cerning the facts embodied in this note. It is certainly extremely interesting and equally surprising to find a tree, attaining the height of 60 feet, exhibiting a structure such as is described above. A certain amount of light may be thrown on the subject by the fact that some species of the genus are lianes, and, what is more interesting, that one at least, *D. variabilis*, is a climber when growing in the forest, but a shrub when situated in the open.

Schenck¹ makes a few remarks concerning the anomaly of this plant. He states that within the genus *Dalbergia*, anomalous secondary thickening is only known to him in one species, namely *D. paniculata*. He then goes on to say that 'according to a statement of Brandis (Forest Flora), verified for me by the author, the stem of this species consists of broad concentric masses of wood, which alternate with narrow zones of phloem. This occurrence is the more remarkable, because *D. paniculata* is in no way a liane, but is a tree 60 ft. high. The question as to the origin of the anomalous structure is an open one. The possibility is not excluded, that this species may have been derived from a liane and may have inherited from the latter and retained as a character the special form of secondary thickening. Perhaps one will obtain data for the discussion of this question when the stem-structure and the precise affinities of all the species of *Dalbergia* are known. Gamble mentions besides the anomalous *D. paniculata*, Roxb. a number of East Indian species of *Dalbergia*, mostly trees (*D. Sissoo*, *latifolia*, *cultrata*, *lanceolaria*, *nigrescens*), and two lianes (*D. stipulacea*, *foliacea*), all of which exhibit normal wood.'

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THE OVARY OF PARNASSIA PALUSTRIS, LINN.—The following sentence in Payer's *Traité d'Organogénie comparée de la Fleur* (Paris, 1857), p. 183, first attracted my closer attention to *Parnassia palustris*:—

'Contrairement à ce qui se passe dans la plupart des autres plantes, cette fleur du *Parnassia palustris* commence par être irrégulière dans son développement et finit par être complètement régulière à son état parfait.' After satisfying myself that this was so, I examined a large

¹ Schenck, *Anatomie der Lianen*: Botanische Mittheilungen aus den Tropen, Heft 5, Theil 2, pp. 169-170.

number of flowers, and recorded the variation found to exist¹. In doing this I noticed that the traces of zygomorphy do not always completely disappear from the ovary. The present note is concerned with this entirely.

Nearly mature fruits were gathered on the Scarborough cliffs in 1895, and put into alcohol to harden. Some were examined after being in alcohol for six months; others—owing to other more pressing work—have remained in it for more than five years.

FIG. 1.

- DIAGRAM I. 5-carpetted flower with dextrorse spiral.
 DIAGRAM II. 5-carpetted flower with sinistrorse spiral.
 DIAGRAM III. 4-carpetted flower with dextrorse spiral.
 DIAGRAM IV. 3-carpetted flower with dextrorse spiral.

In measuring their carpels, each ovary was cut transversely and each placenta marked by touching the opened channel under it—between it and the ovary wall—with ink, on doing which a little of the ink passes up the channel and is seen from outside as a black streak. Thus marked, the lower half of the ovary was carefully 'centred' on a metal disk marked for the purpose with concentric

¹ Teratological observations on *Parnassia palustris*: Journ. Bot., 1896, pp. 12-15.

circles, and the distance from ink-mark to ink-mark, i. e. placenta to placenta, measured by means of a graduated and index-bearing scale which could be revolved round the metal disk. When the carpels had thus been measured, the relative position of the sepals was determined.

K. Schumann has described a similar machine in the *Berichte der Deutschen Botanischen Gesellschaft* (Bd. xi (1893), p. 248).

With my machine, 26 5-carpelled, 89 4-carpelled, and 20 3-carpelled fruits were measured. The diagrams on p. 187, showing the sepals and carpels, illustrate the results. In them the sepals are numbered in their sequence along the spiral—dextrorse or sinistrorse—and the carpels according to their size.

The largest carpel (No. I) stands over (in part at least) sepal No. 1; but carpel No. II—the second in size—has no relation to sepal No. 2, but is that to the side of carpel I—contrary to thread of spiral. Carpell III stands on the other side; IV and V, if present, are those more remote from I. In this way the fruit is seen to be made of carpels decreasing in size towards its late-developing side. In illustration of this are the following figures:—

TABLE I.

Size of carpels in 5-carpelled flowers with dextrorse spiral.

I.	II.	III.	IV.	V.
101°	89°	58°	70°	42°
97	75	74	69	45
96	70	73	74	47
91	82	80	59	48
90	69	90	62	49
88	78	67	66	61
86	60	71	80	63
85	62	70	88	55
84	89	75	64	48
76	65	68	77	74
72	84	75	71	58
<i>Total</i> 966	823	801	780	590
<i>Average</i> 87.8°	74.7	72.7	70.9	53.6

TABLE II.

Size of carpels in 5-carpelled flowers with sinistrorse spiral.

I.	II.	III.	IV.	V.
109°	58°	60°	84°	49°
108	67	76	57	52
107	72	79	75	27
102	76	75	66	41
100	71	69	69	51
98	71	71	72	48
98	76	81	60	45
97	76	79	60	48
97	81	58	58	66
91	81	81	63	44
89	71	82	73	45
86	69	75	80	50
86	86	68	77	43
86	74	76	70	54
71	78	76	66	69
<i>Total</i> 1425	1107	1106	1030	732
<i>Average</i> 95.0°	73.7°	73.7°	68.7°	48.8°

I did not make any measurements of the variation of the carpels from their *theoretical* superposition over the corresponding sepals.

The number of 4-carpelled fruits examined is too great to allow of the insertion of details in this note. Of the 89 examined, 52 were dextrorse, 37 sinistrorse. The average sizes obtained are as follows:—

TABLE III.

Average size of carpels in fruits with four carpels.

<i>No. of Carpel.</i>	I.	II.	III.	IV.
Dextrorse flowers (52)	105.1°	88.3°	83.3°	83.3°
Sinistrorse flowers (37)	99.4	88.5	87.0	85.0
<i>Total</i> (89)	102.7	88.3	84.9	84.0

In all but two of these 4-carpelled flowers the angle ACB was measured (see Fig. 1, Diagram III), the middle of sepal 4 being one fixed point, the near limit of carpel I being the other. It was found that in 84 cases the limit of the carpel extended beyond the middle of sepal 4; and in no case was carpel I superposed exactly to sepal I. The average result is indicated in Diagram III, where it is shown that the ultimate position of this carpel is over the petal the next in the direction of the spiral to sepal I. The average size of the angle ACB proved to be 14° ; the greatest angles measured were 61° , 29° , 28° , 27° , and so on; the least were -16° , -5° , and -2° , being the three cases in which the limit of the carpel did not extend beyond the middle of sepal 4.

It is not to be assumed that carpel I is always the largest. This is not so, as the following table indicates:—

TABLE IV.

Number of cases in which the various carpels were relatively large or small among 4-carpelled fruits.

<i>No. of Carpel.</i>	<i>Largest.</i>	<i>2nd.</i>	<i>3rd.</i>	<i>Least.</i>
I.	69	13	5	2
II.	13	37	28	11
III.	5	26	29	29
IV.	5	19	26	39

Turning now to 3-carpelled fruits, the following figures were obtained, and the following measurements of the angle BCD (see Diagram IV) which was measured instead of the angle ACB .

TABLE V.

Size of carpels in 3-carpelled flowers with dextrorse spiral.

I.	II.	III.	Angle BCD.
174°	86°	100°	+ 6°
148	110	102	- 13
136	120	104	+ 4
126	116	118	- 9
122	122	116	+ 6
121	129	110	-46
120	136	104	- 3
113	140	117	-17
Total 1060	959	861	- 72
Average 132.5°	119.9°	107.5°	- 9°

TABLE VI.

Size of carpels in 3-carpelled flowers with sinistrorse spiral.

I.	II.	III.	Angle BCD.
168°	87°	105°	+ 18°
168	87	105	- 7
168	80	112	+ 20
159	99	102	+ 11
151	101	108	+ 10
148	121	91	+ 18
135	118	107	-17
131	126	103	- 8
127	135	98	-29
126	125	109	-26
124	135	101	-29
105	138	117	+ 1
Total 1710	1352	1258	-38
Average 142.5°	112.9°	104.8°	- 3°

The carpels are represented in their average proportion to each other, and their average position with regard to the sepals in Diagram IV. In this figure carpel I will be seen turned towards the direction of the spiral as in Diagram III, though not so markedly.

These observations may prove suggestive. I do not at present propose to make any deductions from them.

I. HENRY BURKILL.

THE PRIMITIVE ALGAE AND THE FLAGELLATA.—

Since the appearance of my article in the last number of the *Annals*, I have learned that the theory of the parallel evolution of the brown and green Algae, to the exposition of which a section of my article was devoted, was first suggested by Professor Wille so long ago as 1891. The hypothesis, and at that time it could be no more, was briefly brought forward in the chapters on Algae which Wille contributed to Warming's *Systematic Botany* (3rd Danish Edition, section *Syngeneticæ*).

In the English translation of this work the editor has unfortunately omitted just the two sentences which contain this view, so that I was quite unaware that Wille had been the first to suggest it or I would gladly have associated with the theory the name of one to whom algology owes so much.

Further, I should like to add that on looking through the section on the phylogeny of the Chlorophyceae, it occurs to me that I might have dealt more directly with the views brought forward by Chodat at the British Association in 1896 (see *Annals of Botany*, vol. xi). These views have, however, their origin in conceptions of the polymorphism of the green Algae which cannot be said to be generally accepted, so that it would have been difficult to have considered them without introducing controversial details, but the spirit of the phylogenetic treatment is eminently scientific, and I am at one with the author in thinking that the broad lines of affinity are remarkably clear in this group.

Finally, I regret that the following reference to a paper which is mentioned in the text has been omitted from the bibliography:—West, G. S. '98, *Alga-Flora of Cambridgeshire*, *Journal of Botany*, vol. xxxvii.

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Burkill. I. H. 1901. "The ovary of *Parnassia palustris*, Linn." *Annals of botany* 15, 186–192. <https://doi.org/10.1093/oxfordjournals.aob.a088812>.

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DOI: <https://doi.org/10.1093/oxfordjournals.aob.a088812>

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