Ian McHarg: Champion for Design with Nature

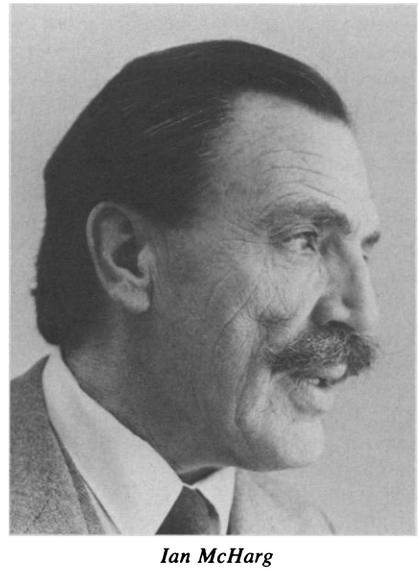
The greater Philadelphia Cultural Alliance held a public symposium a few months ago at which some artists and scientists talked about creativity in America. Among the speakers was landscape architect Ian McHarg, who between turbulent gusts of Marlboro smoke decried in his gravelly Scottish brogue the narcissism of modern artists. The world was threatened with atomic cataclysm, but the "bloody precious artists" were sitting around "playing with their psyches." He invited the audience to contemplate Vincent Van Gogh, compared to whom Kenneth Clark, documenter of western civilization, was nothing but a "fatuous butterfly." If modern artists wanted to know about creativity they should look at photosynthesis—"the most profound creative act that ever happened"—and science: "The man who invented the electron microscope had skills that would make Michelangelo whimper."

McHarg's rangy mind, colorful mode of expression, and willingness to offend makes him rather unusual as landscape architects go. But behind the extravagant language hums a methodical brain and a fervent, highly developed philosophy about man's relationship to nature that has propelled him to the forefront of landscape architecture in America.

McHarg's forum, and the laboratory in which he develops his ideas, has been the Department of Landscape Architecture and Regional Planning which he founded 22 years ago at the University of Pennsylvania's Graduate School of Fine Arts. He is one of the first of a new breed of landscape architects who call themselves "ecological planners," and many consider him to be the individual most responsible for pulling landscape architecture out of the narrow confines in which it has dwelt for most of this century, and turning it into a broad multidisciplinary tool for resource management and land use planning.*

Under McHarg's leadership (says McHarg) Pennsylvania has taken the lead away from Harvard as being the "preferred source" of teachers in landscape architecture and regional planning, and his graduates are scattered in universities around the world. He is the author of a book, *Design With Nature*, which was much touted when it came out in 1969, coinciding as it did with the environmental fever that peaked with Earth Day in 1970. He is also a partner in the Philadelphia firm of Wallace, McHarg, Roberts and Todd, which has done numerous regional studies in metropolitan areas around the country and which is now designing a huge environmental park in Iran.

Since ecological planning began to evolve in some universities in the early 1950's, it has over the past decade ridden the new wave of environmental awareness and has been turned into a highly complex, computerized undertaking that combines science, social science, economics, and futurism. Certain principles have now become common sense among environmental planners: for example, that one should preserve top-quality farmland, that one should not build on a hillside subject to erosion, on valuable wetlands, or on a floodplain. One does not build facilities that are likely to pollute one's aquifer. One does not cut a highway through the heart of an established community. And one takes into account the social ecology—that is, no plan is going to work if foisted from on high without public participation.



Ian McHarg

Such precepts, however, are daily being violated, through ignorance, shortsightedness, and greed (as McHarg would say). The man, therefore, plays an important role in his ability to grab peoples' attention and communicate his ideas. He does not bore students or his many other audiences with drab banalities about the need to preserve the earth's bounty, nor does he soft-pedal his message to suit his listeners. He tells industry it's high time for some "toilet training." When Lady Bird Johnson once invited him to address some highway engineers, according to one colleague, he shocked the assemblage by accusing them of raping the landscape and strangling it in ribbons of concrete. At one community meeting, according to an article in *Atlantic* magazine, a matron inquiring what she could do about pollution was instructed to seek out the president of U.S. Steel and "bite him on the jugular."

His rehetoric is not idle. He has thought out his case from the bottom up, that is, from the beginning of creation. Western Judeo-Christian civilization, he maintains, is in the grips of a man-centered theosophy that is spelled out right there in Genesis, and that has resulted in a flagrant, even heretical, disregard for the need to live in harmony with the natural environment.

McHarg's awareness of the lengths to which man could foul up that environment bloomed at an early age, prodded by the extremes he saw near his home town of Clydebank, Scotland. On the one side was Glasgow—"a sandstone excretion cemented with smoke and grime," on the other, the stark beauty of the Western Highlands. He figured there must be a better way to preserve nature's bounty in the midst of man's toil.

McHarg received schooling in art, architecture, and engineering in Glasgow, followed by 7 years as a paratrooper in the British Army. In 1946 he sent a telegram to Harvard inviting it to admit him into its school of architecture, and Harvard accepted. He returned to Scotland 4 years later with degrees in landscape architecture and city planning, but in another 4 years he was back again, this time to Pennsylvania, where he has been rooted ever since.

McHarg is a combination of iconoclast, guru, and synthesizer. In the last role, he is probably one of the few genuinely interdisciplinary thinkers around. He has brought an extraordinary range of disciplines into his department: on the faculty, in addition to architects, landscape architects, and city planners are a geologist, an ethnographer, an anthropologist, a medical anthropologist, a geochemist, a hydrologist, a soil scientist, a

*Others prominent in the field include Philip Lewis of the University of Wisconsin, Carl Steinitz of Harvard, and Canadian landscape architect Angus Hill.

plant ecologist, a limnologist, and a resource economist. Students are required to have competence in the physical sciences, the biological sciences, and ethnography and anthropology. The aim is to produce "applied human ecologists" equipped with a "working method which allows them to go anyplace using scientific data and perceptions to find out what it is, why it is what it is, and where it's going, and also to know of people why they are where they are and what they're doing, and to ask the people what their perceptions of their natural and social environment are. . . ."

The vehicle to convey McHarg's all-embracing personal vision has been a course he has been running for the past 15 years, called "man and the environment." Each year he invites a series of distinguished lecturers to take students through the evolution of the cosmos, the solar system, plants and animals, the biosphere, and finally, the evolution of man. With man thus put in perspective, lectures move on to "the attitudes toward God, man, and nature represented in the major philosophies and theologies of the world," from the polytheism of ancient Egypt to the transcendentalism of Emerson and Thoreau. Then on to human behavior, the effects of environmental stress and overcrowding—and a discussion of the Midtown Manhattan Study of 1962 in which it was concluded that 20 percent of the population were indistinguishable from patients in mental institutions.

Finally, students hear speakers whose thinking may offer guidance toward the shaping of a healthier future. Among these have been poet Howard Nemerov, naturalist Loren Eiseley, Lewis Mumford, Margaret Mead, Hans Selye, Barry Commoner, and Erich Fromm.

Academy Study Finds Low Energy Growth Won't Be Painful

A National Academy of Sciences committee that is conducting a comprehensive study of future energy options has given some intriguing hints of its thinking. The group seems to have reached a consensus that a low rate of energy growth is possible without imposing adverse effects on the economy or requiring major changes in the life-styles to which Americans have grown accustomed.

The committee may thus add credence to previous studies that have endorsed the possibility of low rates of energy growth. Two of the most prominent of those previous estimates were the controversial low-growth scenario of the Ford Foundation's Energy Policy Project (*Science*, 1 November 1974) and recent projections by the Institute for Energy Analysis, headed by nuclear expert Alvin Weinberg (*Science*, 14 January 1977).

The significance of this increasing acceptance of low growth forecasts is that—if they are right—the energy problem may be a bit more manageable than is commonly portrayed. There may be less need to despoil the earth in a frantic search for new sources of fuel; the pampered public need not worry about reverting to primitive living because of insufficient energy; and decision-makers may have the luxury of downgrading the uses of particular fuels that are considered dangerous or undesirable.

The academy's study is perhaps the most comprehensive of the many energy studies to emerge in recent years. It is certainly one of the most ambitious studies ever launched by the academy in its long history of advising the government. The study was commissioned by the federal Energy Research and Development Administration at a cost of $2 million (additional funds may be added before the project is completed). Some 250 scientists, engineers, and other professionals are participating in the study under the direction of Harvey Brooks, professor of technology and public policy at Harvard, and Edward L. Ginzton, board chairman of Varian Associates; a full-time staff is headed by Jack M. Hollander, on leave as associate director of the Lawrence Berkeley Laboratory of the University of California.

The committee's final report is not due until 30 June, and it has thus far carefully avoided announcing any conclusions or recommendations. But in an interim report issued in mid-January, the committee indicated the "thrust and direction" of its inquiry in language deliberately chosen to reveal "some trends and directions" in the committee's thinking.

It seems clear that the committee envisions the possibility of a lower rate of energy growth than those suggested by most previous studies. The scenarios currently under consideration by the committee would put total energy use in this country in the year 2010 somewhere between a low of 70 quads (quadrillion Btu's) and a high of 210 quads. The low estimate is essentially equivalent to current energy use and is far less than the low-growth estimates of the Ford study (100 quads in the year 2000) and the Weinberg study (118 quads in 2010). The academy's high estimate is higher than Weinberg's, but it is still far less than the figure that would prevail if historical patterns of energy growth continued. The academy's final report will not designate any one scenario as most probable or most desirable. But the scenarios indicate the range of future energy use that the committee considers plausible.

The reduced rate of energy growth could occur, in the committee's opinion, without harming the economy as measured by the gross national product (GNP) or by the number of jobs. The committee believes that there is "substantial technological leeway" for providing a high level of goods and services with less energy [as might occur, for example, if we built factories and automobiles that were more energy-efficient]. It concludes that "there may be considerable leeway, over the long term, in the amount of end-use energy required for a given rate of growth of GNP and employment."

Similarly, the committee suggests—at least by implication—that energy moderation need not imply a drastic change in life-styles. In a list of alternative ways to reduce energy use, the committee puts "curtailment" of demand for goods and services in last place, thereby indicating that it is not considering asking everyone to abandon cars and refrigerators. Instead, it focuses attention on increasing the efficiency of energy use and changing the mix of goods and services toward those that require less energy. Even the academy's lowest growth scenario, which projects per capita energy consumption far below today's levels, is said to envision essentially the same level of amenities as we enjoy today. Whatever changes in life-style occur are expected to result from factors other than energy constraints.—PHILIP M. BOFFEY

In America the formal history of landscape architecture begins with Frederick Law Olmsted, designer of Central Park and later the national park system. In the early 1900's, a schism developed in the profession, with one branch increasingly occupying itself with social concerns—zoning laws and so forth—and the other co-opted by owners of great estates for whom they designed gardens. The former branch evolved into what eventually became urban planners, says Robert Nichols of the School of Landscape Design of the University of Georgia (also a former McHarg student) while the latter went into a decline, revitalized to some degree for work on public projects during the New Deal.

Keeping ecology in its broadest sense—that is, the harmony of both human and natural systems—center stage, rather than allowing it to be preempted by particular disciplines such as biology, is still an uphill battle, McHarg believes. Despite all the talk of "holistic" and "interdisciplinary" approaches, these concepts run against the powerful undertow of old ideas. "We're still in the last stage of 19th-century reductionism," he says, and "anybody concerned with whole systems is just not respectable."

Progress nonetheless has been spurred by the fact that ecological planning is increasingly being perceived as being synonymous with economical planning. As Eugene P. Odum, director of the University of Georgia's Institute of Ecology, points out, the big obstacles to sensible land planning are social and economic. McHarg, he says, is able to sell his approach not on the somewhat frail ground of aesthetics but on solid economic grounds. Good planning, for example, minimizes land erosion, reduces the perils of flooding, minimizes maintenance costs, preserves water supplies—and also preserves social values. The benefits are even more striking when unquantifiable human values are taken into account, as they are by a few "ecological" economists—notably such as E. F. Schumacher, Kenneth Boulding, and Nicholas Georgescu-Roegen. It all boils down to building an environment that promotes "human health and well-being," one of McHarg's favorite phrases.

Ecological planning is not what the forces of economic development contemptuously label "preservationist": it does not seek to impose values; rather it is a process. It involves exhaustive inventories—physical, biological, and social—of an area for which changes are proposed. Detailed maps are then prepared of every system in the area—water, biota, soil, historic landmarks, human settlements, recreation areas, and on and on. Maps are overlayed upon each other in such a way that planners can see which areas can best tolerate the proposed developments.

Once thorough knowledge of a system has been developed and options laid out, the affected populace decides what to do next. Ecological planning is not ecological if it is not also democratic.

Defensive Planning

Although there is now more of a demand for than a supply of the kind of planners McHarg turns out, he still sees himself as something of a maverick, an adversary. (Things aren't as bad as they were 22 years ago "when I had to grab colleagues by the scruff of the neck and hold them long enough to at least reveal my obsession . . . at that time they thought you were either a pansy or a nut.")

"The kind of planning I do is most efficacious for adversary groups . . . people who are going to be screwed by something or other, whether it's a dam or a highway or a transmission line or an atomic reactor. Their success is contingent on having more information than the adversary. Ecological planning is a way to get more and better information—by and large these great, brutish adversaries are so arrogant but they are also careless—they really don't do their homework."

Also finding themselves in adversary positions are small municipalities where encroaching growth threatens to obliterate their integrity. The Medford, New Jersey, study is commonly cited as one of the most elegant examples of his work. In this case the citizens called in McHarg to help them devise ordinances to regulate urban and industrial encroachments that could engulf the community. "So far as I know," he says, "this is the very first study towards the end of producing ordinances—not a plan—just ordinances, to regulate growth in response to the carrying capacity of the natural system." Nichols believes the Medford study was a "turning point" for land use planning. People are always going to take elements of a plan to court, and since courts are reluctant to uphold restrictive zoning a healthy plan can get holes shot through it. But the Medford study was so thorough, says Nichols, that it supplied not one but half a dozen rationales for every proposed ordinance—a tightly woven mesh of rationales that made it much more invulnerable to legal attacks.

Another group that has been persuaded of the benefits of ecological planning, says McHarg, have been the big developers, who have figured out that thorough planning saves money. His prize example in this category is the new town of Woodlands near Houston. McHarg boasts that he saved the developer $68 million; $18 million was saved in not building a storm drain system because the planners determined that it would be better if the water ran off into the underlying aquifer; and a $50 million grant was obtained from the department of Housing and Urban Development "because the environmental analysis was so impeccable."

Those least amenable to the ecological approach, says McHarg, have been state, local, and the federal governments. The locals are understaffed and don't know what to do for the most part; as for the feds, "it seems there are no criteria of excellence. . . . There's nothing there . . . I can't find anybody who wants to do something good for whom I can do something good who would know what was good."

Visions for the Future

McHarg has many ideas that have yet to be realized. Many are embodied in a grandiose proposal contracted for 3 years ago by the Environmental Protection Agency that was formulated by his firm. This was a proposal for a national ecological inventory to collect all the information that describes the natural systems of the United States, as well as the interaction of natural and human systems. The country would be divided into 34 natural regions—prairies, coastal plain, the Rockies, and so forth—and each would have a regional laboratory. The information would all be centralized and coordinated in a national environmental institute. The information would be available to all, through computer terminals in libraries, for example, and any party who wanted to interfere with any system would have to employ the available data to predict the consequences of planned actions. But, says McHarg, EPA "hasn't paid any attention to it. It wasn't even published."

McHarg does, however, have one government paying attention to him: Iran. For the past 2½ years he has been working on a project he calls "the most challenging of my career"—the design of an environmental park outside Teheran, a multi-hundred-million dollar fantasy land on 600 acres of naked ground. McHarg was called in for the job by minister of environment Eskandar Firouz, who explained he wanted to build a park that would depict and explain all the environ-

ments of Iran. The McHarg firm did an ecological study of the whole country, dividing it into 21 "biophysical-cultural" regions. The park will contain a museum of natural history, an academy of natural sciences, a planetarium, an aquarium, a botanical garden, and a zoological garden. Speicfic environments will be replicated, and the history of man, the history of Iran, and the history of biological and human adaptations to environments will be explained through multitudinous means. Pardisan, as the project is called, will also be a research center. In the words of Firouz "it must transform Iranian attitudes towards the environment" and "it must help modern Persians to solve modern problems."

According to the richly illustrated book describing the plan, Pardisan is conceived in the image of a Persian Garden, a "powerful metaphysical symbol" that represents, through irrigation and airflow regulation, the creation of paradise in a wasteland. Nichols finds it "very curious for the guru of natural systems to be involved in the creation of an artificial system." Yet the garden metaphysic—or the garden as metaphor—is one that has long attracted McHarg. He is fond of citing Renaissance gardens as an example of good art but unhealthy metaphysic, in that unnatural discipline and symmetry symbolized man's drive to quell nature. On the other hand, he sees the landscaping that went beyond the garden walls to transform the face of 18th-century England as a healthy metaphysic—one in which human activities and nature's beauties were harmoniously combined. At another extreme is the metaphysic of Oriental gardens which represent naturalism rather than anthropocentrism—the subordination of the individual. The Persian Garden is yet another metaphysic: making the desert bloom.

Although McHarg does not see a whole lot being done right in this country, he is hopeful that attitudes are changing and cites with approval the spate of new books on ecology that have come out in recent years. Still, he believes we lack a guiding metaphysic for our relationship with nature.

In *Design With Nature*, he writes: "Our failure is that of the Western World and lies in prevailing values. Show me a man-oriented society in which it is believed that . . . man is exclusively divine and given dominion over all things . . . and I will predict the nature of its cities and their landscapes . . . the hot-dog stands, the neon shill, the ticky-tacky houses, dysgenic city and mined landscapes. This is the image of the anthropomorphic, anthropocentric man; he seeks not unity with nature but conquest. Yet unity he finally finds, but only when his arrogance and ignorance are stilled and he lies dead under the greensward."

—CONSTANCE HOLDEN

RESEARCH NEWS

Sexual Dimorphism and Mating Systems: How Did They Evolve?

Sociobiologists tend to look for the simplest explanations of evolved forms and behaviors. And for many years, the question of why members of one sex often evolved to be different in size from those of the other (sexual dimorphism with respect to size) seemed to have a simple explanation. This theory has been used to explain the origin of human sexual dimorphism with respect to size and has been used to infer information on how members of prehistoric human groups behaved. But in recent years investigators have taken a new look at the question of how this kind of sexual dimorphism evolved and have begun to conclude that no single theory suffices to explain this phenomenon.

For more than a century, a theory advanced by Charles Darwin has dominated research on sexual dimorphism. Darwin proposed that sexual dimorphism occurs in response to competition among members of one sex for access to members of the other sex. Males of a species may be larger than the females, more brilliantly plumaged, or may behave differently when they must compete with each other for mates. In cases of sexual dimorphism on the basis of size, males would evolve to be large whenever large size confers an advantage in intrasexual competition.

Darwin left unanswered the question of the conditions under which intrasexual competition will occur. Others have subsequently suggested that the answer might hinge on parental care. A few years ago Robert Trivers of Harvard University formalized these ideas and proposed that whichever sex invests the most in the offspring will tend to be in short supply and will be competed for. Since female birds and mammals usually contribute more than males to parental care, females will tend to be the prizes in a competition among males of these species. Trivers suggested that ecological factors, such as the abundance and distribution of food, affect the evolution of intrasexual competition by affecting parental investment.

Trivers' extension of Darwin's theory won widespread acceptance and has been widely applied to vertebrates. This theory also leads to predictions of what sorts of mating systems will occur. When members of one sex compete with each other for mates, some individuals will be inordinately successful and will have many mates. The extent of intrasexual competition has been linked to the development of monogamous, polygynous (individual males tend to mate with more than one female), and polyandrous (individual females tend to mate with more than one male) mating systems.

Richard Alexander and his associates at the University of Michigan recently reviewed the literature and reconfirmed that there is a positive correlation between the extent of sexual dimorphism (and so, presumably, intrasexual competition) and the mating systems of primates, artiodactyls (deer, antelopes, and their relatives), and pinnipeds (seals, walruses, and their relatives). These investigators explain their findings in terms of the theories of Darwin and Trivers. Moreover, they believe that the fact that human males tend to be larger than females is evidence of past mating systems in which males competed for females and the most successful males fathered offspring of more than one female. Alexander notes that social constraints have forced many people into monogamy. But the prevalence of divorce and promiscuity makes our society effectively a polygynous one.

Although Alexander and others still stress the theory linking parental investment to mating systems and sexual dimorphism with respect to size, some investigators are now beginning to question it. They ask whether intrasexual competition is the dominant factor in the evolution of this kind of sexual dimorphism and whether parental investment