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A forum for the exchange of news, views, and information among ecologists, land reclamationists, managers of parks, preserves and rights-of-way, naturalists, engineers, landscape architects and others committed to the restoration and wise stewardship of plant and animal communities.

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Perspective

Restoration and Reunion with Nature

A historian suggests that in restoring forests, prairies, and wetlands, we restore more than the communities themselves. We also restore our relationship with them.

Restoration is a backward-looking philosophy. But unlike romanticism, which is a longing for the past, or preservation, which seeks to save what already exists, restoration implies an active participation in bringing the past back to life. It recognizes that, while humans may be part of nature, they also have more power to alter it than do other species. Admitting this, it goes on to provide ways to use that power responsibly and ethically by going back in time to heal what has been changed or damaged. But this very act, even as in some ways it reaches into the past, also creates a new future.

In reconstructing natural ecosystems such as prairies, forests, rivers, and lakes, humans are imitators of nature. By studying and mimicking natural patterns they can recover not only the communities themselves but some of the wisdom inherent in both cultural and biological evolution. Rather than taking nature apart and simplifying ecosystems, as the past three centuries of mechanistic science have taught us to do supremely well, restorationists are actively putting them back together. Rather than analyzing nature for the sake of dominating and controlling it, restorationists are synthesizing it for the sake of living symbiotically within the whole.

Mimesis, the process of imitation through which restoration takes place, has had an important history. Indian hunters mimicked the sounds, smells, and behavior of the animals they captured for food. Forest clearings planted with corn, beans, and squash by Indian women mimicked nature's polycultural patterns. The Indian's oral-aural culture of myths, songs, and poems by which tribal values were preserved were grounded in the mimetic, oral mode of knowing. In peasant agriculture, peasants danced in the fields to awaken the generative powers of nature and spread cider, cake, or corn on the ground to influence the seasonal cycles. The alchemist who followed in nature's footsteps to imitate her ways was participating in the natural cycles in order to hasten them. The miner who cajoled nature through prayer before following a vein of ore, and the smith who abstained from drinking and eating before shaping a metal on the anvil, were artists uncovering nature's own hidden patterns.

Platonism in ancient Greece and mechanistic science in early modern Europe both undermined the mimetic tradition by elevating analysis to a position of reverence. To Plato, mimesis was simply a catalogue of responses learned by rote. The knower should be separated from the known; the subject from the object. Not recollection and participation, but problem-solving and analysis were what mattered most. The song and narrative were replaced by logic, arithmetic, and science. Two millennia later, Newtonian scientists undertook to understand nature by dividing it into atomic parts and changing it through external forces. To Francis Bacon, imitation meant obeying nature in order to command her. Nature was to be dominated, not by following but by prodding and ferreting out her secrets. The organic cosmos of Aristotle, in which nature acted and developed from within, gave way to a world view that sanctioned external manipulation and control. The model of the technician repairing the clock from the outside superseded that of the artist who revealed the form inherent in the matter, or the doctor, whose herbs healed the body because their inner knowledge (scientia) became one with the body's own knowledge.

Drawing on the mechanistic model, modern agricul-

Foreshadowing the scientist's ambivalent relationship with nature, the hermetic philosopher not only follows Nature, but may be seen as stalking or pursuing her. The staff and lantern can help the traveler find a path, but may also be used to pry out secrets. In the act of restoration, the ambivalence is resolved through an act of imitation that results both in healing and in deeper insight into Nature's ways. This 1618 engraving by Johann Theodore de Bry was reproduced in Dr. Merchant's The Death of Nature.

ture has increasingly moved in the direction of artificial ecosystems occupied by monocultures that are vulnerable to pest outbreaks and catastrophic collapse. Identical fields outlined in precise geometric patterns for efficient cultivation and harvesting replicate lattice-like atomic patterns, replacing the diversity of small, haphazard patchworks of fields created in forest clearings. Further stimulated by urbanization and industrialization, traditional agriculture was profoundly altered during the agricultural improvement movements of the eighteenth and nineteenth centuries by the introduction of more efficient machinery and irrigation technology and by improvements in crop and animal breeding, artificial fertilizers, and chemical pesticides. As a result, the external energy needed to produce the chemicals; operate the farm machinery; and process, store, and transport the products often surpasses the calories the foods themselves supply.

Today, restoration is part of a spectrum of emerging disciplines based on imitation, synthesis, and a creative reciprocity between humans and non-human nature. Both restoration and agroecology look back to traditional agriculture, combining it with ecology in order to design sustainable systems by mimicking nature. Together, these disciplines represent a spectrum of practices based on reestablishing contact with nature through imitation. Thus, much is being learned by studying the polycultural methods of traditional farmers, combining the wisdom of traditional agriculture developed over generations of trial and error with an understanding of local ecology. In the resulting agroecosystems, the spatial arrangements and seasonal development of wild plant species are used as models; the farmer imitates the arrangement of local species of grass, vine, shrub and tree to design integrated cereal, vegetable, fruit, and tree crop systems.

Similarly, agroforestry restores complementary arrangements of trees, crops, and animals in accord with ecological principles in order to maintain productivity without environmental degradation. Orchards are planted with a ground cover of legumes or berries and foraged by poultry, pigs, and bees to keep down pests and produce well-mulched and manured soil.

Permaculture carries the process of imitation a step further. As an agriculture for the future, it imitates ecosystem evolution toward climax states by designing perennial plant and animal crop interactions. In contrast to monocultural agriculture, permaculture uses several stories of trees, shrubs, vines, and perennial ground crops to absorb more light and nutrients, increasing the total yield. Plants and animals coexist in separate niches that reduce competition and promote symbiosis among species. Complexity not only helps to ward off catastrophes but increases the variety of foods produced. External energy and physical labor decrease as perennials mature, so that energy needs are provided from within.

As a form of agriculture, restoration, too, is based on the capacity of both humans and nature for action. While restoration is oriented toward the reconstruction of authentic replicas of natural habitats, agriculture traditionally aims at the production of food, clothing, and shelter. In either case, however, the principle of mimesis is important: people can use the environment to fulfill real needs, while non-human nature acts reciprocally as a partner. In this way nature is used with respect, not as something passive and manipulable as in the mechanistic model but as a partner that is active and alive.

At a deeper level, a number of scientists in the past few years have proposed alternatives to the mechanistic framework based on nature's inherent activity, self-organization, permeable boundaries, and resilience. These deep structural changes in science itself may be indicative of the emergence of a new paradigm compatible with the recognition that a global crisis exists in current patterns of resource use.

The Gaia hypothesis of British chemist James Lovelock (**R&MN** 2:45) proposes that the earth's biota as a whole maintain an optimal, life-supporting chemical composition within the atmosphere and oceans. Gaia, the name of the Greek earth goddess, is a metaphor for a self-regulating system that controls the functioning of the earth's chemical cycles.

The thermodynamics of Ilya Prigogine contrasts the equilibrium and near-equilibrium dynamics of the closed, isolated physical systems described by the mechanistic model with open, biological and social systems in which matter and energy are constantly being exchanged with their surroundings. In a similar spirit, the new physics of David Bohm contrasts the older world picture of atomic fragmentation with a new philosophy of wholeness expressed in the unfolding and enfolding of moments within a "holomovement." Bohm's cosmology emphasizes the primacy of process rather than the domination of parts.

These new theoretical frameworks share with action-oriented disciplines, such as restoration and permaculture, a participatory form of consciousness rooted in ecology. In opposition to the subject/object, mind/body, and nature/culture dichotomies basic to mechanistic science, ecological consciousness recognizes mind and skin as permeable boundaries that integrate organism with environment, tacit knowing and learning through visceral imitation, and complexity and process as a merging of nature with culture. Opposed to the abstract concepts of a disembodied intellect imposed on agriculture is the embeddedness of design in gardens that mimic natural patterns. Humans are neither helpless victims nor arrogant dominators of nature but active participants in the destiny of the systems of which they are a part.

The biological control of insects also uses natural ecosystems as models. Uncultivated land surrounding fields harbors birds and insect enemies as well as pests. Hedges and flowers along roadsides are attractive to beneficial insects. Diversity in crops and surroundings and arrangements of beneficial plants mimic

natural conditions making crops less visible to insect enemies and acting as barriers to pest dispersal. Thus, by imitating nature, agricultural systems can be designed both to suppress pests and maximize total yield.

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