Lecture 28
Darwin on Geographic Distribution of Species

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Continents

Differences between continents

Flora and fauna are very different in the new world (America), the old world (Europe, Africa, Asia), and Australia. These differences aren't due to differences in climate or land.

- *There is hardly a climate or condition in the Old World which cannot be paralleled in the New—at least as closely as the same species generally require . . . Notwithstanding this general parallelism in the conditions of the Old and New Worlds, how widely different are their living productions!* (316)
- *In the southern hemisphere, if we compare large tracts of land in Australia, South Africa, and western South America, between latitudes* 25° *and* 35°*, we shall find parts extremely similar in all their conditions, yet it would not be possible to point out three faunas and floras more utterly dissimilar.* (316–17)

Application of the law of likelihood

Let D = species on different continents are different even when the physical conditions are similar, N = species arose by natural selection, C = species were created independently.

- D is expected given N, because species on different continents have been evolving in isolation, with different competitors, for a long time.
- D isn't expected given C. Since the conditions on different continents are often the same, the same species could have been created on these continents.
- So, $p(D|N) > p(D|C)$.
- So, by the law of likelihood, D favors N over C.

Similarities within continents

- *We may compare the productions of South America south of lat. 35° with those north of 25°, which consequently are separated by a space of ten degrees of latitude and are exposed to considerably different conditions; yet they are incomparably more closely related to each other than they are to the productions of Australia or Africa under nearly the same climate.* (316–17)
- *The plains near the Straits of Magellan are inhabited by one species of Rhea (American ostrich), and northward the plains of La Plata by another species of the same genus; and not by a true ostrich or emu, like those inhabiting Africa and Australia under the same latitude. On these same plains of La Plata we see the agouti and bizcacha, animals having nearly the same habits as our hares and rabbits and belonging to the same order of Rodents, but they plainly display an American type of structure. We ascend the lofty peaks of the Cordillera, and we find an alpine species of bizcacha.* (318)

Application of the law of likelihood

Let S = species on the same continent are similar, even when the physical conditions are different.

- S is expected given N, since species on the same continent are descended from common ancestors.
- S isn't expected given C, since dissimilar species could have been created for different environments on the same continent.
- So, $p(S|N) > p(S|C)$.
- So, by the law of likelihood, S favors N over C.

Oceanic islands

These are islands in the ocean far from a continent.

Have relatively few native species (347)

The species of all kinds which inhabit oceanic islands are few in number compared with those on equal continental areas . . . New Zealand, for instance, with its lofty mountains and diversified stations, extending over 780 miles of latitude, together with the outlying islands of Auckland, Campbell, and Chatham, contain altogether only 960 kinds of flowering plants; if we compare this moderate number with the species which swarm over equal areas in South-Western Australia or at the Cape of Good Hope, we must admit that some cause, independently of different physical conditions, has given rise to so great a difference in number. Even the uniform county of Cambridge has 847 plants . . . We have evidence that the barren island of Ascension aboriginally possessed less than a half-a-dozen flowering plants; yet many species have now become naturalised on it, as they have in New Zealand and on every other oceanic island which can be named.

Application of the law of likelihood

Let F = oceanic islands have relatively few native species.

- F is expected given N, since native species must have arrived from elsewhere, or be descended from species that arrived from elsewhere, and many species cannot cross a large expanse of ocean.
- F isn't expected given C, since the islands can support many more species than are native there and so a large number of species could have been created on these islands.
- So, $p(F|N) > p(F|C)$.
- So, by the law of likelihood, F favors N over C.

A large proportion of native species are endemic (348)

Although in oceanic islands the species are few in number, the proportion of endemic kinds (i.e. those found nowhere else in the world) is often extremely large. If we compare, for instance, the number of endemic land-shells in Madeira, or of endemic birds in the Galapagos Archipelago, with the number found on any continent, and then compare the area of the island with that of the continent, we shall see that this is true.

Application of the law of likelihood

Let E = a large proportion of the native species on oceanic islands are endemic.

- E is expected given N.

  > *This fact might have been theoretically expected, for . . . species occasionally arriving after long intervals of time in a new and isolated district, and having to compete with new associates, would be eminently liable to modification, and would often produce groups of modified descendants.* *(348)*

- E isn't expected given C, since a creator could have put species that existed elsewhere on the islands.
- So, $p(E|N) > p(E|C)$.
- So, by the law of likelihood, E favors N over C.

No native terrestrial mammals but native bats (350–51)

I have carefully searched the oldest voyages, and have not found a single instance, free from doubt, of a terrestrial mammal (excluding domesticated animals kept by the natives) inhabiting an island situated above 300 miles from a continent or great continental island; and many islands situated at a much less distance are equally barren . . . Yet it cannot be said that small islands will not support at least small mammals, for they occur in many parts of the world on very small islands, when lying close to a continent; and hardly an island can be named on which our smaller quadrupeds have not become naturalised and greatly multiplied . . . Although terrestrial mammals do not occur on oceanic islands, aerial mammals do occur on almost every island. New Zealand possesses two bats found nowhere else in the world: Norfolk Island, the Viti Archipelago, the Bonin Islands, the Caroline and Marianne Archipelagoes, and Mauritius, all possess their peculiar bats.

Application of the law of likelihood

Let M = oceanic islands don't have native terrestrial mammals but they do have unique native species of bats (aerial mammals).

- M is expected given N.

  > *Why, it may be asked, has the supposed creative force produced bats and no other mammals on remote islands? On my view this question can easily be answered; for no terrestrial mammal can be transported across a wide space of sea, but bats can fly across . . . We have only to suppose that such wandering species have been modified in their new homes in relation to their new position.* (351)

- M isn't expected given C, since a creator could have put terrestrial mammals on oceanic islands as easily as putting unique species of bats there.
- So, $p(M|N) > p(M|C)$.
- So, by the law of likelihood, M favors N over C.

Species on oceanic islands related to those of nearest continent

The most striking and important fact for us is the affinity of the species which inhabit islands to those of the nearest mainland, without being actually the same. Numerous instances could be given. The Galapagos Archipelago, situated under the equator, lies at the distance of between 500 and 600 miles from the shores of South America. Here almost every product of the land and of the water bears the unmistakeable stamp of the American continent. There are twenty-six land birds; of these, twenty-one or perhaps twenty-three are ranked as distinct species, and would commonly be assumed to have been here created: yet the close affinity of most of these birds to American species is manifest in every character, in their habits, gestures, and tones of voice. So it is with the other animals, and with a large proportion of the plants . . . The inhabitants of the Cape de Verde Islands are related to those of Africa, like those of the Galapagos to America. (353–54)

Application of the law of likelihood

Let R = the native species on oceanic islands are related to, but not identical to, those on the nearest continent.

- R is expected given N.

  > *On the view here maintained, it is obvious that the Galapagos Islands would be likely to receive colonists from America, whether by occasional means of transport or (though I do not believe in this doctrine) by formerly continuous land, and the Cape de Verde Islands from Africa; such colonists would be liable to modification,—the principle of inheritance still betraying their original birthplace.* (354)

- R isn't expected given C. The geology and climate of the Galapagos Islands is similar to that of the Cape de Verde Islands, not to that of South America. (354)
- So, $p(R|N) > p(R|C)$.
- So, by the law of likelihood, R favors N over C.

Question

1. For each of the following facts, say whether it favors natural selection over independent creation as the origin of species and justify your answer using the law of likelihood.
   (a) Species on different continents are different, even when the physical conditions are similar.
   (b) Species on the same continent are similar, even when the physical conditions are different.
   (c) Oceanic islands have relatively few native species.
   (d) A large proportion of the native species on oceanic islands are endemic.
   (e) Oceanic islands don't have native terrestrial mammals but they do have unique native species of bats (aerial mammals).
   (f) The native species on oceanic islands are related to, but not identical to, those on the nearest continent.

Reference


Charles Darwin.
On the Origin of Species.
London, 6th edition, 1872.
At darwin-online
Numbers in parentheses are page numbers of this edition.