

The 27 Laws of Ecology

Twenty-seven basic propositions may be said to cover ecological formulae and comprise the body of the so-called Laws of Ecology. The propositions have taken shape over a number of years, and have been collated by Pierre Dansereau, head of the Department of Ecology at the New York Botanical Garden and Adjunct Professor of Botany at Columbia University. Mr. Dansereau is credited with the authorship of several of the propositions and with the reformulation of others. Mr. Dansereau's compendium follows:

A. Physiology of Ecotopic Fitness (1-9)

- 1. Law of the Inoptimum.** No species encounters in any given habitat the optimum conditions for all of its functions.
- 2. Law of Aphasy.** Organic evolution is slower than environmental change on the average, and hence migration occurs.
- 3. Law of Tolerance.** A species is confined, ecologically and geographically, by the extremes of environmental adversities that it can withstand.
- 4. Law of Valence.** In each part of its area, a given species shows a greater or lesser amplitude in ranging through various habitats (or communities); this is conditioned by its requirements and tolerances being satisfied or nearly overcome.
- 5. Law of Competition-Cooperation.** Organisms of one or more species occupying the same site over a given period of time use (and frequently reuse) the same resources through various sharing processes which allow a greater portion to the most efficient.
- 6. Law of the Continuum.** The gamut of ecological niches, in a regional unit, permits a gradual shift in the qualitative and quantitative composition and structure of communities.
- 7. Law of Cornering.** The environmental gradients upon which species and communities are ordained either steepen or smoothen at various times and places, thereby reducing utterly or broadcasting greatly that part of the ecological spectrum which offers the best opportunity to organisms of adequate valence.
- 8. Law of Persistence.** Many species, especially dominants of a community, are capable of surviving and maintaining their spatial position after their habitat and even the climate itself have ceased to favor full vitality.
- 9. Law of Evolutionary Opportunity.** The present ecological success of a species is compounded of its geographical and ecological breadth, its population structure, and the nature of its harboring communities.

B. Strategy of Community Adjustment (10-14)

- 10. Law of Ecesis.** The resources of an unoccupied environment will first be exploited by organisms with high tolerance and generally with low requirements.
- 11. Law of Succession.** The same site will not be indefinitely held by the same plant community, because the physiographic agents and the plants themselves induce changes in the whole environment, and these allow other plants heretofore unable to invade, but now more efficient, to displace the present occupants.
- 12. Law of Regional Climax.** The processes of succession go through a shift of controls but are not indefinite, for they tend to an equilibrium that allows no further relay; the climactic-topographic-edaphic-biological balance of forces results in an ultimate pattern which shifts from region to region.
- 13. Law of Factorial Control.** Although living beings react holocenotically (to all factors of the environment in their peculiar conjunction), there frequently occurs a discrepant factor which has controlling power through its excess or deficiency.
- 14. Law of Association Segregation.** Associations of reduced composition and simplified structure have arisen during physiographic or climatic change and migration through the elimination of some species and the loss of ecological status of others.

C. Regional Climatic Response (15-20)

15. Law of Geocological Distribution. The specific topographical distribution (microdistribution) of an ecotypic plant species or of a plant community is a parallel function of its general geographical distribution (macrodistribution), since both are determined by the same ecological amplitudes and ultimately by uniform physiological requirements.

16. Law of Climatic Stress. It is at the level of exchange between the organism and the environment (microbiosphere) that the stress is felt which eventually cannot be overcome and which will establish a geographic boundary.

17. Law of Biological Spectra. Life-form distribution is a characteristic of regional floras which can be correlated to climatic conditions of the present as well as of the past.

18. Law of Vegetation Regime. Under a similar climate, in different parts of the world, a similar structural-physiognomic-functional response can be induced in the vegetation, irrespective of floristic affinities and/or historical connections.

19. Law of Zonal Equivalence. Where climatic gradients are essentially similar, the latitudinal and altitudinal zonation and cliseral shifts of plant formations also tend to be; where floristic history is essentially identical, plant communities will also be similar.

20. Law of Irreversibility. Some resources (mineral, plant, or animal) do not renew themselves, because they are the result of a process (physical or biological) which has ceased to function in a particular habitat or landscape at the present time.

D. Geographic Distribution (21-27)

21. Law of Specific Integrity. Since the lower taxa (species and subordinate units) cannot be polyphyletic, their presence in widely separated areas can be explained only by former continuity or by migration.

22. Law of Phylogenetic Trends. The relative geographical positions, within species (but more often genera and families), of primitive and advanced phylogenetic features are good indicators of the trends of migration.

23. Law of Migration. Geographical migration is determined by population pressure and/or environmental change.

24. Law of Differential Evolution. Geographic and ecological barriers favor independent evolution, but the divergence of vicariant pairs is not necessarily proportionate to the gravity of the barrier or the duration of the isolation.

25. Law of Availability. The geographic distribution of plants and animals is limited in the first instance by their place and time of origin.

26. Law of Geological Alternation. Since the short revolutionary periods have a strong selective force upon the biota, highly differentiated life forms are more likely to develop during those times than during equable normal periods.

27. Law of Domestication. Plants and animals whose selection has been more or less dominated by man are rarely able to survive without his continued protection.

Collated as an Appendix to an article, "Ecological Impact and Human Ecology," by Pierre Dansereau in the book *Future Environments of North America* by, edited by F. Fraser Darling and John P. Milton; The Natural History Press, division of Doubleday & Company: New York, 1966, 1970.