BOTANIC EVIDENCE IN FAVOUR OF LAND CONNECTION BETWEEN FUEGIA AND TASMANIA DURING THE PRESENT FLORISTIC EPOCH.

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Tasmania is rich in plant vestiges, that is, in the presence of isolated species or small groups which appear to be the last remnants of various migrants or passed floras, and it is an interesting speculation whence came those forms and what topographical conditions of past ages they may indicate. The only part of this history that has received any attention up to the present is that which appears to give weight to the theory of continuity of land between Tasmania and Fuegia, by way of antarctic or subantarctic regions, during comparatively recent times.

In some plant groups there is close affinity between the floras of temperate South America and Tasmania. *Donatia depressa* extends from Tasmania to New Zealand, the islands of the Southern Pacific, South America and Tristan d'Acunha. The fruit is fleshy and contains thick-walled pyrenes capable of resisting digestion for a considerable period, and may, therefore, have been widely distributed by migrating birds. *Acæna* has a similarly wide distribution, but there, again, the dry burr fruits would favour a similar transportation. Conifers throw little light on the subject. The genus *Fitzroya* consists of two species, one in Tasmania the other in South America, but the ancient vestiges in this group give a hint of migration too profound for our present purpose. The *Proteaceæ* give but little evidence, as they appear to have migrated from an equatorial centre, the sub-family *Nucamentaceæ* passing to South Africa and Australia, *Folliculares* and *Embothrieæ* to Australia and South America. Of the numerous genera in the family only one, *Lomatia*, is common to Australia and South America.

It is possible that a study of freshwater *Algæ*, especially *Desmids*, would give valuable evidence, but, unfortunately, the study of botany has been so poorly supported with us that these important forms have been entirely neglected.

The only plants which appear to give any weighty information are those belonging to the genus *Fagus*,

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commonly known as beech. The beeches living on the earth in the present day are divisible into two groups—the beeches proper, which live only in the cooler parts of the northern hemisphere, and the southern beeches (*Nothofagus*), living only in Fuegia, New Zealand, Tasmania, and South-Eastern Australia. The southern beeches differ from the group found in the northern hemisphere mainly by having smaller flowers and very narrow medullary rays. But the common characters are too numerous and close to permit the idea that the two groups had independent origin. Therefore, we must conclude their distribution was once continuous across equatorial regions. The present day beeches require a temperate climate, and from this it has been inferred that beeches of former days must have had a similar constitution. Were this so, it would require a cool climate, or, possibly, continuous very high land from north to south at the time when the two groups were connected. It is possible, however, that the genus included forms adapted to tropical conditions which have since passed away. The neighbouring genus of oak has a typical temperate form in Northern Europe, yet it has a profuse distribution in Mexico and Java, but has been exterminated south of the equator. It would not be any strain on the botanical imagination to reconstruct beech with a tropical continuity. The constitution of a genus as it exists in the present day is usually adopted by palæontologists as an indication of climatic conditions, but it is very doubtful if this is always reliable. When we find a genus like *Thismia*—which appeared till the other day to be essentially tropic—with a representative in Southern Tasmania, and there often living at an altitude exceeding 2,000 feet, it makes one think.

The seeds of beech have thin coats, slightly winged. They are rapidly digested if swallowed whole, become waterlogged and sink if blown into the sea, and are too large to be transported any appreciable distance by wind. Therefore, we may conclude, whatever their distribution may have been, it must have been along continuous land, or, at least, where but narrow straits intervened. We may assume that the beeches of Fuegia were once continuous in distribution with the beeches of North America, and that a long separation has permitted a considerable change in their structure.

The beeches of Tasmania are remarkably close in structure to those of Fuegia. If we infer they had a like north and south migration, then we must assume they were evolved on a parallel line, which is certainly possible, though it would be a strange coincidence that such in-

essential details as small flowers and narrow medullary rays should have been also evolved similarly on the two lines. As the Fuegian and Tasmanian beeches are so very close to one another, it would simplify matters greatly if we could assume an east and west distribution of the *Nothofagus* subgenus after it had been evolved.

Besides the similarity of structure, other features lend weight to this direct continuity. Some of the beeches of Fuegia are infested with a unique fungus parasite, *Cyttaria*, the only relative of which is found on the beech of Tasmania. Here, again, though it would be convenient to assume that the closely related beech with the equally closely related parasite must indicate a direct migration along a land connection, such a bridge may have been just as probably subequatorial across the Pacific as subantarctic.

The strongest evidence in favour of a high latitude land connection is to be found in the presence of deciduous beeches in both Fuegia and Tasmania. It is generally taught that the deciduous habit is acquired by plants through being subjected to regular dry periods. In many places in the tropics where once a year there is a dry season, the trees save themselves from fatal transpiration by shedding their leaves. Plants growing at a high latitude are subjected to physiological dryness in the winter because the water in the soil, being frozen, is incapable of being absorbed. It is assumed that the many deciduous trees of the northern temperate zone acquired their habit as an adaptation to such conditions, and have retained the custom, though now living under a much less severe climate. It is singular, if this explanation be correct, why it is not customary for shrubs which live at a high altitude, where the winter soil is always frozen, to have acquired the same habit. It is, perhaps, more probable that the deciduous economy has been thoroughly fixed upon trees growing within the polar circle, where a complete absence of effective light for many months has rendered the winter shedding of leaves and rapid exposure of young foliage in the returning spring, features of vital importance. If such is the case, then we must consider the evergreen beeches of Fuegia, New Zealand, and Tasmania to be normal temperate trees, but the deciduous beeches of Fuegia and our *Fagus Gunnii* to be species that have acquired the deciduous habit by a comparatively recent evolution within the Antarctic circle. If for this reason we do sufficient violence to topographical ideas of the Earth as to demand an extension of Fuegia and Tasmania to Antarctic, we certainly need not be too modest to claim the probability of their direct connection.