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Ecology and Revolutionary Thought

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dens of toil and false needs, from the trammels of authority and irrational compulsion, individuals will finally, for the first time in history, be in a position to realize their potentialities as members of the human community and the natural world.

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all-round excellence and an all-round activity. It implies a respect for the wholeness or the oneness of life, and a consequent dislike of specialization. It implies a contempt for efficiency-or rather a much higher ideal of efficiency; and efficiency which exists not in one department of life, but in life itself.⁽⁵⁾ An anarchist society, although it would surely aspire to more, could hardly hope to achieve less than this state of mind.

If the ecological community is ever achieved in practice, social life will yield a sensitive development of human and natural diversity, falling together into a well balanced, harmonious whole. Ranging from community through region to entire continents, we will see a colorful differentiation of human groups and ecosystems, each developing its unique potentialities and exposing members of the community to a wide spectrum of economic, cultural and behavioral stimuli. Falling within our purview will be an exciting, often dramatic, variety of communal forms—here marked by architectural and industrial adaptations to semi-arid ecosystems, there to grasslands, elsewhere by adaptation to forested areas. We will witness a creative interplay between individual and group, community and environment, humanity and nature. The cast of mind that today organizes differences among humans and other life-forms along hierarchical lines, defining the external in terms of its “superiority” or “inferiority,” will give way to an outlook that deals with diversity in an ecological manner. Differences among people will be respected, indeed fostered, as elements that enrich the unity of experience and phenomena. The traditional relationship which pits subject against object will be altered qualitatively; the “external,” the “different,” the “other” will be conceived of as individual parts of a whole all the richer because of its complexity. This sense of unity will reflect the harmonization of interests between individuals and between society and nature. Freed from an oppressive routine, from paralyzing repressions and insecurities, from the bur-

⁽⁵⁾ H. D. F. Kitto, *The Greeks* (Aldine; Chicago, 1951), p. 16.

In almost every period since the Renaissance the development of revolutionary thought has been heavily influenced by a branch of science, often in conjunction with a school of philosophy.

Astronomy in the time of Copernicus and Galileo helped to change a sweeping movement of ideas from the medieval world, riddled by superstition, into one pervaded by a critical rationalism and openly naturalistic and humanistic in outlook. During the Enlightenment—the era that culminated in the French Revolution—this liberatory movement of ideas was reinforced by advances in mechanics and mathematics. The Victorian era was shaken to its very foundations by evolutionary theories in biology and anthropology, by Marx’s contributions to political economy, and by Freudian psychology.

In our own time, we have seen the assimilation of these once-liberatory sciences by the established social order. Indeed, we have begun to regard science itself as an instrument of control over the thought processes and physical being of man. This distrust of science and of the scientific method is not without justification. “Many sensitive people, especially artists,” observes Abraham Maslow, “are afraid that science besmirches and depresses, that it tears things apart rather than integrating them, thereby killing rather than creating.”⁽¹⁾ What is perhaps equally important, modern science has lost its critical edge. Largely functional or instrumental in intent, the branches of science that once tore at the chains of man are now used to perpetuate and gild them. Even philosophy has yielded to instrumentalism and tends to be little more than a body of logical contrivances; it is the handmaiden of the computer rather than of the revolutionary.

There is one science, however, that may yet restore and even transcend the liberatory estate of the traditional sciences and philosophies. It passes rather loosely under the name “ecology”—a

⁽¹⁾ Abraham H. Maslow, *Toward a Psychology of Being* (Van Nostrand; New York, 1962), p. viii.

term coined by Haeckel a century ago to denote “the investigation of the total relations of the animal both to its inorganic and to its organic environment.”⁽²⁾ At first glance, Haeckel’s definition is innocuous enough; and ecology narrowly conceived of as one of the biological sciences, is often reduced to a variety of biometrics in which field workers focus on food chains and statistical studies of animal populations. There is an ecology of health that would hardly offend the sensibilities of the American Medical Association and a concept of social ecology that would conform to the most well-engineered notions of the New York City Planning Commission.

Broadly conceived of, however, ecology deals with the balance of nature. Inasmuch as nature includes man, the science basically deals with the harmonization of nature and man. The explosive implications of an ecological approach arise not only because ecology is intrinsically a critical science—critical on a scale that the most radical systems of political economy have failed to attain—but also because it is an integrative and reconstructive science. This integrative, reconstructive aspect of ecology, carried through to all its implications, leads directly into anarchic areas of social thought. For, in the final analysis, it is impossible to achieve a harmonization of man and nature without creating a human community that lives in a lasting balance with its natural environment.

The Critical Nature of Ecology

The critical edge of ecology, a unique feature of the science in a period of general scientific docility, derives from its subject matter—from its very domain. The issues with which ecology deals are imperishable in the sense that they cannot be ignored without bringing into question the survival of man and the survival of the

⁽²⁾ Quoted in Angus M. Woodbury, *Principles of General Ecology* (Blakiston; New York, 1954), p. 4.

I submit that an anarchist community would approximate a clearly definable ecosystem; it would be diversified, balanced and harmonious. It is arguable whether such an ecosystem would acquire the configuration of an urban entity with a distinct center, such as we find in the Greek *polis* or the medieval commune, or whether, as Gutkind proposes, society would consist of widely dispersed communities without a distinct center. In any case, the ecological scale for any of these communities would be determined by the smallest ecosystem capable of supporting a population of moderate size.

A relatively self-sufficient community, visibly dependent on its environment for the means of life, would gain a new respect for the organic interrelationships that sustain it. In the long run, the attempt to approximate self-sufficiency would, I think, prove more efficient than the exaggerated national division of labor that prevails today. Although there would doubtless be many duplications of small industrial facilities from community to community, the familiarity of each group with its local environment and its ecological roots would make for a more intelligent and more loving use of its environment. I submit that, far from producing provincialism, relative self-sufficiency would create a new matrix for individual and communal development—a oneness with the surroundings that would vitalize the community.

The rotation of civic, vocational and professional responsibilities would stimulate the senses in the being of the individual, creating and rounding out new dimensions in self-development. In a complete society we could hope to create complete men; in a rounded society, rounded men. In the Western world, the Athenians, for all their shortcomings and limitations, were the first to give us a notion of this completeness. “The *polis* was made for the amateur,” H. D. F. Kitto tells us. “Its ideal was that every citizen (more or less, according as the *polis* was democratic or oligarchic) should play his part in all of its many activities—an ideal that is recognizably descended from the generous Homeric conception of *arete* as an

An anarchist society should be a decentralized society, not only to establish a lasting basis for the harmonization of man and nature, *but also to add new dimensions to the harmonization of man and man*. The Greeks, we are often reminded, would have been horrified by a city whose size and population precluded a face-to-face, often familiar, relationship between citizens. There is plainly a need to reduce the dimensions of the human community—partly to solve our pollution and transportation problems, partly also to create *real* communities. In a sense, we must *humanize* humanity. Electronic devices such as telephones, telegraphs, radios and television receivers should be used as little as possible to mediate the relations between people. In making collective decisions—the ancient Athenian ecclesia was, in some ways, a model for making social decisions—all members of the community should have an opportunity to acquire in full the measure of anyone who addresses the assembly. They should be in a position to absorb his attitudes, study his expressions, and weigh his motives as well as his ideas in a direct personal encounter and through face-to-face discussion.

Our small communities should be economically balanced and well rounded, partly so that they can make full use of local raw materials and energy resources, partly also to enlarge the agricultural and industrial stimuli to which individuals are exposed. The member of a community who has a predilection for engineering, for instance, should be encouraged to steep his hands in humus; the man of ideas should be encouraged to employ his musculature; the “inborn” farmer should gain a familiarity with the workings of a rolling mill. To separate the engineer from the soil, the thinker from the spade, and the farmer from the industrial plant promotes a degree of vocational overspecialization that leads to a dangerous measure of social control by specialists. What is equally important, professional and vocational specialization prevents society from achieving a vital goal: the humanization of nature by the technician and the naturalization of society by the biologist.

planet itself. The critical edge of ecology is due not so much to the power of human reason—a power which science hallowed during its most revolutionary periods—but to a still higher power, the sovereignty of nature. It may be that man is manipulable, as the owners of the mass media argue, or that elements of nature are manipulable, as the engineers demonstrate, but ecology clearly shows that the *totality* of the natural world—nature viewed in all its aspects, cycles and interrelationships—cancels out all human pretensions to mastery over the planet. The great wastelands of the Mediterranean basin, once areas of a thriving agriculture or a rich natural flora, are historic evidence of nature’s revenge against human parasitism.

No historic examples compare in weight and scope with the effects of man’s despoliation—and nature’s revenge—since the days of the Industrial Revolution, and especially since the end of the Second World War. Ancient examples of human parasitism were essentially local in scope; they were precisely *examples* of man’s potential for destruction, and nothing more. Often, they were compensated by remarkable improvements in the natural ecology of a region, such as the European peasantry’s superb reworking of the soil during centuries of cultivation and the achievements of Inca agriculturists in terracing the Andes Mountains during the pre-Columbian times.

Modern man’s despoliation of the environment is global in scope, like his imperialisms. It is even extraterrestrial, as witness the disturbances of the Van Allen Belt a few years ago. Today human parasitism disrupts more than the atmosphere, climate, water resources, soil, flora and fauna of a region: it upsets virtually all the basic cycles of nature and threatens to undermine the stability of the environment on a worldwide scale.

As an example of the scope of modern man’s disruptive role, it has been estimated that the burning of fossil fuels (coal and oil) adds 600 million tons of carbon dioxide to the air annually, about .03 percent of the total atmospheric mass—this, I may add, aside

from an incalculable quantity of toxicants. Since the Industrial Revolution, the overall atmospheric mass of carbon dioxide has increased by 25 percent over earlier, more stable, levels. It can be argued on very sound theoretical grounds that this growing blanket of carbon dioxide, by intercepting heat radiated from the earth, will lead to more destructive storm patterns and eventually to melting of the polar ice caps, rising sea levels, and the inundation of vast land areas. Far removed as such a deluge may be, the changing proportion of carbon dioxide to other atmospheric gases is a warning about the impact man is having on the balance of nature.

A more immediate ecological issue is man's extensive pollution of the earth's waterways. What counts here is not the fact that man defouls a given stream, river or lake—a thing he has done for ages—but rather the magnitude water pollution has reached in the past two generations. Nearly all the surface waters of the United States are now polluted. Many American waterways are open cesspools that properly qualify as extensions of urban sewage systems. It is a euphemism to describe them as rivers or lakes. More significantly, large amounts of ground water are sufficiently polluted to be undrinkable, and a number of local hepatitis epidemics have been traced to polluted wells in suburban areas. In contrast to surface-water pollution, the pollution of ground or subsurface water is immensely difficult to eliminate and tends to linger on for decades after the sources of pollution have been removed.

An article in a mass-circulation magazine appropriately describes the polluted waterways of the United States as "Our Dying Waters." This despairing, apocalyptic description of the water pollution problem in the United States really applies to the world at large. The waters of the earth are literally dying. Massive pollution is destroying the rivers and lakes of Africa, Asia and Latin America, as well as the long-abused waterways of highly industrialized continents, as media of life. (I speak here not only of radioactive pollutants from nuclear bomb tests and power reactors, which apparently reach all the flora and fauna of the sea; the oil

The ecologist uses the term "biotic pyramid" in speaking of biological advances; the anarchist, the word "individuation" to denote social advances. If we go beyond Read we will observe that, to both the ecologist and the anarchist, an ever-increasing unity is achieved by growing differentiation. *An expanding whole is created by the diversification and enrichment of its parts.*

Just as the ecologist seeks to expand the range of an ecosystem and promote a free interplay between species, so the anarchist seeks to expand the range of social experience and remove all fetters to its development. Anarchism is not only a stateless society but also a harmonized society which exposes man to the stimuli provided by both agrarian and urban life, to physical activity and mental activity, to unrepressed sensuality and self-directed spirituality, to communal solidarity and individual development, to regional uniqueness and worldwide brotherhood, to spontaneity and self-discipline, to the elimination of toil and the promotion of craftsmanship. In our schizoid society, these goals are regarded as mutually exclusive, indeed as sharply opposed. They appear as dualities because of the very logistics of present-day society—the separation of town and country, the specialization of labor, the atomization of man—and it would be preposterous to believe that these dualities could be resolved without a general idea of the *physical* structure of an anarchist society. We can gain some idea of what such a society would be like by reading William Morris's *News From Nowhere* and the writings of Peter Kropotkin. But these works provide us with mere glimpses. They do not take into account the post-World War II developments of technology and the contributions made by the development of ecology. This is not the place to embark on "utopian writing," but certain guidelines can be presented even in a general discussion. And in presenting these guidelines, I am eager to emphasize not only the more obvious ecological premises that support them, but also the humanistic ones.

pp. 55-144.

nature, an expanding natural environment enlarges the basis for social development. But the answer to the question goes much deeper than many ecologists and libertarians suspect. Again, allow me to return to the ecological principle of wholeness and balance as a product of diversity. Keeping this principle in mind, the first step towards an answer is provided by a passage in Herbert Read's "The Philosophy of Anarchism." In presenting his "measure of progress," Read observes: "Progress is measured by the degree of differentiation within a society. If the individual is a unit in a corporate mass, his life will be limited, dull, and mechanical. If the individual is a unit on his own, with space and potentiality for separate action, then he may be more subject to accident or chance, but at least he can expand and express himself. He can develop—develop in the only real meaning of the word—develop in consciousness of strength, vitality, and joy."

Read's thought, unfortunately, is not fully developed, but it provides an interesting point of departure. What first strikes us is that both the ecologist and the anarchist place a strong emphasis on spontaneity. The ecologist, insofar as he is more than a technician, tends to reject the notion of "power over nature." He speaks, instead, of "steering" his way through an ecological situation, of *managing* rather than *recreating* an ecosystem. The anarchist, in turn, speaks in terms of social spontaneity, of releasing the potentialities of society and humanity, of giving free and unfettered rein to the creativity of people. Both, in their own way, regard authority as inhibitory, as a weight limiting the creative potential of a natural and social situation. Their object is not to *rule* a domain, but to *release* it. They regard insight, reason and knowledge as means for fulfilling the potentialities of a situation, as facilitating the working out of the logic of a situation, not as replacing its potentialities with pre-conceived notions or distorting their development with dogmas.

Turning to Read's words, what strikes us is that both the ecologist and the anarchist view differentiation as a measure of progress.

spills and the discharge of diesel oil have also become massive pollution problems, claiming marine life in enormous quantities every year.)

Accounts of this kind can be repeated for virtually every part of the biosphere. Pages could be written on the immense losses of productive soil that occur annually in almost every continent of the earth; on lethal air pollution episodes in major urban areas; on the worldwide distribution of toxic agents, such as radioactive isotopes and lead; on the chemicalization of man's immediate environment—one might say his very dinner table—with pesticide residues and food additives. Pieced together like bits of a jigsaw puzzle, these affronts to the environment form a pattern of destruction that has no precedent in man's long history on earth.

Obviously, man could be described as a highly destructive parasite who threatens to destroy his host—the natural world—and eventually himself. In ecology, however, the word "parasite" is not an answer to a question, but raises a question itself. Ecologists know that a destructive parasitism of this kind usually reflects the disruption of an ecological situation; indeed, many species that seem highly destructive under one set of conditions are eminently useful under another set of conditions. What imparts a profoundly critical function to ecology is the question raised by man's destructive abilities: What is the disruption that has turned man into a destructive parasite? What produces a form of parasitism that results not only in vast natural imbalances but also threatens the existence of humanity itself?

Man has produced imbalances not only in nature, but, more fundamentally, in his relations with his fellow man and in the very structure of his society. The imbalances man has produced in the natural world are caused by the imbalances he has produced in the social world. A century ago it would have been possible to regard air pollution and water contamination as the result of the self-seeking activities of industrial barons and bureaucrats. Today, this moral explanation would be a gross oversimplification. It is

doubtless true that most bourgeois enterprises are still guided by a public-be-damned attitude, as witness the reactions of power utilities, automobile concerns and steel corporations to pollution problems. But a more serious problem than the attitude of the owners is the size of the firms themselves—their enormous proportions, their location in a particular region, their density with respect to a community or waterway, their requirements for raw materials and water, and their role in the national division of labor.

What we are seeing today is a crisis in social ecology. Modern society, especially as we know it in the United States and Europe, is being organized around immense urban belts, a highly industrialized agriculture and, capping both, a swollen, bureaucratized, anonymous state apparatus. If we put all moral considerations aside for the moment and examine the physical structure of this society, what must necessarily impress us is the incredible logistical problems it is obliged to solve—problems of transportation, of density, of supply (of raw materials, manufactured commodities and foodstuffs), of economic and political organization, of industrial location, and so forth. The burden this type of urbanized and centralized society places on any continental area is enormous.

Diversity and Simplicity

The problem runs even deeper. The notion that man must dominate nature emerges directly from the domination of man by man. The patriarchal family planted the seed of domination in the nuclear relations of humanity; the classical split in the ancient world between spirit and reality—indeed, between mind and labor—nourished it; the antinaturalist bias of Christianity tended to its growth. But it was not until organic community relations, feudal or peasant in form, dissolved into market relationships that the planet itself was reduced to a resource for exploitation. This centuries-long tendency finds its most exacerbating development

els for domestic and industrial reasons; they must construct or tear down buildings (the aerial debris produced by these activities is a major source of urban air pollution); they must dispose of immense quantities of rubbish; they must travel on roads with rubber tires (the particles produced by the erosion of tires and roadway materials add significantly to air pollution). Whatever pollution-control devices we add to automobiles and power plants, the improvements these devices will produce in the quality of urban air will be more than canceled out by future megalopolitan growth.

There is more to anarchism than decentralized communities. If I have examined this possibility in some detail, it has been to demonstrate that an anarchist society, far from being a remote ideal, has become a precondition for the practice of ecological principles. To sum up the critical message of ecology: if we diminish variety in the natural world, we debase its unity and wholeness; we destroy the forces making for natural harmony and for a lasting equilibrium; and, what is even more significant, we introduce an absolute retrogression in the development of the natural world which may eventually render the environment unfit for advanced forms of life. To sum up the reconstructive message of ecology: if we wish to advance the unity and stability of the natural world, if we wish to harmonize it, we must conserve and promote variety. To be sure, mere variety for its own sake is a vacuous goal. In nature, variety emerges spontaneously. The capacities of a new species are tested by the rigors of climate, by its ability to deal with predators and by its capacity to establish and enlarge its niche. *Yet the species that succeeds in enlarging its niche in the environment also enlarges the ecological situation as a whole.* To borrow E. A. Gutkind's phrase, it "expands the environment,"⁽⁴⁾ both for itself and for the species with which it enters into a balanced relationship.

How do these concepts apply to social theory? To many readers, I suppose, it should suffice to say that, inasmuch as man is part of

⁽⁴⁾ E. A. Gutkind, *The Twilight of the Cities* (Free Press; Glencoe, N.Y., 1962),

trialized civilization. To use solar, wind and tidal power effectively, the megalopolis must be decentralized. A new type of community, carefully tailored to the characteristics and resources of a region, must replace the sprawling urban belts that are emerging today.

To be sure, an objective case for decentralization does not end with a discussion of agriculture and the problems created by combustible energy resources. The validity of the decentralist case can be demonstrated for nearly all the “logistical” problems of our time. Let me cite an example from the problematical area of transportation. A great deal has been written about the harmful effects of gasoline-driven motor vehicles—their wastefulness, their role in urban air pollution, the noise they contribute to the city environment, the enormous death toll they claim annually in the large cities of the world and on highways. In a highly urbanized civilization it would be useless to replace these noxious vehicles by clean, efficient, virtually noiseless, and certainly safer, battery-powered vehicles. The best of our electric cars must be recharged about every hundred miles—a feature which limits their usefulness for transportation in large cities. In a small, decentralized community, however, it would be feasible to use these electric vehicles for urban or regional transportation and establish monorail networks for long-distance transportation.

It is fairly well known that gasoline-powered vehicles contribute enormously to urban air pollution, and there is a strong sentiment to “engineer” the more noxious features of the automobile into oblivion. Our age characteristically tries to solve all its irrationalities with a gimmick—afterburners for toxic gasoline fumes, antibiotics for ill health, tranquilizers for psychic disturbances. But the problem of urban air pollution is too intractable for gimmicks; perhaps it is more intractable than we care to believe. Basically, air pollution is caused by high population densities—by an excessive concentration of people in a small area. Millions of people, densely concentrated in a large city, necessarily produce serious local air pollution merely by their day-to-day activities. They must burn fu-

in modern capitalism. Owing to its inherently competitive nature, bourgeois society not only pits humans against each other, it also pits the mass of humanity against the natural world. Just as men are converted into commodities, so every aspect of nature is converted into a commodity, a resource to be manufactured and merchandised wantonly. The liberal euphemisms for the processes involved are “growth,” “industrial society” and “urban blight.” By whatever language they are described, the phenomena have their roots in the domination of man by man.

The phrase “consumer society” complements the description of the present social order as an “industrial society.” Needs are tailored by the mass media to create a public demand for utterly useless commodities, each carefully engineered to deteriorate after a predetermined period of time. The plundering of the human spirit by the marketplace is paralleled by the plundering of the earth by capital. (The liberal identification is a metaphor that neutralizes the social thrust of the ecological crisis.)

Despite the current clamor about population growth, the strategic ratios in the ecological crisis are not the population growth rates of India but the production rates of the United States, a country that produces more than half of the world’s goods. Here, too, liberal euphemisms like “affluence” conceal the critical thrust of a blunt word like “waste.” With a ninth of its industrial capacity committed to war production, the U.S. is literally trampling upon the earth and shredding ecological links that are vital to human survival. If current industrial projections prove to be accurate, the remaining thirty years of the century will witness a fivefold increase in electric power production, based mostly on nuclear fuels and coal. The colossal burden in radioactive wastes and other effluents that this increase will place on the natural ecology of the earth hardly needs description.

In shorter perspective, the problem is no less disquieting. Within the next five years, lumber production may increase an overall twenty percent; the output of paper, five percent annually; fold-

ing boxes, three percent annually; plastics (which currently form one to two percent of municipal wastes), seven percent annually. Collectively, these industries account for the most serious pollutants in the environment. The utterly senseless nature of modern industrial activity is perhaps best illustrated by the decline in returnable (and reusable) beer bottles from 54 billion bottles in 1960 to 26 billion today. Their place has been taken over by “one-way” bottles (a rise from 8 to 21 billion in the same period) and cans (an increase from 38 to 53 billion). The “one-way” bottles and the cans, of course, pose tremendous problems in solid waste disposal.

The planet, conceived of as a lump of minerals, can support these mindless increases in the output of trash. The earth, conceived of as a complex web of life, certainly cannot. The only question is whether the earth can survive its looting long enough for man to replace the current destructive social system with a humanistic, ecologically oriented society.

Ecologists are often asked, rather tauntingly, to locate with scientific exactness the ecological breaking point of nature—the point at which the natural world will cave in on man. This is equivalent to asking a psychiatrist for the precise moment when a neurotic will become a nonfunctional psychotic. No such answer is ever likely to be available. But the ecologist can supply a strategic insight into the directions man seems to be following as a result of his split with the natural world.

From the standpoint of ecology, man is dangerously oversimplifying his environment. The modern city represents a regressive encroachment of the synthetic on the natural, of the inorganic (concrete, metals, and glass) on the organic, of crude, elemental stimuli on variegated, wide-ranging ones. The vast urban belts now developing in industrialized areas of the world are not only grossly offensive to the eye and the ear, they are chronically smog-ridden, noisy, and virtually immobilized by congestion.

The process of simplifying man’s environment and rendering it increasingly elemental and crude has a cultural as well as a

the ecological disruption created by conventional fuels. Pieced together as a *mosaic*, as an organic energy pattern developed from the potentialities of a region, they could amply meet the needs of a decentralized society. In sunny latitudes, we could rely more heavily on solar energy than on combustible fuels. In areas marked by atmospheric turbulence, we could rely more heavily on wind devices; and in suitable coastal areas or inland regions with a good network of rivers, the greater part of our energy would come from hydro-electric installations. In all cases, we would use a mosaic of non-combustible, combustible, and nuclear fuels. The point I wish to make is that by diversifying our use of energy resources, by organizing them into an ecologically balanced pattern, we could combine wind, solar and water power in a given region to meet the industrial and domestic needs of a given community with only a minimal use of harmful fuels. And, eventually, we might sophisticate our non-combustion energy devices to a point where all harmful sources of energy could be eliminated.

As in the case of agriculture, however, the application of ecological principles to energy resources presupposes a far-reaching decentralization of society and a truly regional concept of social organization. To maintain a large city requires immense quantities of coal and petroleum. By contrast, solar, wind and tidal energy reach us mainly in small packets; except for spectacular tidal dams, the new devices seldom provide more than a few thousand kilowatt-hours of electricity. It is difficult to believe that we will ever be able to design solar collectors that can furnish us with the immense blocks of electric power produced by a giant steam plant; it is equally difficult to conceive of a battery of wind turbines that will provide us with enough electricity to illuminate Manhattan Island. If homes and factories are heavily concentrated, devices for using clean sources of energy will probably remain mere playthings; but if urban communities are reduced in size and widely dispersed over the land, there is no reason why these devices cannot be combined to provide us with all the amenities of an indus-

ergy used by man. Although it is certainly true that pre-industrial societies relied primarily on animal power and human muscles, complex energy patterns developed in many regions of Europe, involving a subtle integration of resources such as wind and water power, and a variety of fuels (wood, peat, coal, vegetable starches and animal fats).

The Industrial Revolution overwhelmed and largely destroyed these regional energy patterns, replacing them first by a single energy system (coal) and later by a dual system (coal and petroleum). Regions disappeared as models of integrated energy patterns—indeed, the very concept of *integration through diversity* was obliterated. As I indicated earlier, many regions became predominantly mining areas, devoted to the extraction of a single resource, while others were turned into immense industrial areas, often devoted to the production of a few commodities. We need not review the role this breakdown in true regionalism has played in producing air and water pollution, the damage it has inflicted on large areas of the countryside, and the prospect we face in the depletion of our precious hydrocarbon fuels.

We can, of course, turn to nuclear fuels, but it is chilling to think of the lethal radioactive wastes that would require disposal if power reactors were our sole energy source. Eventually, an energy system based on radioactive materials would lead to the widespread contamination of the environment—at first in a subtle form, but later on a massive and palpably destructive scale. Or we could apply ecological principles to the solution of our energy problems. We could try to re-establish earlier regional energy patterns, using a combined system of energy provided by wind, water and solar power. We would be aided by devices more sophisticated than any known in the past.

Solar devices, wind turbines and hydro-electric resources, taken singly, do not provide a solution for our energy problems and

physical dimension. The need to manipulate immense urban populations—to transport, feed, employ, educate and somehow entertain millions of densely concentrated people—leads to a crucial decline in civic and social standards. A mass concept of human relations—totalitarian, centralistic and regimented in orientation—tends to dominate the more individuated concepts of the past. Bureaucratic techniques of social management tend to replace humanistic approaches. All that is spontaneous, creative and individuated is circumscribed by the standardized, the regulated and the massified. The space of the individual is steadily narrowed by restrictions imposed upon him by a faceless, impersonal social apparatus. Any recognition of unique personal qualities is increasingly surrendered to the manipulation of the lowest common denominator of the mass. A quantitative, statistical approach, a beehive manner of dealing with man, tends to triumph over the precious individualized and qualitative approach which places the strongest emphasis on personal uniqueness, free expression and cultural complexity.

The same regressive simplification of the environment occurs in modern agriculture.¹ The manipulated people in modern cities must be fed, and to feed them involves an extension of industrial farming. Food plants must be cultivated in a manner that allows for a high degree of mechanization—not to reduce human toil but to increase productivity and efficiency, to maximize investments, and to exploit the biosphere. Accordingly, the terrain must be reduced to a flat plain—to a factory floor, if you will—and natural variations in topography must be diminished as much as possible. Plant growth must be closely regulated to meet the tight schedules of

¹ For insight into this problem the reader may consult *The Ecology of Invasions* by Charles S. Elton (Wiley; New York, 1958), *Soil and Civilisation* by Edward Hyams (Thames and Hudson; London, 1952), *Our Synthetic Environment* by Murray Bookchin [pseud. Lewis Herber] (Knopf; New York, 1962), and *Silent Spring* by Rachel Carson (Houghton Mifflin; Boston, 1962). The last should be read not as a diatribe against pesticides but as a plea for ecological diversification.

food-processing factories. Plowing, soil fertilization, sowing and harvesting must be handled on a mass scale, often in total disregard of the natural ecology of an area. Large areas of the land must be used to cultivate a single crop—a form of plantation agriculture that not only lends itself to mechanization but also to pest infestation. A single crop is the ideal environment for the proliferation of pest species. Finally, chemical agents must be used lavishly to deal with the problems created by insects, weeds, and plant diseases, to regulate crop production, and to maximize soil exploitation. The real symbol of modern agriculture is not the sickle (or, for that matter, the tractor), but the airplane. The modern food cultivator is represented not by the peasant, the yeoman, or even the agronomist—men who could be expected to have an intimate relationship with the unique qualities of the land on which they grow crops—but the pilot or chemist, for whom soil is a mere resource, an inorganic raw material.

The simplification process is carried still further by an exaggerated regional (indeed, national) division of labor. Immense areas of the planet are increasingly reserved for specific industrial tasks or reduced to depots for raw materials. Others are turned into centers of urban population, largely occupied with commerce and trade. Cities and regions (in fact, countries and continents) are specifically identified with special products—Pittsburgh, Cleveland and Youngstown with steel, New York with finance, Bolivia with tin, Arabia with oil, Europe and the U.S. with industrial goods, and the rest of the world with raw materials of one kind or another. The complex ecosystems which make up the regions of a continent are submerged by an organization of entire nations into economically rationalized entities, each a way station in a vast industrial belt-system, global in its dimensions. It is only a matter of time before the most attractive areas of the countryside succumb to the concrete mixer, just as most of the Eastern seashore areas of the United States have already succumbed to subdivisions and bungalows. What will remain in the way of natural beauty will be de-

tions. The special conditions which allow high populations of a single species in a complex ecosystem are rare events. Management of the biocenose or ecosystem should become our goal, challenging as it is.”⁽³⁾

The “manipulation” of the biocenose in a meaningful way, however, presupposes a far-reaching decentralization of agriculture. Wherever feasible, industrial agriculture must give way to soil and agricultural husbandry; the factory floor must yield to gardening and horticulture. I do not wish to imply that we must surrender the gains acquired by large-scale agriculture and mechanization. What I do contend, however, is that the land must be cultivated as though it were a garden; its flora must be diversified and carefully tended, balanced by fauna and tree shelter appropriate to the region. Decentralization is important, moreover, for the development of the agriculturist as well as for the development of agriculture. Food cultivation, practiced in a truly ecological sense, presupposes that the agriculturist is familiar with all the features and subtleties of the terrain on which the crops are grown. He must have a thorough knowledge of the physiography of the land, its variegated soils—crop land, forest land, pasture land—its mineral and organic content and its micro-climate, and he must be engaged in a continuing study of the effects produced by new flora and fauna. He must develop his sensitivity to the land’s possibilities and needs while he becomes an organic part of the agricultural situation. We can hardly hope to achieve this high degree of sensitivity and integration in the food cultivator without reducing agriculture to a human scale, without bringing agriculture within the scope of the individual. To meet the demands of an ecological approach to food cultivation, agriculture must be re-scaled from huge industrial farms to moderate-sized units.

The same reasoning applies to a rational development of energy resources. The Industrial Revolution increased the *quantity* of en-

⁽³⁾ Robert L. Rudd, “Pesticides: The *Real Peril*,” *The Nation*, vol. 189 (1959), p.

Let us consider the ecological principle of diversity—what Charles Elton calls the “conservation of variety”—as it applies to biology, specifically to agriculture. A number of studies—Lotka’s and Volterra’s mathematical models, Bause’s experiments with protozoa and mites in controlled environments, and extensive field research—clearly demonstrate that fluctuations in animal and plant populations, ranging from mild to pestlike proportions, depend heavily upon the number of species in an ecosystem and on the degree of variety in the environment. The greater the variety of prey and predators, the more stable the population; the more diversified the environment in terms of flora and fauna, the less likely there is to be ecological instability. Stability is a function of variety and diversity: if the environment is simplified and the variety of animal and plant species is reduced, fluctuations in population become marked and tend to get out of control. They tend to reach pest proportions.

In the case of pest control, many ecologists now conclude that we can avoid the repetitive use of toxic chemicals such as insecticides and herbicides by allowing for a greater interplay between living things. We must leave more room for natural spontaneity, for the diverse biological forces that make up an ecological situation. “European entomologists now speak of managing the entire plant-insect community,” observes Robert L. Rudd. “It is called manipulation of the biocenose² The biocenetic environment is varied, complex and dynamic. Although numbers of individuals will constantly change, no one species will normally reach pest propor-

² Rudd’s use of the word “manipulation” is likely to create the erroneous impression that an ecological situation can be described by simple mechanical terms. Lest this impression arise, I would like to emphasize that our knowledge of an ecological situation and the practical use of this knowledge are matters of insight rather than power. Charles Elton states the case for the management of an ecological situation when he writes: “The world’s future has to be managed, but this management would not be like a game of chess ... [but] more like steering a boat.”

based by trailer lots, canvas slums, “scenic” highways, motels, food stalls and the oil slicks of motor boats.

The point is that man is undoing the work of organic evolution. By creating vast urban agglomerations of concrete, metal and glass, by overriding and undermining the complex, subtly organized ecosystems that constitute local differences in the natural world—in short, by replacing a highly complex, organic environment with a simplified, inorganic one—man is disassembling the biotic pyramid that supported humanity for countless millennia. In the course of replacing the complex ecological relationships, on which all advanced living things depend, for more elementary relationships, man is steadily restoring the biosphere to a stage which will be able to support only simpler forms of life. If this great reversal of the evolutionary process continues, it is by no means fanciful to suppose that the preconditions for higher forms of life will be irreparably destroyed and the earth will become incapable of supporting man himself.

Ecology derives its critical edge not only from the fact that it alone, among all the sciences, presents this awesome message to humanity, but also because it presents this message in a new social dimension. From an ecological viewpoint, the reversal of organic evolution is the result of appalling contradictions between town and country, state and community, industry and husbandry, mass manufacture and craftsmanship, centralism and regionalism, the bureaucratic scale and the human scale.

The Reconstructive Nature of Ecology

Until recently, attempts to resolve the contradictions created by urbanization, centralization, bureaucratic growth and statification were viewed as a vain counterdrift to “progress”—a counterdrift that could be dismissed as chimerical and reactionary. The anarchist was regarded as a forlorn visionary, a social outcast, filled

with nostalgia for the peasant village or the medieval commune. His yearnings for a decentralized society and for a humanistic community at one with nature and the needs of the individual—the spontaneous individual, unfettered by authority—were viewed as the reactions of a romantic, of a declassed craftsman or an intellectual “misfit.” His protest against centralization and statification seemed all the less persuasive because it was supported primarily by ethical considerations—by Utopian, ostensibly “unrealistic,” notions of what man could be, not by what he was. In response to this protest, opponents of anarchist thought—liberals, rightists and authoritarian “leftists”—argued that they were the voices of historic reality, that their statist and centralist notions were rooted in the objective, practical world.

Time is not very kind to the conflict of ideas. Whatever may have been the validity of libertarian and non-libertarian views a few years ago, historical development has rendered virtually all objections to anarchist thought meaningless today. The modern city and state, the massive coal-steel technology of the Industrial Revolution, the later, more rationalized, systems of mass production and assembly-line systems of labor organization, the centralized nation, the state and its bureaucratic apparatus—all have reached their limits. Whatever progressive or liberatory role they may have possessed, they have now become entirely regressive and oppressive. They are regressive not only because they erode the human spirit and drain the community of all its cohesiveness, solidarity and ethico-cultural standards; they are regressive from an objective standpoint, from an ecological standpoint. For they undermine not only the human spirit and the human community but also the viability of the planet and all living things on it.

It cannot be emphasized too strongly that the anarchist concepts of a balanced community, a face-to-face democracy, a humanistic technology and a decentralized society—these rich libertarian concepts—are not only desirable, they are also necessary. They belong not only to the great visions of man’s future, they now con-

stitute the preconditions for human survival. The process of social development has carried them out of the ethical, subjective dimension into a practical, objective dimension. What was once regarded as impractical and visionary has become eminently practical. And what was once regarded as practical and objective has become eminently impractical and irrelevant in terms of man’s development towards a fuller, unfettered existence. If we conceive of demands for community, face-to-face democracy, a humanistic liberatory technology and decentralization merely as reactions to the prevailing state of affairs—a vigorous “nay” to the “yea” of what exists today—a compelling, objective case can now be made for the practicality of an anarchist society.

A rejection of the prevailing state of affairs accounts, I think, for the explosive growth of intuitive anarchism among young people today. Their love of nature is a reaction against the highly synthetic qualities of our urban environment and its shabby products. Their informality of dress and manners is a reaction against the formalized, standardized nature of modern institutionalized living. Their predisposition for direct action is a reaction against the bureaucratization and centralization of society. Their tendency to drop out, to avoid toil and the rat race, reflects a growing anger towards the mindless industrial routine bred by modern mass manufacture in the factory, the office or the university. Their intense individualism is, in its own elemental way, a *de facto* decentralization of social life—a personal withdrawal from mass society.

What is most significant about ecology is its ability to convert this often nihilistic rejection of the status quo into an emphatic affirmation of life—indeed, into a reconstructive credo for a humanistic society. The essence of ecology’s reconstructive message can be summed up in the word “diversity.” From an ecological viewpoint, balance and harmony in nature, in society and, by inference, in behavior, are achieved not by mechanical standardization but by its opposite, organic differentiation. This message can be understood clearly only by examining its practical meaning.