Metagymnospermæ consisting of the Conifers and Guetales. It is well point out that *Ginkgo* forms a link between the two main divisions. The long chapter on Coniferales is chiefly devoted to an exposition of the author's well-known view of the primitive position of the Abietineæ, and especially of *Pinus,* and the derivation of the ancient Araucarineæ from that group. This hypothesis is maintained with great ingenuity, in the face of much inherent improbability. The opposite view of the direct derivation of the Araucarineæ from their immediate Palæozoic predecessors, the Cordaiteæ, has been considerably strengthened by the work of Boyd Thomson and Burlingame.

The view, maintained by Wieland and his followers, of an affinity between the Bennettitales and the Angiosperms, is rejected. In this connection it may be pointed out that we have no actual proof that fertilization in *Bennettites* was by spermatozoids, as the author assumes.

The chapter on Herbaceous Dicotyledons is important, for it sets forth in detail the author's theory of their derivation from arboreal ancestors, a view which is well worthy of consideration. The author believes that the fresh and vigorous herbaceous vegetation will tend in future to supplant the forest trees; he has no such hopes, however, for the Monocotyledons, which he acutely remarks (p. 198), may be said to represent the second childhood of the vascular plants. "This group seems to have reached such a high degree of specialization that it will probably in the long run entirely disappear and be replaced by new derivatives of the still plastic dicotyledons" (p. 416). Such a consummation, however, is not likely to be reached while man remains dominant.

In the chapter on anatomical structure and climatic evolution, the question of annual rings is considered. While the author finds no such rings in Cordaitean wood from Prince Edward Island (Lat. 46° 30′) he believes that they are present in contemporary wood from Lancashire (Lat. about 53° 30′). The difference of latitude seems too small to be significant, and most appearances of annual rings in Carboniferous woods from any source are fallacious.

Chapter XXXI. is on a special subject, the evolutionary principles exhibited by the Compositæ, and is chiefly concerned with the somewhat narrow question of the distribution of oil-canals.

The concluding chapter is on anatomical technique, including the sectioning of coal and photomicrographic methods. On all these subjects the author is an acknowledged expert, and his counsels will be of the greatest value to practical workers.

The index might perhaps have been made fuller with advantage. No references are given in the book; the accumulation of references often becomes a burden, but a few would have been of service to the reader as a guide to his future studies.

In the present notice, attention has often been directed to points which seem open to criticism, or on which there is much difference of opinion. These divergences of view in no way detract from a high estimate of the great interest and complete originality of Professor Jeffrey's remarkable work.

The illustrations, as one would expect in a book by this author, are abundant and excellent.

D. H. S.

SPECIAL ARTICLES

ON THE SERIES IN THE ULTRA-VIOLET FLUORESCENCE OF SODIUM VAPOR

In two papers[1] published by Professor J. C. McLennan an account of the extension of Professor Wood's iodine vapor spectrum into the ultra-violet is put forth. Professor McLennan has not only proved that the resonance spectrum can not be obtained in the violet, but has also proved "that we have to do here with a case of ordinary fluorescence where Stokes's law is followed and where fluorescence is stimulated by the light from any one of a number of wave-lengths of a limited portion of the spectrum." In this case the fluorescence spectrum begins at $\lambda 4600$ and extends to $\lambda 2100$,

[1] J. C. McLennan, *Proc. Roy. Soc.*, LXXXVIII., p. 289; XCL., p. 23.

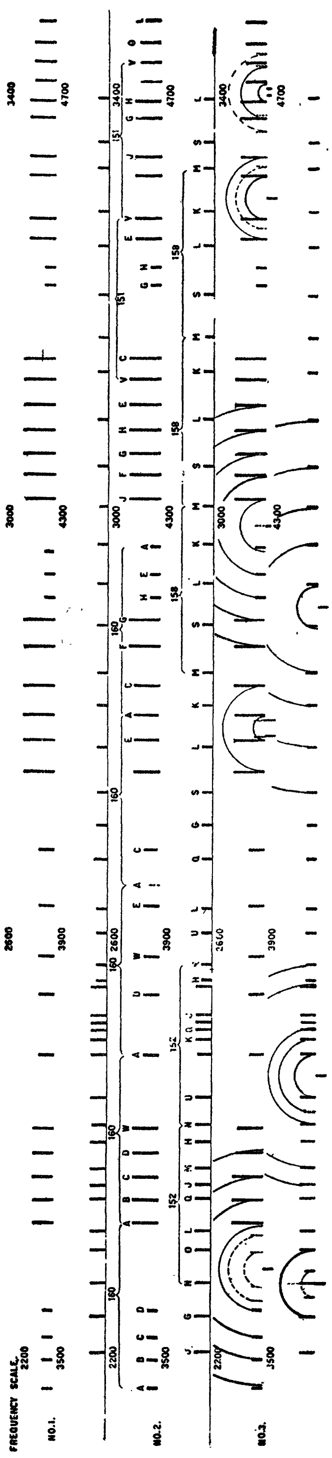

FIG. 1.

while the absorption region begins at λ2100, has a maximum between λ2000 and λ1900 and extends to λ1800.

The uranyl salts can also be stimulated by light of a wide range of wave-lengths and in the main Stokes's law is followed, although the fluorescence and absorption regions overlap. Like Professor McLennan's spectrum, the spectra of the uranyl salts appear to be unaffected by the mode of excitation, and while both spectra have been carefully tested for resonance, both have failed to show the phenomenon. For the above reasons it was thought that possibly the spectrum of the iodine vapor could be resolved into series of the same simple type as those found in the uranyl salts. If the wave-lengths of Professor McLennan's bands are converted into frequency numbers and plotted it is easy to discover series having constant intervals. Spectrum No. 1 in Fig. 1 shows the bands without any attempt at classification. It will be noted that the spectrum is in two sections because of its great length.

Professor McLennan notices several groups of bands which are spaced approximately 20 units apart. Such groups are present at $1/\lambda = 2400$ and at $1/\lambda = 3100$, but the series designated in spectrum No. 2 of Fig. 1 possesses much longer intervals. In this plot the members of the same series are given the same letter, and in addition a few have also been designated by long brackets. Such series as *A, V, N* and *M* are given brackets and the average value of the interval placed over the bracket. Here, as has so often been observed in the study of the uranyl spectra, a given series has a constant interval, but the various series have slightly different intervals. The value assigned to series *A* is 160, but this is an average value for the series, the actual intervals being given under Series *A* in Table I. as varying between 161 to 159 units. If the reader inspects the other series he will observe that the differences are generally unequal, but show no systematic deviation from a mean value. There are a few gaps in the series which may be caused by the presence of an exceedingly strong mercury line in the region or by the dimness of the fluorescence. The fluorescence bands were located by reference to the strong lines of the mercury arc which served as the source of excitation.

TABLE I

Bands Arranged in Series of Constant Intervals

Series	λ	1/λ	Δ(1/λ)	Series	λ	1/λ	Δ(1/λ
A......	4608	2170		*L*.....	2883	3469	
	4290	2331	161		2760	3623	154
	4015	2491	160		......	......	153
	......	......	161		2545	3929	153
	3555	2813	161		2450	4082	153
	3365	2972	159		2360	4237	155
					2277	4392	155
B......	4550	2198			2195	4556	164
	4250	2353	155		2129	4697	141
C......	4505	2220		*M*.....	2715	3683	
	4210	2375	155		......	......	156
	......	......	158		......	......	157
	3725	2685	157		2408	4153	157
	3520	2841	156		2320	4310	157
	......	......	154		2237	4470	160
	3175	3150	155		2162	4625	155
D......	4452	2246		*N*.....	2799	3573	
	4170	2398	152		2685	3724	151
	3925	2548	150		2580	3876	152
E......	3800	2632		*O*.....	2900	3448	
	3585	2789	157		2774	3605	157
	3395	2946	157				
	3220	3106	160	*Q*.....	2737	3654	
	3065	3263	157		2622	3814	160
F......	3475	2878		*S*......	2476	4039	
	3290	3040	162		2382	4198	159
					2300	4348	150
G......	3445	2903			2218	4509	161
	3268	3060	157		2148	4655	146
	3107	3219	159				
	2960	3378	159	*U*.....	2667	3750	
	2825	3540	162		2560	3906	156
	......	......	157				
	2594	3855	158	*V*.....	3195	3130	
					3047	3282	152
H......	3420	2924			2915	3431	149
	3245	3082	158				
	3090	3236	154	*W*.....	4130	2421	
	2946	3394	158		3870	2584	163
	......	......	157				
	2697	3708	157	*K*.....	2628	3805	
					......	......	158
J......	3315	3017			2426	4122	159
	......	......	162		2340	4274	152
	2993	3341	162		2254	4437	163
	2853	3505	164		2179	4589	152
	2727	3667	162				
	2612	3828	161				

An argument against arranging the bands in series of constant intervals as outlined lies in the fact that nine of the nineteen series have less than four members present. The remaining ten series have five or more bands present, however, and it is worthy of note that the system is sufficiently universal to include all but three or four of the bands. The independence of the series is remarkably good—rarely

TABLE II

Bands Grouped around Mercury Lines (in Frequency Numbers)

Mercury Lines	Fluorescence Bands	Differences	Mercury Lines	Fluorescence Bands	Differences
	2170	+117		3540	+ 31
	2198	+ 89		3559*	+ 12
	2220	+ 67	3571		0
	2246	+ 41		3584*	− 13
	2255*	+ 32		3605	− 34
	2268*	+ 19			
2287		0		3667	+104
	2303*	− 16		3683	+ 88
	2319*	− 32		3724	+ 47
	2331	− 44		3737*	+ 34
	2353	− 66		3750	+ 21
	2375	− 88	3771		0
	2398	−111		3791	− 20
				3805	− 34
	2759	+ 41		3814	− 43
	2789	+ 11		3855	− 84
{2793		0		3876	−105
{2808					
	2813	− 13		4039	+177
	2841	− 41		4082	+134
				4122	+ 94
	2878	+114		4153	+ 63
	2903	+ 89		4198	+ 18
	2924	+ 68	4212		0
	2946	+ 46	4220		
	2972	+ 20		4237	− 21
2992		0		4274	− 58
	3017	− 25		4310	− 94
	3040	− 48		4348	−132
	3060	− 68		4392	−176
	3082	− 90			
	3106	−114			
	3263	+ 40			
	3273*	+ 30			
	3282	+ 21			
3303		0			
	3323	− 20			
	3332*	− 29			
	3341	− 38			

* Geissler tube lines.

does a member of one series serve as a member of another series. It is possible to arrange many of the bands in series of shorter intervals, for at $1/\lambda = 2793$ and $1/\lambda = 2793$

and $1/\lambda = 2992$ intervals of 90 units are present, at $1/\lambda = 3304$ intervals of 106 units, and at $1/\lambda = 3571$ intervals of 77 units, but these series of shorter intervals do not include as large a total number of bands as the series of longer intervals.

There appears, however, to be an entirely different scheme of classification, which is offered the reader as an alternative plan. It is found that several well-filled groups of bands can be arranged in pairs about a few centers. These centers take on more interest when it is found that they coincide with lines of the mercury spectrum. Occasional pairs from the Geissler tube spectrum of iodine can be arranged about the same centers, such lines being connected by dotted arcs in Spectrum No. 3. It is understood that Spectrum No. 3, like Spectrum No. 2, is a replica of Spectrum No. 1, which was plotted from the reciprocals of McLennan's values. The arcs in Spectrum No. 3 show how the bands can be grouped in concentric pairs.

In Table II. is given the frequency numbers of the mercury centers with the appertaining fluorescence bands, as well as the differences in frequency between bands and mercury center. Positive differences indicate that the bands are of smaller frequency and negative differences that the bands are of larger frequency than the frequency of the center. Although it is evident that the pairs are not always equally spaced about the centers the errors are no greater than those observed in the first method of classification. The mercury line or pair of lines which serves as a center is generally a fairly prominent line in a group of mercury lines, an exception being the first center, $1/\lambda = 2287$, or $\lambda = 4372$, which is a dim satellite of $\lambda = 4359$.

It is of interest to observe, in comparing the two plans of classification, that the second is not so universal in its application as the first, while the use of mercury centers suggests something akin to resonance, which is contrary to Professor McLennan's observations.

H. L. HOWES

PHYSICAL LABORATORY OF CORNELL UNIVERSITY,
October 30, 1917

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SECTION G—BOTANY

THE only meeting of Section G for reading of papers took place at 2 P.M., Saturday, December 29, 1917, at the school of applied science, Carnegie Institute as a joint session with the Botanical Society of America and the American Phytopathological Society. The program consisted of the Vice-Presidential address followed by a Symposium on War Problems in Botany as outlined in the printed program. Dr. Bailey was prevented by war work from presenting his paper on the National Research Council. Dr. Coulter was not present, but his paper was read by Dr. H. C. Cowles. Dr. Smith was not present and his paper was not presented.

At the business meeting following the reading of papers, D. T. MacDougal was elected member of council, R. A. Harper member of Sectional Committee for 5 years and A. B. Stout member of general committee.

It was moved and carried that a committee be appointed by the chair to report to a later business meeting of the section on two considerations: (*a*) The organization of American botanists to forward the project of a pathological survey as suggested in the invitation paper of Dr. G. R. Lyman; (*b*) the possibility of assignment of drafted men of technical training and ability to scientific work of national importance and a recognition in some way that they are engaged in war service. The committee appointed by the chair consisted of G. R. Lyman. L. H. MacDaniels and C. L. Shear.

It was moved and carried that the business meeting adjourn till 9 A.M. Monday, December 31.

At the meeting of the Sectional Committee, December 29, the following members were present: Gager, Livingston, Blakeslee, Selby, MacDougal. Newcomb. Bartlett. Cook, Shear. A. F. Blakeslee was nominated for vice-president of the section for the ensuing year and Mel T. Cook for secretary for five years.

At the request of a group of botanical