fully correlated with the scale leaves of the latter genus. From the Priestley Glacier rather indifferently preserved wood is described under the name *Antarcticoxylon Priestleyi* and considered as a new type probably Araucarian in its relationship. Winged pollen grains are described as *Pityosporites antarcticus.* These are suggestive of the Abietineæ, but may be those of the Podocarpineæ. The remainder of the collection has little interest beyond its indication of the presence of arboreal forms in high southern latitudes.

The exact age of these plant-containing beds can not be definitely determined from the present collections, although there is no reason to doubt the legitimacy of the author's conclusion that the Beacon sandstone is probably Permo-Carboniferous in age with the further possibility that its upper part may be early Mesozoic.

The demonstration of the former presence of *Glossopteris* in Antarctica is of the greatest importance. It may be recalled that during the late Devonian or early Carboniferous a flora that may be called a cosmopolitan flora, characterized by such genera as *Bothrodendron, Archæocalamites, Archæopteris,* etc., has been found in Ellesmere Land, Spitzbergen, Greenland, Europe, North and South America, South Africa and Australia. Late in the Upper Carboniferous the floras of the world may be segregated into a northern province, of the cosmopolitan type and a southern province characterized by the *Glossopteris* flora as Neumayr termed it or the *Gangamopteris* flora as christened by David White. This latter flora, associated with glacial climatic conditions, has now been recognized from Australia, Tasmania, India, Madagascar, South Africa and South America. Its presence in Antarctica supplies an important link in the chain connecting the now isolated land masses of the southern hemisphere and also suggests the possibility of this flora having originated on the broad bosom of the Antarctic continent.

An elaboration of this theme would be out of place in the present notice. It has been somewhat fully discussed by Professor Seward in the present connection and it was also fully discussed by David White[2] in 1907 in connection with his study of the flora of the coal measures of Brazil. Arber's general account[3] of the *Glossopteris* flora, which was reviewed by me[4] in these columns brought the subject down to about 1904. All of these works contain full bibliographic references to which the reader who desires to pursue the subject further is referred.

When the late Professor Heer published his first account of the Arctic fossil floras the greatest scientific interest was aroused. We have now come to see pretty clearly that existing climates may be regarded as the exception rather than the rule when geologic time is considered as a whole. This coupled with the already described accounts of Jurassic, Cretaceous and Tertiary plants from the Antarctic continent opposite from Victoria Land[5] tends to make the discoveries announced in Professor Seward's paper seem normal and just what we should have expected. This is, however, somewhat offset by the tragedy of the Scott expedition, and it should further be remembered that demonstration has now replaced speculation and we now have a groundwork of solid facts of great importance that promise much for the future.

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SPECIAL ARTICLES

A BOTANICAL INDEX OF CRETACEOUS AND TERTIARY CLIMATES

IN studying the distribution of Dicotyledons in the principal phytogeographical regions of the earth the writers have encountered certain

[2] White, David, "Permo-Carboniferous Climatic Changes in South America," *Jour. Geol.*, Vol. 15, pp. 615–655, 1907.

[3] Arber, E. A. N., "Catalogue of the Fossil Plants of the *Glossopteris* Flora in the Dept. of Geology, British Museum (Nat. Hist.)," London, 1905.

[4] Berry, E. W., SCIENCE, N. S., Vol. 23, pp. 780–782, 1906.

[5] Berry, E. W., "Some Paleontological Results of the Swedish South Polar Expedition under Nordenskiold," SCIENCE, N. S., Vol. 38, pp. 656–661, 1913.

interesting correlations between structural characters and climate. Particularly significant in the consideration of certain problems of geology and climatology is the climatic distribution of two types of leaves and leaflets. Those with entire margins predominate in tropical, arctic and alpine regions, moors, steppes, deserts, saline situations, and other physiologically dry environments. (In this connection it should be noted that the leaves of tropical rainforests and other tropical plant communities that live in moist environments, although often of relatively large size, are semi-xerophilous in structure.) Leaves and leaflets with non-entire margins, on the other hand, are comparatively infrequent in such situations, and are very numerous in moist temperate regions having cold winters and warm summers.

In the following table are given for a number of extensive regions in the frigid, temperate and tropical zones the percentage of entire-leaved woody plants in the Dicotyledonous flora.[1]

	Per Cent. Entire
Frigid	
Ellesmereland	100
New Zealand Alps	77
North East Siberia	65
Cold Temperate	
North East Germany	24
Central Russia	28
East Central North America	28
North Russia	30
England	32
Kamtschatka	33
Rocky Mountains	36
South East Siberia	37
West Siberia	44
France	44
Warm Temperature	
South Russia	39
East Central China	48
South East United States	49
Italy	50
Los Angeles Region	54
Spain	56
Sub-tropical and Tropical	
Hongkong	71
South West Asia	72
Bombay	72
Upper Nile Region	74
Southern Africa	74
Nicaragua	76
West Indies	76
Egypt	77
South East Central Africa	78
Brazil	79
Ceylon	80
Manila	81
West Central Africa	81
Queensland	82
New South Wales	82
West Australia	83
Florida	83
South West Central Africa	83
Mauritius-Seychelles	85
Malay States	86

[1] In the computation of the percentages given in this table woody Dicotyledons alone were used since herbaceous forms are of very infrequent occurrence in the fossil floras of the Cretaceous and early Tertiary.

In the temperate regions given above there are more or less extensive areas of physiologically dry environments which are reflected in the floras by plants with relatively small entire leaves. In the tropical regions, on the other hand, there are cool uplands and shady comparatively temperate habitats which possess many plants with non-entire leaves and leaflets. The effect of these cool uplands upon the character of the foliage is well illustrated by comparing the percentage of entire-leaved Dicotyledons in the mountainous Simla region (58 per cent.) with that of the adjacent Upper Gangetic Plain (71 per cent.), and also by contrasting lowland (76 per cent.) and upland (56 per cent.) Hawaii.

In view of these facts it seems desirable to give an analysis of two floras that are more nearly homogeneous phytogeographically. The first flora, cold-temperate mesophytic, was constructed by eliminating from the flora of east central North America (east of the 95th meridian and between the 40th and 50th parallels of latitude) all plants growing on physiologically dry environments. The second flora, tropical, was formed from the woody plants of the moist lowlands of the Amazon valley.

Mesophytic-cold-temperature

	Entire, Per Cent.	Non-entire, Per Cent.
Trees	10	90
Shrubs	14	86
Woody	13	87

Moist-lowland-tropical

	Entire, Per Cent.	Non-entire, Per Cent.
Trees	90	10
Shrubs	87	13
Woody	88	12

From this table it is clear that leaves with non-entire margins are of very infrequent occurrence in lowland tropical floras, and those with entire margins in mesophytic cold-temperate ones. In fact the correlation between leaf structure and climate is so intimate in widely separated regions of the earth and in the distribution of many families, genera and even species that the modifying influences of environment are clearly demonstrated. For more detailed evidence, in regard to correlations between foliar structures and climate and the probable function of the non-entire leaf margin, the reader is referred to the following papers.[2]

It has been stated above that in moist tropical regions the leaves are of comparatively large size (megaphyllous). Any large heterogeneous tropical region will contain in consequence, among its entire-leaved plants, varying proportions of megaphyllous and microphyllous types. Similarly, in sub-tropical and warm-temperate zones the entire leaves will consist of varying proportions of these two types, depending upon the distibution of rainfall and other factors. In cold-temperate regions, however, the entire-leaves will be composed almost entirely of comparatively small-leaved types.

The percentages of entire-leaved woody Dicotyledonous plants in a few Cretaceous and Tertiary floras are recorded in the next table.

Tertiary

	Entire, Per Cent.
Eocene-Green River-Lesq	29
Eocene-Arctic-Heer	29
Eocene-Spitzbergen-Heer	46
Eocene-Bad Lands-Lesq	29

Cretaceous

	Entire, Per Cent.
Montana-Knowlton	62
Patoot-Arctic-Heer	51
Atane-Arctic-Heer	81
Amboy-Newberry	67
Dakota-Lesq	54
Raritan-Berry	71

A comparison of the Tertiary percentages with those of modern floras indicates very clearly the general temperate character of the climates which prevailed in the regions where these fossil floras existed. Similarly, the percentages of non-entire leaves in the Patoot, Dakota and Amboy Cretaceous formations denote climatic conditions intermediate between those of tropical and temperate regions. The high percentages of entire-leaved forms (megaphyllous) in the Atane beds points to the tropical character of the climate which existed in certain arctic regions during parts of the Cretaceous.

Of course caution is needed in comparing any specific percentage in this table with that of a corresponding one in the table of living floras. This is due to the fact that one can not always be certain that any known fossil flora is a fair sample of the total ancient vegetation of which it once formed a part. Furthermore, the percentages of entire leaves in fossil and living floras must be homologous, that is, composed of similar portions of megaphyllous and microphyllous types.

In conclusion it should be noted that this method of studying fossil floras rests upon a physiological and ecological basis rather than upon the usual phylogenetic one. It promises to afford a simple and rapid means of gauging the general climatic conditions of the Creta-

[2] Sinnott, E. W., and Bailey, I. W., "Foliar Evidence as to the Ancestry and Early Climatic Environment of the Angiosperms," *Am. Jour. Bot.*, Vol. II., No. 1, January, 1915; Bailey, I. W., and Sinnott, E. W., "The Climatic Distribution and Physiological Significance of Certain Types of Angiosperm Leaf-margin." *Ined.*

ceous and Tertiary, and checking the accuracy of conclusions derived from other lines of evidence.

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THE BROWN GRAPE APHID

This aphid is commonly known as *Macrosiphum viticola* Thomas. Unable to find any record of its complete life cycle the writers have made some observations on the form at Vienna, Va. These seem worthy of note at the present time, in view of the economic importance of the species.

The eggs are polished black and are laid during November or late October. They are placed in the axils of the leaves of *Viburnum prunifolium* Linn. In the spring they hatch before the leaves open and the young feed on the bursting flower buds. The stem mother appears unlike a *Macrosiphum,* having short cornicles. Late in April, or in early May, the second generation matures and this nearly all becomes alate.

Such alate forms are unable to subsist on the *Viburnum,* but migrate to the grape and produce the third generation on that plant. Here the species lives throughout the summer, producing apterous and alate forms. We have also some intermediates similar to those recently described by us in *Aphis pomi* DeGeer. These intermediates were taken in May and June.

The fall migrants are unlike the spring migrants in sensory characters, the sensoria on the antennæ averaging about as follows: Segment III., 30; IV., 25; V., 15. These fall migrants may be found depositing their young upon the *Viburnum* leaves during the middle of October.

The ovipara is apterous and, after being fertilized by the alate male, deserts the leaves and migrates to the twigs in order to deposit her winter eggs.

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THE RELATION OF MITOCHONDRIA TO GRANULES OF THE VITAL AZO DYES[1]

The more ardent hopes which relate to the subject of vital staining are perhaps connected with the successful staining of living, preformed components of the cell. Instances of such a phenomenon are often enough alleged without sufficient substantiation. Goldmann,[2] whose papers did so much to attract general interest to this subject, believed that the dyes, isamine blue and trypan blue, must be looked upon as combining with some preformed, but hitherto unidentified, elements of the living cell, and this is substantially the attitude of Kiyono,[3] who has added the latest considerable contribution to this subject. Tschaschin[4] of Maximow's laboratory has given this hypothesis its most concrete formulation by claiming that we are dealing with an elective, truly vital staining of the mitochondria of connective tissue cells. On the other hand, Evans and Schulemann[5] came to the conclusion that the process of staining with these dyes is more intelligible as an ultra-microscopic phagocytosis, and interpreted the dye granules as storage phenomena, in no way related to the living elements of the cell. In view of this discrepancy in the points of view of different workers, a cytological study of some of the cells which react to azo dyes has been suggested by Dr. Evans and carried out under his direction.

The study has been limited to cells of subcutaneous tissue in adult mice. As has been

[1] From the anatomical laboratory of the Johns Hopkins Medical School, Baltimore.

[2] Goldmann, E. E., "Die äussere und innere Sekretion des gesunden und kranken Organismus im Lichte der 'vitalen Färbung,'" Tübingen, 1909. "*Neue Untersuchungen usw.*," Tübingen, 1912.

[3] Kiyono, "Die vitale Karminspeicherung," Fischer, 1914.

[4] Tschaschin, S., *Folia Hæmatologica,* Bd. XIV., S. 295, 1912; Bd. XVI., S. 247, 1913, Bd. XVII., S. 317, 1913.

[5] Evans and Schulemann, *Jahresb. d. Sch. Ges. f. Vat. Kul.*, 1913; Science, Vol. XXXIV., p. 443, 1914; *Deut. med. Wochenschr.*, No. XIII., 1914.