tive branching of the endogenous and columnar monocot, mark out the great ways of higher seed plant evolution. And when these ways are followed back with due attention to the most logical grouping of the seed plants and the fossil record, it is seen that flowers must go so far back that it is reasonable to hypothesize archaic forms above the algae leading into plants little else than a stalk bearing a few leaves followed above by micro- and then megasporophylls. According to such conceptions, in the subsequent course of phytologic evolution foliage leaf advance often tended to be thrown back into the megasporophyll, while flowers always tended to remain small, cones always to reach giantism. Whence as in the above classification, it seems reasonable to consider the flowering types as the older line and to place them between the simple cone types (cycads) on the one hand and the inflorescent strobilar types (conifers) on the other.

In looking over present day plants, and back through time, nothing is so deceptive as megaphylly and giantism, unless perhaps the mixed cones of selaginella and those of lepidodendron. It is too much to expect directly from fossils the fuller history of flower and cone. The sporophyll, cataphyll and stipules, the rôle of branching, of monoecism and dioecism, must all be considered *per se*. Only through analysis aided by diagram is it seen that the flower has always been just an emplacement of sporophylls at first spiral, then whorled and cyclic. And then only does unity in the classification—accord in structure and origin begin to appear.

Moreover, botanists have not sufficiently emphasized the fundamentally significant fact that precisely the forms concerned in plant descent throughout the ages, therefore the relatively extinct forms, should not be expected to occur as left-overs in surviving floras. Mainly the specialized types, or those of peculiar environments are the ones seen as fossils. The assumption that the visible fossil antecedents are numerous is an utter fallacy. It too easily leads to the thought that the dint of a hard analysis and approach to the problems of seed plant origin from every possible view-point may be escaped.

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THE OCCURRENCE OF PHYLLOERYTHRIN IN THE DIGESTIVE SYSTEM OF HERBIVOROUS ANIMALS

IN 1903 Marchlewski[1] described a compound obtained from the fresh excrement of a cow fed entirely on grass and gave to this compound the name of phylloerythrin. In the same year Loebisch and Fischler[2] isolated bilipurpurin from ox-bile. Marchlewski later showed that bilipurpurin and phylloerythrin were identical compounds and that they were the decomposition products of chlorophyll formed by the herbivorous animal. H. Fischer and O. Süs[3] used phaeophorbide a to prepare phaeoporphyrin a_6 and a_5 and from these compounds they succeeded in preparing phylloerythrin, thus proving chemically that phylloerythrin originates from chlorophyll.[4]

The presence of such a chlorophyllous product as phylloerythrin in the bile and the feces of herbivorous animals is of considerable interest; and since, in so far as we are aware, no one has determined the place or mode of origin of this substance in the body, the present work was undertaken with these objects in view.

We have demonstrated that phylloerythrin occurs in the third stomach (omasum) of cows and sheep which were fed on a normal winter diet containing chlorophyll. The stomach contents were collected at the slaughter house about fifteen minutes after the animals were killed and the material taken to the laboratory and extracted with a chloroform-pyridine mixture. An ether solution of the extracted pigments was fractionated with hydrochloric acid and the eight to nine per cent. fraction gave an absorption spectrum in pyridine-ether identical with phylloerythrin. This latter substance was crystallized from pyridine-alcohol. At the present time a sufficient quantity for a combustion analysis has not been obtained, but this will be done later. Using the same procedure as that used for the third stomach, we demonstrated spectroscopically that traces of phylloerythrin occur in the first stomach (rumen) of the cow and the sheep. The third stomach contents of a calf on a milk diet gave no trace of phylloerythrin.

Further work on the physiological formation of phylloerythrin outside the animal body is now in progress. The experimental details and a complete summary of the literature pertaining to this work will be published elsewhere a little later.

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[1] *Bull. int. de L'Académie Polonaise des Sciences et des Lettres.* Série A, p. 638–642, 1903.

[2] *Monatsch. f. Chemie.*, pp. 335–350, 1903.

[3] Ann. vol. 482, p. 225–232, 1930.

[4] H. Fischer, O. Moldenhauer and O. Süs, Ann. 486: 107–177, 1931, have shown that phaeoporphyrin a_6 and a_5 are identical.