one with inherently racist, sexist, and xenophobic attitudes toward alien "bodies" whose "secrets" the state seeks to "inscribe" on official records—misunderstands the inherent institutional logic of the modern, mass, bureaucratic state apparatus and its own relentless imperatives for accurate identification and classification. Similarly, Cole's notion that fingerprinting made recidivism real by documenting individuals' repeat offenses, thus "telling magistrates what they wanted to know," reduces the numbing reality of recidivism to a mere epiphenomenon. Here Cole's justifiable abhorrence of the conflation of identification techniques with genetic theories and schemes (something that occurred in fingerprinting's early history before examiners distanced themselves from geneticists and palm readers alike, and something that one hears again in current debates about the capabilities of DNA technology) leads him to ignore the hard realities of, say, robbery or drug-trafficking as occupations. Criminal records, anchored by full sets of inked fingerprints to ascertain identities, do help police and magistrates trace the main contours, though scarcely the details, of robbers' and drug dealers' careers. It makes lively reading to deconstruct authorities' sometimes blundering, often futile efforts to penetrate the opaque social reality of crime as well as officials' regularly maladroit explanations for such thankless work with at-the-time persuasive vocabularies. But sometimes a fingerprint is just a fingerprint.

BOOKS: ECOLOGY

Consequences of Community Drift

Claire de Mazancourt

What determines the number of species that coexist in a community? Why are some species more abundant than others? At a time when biodiversity is being lost at an unprecedented rate as a result of human activities, these questions are some of the most important in ecology. In *The Unified Neutral Theory of Biodiversity and Biogeography*, Peter Hubbell presents a challenging and controversial theory to answer these timely questions.

The Unified Neutral Theory of Biodiversity and Biogeography
by Stephen P. Hubbell
Princeton University Press, Princeton, NJ, 2001. 389 pp. $75, £52. ISBN 0-691-02129-5. Paper, $29.95, £19.95. ISBN 0-691-02128-7.

Traditional theoretical explanations of species coexistence conclude that numerous species cannot coexist on the same few resources: the best competitor will exclude all other species. In order for different species to coexist, they must specialize on different niches, that is, they must use resources in a different manner. Most theories of coexistence explore how this niche separation can be achieved through spatial or temporal partitioning. This book takes the completely opposite perspective on coexistence. Hubbell, a plant ecologist at the University of Georgia and long-time researcher at the Smithsonian Tropical Research Institute in Panama, hypothesizes that all individuals, whatever species they belong to, are identical in their birth, death, and dispersal rates. There is no superior competitor, and therefore no species are excluded through competitive exclusion. The changes in species abundance through time are due to chance alone; there is no population regulation of particular species. Specifically, the abundance of each species follows a random walk (drift), subject only to the constraint that the total number of individuals (over all species) in the community remains constant. Hubbell calls this process the zero-sum ecological drift.

Forest canopy on Barro Colorado Island.

Hubbell's mathematical framework is a neutral hypothesis. It resembles the neutral hypothesis in genetics, which states that almost all mutations of DNA have no effect on the proteins translated from the sequence and therefore are not subject to natural selection. Hubbell builds upon Robert H. MacArthur and Edward O. Wilson's theory of island biogeography, which predicts the number of species present on an island as a function of the diversity on the mainland (the source of immigrant species), the distance to the mainland (greater distances reduce the chance of immigration), and the size of the island (the probability of species extinction decreases as the size of the island grows). Hubbell's theory extends MacArthur and Wilson's work by incorporating a description of population dynamics and introducing speciation on an evolutionary time scale.

Hubbell's assumptions lead to some remarkable results. Under the random drift of species abundance, the expected time for a species to go extinct is so long that it allows for speciation to take place. The model produces a dynamic equilibrium in the distribution of species' relative abundances, although the abundance rank of each individual species changes through time. The theory generates a single dimensionless number, the fundamental biodiversity number (θ), which depends only on the speciation rate and the size of the global community. This number predicts the community species richness as well as species relative abundance. At a smaller spatial scale, species richness and relative abundance are determined by θ, the probability of immigration, and the size of the local community. The predicted stable state is similar to the patterns observed in many actual communities; Hubbell provides examples from a range of organisms, especially trees in a variety of forests. Hubbell is the first to use a mechanistic model of community dynamics to predict rank-abundance patterns. He also applies his theory to considerations of species-area relationships and diversity equilibria in the fossil record. Among the theory's many predictions is that phylogenetic clades are fractal and self-similar on all taxonomic scales.

This neutral theory has already sparked some controversy in the literature and has inspired many studies. Although the theory's predictions seem consistent with much empirical data, how can such a theory, with assumptions that are so obviously wrong, be useful? For example, the theory assumes that all individuals have the same fecundity, death, and dispersal rates, whatever species they belong to. Hubbell recognizes that tree species in the forests he studies do differ in important characteristics such as their growth rates and shade tolerance. However, he argues that it is precisely such niche differences that lead to the equivalence of all species in the community. By permitting species coexistence, niche differences impart the same long-term fitness to all species. Therefore, Hubbell finds his theory compatible with niche differences between species. In contrast, I would argue that it seems unlikely niche differentiation does not lead to the regulation of species abundance. Hubbell's model has also been criticized for being sensitive to small deviations from the assumptions that species have identical traits. Hubbell contends that the same results are obtained whether or not these deviations are included, and he claims that other factors such as limitations due to dispersal can lead to ecological drift of species abundance.

The Unified Neutral Theory is already on its way to becoming a classic in the biodiversity and species abundance literature. Hubbell's challenging and controversial approach is likely to generate new and exciting discussions in a domain where theories that can be compared to the data are strongly needed.

CREDIT: STEPHEN P. HUBBELL

The author is in the Department of Biology, Imperial College at Silwood Park, Ascot, Berkshire SL5 7PY, UK. E-mail: c.mazancourt.ic.ac.uk