Homo economus as a Keystone Species

BY ROBERT V. O’NEILL AND JAMES R. KAHN

In ecological theory, a keystone species controls the environment and thereby determines the other species that can survive in its presence. Classic examples include starfish that scour rock surfaces, shaping the sessile community (Paine and Levin 1981), and beaver that dam streams, changing a terrestrial into an aquatic ecosystem (Naiman et al. 1986). Casual observation would seem to place humans (which we will refer to as Homo economus) into this same domineering role.

Nevertheless, the current paradigm in ecology considers humans not as a keystone species but as an external disturbance on the “natural” ecosystem. As an example, ecology graduate students are still advised to find research sites that are undisturbed by humans. The rationale comes from a central concept of research design: the controlled experiment. According to this concept, the mechanisms underlying a complex system can be investigated by isolating the system from disturbances. Once this “natural” or control system is understood, then the influences of humans can be superimposed as externally driven disturbances. The problem with this approach is that human beings are, in fact, another biotic species within the ecosystem and not an external influence.

But the artificial isolation of humans from their ecosystems is not due only to the ecologists’ paradigm. In the economic paradigm as well, human society, with all of its self-organization and self-regulatory activity, is represented as a separate “system.” The ecosystem is viewed as external to society, providing goods and services, unoccupied territory in which to expand, and assimilative capacity to handle by-products. The economic model isolates the intricate interactions of the economic market, abstracting the environment into a box labeled “resources” on the input side and a box labeled “effects” on the output side. Consequently, the environment becomes external to economic activity.

Economics seeks to integrate this externalized environment into its own paradigm through the concept of “valuation.” This approach sounds reasonable on the surface.

Society should place a monetary value on the goods and services provided by the ecosystem and also on the effects of human activity on the ability of the ecosystem to provide these goods and services. Values for these “externalities” can then be inserted into the economic model. Within the economic model, these externalities would provide the self-regulation needed to manage society’s use of the environment. But this strategy is actually of limited use because the dynamic responses of the ecosystem itself are not included within the economic model. The economic model assumes, incorrectly, that the environment is the constant and stable background for economic activity. The feedback loop between the human species and its ecosystem remains incomplete.

Thus, a keystone species, Homo economus, is artificially isolated from the ecosystems in which it functions because of limited paradigms in both ecology and economics. The ecological paradigm isolates human activity in a box labeled “disturbances.” The economic paradigm, in turn, isolates ecosystem dynamics in a box labeled “externalities.” Such abstractions are successful as long as the assumption holds that human activity occurs on a relatively small scale. But the assumption is clearly violated when human activity reaches the global dimensions of the latter half of the twentieth century.

The simple fact is that there is no longer any ecosystem that is unaffected by human activities. For example, some time in the recent past, point-source pollution could be considered a local phenomenon. But the magnitude of pollution has now reached global proportions. For example, more than 4 million chemicals are registered with the American Chemical Society, of which 43,000 are subject to the Toxic Substance Control Act (CEQ 1979). These chemicals are distributed and released on every continent. Particularly dangerous are persistent chemicals with low vapor pressure that are released as fine particles. Such pollutants can be transported worldwide in days to weeks. Therefore, chemical pollution is no longer a local problem; the sheer magnitude of the production and application of these chemicals has reached global dimensions.

When do two systems become one?

Whether or not ecological and economic systems can be considered separate systems therefore becomes an important question. Ordinarily, ecologists would integrate all of the species in a locality into a self-organized, self-regulating entity called the ecosystem. Humans are the only species exempted from this rule. Therefore, the critical