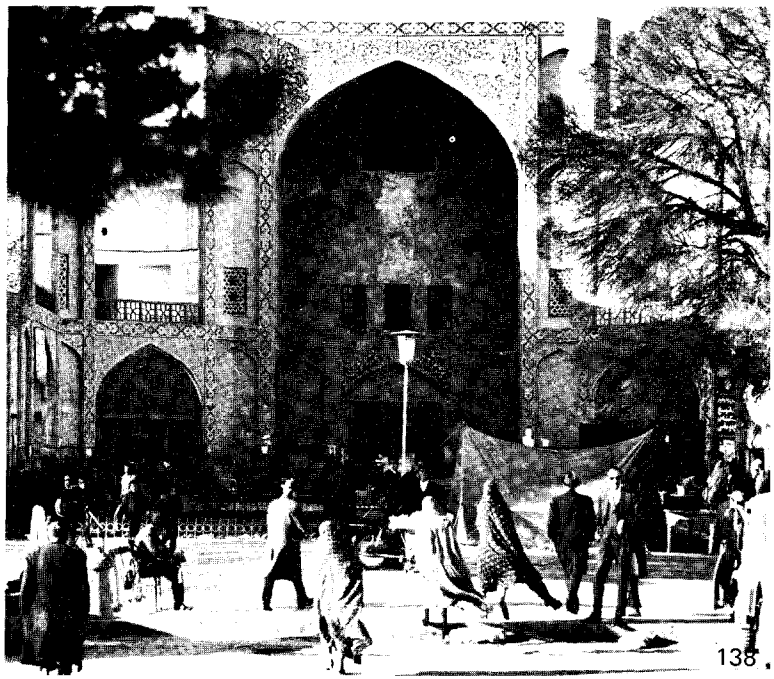
The architectural conception of Pardisan derives from harmonies of geometric relationships long understood in Persian history. While it is acknowledged that constituent parts may require different ordering systems, the striving is towards designing these as patterns, each with its own personal order and geometry which relates in a total sense to the whole. The resulting new level of order becomes a multi-levelled pattern evoking a sense of unity which not only creates a totally uniform pattern but also gives an order of priority to the constituent elements as is evident in a typical multi-level patterned carpet.

This interplay between "unity in multiplicity" and "multiplicity in unity," while enabling the individual to experience the essence of a form hidden behind the veils of multiplicity, also enables the designer to express the multiplicity and interaction of things manifest within the organizing order of the whole. Pardisan, as proposed, utilizes this principle in bringing together the various elements—water, vegetation, geographic identity and service networks—within the unifying reality of the site itself. Probably the most important of all is the built form which most spectators will traverse and from which they will gain the total experience. While the built form in its overall patterning will relate to the multi-layered wholeness of Pardisan, it also will have internal organizing principles which derive from the cultural traditions developed in response to the orders of light and movement.

In this ordering progression of movement, the major dictate of the Persian tradition is that space, not shape, should lead in the generation of form. The gateway, in addition to being the "High Gate," is a symbol of implied sense of passage through the fluid movement of sight, soul and form. The gateway leads to the primary movement system, which is traditionally the bazaar. The orderly, but flexible, spatial organiza-

138. Gateway: Main Bazaar, Isfahan
139. Desert Town showing wind catches (bādgīr)
140. Indoor Dependent Space: Small shop in bazaar, Isfahan
141. Outdoor Nodal Space: Courtyard of the Masjid - i - Shah, Isfahan
142. Integrated Space: Chahar Sōu, Isfahan

143. Architectural Vocabulary
144. Traditional Forms



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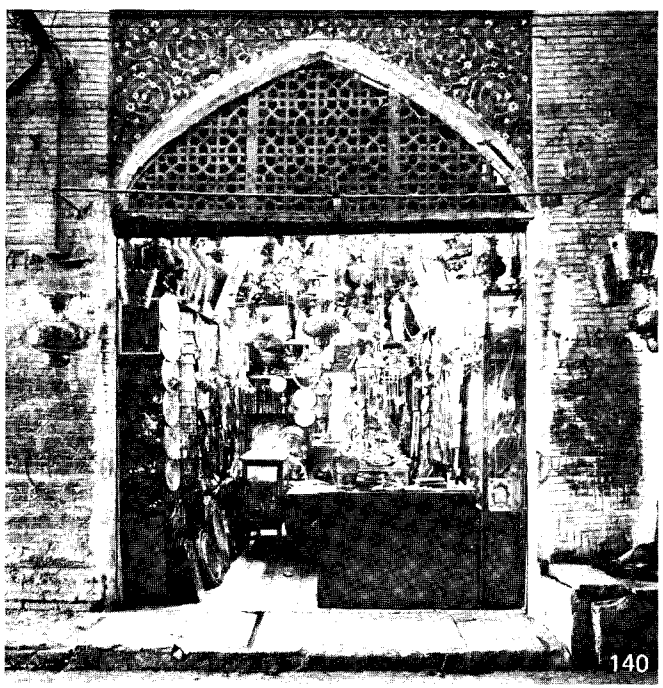

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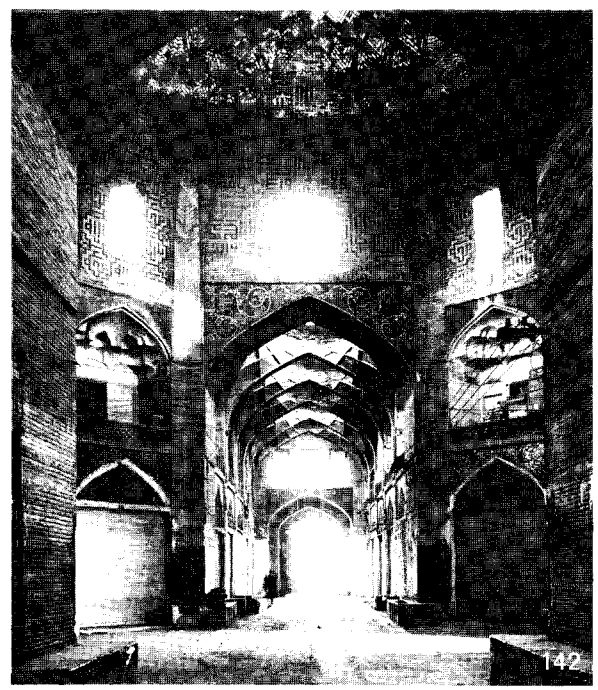
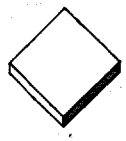
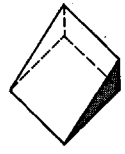
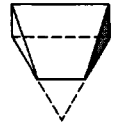
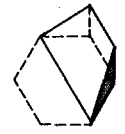
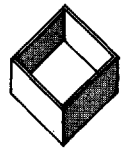
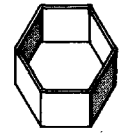
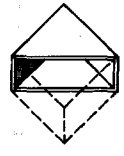
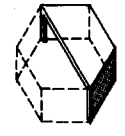
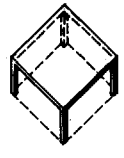
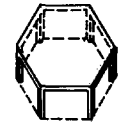
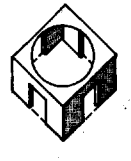
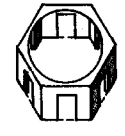
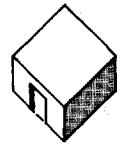
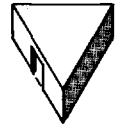
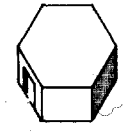


142

Traditional Forms	Adaptive Shapes major/minor	major/minor	major/minor
1 SOCLE / TAKHT			
STAIR / PELEH			
2 COURT YARD / HAYAT / BAGH			
3 GATEWAY / BAB			
4 PORCH / AIVAN / TARAC			
5 INTEGRATIVE SPACE / CHAHARTAQ			
6 ROOM / TAQ			

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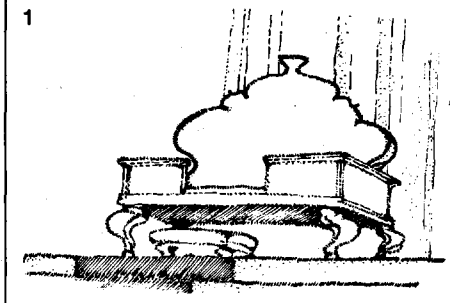

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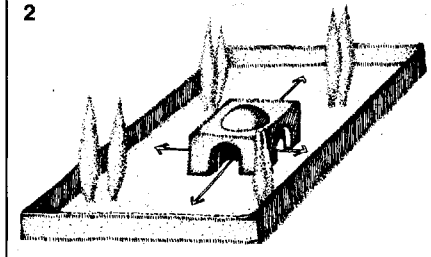

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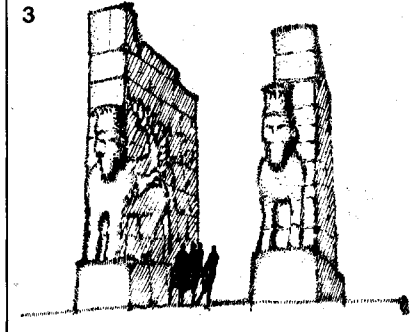

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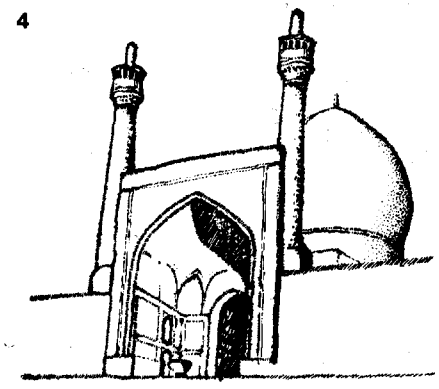

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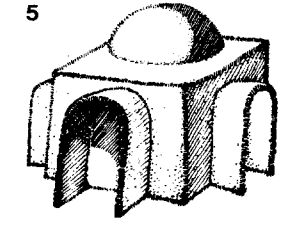

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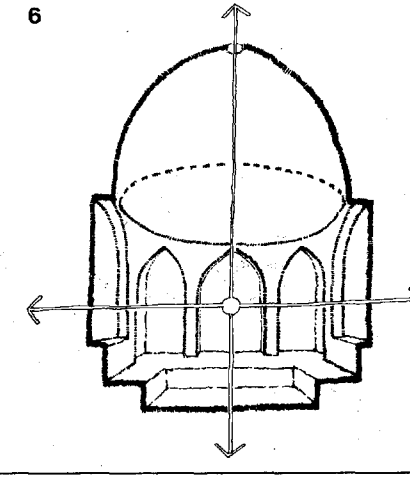

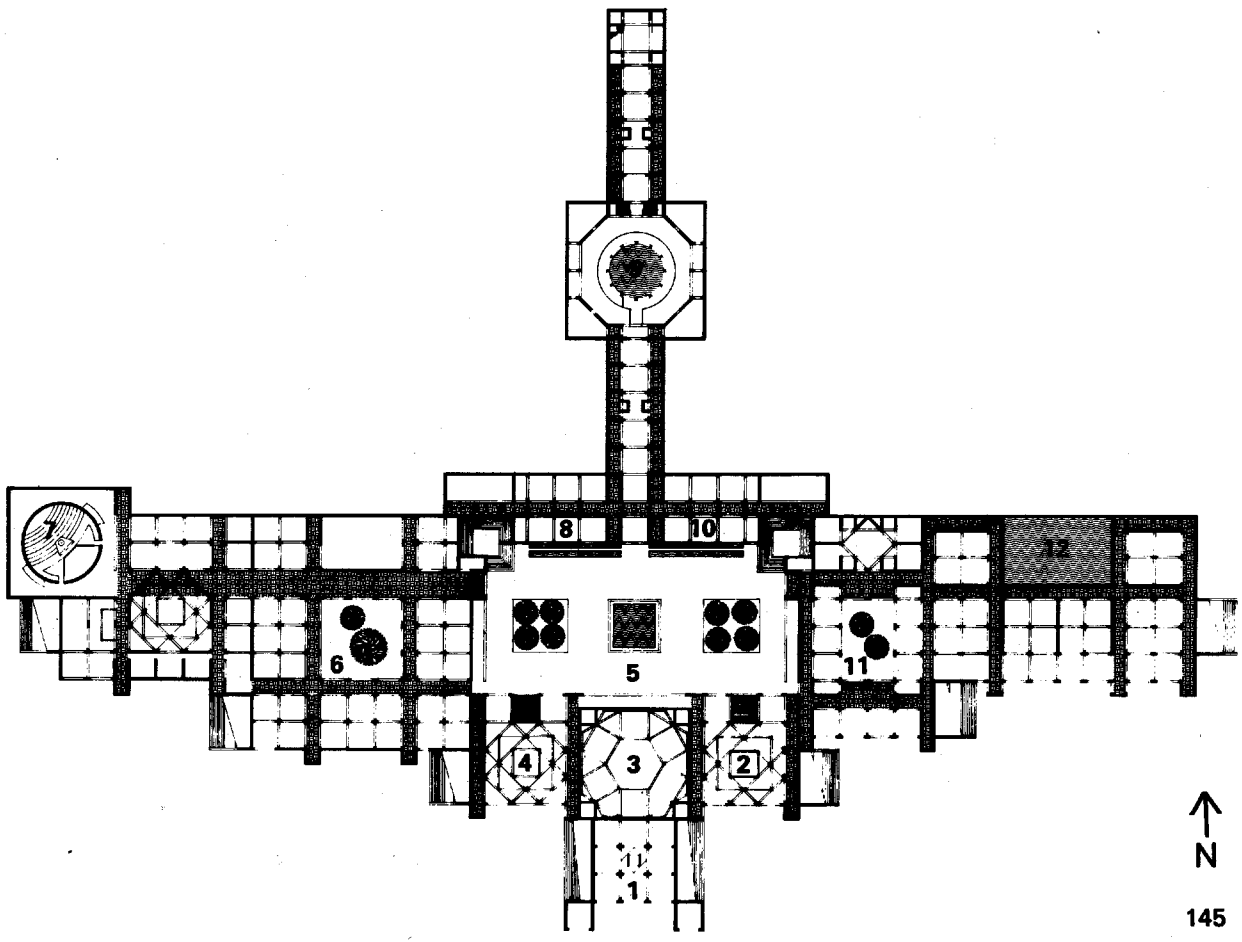

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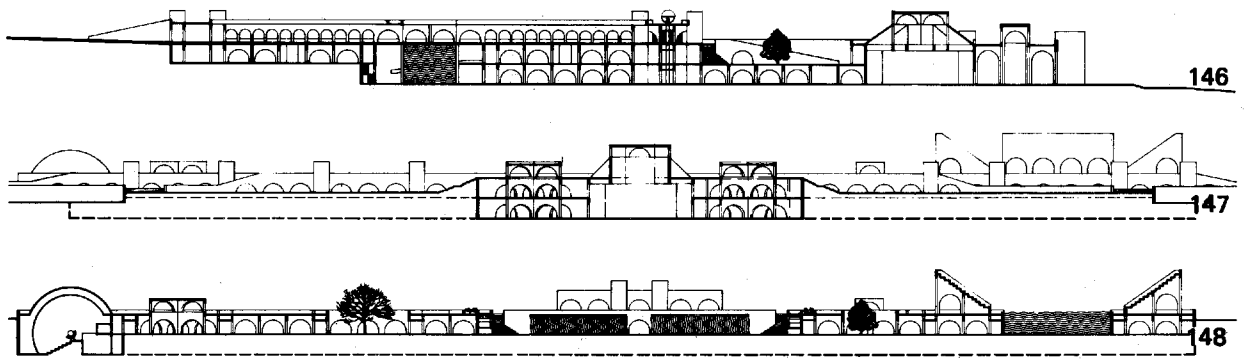

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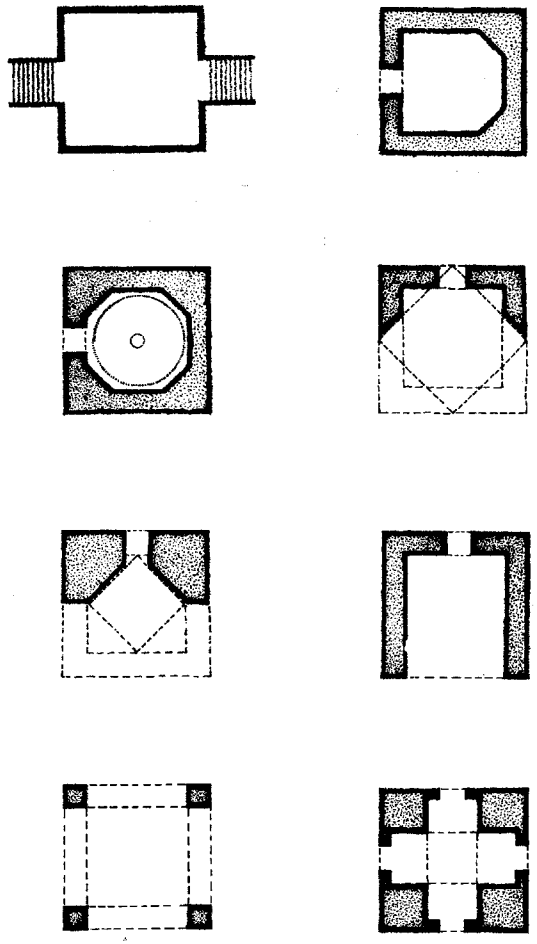

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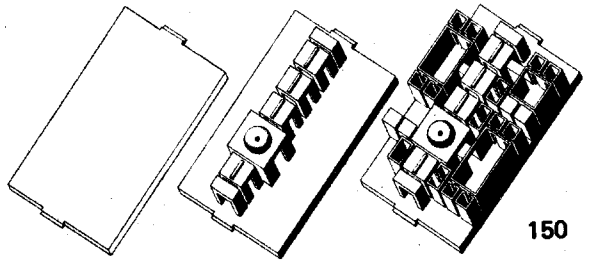

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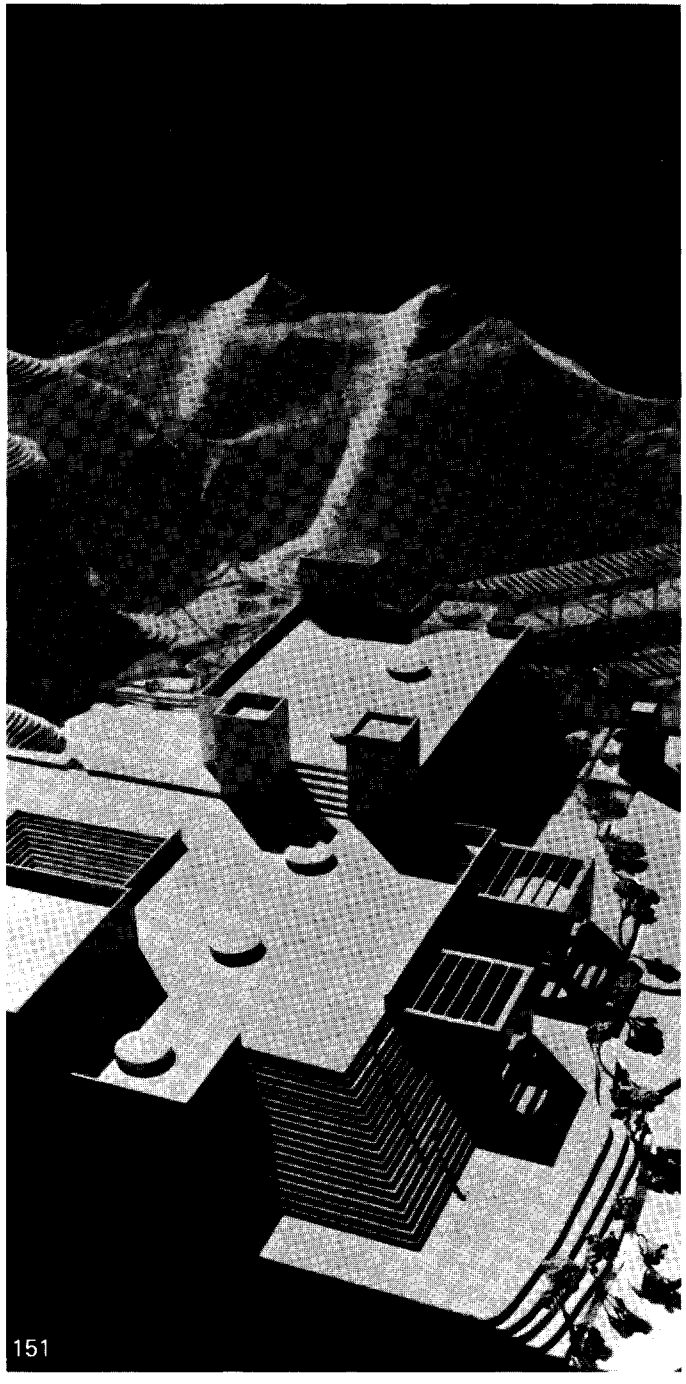

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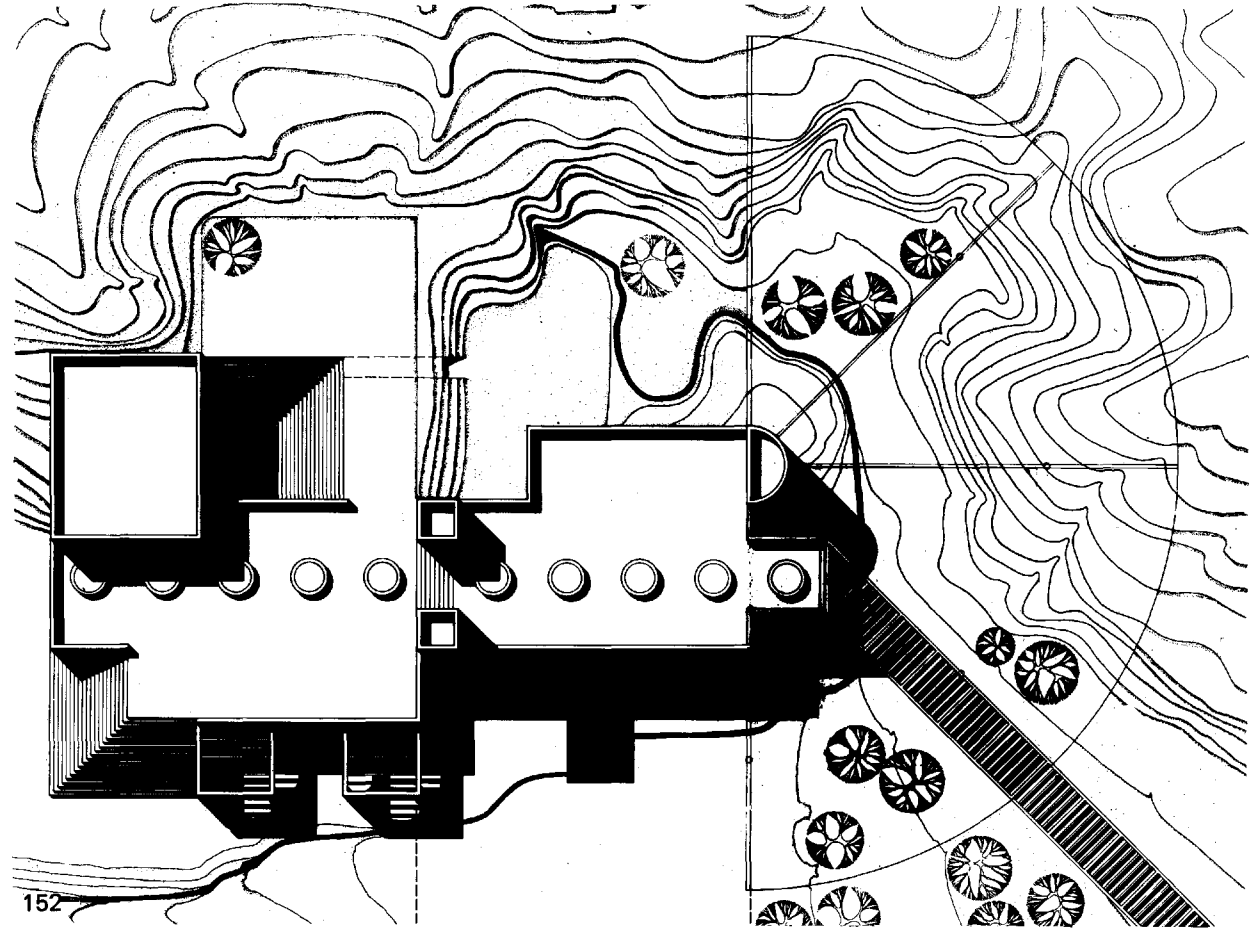

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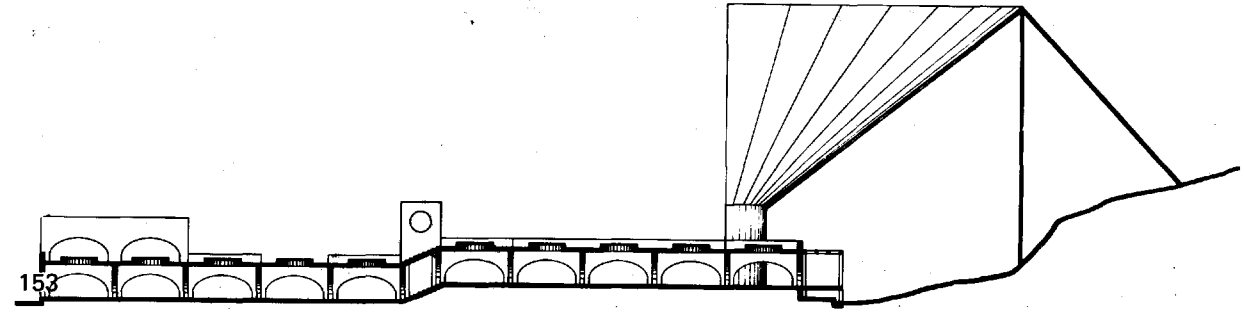

153

tion of the bazaar permits it to respond to the uniqueness of the site and other programmatic elements. It acts as the spine into which other minor movement systems can insert themselves as ribs. Along the spine, major nodal points find their expression as "Chahar Sou." These are integrative spaces providing identity to particular segments of the spine and permitting connections to other movement systems. The space organizing principles of the bazaar also enable specific functions to be located in close relationship through provision of nodal spaces or dependent spaces. These can be either indoor or outdoor. Rhythmic continuity of space, repeated forms and complementary orders, such as water, ensure a harmonious whole. Where necessary, specific identity elements, displaying unique adaptations, can be introduced.

The system of positive space continuity provides a hierarchy of relationships which are qualitative and abstract, temporal forms give shape to concepts by dealing with quantitative artifacts of man. Each generic form is imbued with symbolism and has a tradition of related rhythmic associations for specific functions. The idea of a revered and elevated temporal place is invoked by the plinth or socle. The stair, or peleh, is a form intimately related to the socle or the gateway. The courtyard, hayat/bach, reflects the "sense of place," being viewed as a defined space encompassing within itself a total reflection of the cosmos. The garden, or bagh, is the centrifugally oriented form of the microcosm, the Manifest, while the courtyard, hayat, is centripetal to evoke the microcosm, the Hidden. The gateway, or bab, indicates movement through space over time. Symbolically the term applies as well to the orifices of the body and the bi-annual solstices as it does to a mountain pass leading to a region or a doorway into a building. The porch, aivan/tarac, can be viewed as the transition between the garden, the spirit, and the room, the body. It can either be columnar, tarac, or appear as a niche, aivan. The integrative space, chahartaq, in the shape of a dome resting upon four arches, symbolizes creation itself. The cubical volume of the base represents the basic and the most stable aspects of temporal life, while the superimposed spherical dome represents the mobile spirit, the two together denoting unification of the temporal and the spiritual. The room, taq, is seen as a dependent space to be linked to the main spatial experience. Symbolically, the floor represents the earth, and the niched walls extend the vertical dimension to the roof which represents the spiritual world. The location of openings establishes the personality of a room.

The system of space organization, and the glossary of traditional forms, are admirably suited to deal with the programmatic content of built form in Pardisan. A system of dimensional and structural order needs to be introduced which will enable it to be realized quantitatively. The Persian heritage of accomplishments in the understanding of geometrical harmonies and orders provides an appropriate measure. The rigorous but flexible attributes of pure geometric shapes arranged through the order of space organization allow satisfaction of a program which is highly variable, on a site which requires a great deal of flexibility. The geometric shapes chosen are the square, the triangle and the hexagon. Each of these possesses the virtue of being able to fill a space or a volume by self repetition, thereby permitting dimensional variability without loss of rhythmic order. Additionally, halving of each dimension replicates the original shape with its axis turned diagonally. This permits change of direction for any sequential ordering, a positive virtue in fitting on a variable site. The replicated shape produced by the halving process is of a dimension which is a harmonious reduction of the parent shape's dimension. This enables mu-

145. The Gateway: Plan at Maidan level
    1. Orientation
    2. Ticket
    3. Theatre
    4. Ticket
    5. Maidan
    6. Natural History Museum
    7. Planetarium
    8. Gift Shop
    9. Aquarium
    10. Restaurant
    11. Administration
    12. Aquatic Amphitheatre

146. The Gateway: North-South Section through Orientation, Maidan, and Aquarium

147. The Gateway: East-West Section through Orientation and Ticket Purchase Areas

148. The Gateway: East-West Section through Planetarium, Museum of Natural History, Maidan, Administration, and Aquatic Amphitheatre

149. Evolution of tradition forms from square geometry

150. Evolution of the Bazaar spine through hierarchical ordering of space, traditional forms, and geometry

151. A segment of the Bazaar and the Birds of Prey Aviary

152. Segment of the Bazaar and the Aviary: Plan

153. Segment of the Bazaar and the Aviary: North-South Section

tual packing together of all three parent shapes and is an invaluable asset in achieving the hierarchical system of spatial ordering.

The Pardisan experience will begin at the place of "gateways," where the primary entrances and exits will be located upon three levels. The lowest level is intended for those visiting Pardisan for the first time who will go through the orientation program. At mid-level, the general admissions area will admit those who wish to enter the main exhibitions directly. Located at the topmost level and taking advantage of the great platform created by the roofscape of the functions below, will be the primary egress from the site. Subsequent to the movement through the gateways, the visitor will enter a great enclosed square of the maidan. The handsomely paved court, with a large central pool surrounded by shade trees, will accommodate visitor facilities, travelling outdoor exhibits, story tellers, musicians and general outdoor celebrations. The maidan, in addition to being the major distribution point for site-wide movement by means of the monorail, will also be the main access through or over the Aquarium bridge into the Iranian Bazaar. In the Bazaar diverse activities will be integrated into a unity by the structuring principle of the moving line. The audio-visual experiences of plant, animal and human adaptations will be augmented by replicatable cultural traditions such as restaurants serving regional cuisines and interior designs reflective of indigenous life styles.

With the multiplicity of these displays there will run an architectural thread of unity based upon traditional Persian forms and an indigenous system of form organization. The architecture of Pardisan will express a unity based upon traditional architectural forms, the geometric harmonies of Persian architecture, all addressed to the solution of contemporary problems.

Beyond the exhibition of real phenomena, plants, animals, and cultural artifacts, much of the message of Pardisan will be conveyed by special media. Expanding technology and studies in the field of educational psychology have produced many opportunities for greater and more efficient communications.

Initially, films will assume a large role as the institution of Pardisan evolves. Video projection using video cassette, record and sheet technologies will be used in combination with displays of actual phenomena to show context, as well as inherent processes and structure. Indeed, light sources are now of sufficient strength to permit the use of these projections outdoors. The apparently static, immovable tree may now be perceived as an organic machine actively converting sunlight into sugars. While conventional television screens are suitable for a few individuals, "advent"screens provide an image suited for groups of fifty persons. For very large audiences superscreen projections, one hundred feet in width, are possible. The tilted dome of the planetarium can be used for these images. Holographic projections and lenses allow three-dimensional images of startling reality, useful in dioramas representing past or future events.

It must be accepted that, at least initially, a large number of rural visitors will find reading difficult, so a premium is placed upon communication without the written word. In this direction, the interactive exhibit is useful. It allows individual participation at many levels. By use of mini-computers, this exhibit type reacts appropriately to the visitor addressing it. Simple information is given to a child, while a teacher receives more complex feedback. Computers can also be linked to learning machines, responsive models and puppets, and to the retrieval of satellite imagery of parts of the world and regions of Iran.

154. Video projection
155. ERT Satellite imagery
156. Star projection
157. Activated Model of Pardisan
158. Interactive exhibits

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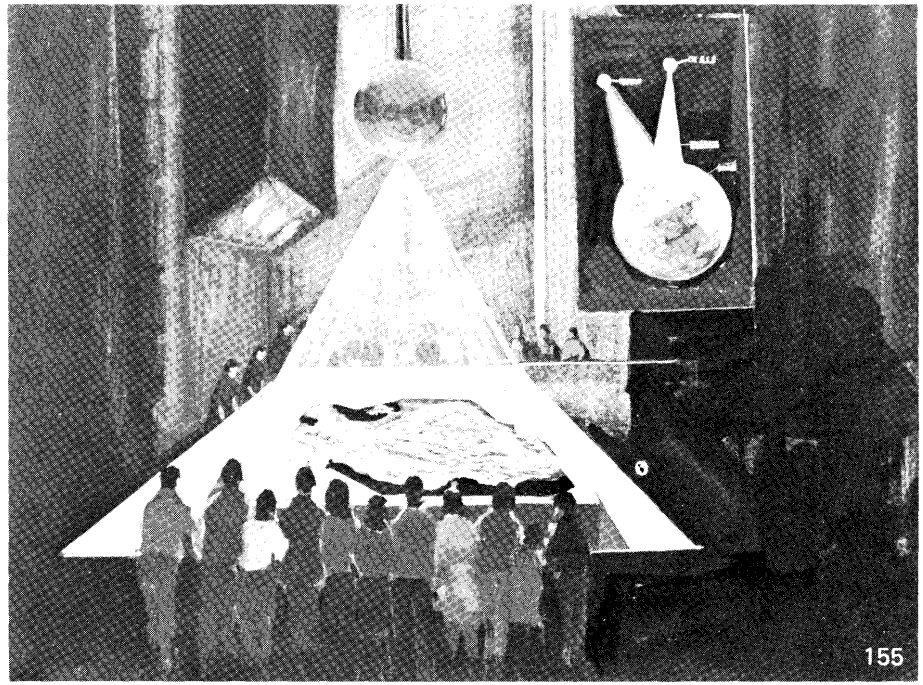

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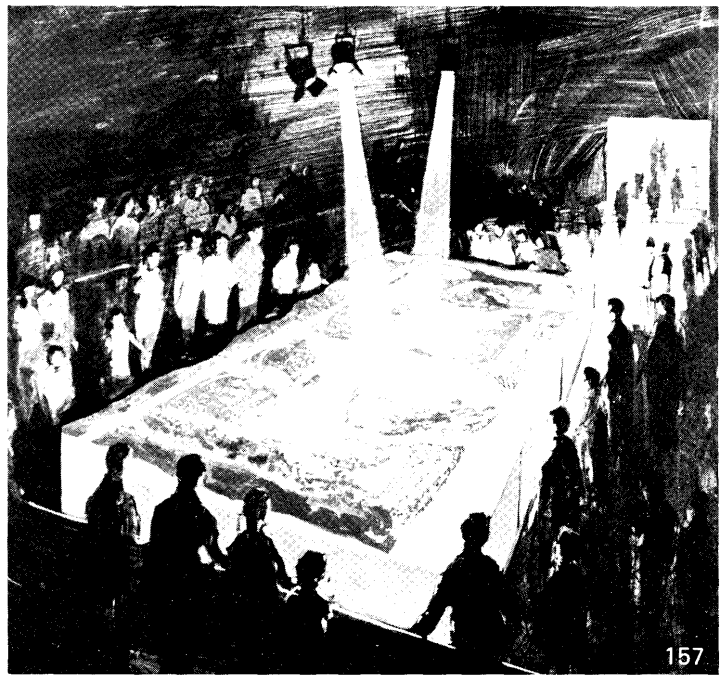

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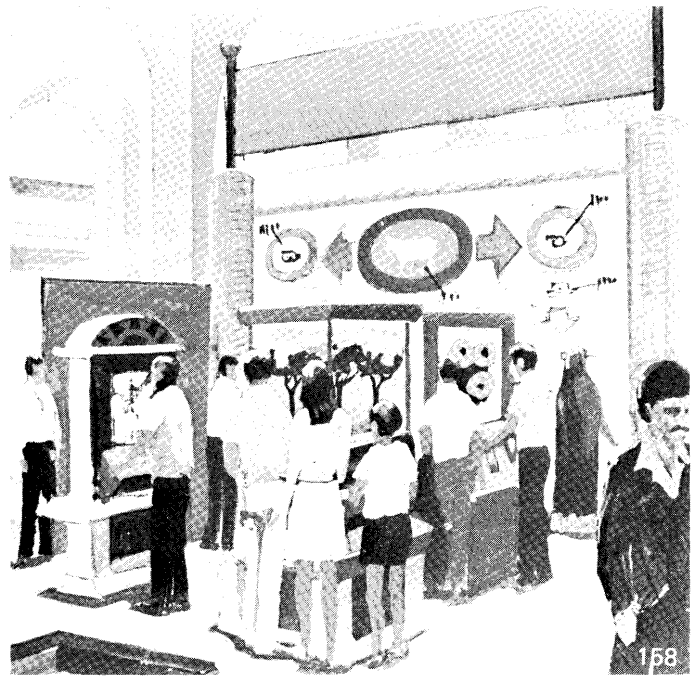

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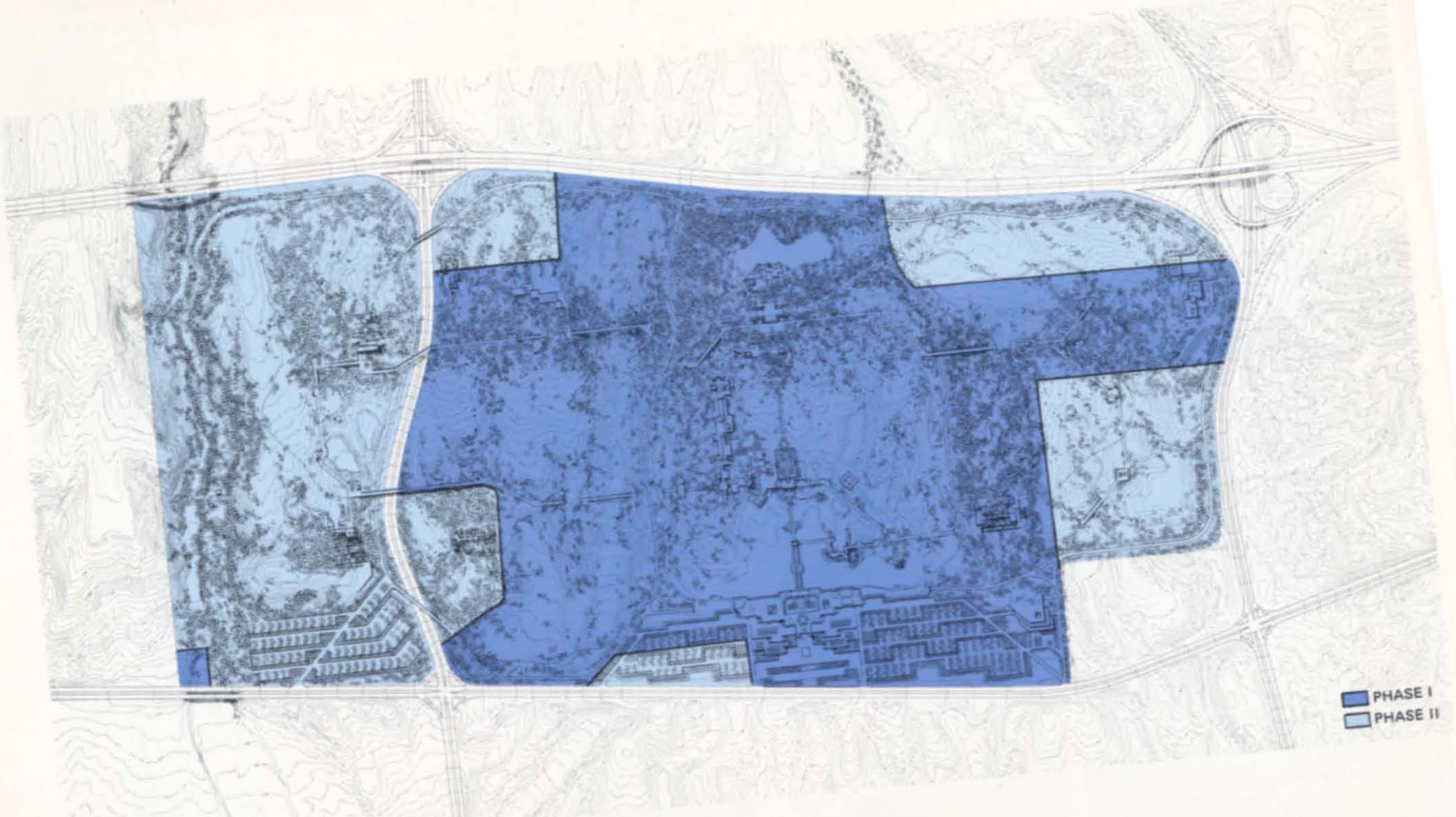
PHASE I
PHASE II

Pardisan is a large and complex project. It is planned to be completed within a decade. Construction will be continuous during this period yet, throughout, the institution must operate, be attractive and instructional during its growth. This presents problems of phasing, but it also provides opportunities, particularly if the actual building of Pardisan is used as an exhibit and as an example.

It is intended to complete the Iranian exhibit and nine of the major world analogues within the first phase. This will represent all of the bioclimatic zones. This first phase concentrates development and excludes the American continent, which is divided from the central area by a highway.

All major grading and general forestation for the entire park will be done in the beginning. The general utilities system will also be established at this time. The Orientation Pavilion, the Planetarium, the Natural History Museum, the Department of Environment headquarters, and most of the bazaar spine will be built in the initial phase. Half of the parking, the administration facility, the main aquarium, the monorail system, the veterinary and research facilities and the staff housing will also be completed in the first five-year period. The indoor facilities which are part of the world environments, designated for first phase, will be constructed during this time.

The construction phases will be in themselves an instructive part of Pardisan. It will be possible for visitors, throughout the entire construction process, to witness the techniques of land rehabilitation, the establishment of botanical specimens, and the replication of animal habitats. Temporary displays will help the visitor to learn the latest and most sophisticated methods of land husbandry.

Along the bazaar spine, construction and cultural exhibition will be synonymous, as regional craftsmen in ceramic, wood and metal work alongside modern construction workers in concrete, glass and steel. Tiles for the domes of the mosque to be reproduced will be molded and fired side by side with the fabrication of the modern, seismic-proof building elements of the spine.

The area shaded on the opposite map indicates that portion of Pardisan which will accommodate educational, recreational and research pursuits in the first five years. Within this segment it will be feasible to accommodate close to the design maximum on peak visitor days of seventy thousand by allowing people to use the site as passive recreation. As with any organism, growth is a period of learning and experience. The phasing process allows for the acquisition of professional experienced personnel on a small scale and for the establishment of a staff training-program for future needs.

Perhaps the most critical problem associated with the realization of Pardisan is the constitution of the human institution to operate this venture. For, assuredly, the structure of the organization and the caliber of its staff, will determine the success or failure of Pardisan. The first problem is of the organizational structure. While the concept and plan for Pardisan are based upon ecological principles, science itself remains obdurately analytical and reductionist. There seems to be no escape from the specificity of scientific disciplines. The staff of Pardisan must include physicists and chemists, mammalogists, ornithologists, ethnographers, anthropologists and more. Typically, academies of natural sciences and museums of natural history have curators for each major scientific division. Yet, such a structure is anti-ecological and contrary to the spirit of Pardisan. The objective is

159. Phasing Plan

to ensure that all investigations and presentations of environmental matters include physical, biological and cultural factors. This being so, the organizational structure might better be related to specific environments, within bioclimatic zones, themselves within continents, finally organized within hemispheres. Such a concept could be developed with an Assistant Director for Universal Themes, one for the Eastern Hemisphere, one for the Western Hemisphere and one for Iran. The next level of administration would consist of the scientific community for each continent. This group would be subdivided into teams responsible for bioclimatic zones within continents. The smallest structural element would be the scientists and administrators responsible for specific exhibits—the Congo Tropical Rain Forest, the Rift Valley Exhibit and the Great Sandy Desert. This appears to provide a structure more consonant with the objectives of Pardisan than a number of curators, each responsible for a single realm. However, perhaps the best guarantee of a holistic view would be the appointment of senior officers who subscribe to the integrative, ecological principles epitomized in Pardisan.

The application of this structure to the Iranian exhibit can demonstrate the proposed organization. An assistant director would be responsible for this most important exhibit. Under him would be six groups, each composed of physical, biological and social scientists, responsible for the constituent bioclimatic zones in Iran. These zones would be subdivided into the twenty-one life zones constituting Iran, each with an appropriate team of scientists, administrators and staff. The smallest unit of organization would be responsible for exhibits within these life zones. This device integrates with the administrative structure of the Department of Environment which is organized into regions similar to those constituting the Iranian exhibit in Pardisan. Thus departmental staff may move between Pardisan and the region itself, undertaking research in the former, applying the results in the region, identifying problems in the region and researching solutions in Pardisan. Such reciprocity between Pardisan and the Iranian regions, engaged in problem seeking and solving, could well be the best demonstration of Pardisan as an adaptive strategy.

Clearly, the early appointment of a director and senior staff is critical. These appointees should have the earliest opportunity to contribute to the design and realization of Pardisan. Such a new and challenging institution, beginning modestly, offers great opportunity to young persons of high promise to build a reputation by contributing to the development of Pardisan.

Particularly in the earliest, formative years, Pardisan could benefit immeasurably by advice from brilliant minds. It is recommended that an International Advisory Committee be formed, drawn from the field of internationally renowned thinkers, to review and advise on the development of Pardisan.

It is also recommended that Pardisan house an Iranian Academy of Environmental Science.

The realization of Pardisan should be employed as a device for recruiting staff. Advisors and consultants, contracted to build planetaria, aquaria, tropical greenhouses and the like, should be responsible for training staff who will operate these facilities after completion and remain in Pardisan.

Iranian nationals should be employed whenever possible. However, where it is necessary to fill positions with foreign nationals, an internship program should be initiated to train Iranians to fill such posts.

COST ESTIMATES

Program Element	Size (Square Meters)	Unit Cost U.S.$/ M^2	Total Cost 1975 U.S.$'s
Department of Environment Building	4,000	550	2,200,000
Universe Buildings			
Orientation and Theme Center	5,755	500	2,877,500
Planetarium Display and Research	2,744	900	2,250,000
Natural History and Science Display and Research	4,400	500	2,200,000
Aquatic Display and Research	2,908	900	2,617,200
Aquatic Amphitheatre (outdoor)	3,880	700	2,716,000
Iran Spine/'Bazaar'	10,860	400	4,344,000
World Environment Building			
North American Tundra	160	450	72,000
North American Coniferous Forest	4,040	550	2,222,000
North American Deciduous Forest	500	450	225,000
North American Grassland	190	450	85,500
North American Desert	310	450	139,500
South American Tundra	280	450	126,000
South American Grassland	450	450	202,500
South American Tropical Forest	4,150	575	2,386,250
European Tundra (Polar)	540	500	270,000
European Tundra (Alpine)	340	500	170,000
European Coniferous Forest	1,640	575	943,000
European Deciduous Forest	420	475	199,500
European Dry Scrub/Woodland	180	475	85,500
African Desert	480	450	216,000
African Savanna	4,120	450	1,854,000
African Tropical Forest	5,990	600	3,594,000
Asian Tundra	30	500	15,000
Asian Deciduous Forest	210	575	120,750
Asian Grassland	220	450	99,000
Asian Desert	400	450	180,000
Asian Tropical Forest	6,790	575	3,904,250
Oceanian Dry Scrub and Woodland	330	450	148,500
Oceanian Desert	350	450	157,500
Oceanian Tropical Forest	970	550	533,500

Continued

Program Element	Size (Square Meters)	Unit Cost U.S.$/ M^2	Total Cost 1975 U.S.$'s
Support Buildings			
Administration	2,000	500	1,000,000
Veterinary Facilities	1,500	500	750,000
Environmental Research Laboratories	1,000	600	600,000
Staff Housing	2,400	375	900,000
Maintenance and Service	1,000	350	350,000
Motor Pool	1,000	350	350,000
Utilities Buildings	1,500	400	600,000
Visitors Facilities	2,500	200	500,000
Special Displays and Exhibition Technologies			5,000,000
Interior Furnishings, Moveable Furnishings, Fixed Equipment			3,000,000
Outdoor Animal Exhibits	1,630,280		3,500,000
Outdoor Vegetation Exhibits	384,970		3,240,000
Outdoor Cultural Exhibits	74,750		1,000,000
Public Recreation and Landscaped Areas			2,466,550
Public Conveyance System			15,000,000
Roads, Parking Walkways Bridges and Tunnels			4,774,700
Site Grading and Drainage			12,000,000
Utilities			
Potable Water Distribution and Storage			1,400,000
Irrigation and Scenic Water			1,800,000
Waste Water Collection and Treatment			1,600,000
Heating/Cooling Plants			3,700,000
Heating/Cooling Distribution			1,200,000
Electrical Distribution and Exterior Lighting			1,200,000
Inventory			3,000,000
TOTAL ESTIMATED COST			106,085,200

The cost estimate for implementation of Pardisan is based upon careful measurement of all site work; utilities; buildings and other facilities and inventory represented in the Master Plan. As far as possible the unit costs take into account the enormous inflation of construction costs in Iran during the last two years and represent a conservative estimate of current costs for the entire park. In some cases the special furnishings and equipment in buildings are not included as these would be premature and uncertain during this master plan phase.

On the 16th day of March 1975, Eskander Firouz planted a ceremonial tree on the site of Pardisan. It was an auspicious moment. His Imperial Majesty, the Shahanshah, had approved Pardisan and allocated the site. It was thus possible and appropriate to engage in this historic act.

Over two years had elapsed since Eskander Firouz had presented his challenge to the consultants. The charge was to create an entirely original institution, which could enhance understanding, planning and managing the environments of Iran. Even more challenging was the insistence upon relevance—this new institution must help modern Persians solve modern problems. As to the elements of this new institution, it should contain institutions elsewhere entitled Academy of Natural Science, Museum of Natural History, Planetarium, Aquarium, Botanical and Zoological Garden. Yet none of these should be discernible as such. All should be integrated into a single entity addressing the problems of environments and adaptation. No such institution has ever been created; none was being contemplated elsewhere. This was to be not merely a novel Iranian institution but a new world institution. Moreover, it was to be a direct response to the aspirations of the Stockholm Conference—"only one world."

There were many propitious factors—the support of His Imperial Majesty, the Shahanshah, the dedication, originality and audacity of the author of the conception, Eskander Firouz, and in consequence, the challenge of this most timely proposal. It was itself such an effective adaptive strategy that it generated unequalled enthusiasm, indeed passion, among all who participated in the development of conception and plan. This, more than any other factor, characterized the Pardisan study. All of the many scientists who participated, the advisors and the consultants' staffs were infused with a dedication to the idea and its magnificent purpose and promise.

This should not discount the difficulties. It is not simple to conceive, plan and design a new national institution with such a breadth of purpose. There were many unproductive investigations, there were agonizing searches for the appropriate schema to integrate the complex purposes of Pardisan and there were, above all, delays. Yet, there never was any doubt about the high seriousness of the venture, any lack of enthusiasm. Indeed it was these very characteristics which, in time, produced the schema and plan. Pardisan was not a project. It was, and is, a cause.

Pardisan, in its design and realization, will be an examplar to all institutions in Iran engaged in modifying and managing the environment. It will provide the first example of ecological planning and design for the country to see.

The Persian Garden is a more powerful metaphysical symbol than is generally realized. As has been discussed, it symbolized the qanat, the device which exploited shallow groundwater and made settlement possible in areas previously incapable of doing so. The Persian Garden is the symbol of the desert made to bloom. Godly men made paradise in the desert; Pardisan, a successor to the Persian Garden, seeks to make the country bloom, not only in its deserts, but its grasslands and forests, its marshes, its animals, and, not least, its people. Each ecosystem, with its plants, animals and micro-organisms has the potential of achieving its climax. Man, the husbandman, by exercising intelligent stewardship and by wise management can contribute to this condition. By such interventions he contributes to the wellbeing of the natural system upon which he depends. He simultaneously enhances human health and wellbeing.

The challenge has been accepted, this report is the response. It now awaits the most important step, realization.

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William H. Roberts was responsible for the review of outstanding aquaria, planetaria, science exhibits, and zoological gardens in Europe and the USA, assisted by Colin Franklin, Narendra Juneja, and W.R. Fisher. William H. Roberts was responsible for program development and the planning of transportation and services.

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