

that the results of research are applied as rapidly as possible in farming. The agricultural improvement councils appointed by these ministers will keep in

close touch with experiments in new farming methods and will advise, after testing, on their introduction into ordinary farming practice.

DISCUSSION

INTERPENETRATING CLIMAXES IN QUEBEC

AN accurate mapping of the climax areas of vegetation is possible to date only in the North Central States. Phytosociological work in New England, Quebec, Ontario and the Maritime Provinces is still fragmentary. The general limits of the Canadian forest (*piceetum*), of the lake forest (*tsugetum*) and of the oak-hickory forest (*quercetum*) are fairly well known. But their ultimate reaches in the Northeast have not been thoroughly investigated.

Recent exploration has revealed that the sugar maple community extends quite to the tip of the Gaspé Peninsula. It is absent from the immediate coastline all the way from Saint-Jean-Port-Joli, but occupies the hinterland in a more or less continuous strip on the foothills. It is true that beech (*Fagus grandifolia*) drops out at the beginning of the peninsula, but these maple woods are otherwise typical, with *Acer saccharophorum*, *Betula lutea*, *Acer pennsylvanicum*, *Cornus alternifolia*, *Dicentra Cucullaria*, etc. It is also noteworthy that, when tapped, they seem to yield an average quantity of sugar.

This poses the question of interpretation of interpenetrating climaxes. Potzger and Friesner¹ have shown that, in Indiana, conditions can be such that the more "favorable" sites will be occupied by the mesophytic *aceretum*, and the less favorable but topographically mature will be colonized by the *quercetum*. It may be that such circumstances prevail in the Gaspé in reference to the *aceretum*, occupying the sheltered, well-drained foothills, whilst the more hygic *piceetum* dominates elsewhere.

Again, north of Lake Saint-Jean, the same relationship obtains between the boreal forest and the taiga or hudsonian zone. The new road built by the Aluminum Company of Canada to its barrage at Passes Dangereuses (latitude 50° N) offers a good cross-section through virgin forest. At about latitude 49°, one can witness the contact of three climaxes: (1) immense stretches of very typical Canadian forest; (2) isolated stands of taiga; (3) restricted stands of deciduous forest. The last true maple grove occurs at Metabetchouan, on the shores of Lake Saint-Jean itself. Gradually the typical elements fall out: *Acer saccharophorum* a few miles north of the lake, *Acer rubrum* 20 miles, and finally *Betula lutea* 38 miles. The last named, with hardly any admixture of fir

(*Abies balsamea*), forms pure stands at the aforementioned point of contact.

Just what climatic interpretations are warranted by the distribution of these phytosociological groups in the Province of Quebec? There is some evidence that our climate is getting colder and moister (Cooper,² Sears³), at least in the east (Griggs,⁴ Raup⁵). The distribution just outlined is certainly consistent with that theory. Also the existence in the Gaspé Peninsula of a few isolated and evidently relict colonies of red oak (*Quercus borealis*⁶) seems to indicate formerly warmer and drier conditions. It is not unlikely that species of wide midland distribution, such as *Hamelis virginiana*, *Celtis occidentalis*, *Andropogon furcatus*, *Sorghastrum nutans*, *Camptosorus rhizophyllus* and others apparently introduced through the Ottawa Valley, are equivalent in Quebec to prairie relicts in Ohio and Indiana⁷ and owe their extension to a former period of reduced precipitation. There is evidence also that the "lake forest" reached much further to the north and east, since *Tsuga canadensis* once occurred at Matamek,⁸ several hundred miles beyond its present distribution.

Interpenetrating climaxes therefore may be indicative of former conditions and their moving borderlines are likely to follow the fluctuations of climatic trends. The relative vitality within a given area and on comparable topography and soil of the elements respectively characteristic of each climax is an indication of the immediate trend of the locality. It has been shown, in Alaska,⁹ for instance, that local factors can be active in a sense (warming or cooling) opposite to the general trend.¹⁰

Many factors, therefore, must be taken into consideration to correctly interpret the present pattern of vegetational types in Quebec. The first is cohesion of the climax complex. Of course, the climax association, for instance, *Aceretum saccharophori*, on the edge of its range in Gaspé and Lake Saint-Jean, tends to disintegrate. It can still be said to represent the climax association, however, as long as it is not conspicuously invaded by the elements of the neighboring

² W. S. Cooper, *Jour. Geol.*, 50: 981-994, 1942.

³ P. B. Sears, *Bot. Rev.*, 8: 708-736, 1942.

⁴ R. F. Griggs, *Science*, 95: 515-519, 1942.

⁵ H. M. Raup, *Jour. Arn. Arb.*, 18: 79-117, 1937.

⁶ E. Campagna, *Ann. de l'Acfas*, 5: 104, 1939.

⁷ N. E. Transeau, *Ecology*, 16: 423-437, 1935.

⁸ Paul W. Bowman, *Ecology*, 12: 694-708, 1931.

⁹ R. F. Griggs, *Ecology*, 15: 80-96, 1934.

¹⁰ W. S. Cooper, *Ecol. Monogr.*, 12: 1-22, 1942.

¹ J. E. Potzger and R. C. Friesner, *Butler Univ. Bot. Stud.*, 4: 181-185, 1940.

climax, the *piceetum*. In other words, it is true *aceretum* if the climax elements are still dominant, in number of species and in abundance of individuals. This seems to be the case for the Gaspé stands of deciduous forest.

Second is vitality. Do these aforementioned elements tend to complete their cycle and development? With as great relative success as in the optimal area? Again this is so in the Gaspé *aceretum*.

A third factor, of more delicate interpretation, owing to the lack of available data, is the possible position of climax associations as pre-climax or post-climax outside their optimum range, as suggested by Cain¹¹ and Potzger and Friesner¹² in relation to *quercetum* and *aceretum* in Indiana. It is not unlikely that in Quebec stands of "lake forest," for instance, on the sandy soils at the mouth of the Richelieu, are pre-climax to the maple grove or possibly even sub-climax. It may be that deciduous forest in Gaspé is pre-climax to the more generalized spruce-fir (*piceetum*). The southernmost islands of taiga mentioned above might also be considered as post-climax, since they are—under a scarcely modified form—sub-climax farther south, in the hydrosere.

Surely the southern edge of the laurentian shield presents a fairly complex vegetational pattern. It has most often been considered an "ecotone." However, to one who is familiar with that pattern, it appears much more as a mosaic of associations than of species. What is meant here is that, for instance, the deciduous forest and the Canadian forest on their points of contact may interfinger over fairly large areas, but in any given stand, each community remains distinct: the species themselves do not ordinarily mingle. That is also true, although to a lesser degree, of the later seral stages. For instance, white pine and hemlock seldom if ever occur on the climax site of spruce-fir forest, as they are subclimax to the deciduous forest.

In any case, it seems doubtful here if the designations pre-climax and post-climax will serve any useful purpose if two climaxes interpenetrate over an area several hundred miles wide. It may be better to recognize the permanence of two separate climaxes over a varied topography that allows, however, of no physiographic evolution rapid enough to overcome climatic change itself.

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THE GENERIC NAME OF THE SAND FLY

IN his statement published in *SCIENCE* for April 28, 1944, your correspondent, W. F. Rapp, Jr., has completely overlooked the reason for the emended spell-

¹¹ S. A. Cain, *Am. Midl. Nat.*, 21: 146-181, 1939.

¹² Potzger and Friesner, *l.c.*

ing, *Phlebotomus*, commonly applied to the sand flies, otherwise known as *Flebotomus*. All codes of nomenclature provide, of course, that the spelling of every generic name be that used by the author in his original publication where the name was first proposed. Specific exception is made, however, where it is evident that the original spelling includes a typographical error and permission is given to correct such mistakes in later publications.

Rondani used *Flebotomus* in designating the genus in 1840, but the derivation of the name is so obvious (from *φλεβός*, vein and *τομή*, cutting) that Agassiz and most later zoologists have emended the spelling to *Phlebotomus*, using the corrected Latinized form. Thus, the change has been made to correct a very evident typographical error, and not for reasons unknown, nor "to make it easier to pronounce," as suggested by Dr. Rapp. A further reason to invoke the provision of the code concerning the correction of typographical errors lies in the common and longstanding use of the combining form *phlebo-* in a series of common medical terms referring to veins, blood, blood-letting, etc. Also the term phlebotomic or its close counterpart is regularly applied to the blood-sucking insects in English and in the other more widely used European languages.

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ISOLATION OF ERGOSTEROL FROM PENICILLIUM NOTATUM

DURING the course of the determination of the hydrocarbon content of plants as part of work on the origin of petroleum,¹ we have studied *Penicillium notatum*, grown for the production of penicillin. The non-saponifiable matter from a butanol extract of the wet mycelium produced an easily purified sterol which has the distinctive properties of ergosterol; m.p. 160-162°, $[\alpha]^{25}_D - 126^{2a}$. Acetate, m.p. 171-174°, $[\alpha]^{25}_D - 90^{2b}$. Benzoate, m.p. 165-167°, $[\alpha]^{25}_D - 64^{2c}$. The amount of ergosterol isolated approximated 1 per cent. of the dry weight of the mycelium, although maximum recovery was not attempted. Ergosterol has been isolated from yeast, ergot and a variety of fungi. It will be recalled that the irradiation of ergosterol yields vitamin D₂, calciferol.

We wish to thank the Department of Bacteriology of the School of Agriculture and the War Production Board Penicillin Project for the material studied.

¹ American Petroleum Institute Research Project 43b.

² (a) Purified hydrated ergosterol melts at 160-163°, $[\alpha]^{25}_D - 128.7$, Callow, *Biochem. Jour.*, 25: 79, 1931. (b) Acetate, m.p. 179-180°, $[\alpha]^{25}_D - 90$, Bills and Honeywell, *Jour. Biol. Chem.*, 80: 15, 1928. (c) Benzoate, m.p. 168-170°, $[\alpha]^{25}_D - 70.5$, Wieland and Asano, *Ann.*, 473: 300, 1929.