# POLYEMBRYONY IN CERTAIN NUT BEARING PINES.

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In seeds of nut bearing pines, "pinyon nuts", used for class study, the presence of two embryos in individual seeds has been observed from time to time. During the autumn of 1922, a member of the class called my attention to two well developed embryos of nearly the same size in a seed, probably of *Pinus edulis* Englemann, given him for study. Closer examination revealed the fact that in this seed three other smaller embryos were also present, making five in all, as shown in figure 1. The three smaller embryos are large enough to be recognized by the unaided eye. The figure represents the five embryos in proper proportion. In the three smaller embryos no indication of cotyledons could be recognized with the hand lens. The two larger embryos seemed to be mature as regards the differentiation of parts. The one near the chalazal end is perceptibly larger. In cases in which only one embryo is present

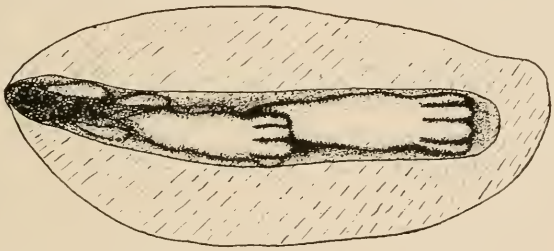

Fig. 1. One-half of endosperm of *Pinus edulus*, showing the five embryos in position. x 6.

in the mature seed, the length of the embryo is almost equal to the length of the endosperm.

As is well known, polyembryony in the genus Pinus results from the cleavage of the pro-embryo into four embryos, all of which tend to develop, but owing to competition, embryonal selection results, and only one embryo, as a rule, matures in the seed. If only one egg be fecundated, we have mono-zygotic cleavage polyembryony. But if two or more eggs are fecundated, as frequently happens in some species of pines (*P. laricio*), we have what may be termed poly-zygotic cleavage polyembryony. In Gymnosperms in which the embryonal cells do not separate, and one embryo develops from each fecundated egg, polyembryony can result only from two or more fecundated eggs. This is simple poly-zygotic polyembryony.

In cases of poly-zygotic cleavage polyembryony in Gymnosperms, it is very evident that among the numerous embryos that begin development, with apparently an equal start, the struggle for supremacy is very intense. The instance of figure 1 shows that the two larger were almost potentially equal, the one being unable to crowd out the other. Each, however, is about one-half the size of the single embryo normally

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surviving in the mature seed. Both were unable to obliterate completely the three smaller embryos by the time the seed matured.

What it is that enables the successful embryo or embryos to win out in the struggle, assuming that two or more have an equal start, can only be conjectured.

The writer has conducted a class in the embryology of Gymnosperms for many years, using chiefly *Pinus laricio*, and of the numerous pro-embryos in various stages of growth observed, the one which apparently had the upper hand seemed to be the one plunged more deeply chalazal-wards in the endosperm, but cases have been observed in which the deepest was not the largest.

Time and again it has been observed in microtome sections that embryos were entangled among the suspensors, some pointing directly towards the micropyle and growing in that direction. It would seem reasonable to assume that such embryos would be as well nourished as those growing downward into the endosperm.

For an admirable presentation of polyembryony in Gymnosperms the reader is referred to the following papers by John T. Buchholz: Suspensor and early embryo of Pinus. Bot. Gaz. 66: 185-228, 1918; Polyembryony among Abietineae. Bot. Gaz. 69: 153-167, 1920; Embryo development and polyembryony in relation to the phylogeny of conifers. Amer. Jour. Bot. 7: 125-145, 1920.