

Belakovsky in Flora 11 June 1879

Notes about the Gymnosperm of Conifers.

I had in 1874 written in this Journal an article opposing Gymnosperm, but have satisfied myself now of the correctness of that doctrine.

In a proleiferous cone of *Picea excelsa* I found the abnormal development much further advanced than in Stenkel's specimen 1876

In all buds on the upper part of the elongated axis the separated carpellary leaves were recognized - latent prophylls of a kind, horny texture. All the transition forms prove that these carpellary leaves are connate (in the normal scale) with their posterior edges (= Stenkel, contra Caspary). The carpal scale turns its (morphological) upper side towards the bract, the lower side towards the axis [this was long known, ~~well known~~ ^{by Braun}] and that thus the ovules are on the lower ^{morphologically} dorsal side of the carpal.]

The dorsal position of the ovule proves that it can not be an axillary production, and thus one of the main steps of those, who declare the ovule a flower, falls to the ground, and the marginal ovule of Cycadeae are also real ovules (not flowers).

It must also be remarked that in retrograde metamorphosis the ovules of Conifers never become ^{or prove to be} branchlets, but begin to disappear. If flowers, they would sometimes at least become foliaceous ~~and~~ branchlets. The conifer ovules are therefore

conversions from the dorsal side of the leaf, analogous to the indusia and sori of ferns; the indusium of *Stemmatophyllum* is especially analogous, but is marginal; more dorsal in *Savallia* ^{or *Capitella*} and also cup-shaped; *Abietina* and *Balanites* have two lateral ^{some} indusia on the lobes.

As the gymnosperm of *Abietina* is thus proved, the rest of the Coniferae follows of course. But *Abraham* has also studied proliferation of *Cryptomeria*, where with place of the carpel-scale buds appeared. Thus the foreleaves in *Cryptomeria* represent an equal number of carpel-scales.

Even in *Abietina* the scale is principally for the greater part developed after the formation of the ovules, though these originate from it. In *Cupressus* this scale is developed ^{even as late} ~~as~~ the following spring. This was undoubtedly the principal reason for the assumption of a disc.

I have come to the firm conviction that 1, an ovule can only be developed as depending on a carpel and 2, that the nucleus represents the macrosporangium of vascular Cryptogams. These conclusions are confirmed by a great many observations in all classes of plants and are also the logical consequence of the Descentance theory, and must be true if the doctrine

of the genetic connection of the vegetable world is true. Warming has also lately acknowledged my second thesis.

Van Tieghem and Hupfänger have proved that the connate scale of *Cupressus*, *Taxodium*, etc. can not be separated, morphologically, from the free scale of *Abietina* and *Abraham* has confirmed it by the study of proliiferous cones.

The history of the evolution misleads, especially in metamorphosed organs.

A late development of carpels, much later than the development of their ovules has been also observed in some Angiosperms, e.g. *Cuscuta*, where first 4 naked ovules appear.

The explanation of the structure of *Taxaceae* (*Taxus* and *Podocarpus*) offers greater difficulty. What is the history, strobili or cupule?

It makes its appearance where no trace of cupulose scale is noticeable and most probably is an altered, late-developed scale itself. In *Davallia* the cupule is oblique, but makes a difference. *Cephalotaxus* has ~~no scale~~ ^{no cupule} but seems to connect with *Cupressaceae* and shows at the maturity of the fruit a small flattened rudiment between both

ovules, which is most probably the rudimentary carpel scale
gynodioecy offers the greatest difficulty

It seems probable that the 2-seeded peduncle represents
the 2-seeded scale of Abietinae; the peduncle itself is the
prolonged base of the carpellary scale

The Cupule may be a ^{circular} ~~round~~ carpel ^{ovoid} ~~vase~~ one
(or of several carpel scales)

The apparently terminal ovule of *Taxus* & *Fernox*
would after all be axillary to one of the uppermost pair of
scales — In this case, however, the ovule would arise
not from the dorsal, but from the ventral side of the scale. I can
not concede that the ovule can be without a carpellary
organ — from a morphological and phylogenetic standpoint.

We would then have *Abietinae* with dorsal & *Taxaceae*
with ventral ovula — which is not impossible (both Braun
and Mohl have seen *monotrochites* where they suppose di'cous
ovule like organs also on the ventral side of the altered carpel scale
In Mohl's case a leaf organ was partly carpel & partly another
In *Andropogon inflorescence* (*monotrochites*)

Braun has seen sori on the upper side of fern leaves.

Result: The Gymnospermism of *Comfene* is sufficiently
proved, but the nature of the Cupule of
Taxaceae is to be explained yet on one
or the other ways indicated above



Engelmann, George. 1879. "Engelmann, George Aug. 1879 [notes]." *George Engelmann letters to Asa Gray*

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