CC/NUMBER 46
NOVEMBER 13, 1989

This Week's Citation Classic®

Connell J H & Slatyer R O. Mechanisms of succession in natural communities and their role in community stability and organization. *Amer. Naturalist* 111:1119-44, 1977.

[Dept. Biological Sciences, Univ. California, Santa Barbara, CA and Dept. Environmental Biology, Research Sch. Biological Sciences, Australian National Univ., Canberra, Australia]

Ecological succession consists of the changes in species over time, usually following a disturbance. An earlier species may either facilitate the establishment of a later one, inhibit it, or have no effect. Experimental manipulation in the field of the species abundances is one way to test these possible mechanisms. In most natural communities, succession is frequently interrupted by disturbances, starting the processes all over again. [The *SCI*® indicates that this paper has been cited in over 395 publications.]

Mechanisms of Ecological Succession

Joseph H. Connell
Department of Biological Sciences
University of California
Santa Barbara, CA 93106
and
Ralph O. Slatyer
Research School of Biological Sciences
Australian National University
Canberra, ACT
Australia

June 26, 1989

This paper originated in the meeting and exchange of ideas between two people with quite different viewpoints. In 1973 Ralph O. Slatyer arrived from Australia to spend his sabbatical leave with Joseph H. Connell and his colleagues in California. Our scientific backgrounds were quite different. Slatyer was a plant physiologist whose background included micrometeorology and soil science, and who had worked extensively on plant responses to environmental factors. Connell had studied the ecology of marine invertebrates and trees. At that time Slatyer had decided to shift into ecology and so had come to spend part of a year with our group of ecologists at Santa Barbara.

This turned out to be a stimulating experience for both parties. Slatyer had a whole new set of minds to spar with and the Santa Barbara group was being asked questions they couldn't answer about their own subject. This illustrates the value of linking different viewpoints. Scientists tend to think that the particular aspect they are studying is the main determinant of the structure or process of interest. In our case we were trying to determine the mechanisms that determine community structure. Connell tended to think that species interactions were the main determinants. Slatyer thought in terms of the physical and chemical environment and life-history traits. In fact, all these and other factors play roles, at different scales of time and space.

Ecology had recently become the "in" thing following various environmental events such as the 1969 Santa Barbara oil spill. This had not only galvanized the environmental movement but had also set ecologists to thinking about how natural ecosystems recovered from disturbances, natural or man-made. So we all spent a lot of time kicking around ideas about ecosystem change, particularly the mechanisms underlying the succession of species invading disturbed sites. It gradually became clear that, although several ideas had been proposed about ecological succession, these had never been formulated as explicit testable hypotheses. We decided to try to do this and began to write a paper outlining our scheme.

By this time Slatyer had returned to Australia. We mailed drafts of our paper back and forth and slowly a set of testable hypotheses emerged about the mechanisms underlying ecological succession. We both liked to do field experiments; Slatyer had learned the techniques during his undergraduate training in agriculture, while Connell had begun in graduate school. Slatyer's field experiments were done in herbaceous and arid shrub lands and at alpine and valley bottom tree lines, Connell's in the marine intertidal, coral reefs, and rain forests. So we decided to include in the paper some suggestions about possible field experimental designs to test the hypothesis. Our students and colleagues, with great forebearance, read many drafts of our efforts during the two years it took to get the paper written and published.

The paper has since stimulated several field experimental[1-5] studies and a lot of argument, published[6] and unpublished. The reasons for its being cited often are probably: (a) it brought together older ideas and some new ones into an organized set of testable hypotheses, and (b) it suggested various practical ways to test the hypotheses. We're inclined to think that it was the contrast between our different viewpoints together with our shared belief in the power of experimental tests that produced the ideas in the paper.

1. **Sousa W P.** Experimental investigation of disturbance and ecological succession in a rocky intertidal algal community. *Ecol. Monogr.* 49:227-54, 1979. (Cited 155 times.)
2. **Turner T.** Facilitation as a successional mechanism in a rocky intertidal community. *Amer. Naturalist* 121:729-38, 1983. (Cited 20 times.)
3. **Harris L G, Ebeling A W, Laur D R & Rowley R J.** Community recovery after storm damage: a case of facilitation in primary succession. *Science* 224:1336-8, 1984. (Cited 20 times.)
4. **del Moral R.** Competition as a control mechanism in subalpine meadows. *Amer. J. Bot.* 70:232-45, 1983. (Cited 25 times.)
5. **Hils M H & Vankat J L.** Species removals from a first year old field plant community. *Ecology* 63:705-11, 1982.