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# BULLETIN

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## CBA TWENTIETH ANNUAL MEETING 1984 -- VINGTIEME REUNION ANNUELLE DE L'ABC

## UNIVERSITY OF NEW BRUNSWICK -- FREDERICTON
## JUNE 24-27

Our TWENTIETH ANNUAL MEETING will be on the Fredericton Campus of the University of New Brunswick. This year there will be a main symposium - DEVELOPMENT OF WOODY PLANTS - and three sectional symposia. Presently there are 93 papers scheduled (including 27 student papers) representing work in all the provinces as well as five states of the United States, Poland, Tanzania, and Uganda.

### PROGRAM HIGHLIGHTS

June 24 (Sunday)

19:00 Informal Reception

June 25 (Monday)

08:30 Opening Ceremonies
08:45 Main Symposium

DEVELOPMENT OF WOODY PLANTS
1. Dr. P.B. Tomlinson (Harvard U.)
   - "Tree form as a process"
2. Dr. P.R. Larson (U.S. For. Serv.)
   - "Shoot Development of Woody Angiosperms"
3. Dr. J.N. Owens (U. Victoria)
   - "Patterns of bud and shoot development in conifers"

13:15 Contributed Papers: Ecology; Structure and Development
16:20 Section Meetings
19:45 Luella Weresub Memorial Lecture
K.A. Harrison (Acadia U.)
- "The beautiful and the strange mushrooms found in our Maritime woodlands"

June 26 (Tuesday)

08:30 General Symposium - Balsam Fir Development: The Tree and the Forest
1. Dr. G.R. Powell (U.N.B.)
   - "Patterns of development in balsam fir crowns"
2. Dr. C.H.A. Little (Can. For. Serv.)
   - "Indol-3-ylacetic acid and the control of cambial activity and dormancy in balsam fir"
3. Dr. G. Baskerville (U.N.B.)
   - "Balsam fir development: trees, stands and forests"

08:30 Contributed Papers: Ecology
10:15 Contributed Papers: Ecology; Structure and Development
13:00 Half-day field trips (see page 49)

June 27 (Wednesday)

08:30 Mycology Symposium - The morphogenetic Influence of Fungi on Woody Plants
1. Dr. J.A. Traquair (Agr. Can.)
   - "Effects of fungi on root morphology"
2. Dr. R.E. Wall (Can. For. Serv.)
   - "Morphogenetic influence of fungi on woody plants: Cankers and galls"
3. Dr. N.J. Whitney (U.N.B.)
   - "The morphogenetic influence of fungi on woody plants: Foliage problems"

08:30 Ecology Symposium - Botanically Significant Areas in Atlantic Canada
1. Dr. A.A. Wilson (Nova Scotia Museum)
   - "Saltmarshes in the Maritimes: an interpretive approach to plant communities"
2. Dr. P.A. Keddy (U. Ottawa)
   - "The Atlantic coastal plain flora of southwestern Nova Scotia: a nationally significant botanical area"
3. Mr. H.R. Hinds (U.N.B.)
   - "Botanically significant areas of New Brunswick"
4. Mr. R.J. Belland (Memorial U.)
   - "The ecology and phytogeography of rare mosses in the Gulf of St. Lawrence region"

10:15 Contributed Papers: Mycology and Phycology; Systematics and Phytogeography
13:15 Contributed Papers: Ecology; General; Systematics and Phytogeography
16:20 Annual General Meeting
19:30 Banquet and Address
Dr. James Downey, President
University of New Brunswick

In addition to our own program the Province of New Brunswick is celebrating it's Bicentennial Year. Come and partake of CBA conviviality and New Brunswick hospitality.

Tree form as a process
P.B. TOMLINSON
Harvard University, Harvard Forest,
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The term "tree" is used in a restricted sense by botanists to refer to tall plants and by foresters in a more restricted sense to refer to timber-producing tall plants. An unrestricted (mathematical) definition is useful because it refers to a great diversity of differently restricted structures (both biological and non-biological) and results of analyses of some of these may be applied to analysis of others, e.g. of river systems to branch orders of botanical trees. Trees are organisms which fill space to intercept light, presumably in an efficient manner. They have predominantly mechanical and physiological constraints which limit how they do this. The initial axis may or may not be branched. Perhaps their most characteristic feature is their acropetal growth which is often (but not necessarily) supplemented by secondary change (either of mass or stiffness). Tree form therefore has developmental limitations; its understanding requires a dynamic approach. Seeing trees as the end product of processes is therefore particularly informative. Three main areas will be highlighted where our understanding of trees has increased in the last two decades. First, a cosmopolitan appreciation of total diversity of tree form by taking into consideration tropical species has lead to better comparative description of trees. In particular, deterministic versus opportunistic developmental processes may be contrasted in terms of "architecture" and "reiteration". Second, simulation of simple tree forms, based on real examples, by computer modelling demonstrates some of the complexity involved in control of tree form and provides analogues of control processes occurring within real trees. Third, examination of the simple requirements for control mechanisms of water flow in trees suggests that the transport pathway must include designed constrictions which permit some axes to be hydraulically dominant. The overview demonstrates that despite the complexity of tree form an integrated physiological-developmental-structural viewpoint is possible.

Patterns of bud and shoot development in conifers
J.N. OWENS
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North temperate conifers belong to the families Pinaceae, Cupressaceae, Taxodiaceae and Taxaceae. Variation of tree form within these families is conservative and results in part from differences in development of buds, shoots and branches. The physiological bases of these processes are poorly understood because most physiological studies are of seedings and these processes in seedlings often differ from that in mature trees. Separate descriptions of bud development, shoot development and methods of branching would be artificial since they are interrelated. Consequently, I will discuss patterns of development as they occur in groups of conifers and some of the variations therein. The most common pattern occurs in genera such as Abies, Picea and Pseudotsuga. All axillary buds are initiated soon after dormancy. Axillary and terminal apices pass through a phase of bud scale initiation, as the shoots on which they are borne elongate, undergo a brief transitional period then enter a phase of foliar initiation before becoming dormant. Shoot elongation results from an early phase of cell division which ends as the period of cell expansion begins. Few studies have correlated changes in endogenous growth substances, photosynthates and mobilization of photosynthates with stages of shoot and bud development. A variation of this pattern occurs in Larix in which long-shoot buds are partially preformed and dwarf shoots are completely preformed. Another pattern occurs in Pinus in which a preformed long-shoot bud develops by initiating cataphylls, most with an axillary bud, throughout the growing season. The time and pathway of axillary bud determination partially depends upon the position of the axillary bud on the long-shoot bud. The occurence of monocyclic or polycyclic long-shoot buds in pines also affect tree form. A different pattern exists in the Cupressaceae and some of the Taxodiaceae which have neither preformed vegetative buds nor bud scales. Axillary buds are initiated throughout the growing season, undergo simultaneous leaf primordial initiation and internode elongation, sylleptic branches form and apical dominance is not pronounced.

Shoot development of woody angiosperms
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Woody plants can be characterized as possessing persistently perennial aerial parts and a secondary meristematic sheath, produced by a cambium, extending throughout most of the perennial tissues. Trees can be further characterized as exceeding a minimum size and conforming to a certain configuration. Perenniality subsumes other growth attributes such as persistent perennation, dormancy, survivability, axillary meristems, and apical control. Seasonal growth of woody angiosperm shoots may occur either as a single flush of preformed leaves, as recurrent flushes of preformed and neoformed leaves, or as the indefinite production of neoformed leaves. Leaves in the latter category often exhibit seasonal heterophylly and leaves in all categories vary in seasonal longevity. Dormancy is expressed morphologically in different ways in different species, and the resumption of growth following dormancy varies among shoot types. Secondary vascular development is closely correlated with shoot growth patterns, particularly with internode maturation and leaf expansion. Specific events in the seasonal development of the procambium—cambium continuum will be summarized.

The Luella Weresub Memorial Lecture
The Beautiful and The Strange Mushrooms
found in our Maritime Woodlands
Kenneth A. Harrison
Research Associate, Biology Dept. Acadia Univ.,
Wolfville, N. S.
Research Associate, Univ. of Mich. Herbarium,
North U. Bldg., Ann Arbor, Mich.

A 45 minute presentation illustrated by Kodachrome slides of some of the fleshy fungi found in New Brunswick and Nova Scotia. It will be largely restricted to the edible, the beautiful and some of the recently described new species that have been discovered in the Maritime Provinces. Among the beautiful will be the deadly and some of the poisonous mushrooms. There will also be some information on how our native fungi relate to our forests and how the wild life thrives when mushrooms and underground fungi are abundant.

ATKINS, T.A. Dept. of Botany, U. of Manitoba, Winnipeg, Manitoba, R3T 2N2; P.F. LEE, Dept. of Biology, Lakehead U., Thunder Bay, Ont. P7B 5E1; J.M. STEWART, Dept. of Botany, U. of Manitoba, Winnipeg, Man. R3T 2N2.

Competitive exclusion of wild rice (Zizania aquatica) from high edaphic mineral nutrition sites.

Continuing field investigations of wild rice ecology at Lake of the Woods, Ontario, indicate interspecific competition to be a more significant factor limiting productivity than previously thought. In a study primarily designed to relate wild rice productivity to sediment interstitial water mineral nutrition, the competitive effects of Nymphea, Nuphar, and Ceratophyllum were found to be highly important. Ceratophyllum was observed only at the high edaphic mineral nutrition sites. Competition for space at these sites can be great enough to force the exclusion of wild rice in extreme cases. Ramifications to wild rice ecology, management, and study are discussed.

ATKINS, T.A. Dept. of Botany, U. of Manitoba, Winnipeg, Manitoba, R3T 2N2; A.G. THOMAS, Agriculture Canada, Res. Stn., Regina, Sask. S4P 3A2; J.M. STEWART, Dept. of Botany, U. of Manitoba, Winnipeg, Man. R3T 2N2.

Wild rice (Zizania aquatica) germination experiments using 100 combinations of day and night temperatures and 3 lengths of afterripening period.

Wild rice germination experiments were conducted using a 100 cell germinator, an instrument which gives 100 combinations of day and night temperatures. Three experiments were conducted during a three month period ending in mid-May.

Each experiment yielded a response surface of wild rice germination against day and night temperature. Within upper and lower temperature thresholds, germination increased with increasing day-night temperature fluctuation.

Results of the three experiments illustrate increased rate and success of wild rice germination resulting from lengthened afterripening period.

The implications of these findings are discussed in relation to wild rice ecology.

Taxonomy of Carex section Bicolores.

P.W. Ball, Botany Department, Erindale College, University of Toronto, Mississauga, Ontario, L5L 1C6

Mackenzie recognised 5 species in this small section of Carex subg. Carex. Carex rufina is unique in the section in having a distinctly beaked perigynium with a serrulate margin. It appears closer to species in section Acutae than to the remainder of section Bicolores. Morphological data from the remaining taxa was subjected to Principal Components Analysis and Discriminant Function Analysis. This indicates that four taxa can be recognised, C. aurea, C. bicolor, C. garberi and C. hassei, but that in western North America intermediates appear to occur fairly frequently.

Balsam Fir Development: Trees, Stands and Forests

G. BASKERVILLE,
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Development of fir at each of the tree, stand and forest levels of aggregation is conditioned by the competitive ability of the species. This characteristic derives from physiological structure and is particularly important in forecasting the response of trees, stands and forests to perturbation. Silvicultural and management procedures are based on analyses of competition processes.

Metal tolerance in the moss, Pohlia spp., from the Sudbury area, Ontario.

P.J. BECKETT
Biology Department, Laurentian University, Sudbury, Ontario. P3E 2C6

Pohlia nutans (Hedw.) Lindb. and, to a lesser extent, Pohlia cruda (Hedw.) Lindb. form extensive patches on the acid metal-contaminated Sudbury soil. Washed gametophyte samples, typically, show Cu and Ni accumulations in excess of 1000 µg/g and Al levels of 50-350 µg/g. Sporophytes (capsules) and spores contain approximately 10% of these elements. Spore germination tests between 'Sudbury' and 'control' populations for each species showed that P. nutans was more tolerant than P. cruda to each of the metals and both species' 'Sudbury' populations were more metal tolerant than the 'control' populations. Induced stress, as measured by K leakage from the gametophyte, to the 3 metals was far less in the 'Sudbury' populations. Spores of both species were the most susceptible stage of the life-cycle to toxic elements.

The ecology and phytogeography of rare mosses in the Gulf of St. Lawrence region

R.J. BELLAND
Biology Department, Memorial University of Newfoundland St. John's. A1B 3X9

One-hundred-seventeen (117) mosses in the Gulf of St. Lawrence region can be considered rare there, i.e., known from less that 5 stations. About half of these are known from only 1 or 2 localities. Several explanations may account for their rarity. A large proportion are widespread in eastern North America south of the Gulf region and are at their northern limits in the Gulf. Also, several mosses reach their southern limits in the Gulf. Rare mosses with disjunctive and isolated populations are also rather numerous; a few may be of anthropogenic origin, but most are relics from the Wisconsin Glaciation. The ecology of rare mosses and the relationships of certain habitats to rarity is discussed.

A late snowbed bryophyte community in western Newfoundland, Canada

R.J. BELLAND
Department of Biology, Memorial University of Newfoundland, St. John's. A1B 3X9

The bryophyte floras of 8 bryophyte-dominated late snowbeds near Bonne Bay, western Newfoundland were investigated, and consisted of 51 species of which 5 are reported new for eastern North America (excluding Greenland): Andraeae nivalis Hook., Kiaeria falcata (Hedw.) Hag., Marsupella condensata (Hartm.) Kaal., Moerckia blyttii (Moerck) Brockm. and a newly described species, Trematodon montanus Belland and Brassard. Thirteen bryophytes from the Newfoundland snowbeds are characteristic of this habitat throughout much of their world range, and 15 species show a disjunct distribution between eastern and western North America. The significance of this community to botanic refugia in the Gulf of St. Lawrence region is discussed.

Effects of the oil dispersants corexit 7664 and 9600 and Norman Wells crude oil on four plant growth forms.
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Salix interior, Carex aquatilis, Sphagnum warnstorfii and Cladina mitis were treated with an application of corexit 7664, corexit 9600, SDS and/or oil. The oil:dispersant ratio was 10:1(V:V). Plants were grown in a controlled environment chamber at a day temperature of 12°C and a night temperature of 10°C. Initial growth and recovery after a period of dormancy were evaluated. Oil sprayed on foliage or poured on soil caused the most damage, no S. interior or S. warnstorfii survived. Plants that survived an oil treatment were not adversely affected by the spraying of dispersants, but when dispersants were sprayed on plants not treated with oil, corexit 9600 reduced survival, only 1 out of 10 C. aquatilis survived.

Effects of zinc and cadmium on root growth in metal tolerant Deschampsia caespitosa in solution culture.
D. BLUNDON AND K. WINTERHALDER
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D. caespitosa from Sudbury is strongly tolerant to zinc but only partially tolerant to cadmium (Cox and Hutchinson, 1979). Its strong internal tolerance mechanism to toxic levels of zinc appears to enable it to survive otherwise intolerable levels of cadmium such as are found on Yukon tailings. Zinc antagonistically reduces the toxicity of cadmium possibly by exclusion. This antagonistic interaction gives D. caespitosa potential as a revegetation species for diverse metal toxic substrates.

The introduced element in the Newfoundland moss flora
GUY R. BRASSARD
Dept. of Biology, Memorial University, St. John's, Newfoundland A1B 3X9

Fewer than 12 of Newfoundland's 450 moss species seem likely to have been introduced there by man since the European re-discovery of the island in the late 1400's. These species will be discussed, and data will be presented on their distributions, frequencies, and habitats in Newfoundland. Of the possible introductions to Newfoundland, five are not known elsewhere in North America and only three occur in the Maritime Provinces, but all occur in the British Isles. The most likely methods of introduction to Newfoundland will also be discussed.

Flora and vegetation of Cape Herschel, Ellesmere Island, Northwest Territories.
JAMES BRIDGLAND
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64 vascular plants, 123 mosses and 44 lichens are reported for Cape Herschel, a small peninsula situated on the relatively oceanic eastern coast of Ellesmere Island (ca. 78.5°N).

12 vegetation types, recognized visually in the field and verified by cluster analysis, are described in terms of physiognomy and indicator species. Comparison is made of these vegetation types with other plant communities and associations described from the Queen Elizabeth Islands. The role of life strategies of individual species in determining community composition is discussed.

Prehistoric fires and vegetation changes as recorded in peat from New Brunswick bogs
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Fire history, and its effect on Acadian Forest vegetation, was characterized by microscopic examination of charred particles and pollen preserved over the last 3000 years in 3 New Brunswick bog profiles. Charred particles were found throughout the profiles, indicating a constant rain of air-borne, distant-source particles. Average annual accumulations of charred particles for the 3 sites were: 11.30 $mm^2$/g dry wt at a site with a high recent fire frequency, and 5.15 and 3.80 $mm^2$/g dry wt at medium and low recent fire frequency sites, respectively. The greatest concentration of charred particles occurred at about 2200, 1750, 1500 and 400 yr B.P. and fires seem to have accompanied the establishment of the present-day forest around 1400 yr B.P.

Sequential branch development of black spruce saplings.
G.E. CARON and G.R. POWELL
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Concurrently produced distal, medial, and proximal branches were collected from young plantation-grown black spruce (Picea mariana (Mill.) B.S.P.) saplings aged 10, 12, 14, 16 and 18 years, and their branch morphology and shoot distribution mapped. Four patterns of decreasing shoot length, and associated decreasing number of intiated buds, were identified. The distal, most complex 1st-order branches elongated until intertree competition became high after about 12 years (in the oldest plantations); the less complex medial branches generally stopped elongating after 4 to 7 years; the least complex proximal branches stopped after 1 to 4 years. On the distal branches, 2nd-order shoots of 6th elongation, 3rd-order shoots of 4th elongation, 4th-order shoots of 2nd elongation, and 5th-order shoots of 1st elongation were rare. Megastrobilus and microstobilus bearing, latency of buds, and juvenile characteristics affected branch morphology and development.

Epilithic Algae of the Oldman River: Standing Crops, Productivity and Distribution.
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Longitudinal heli-surveys and seasonal studies indicated the presence of higher standing crops in the middle reaches. Mean standing crops were consistantly higher during late summer and particularly downstream of urban centres. Epilithic algal standing crops averaged 81.3 mg Chl a $m^{-2}$, $^{14}C$ uptake averaged 38.4 mg C $m^{-2}$ $hr^{-1}$ for 1980 and 1981. Cyanophycean algae were numerically dominant throughout the river. Diatoms were relatively more abundant in the middle reaches downstream of domestic and agricultural nutrient sources.

Responses of Chondrus crispus Stackh. to plant growth regulators.

L. C.-M. CHEN and A.R.A. TAYLOR
Atlantic Research Laboratory, National Research Council of Canada, Halifax, N.S., B3H 3Z1, and Biology Department, University of New Brunswick, Fredericton, N.B., E3B 6E1.

Apical and subapical 5 mm long segments of fronds of Chondrus crispus Stackh. were treated separately with several different plant growth regulators in serial dilution in culture medium. After four weeks their weights were remeasured and the number of new growth centers determined relative to controls in plain medium. Positive response in growth was observed especially in apical segments in $10^{-8}$ - $10^{-6}$ M kinetin and GA3.

Increased number of growth centers occurred in apical segments in $10^{-8}$ - $10^{-5}$ M zeatin, and subapical segments at $10^{-8}$ - $10^{-6}$ M zeatin and GA3 but concentrations greater than $10^{-6}$ M kinetin and zeatin inhibited production of new apices.

Revisionary studies in Carex section Extensae: The North American taxa.

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The morphological variation patterns exhibited by the members of Carex section Extensae have been analyzed using multivariate statistical procedures, including principal components analysis and discriminant analysis. A large proportion of the variation exhibited within the complex is due to variability in stature and in the vegetative organs. Discontinuities among taxa result from features of the inflorescence, including perigynium length, beak length, angle of curvature, and beak scabrousness. The length of the peduncle of the terminal staminate spike is also of some value in separating taxa. Seven species are recognized in North America: Carex cryptolepis, C. demissa, C. extensa, C. flava, C. hostiana, C. lepidocarpa, and C. viridula.

Comparison of seed set, achene weight and germination rate in tetraploid, hexaploid and octoploid *Aster lanceolatus*.

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Involucres were separated and seed set determined for each of the cytotypes. Seed set was less than 1% for each over the three years studied. For each of the cytotypes, 500 achenes were weighed. The tetraploid achenes were significantly lighter than the hexaploid or octoploid achenes. Germination percentages also varied among the three cytotypes; tetraploid 35.2%, hexaploid 47.8% and octoploid 65.2%. When separated on the basis of those which germinated, the tetraploid achenes were the lightest, followed by those of the octoploid and hexaploid cytotypes. Mean number of days to germinate did not vary between the tetraploid and hexaploid cytotypes, however, it was significantly different between the previous two cytotypes and the octoploids.

A Biosystematic study of Arnica louiseana and its allies

S.R. DOWNIE and K.E. DENFORD
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A multidisciplinary study of Arnica louiseana and its allies has been carried out using morphological, phytochemical and cytological techniques.

This complex is predominantly apomictic with amphimictic phases in unglaciated Alaska. Disjunct distributions are probably the result of Pleistocene survival in refugia with apomictic phases being responsible for recolonization of glaciated areas.

We have assessed the phylogeny of this group in the light of glacial history and evaluated the relative importance of phytochemical, cytological and geographical data in determining the evolution of the complex.

This study is supported in part by NSERC and The Boreal Institute for Northern Studies.

Barriers to Succession in the Birch Transition Community, Sudbury, Ontario.

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The Birch Transition community is the result of man-induced environmental degradation associated with logging, forest fires, and base metal smelting. The community is characterized by widly spaced coppice stools of white birch, Betula papyrifera, and red maple, Acer rubrum, that have given rise to a mosaic of 'oasis' and 'desert' microclimates. The desert environment is subjected to severe frosts in autumn owing to unimpeded reradiation on clear nights. In summer, high soil surface temperatures and drought, that result from the lack of a forest canopy, proabably exacerbate any toxic effects from the acid, metal-contaminated soils. These conditions have led to periodic dieback of coppices and a lack of seedling establishment. The implications of these barriers to growth, on the long term successional dynamics of the Birch Transition community, are discussed.

Effects of gamma radiation on compound leaf development in the genus *Fraxinus*.

J. R. DUGLE
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Some of the most noticeable effects of chronic irradiation on woody vegetation are phenotypic expressions of somatic variations in leaves. A comparison of effects on two species of ash, *Fraxinus nigra* Marsh. and *F. pennsylvanica* Marsh. is included. With long-term irradiation, there is an increase in alternate leaves in the normally opposite-leaved species. In addition, other morphological and phenological variations have occurred. None of the *F. pennsylvanica* have been killed by long-term irradiation and the dose-rate at which 50% of the *F. nigra* saplings have been killed is 15.6 mGy/h.

Simulating the role of fire in the long-term tree dynamics of the Acadian Forest: I)Structure of the model BURN

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Fire Science Centre and Dept. Biology, University of New Brunswick, Box 4400, Fredericton, N.B. E3B 5A3

Fire as an event has been incorporated in a stochastic and dynamic computer model simulating the long-term succession of the Acadian Forest. Simulated fires are described by 3 characteristics: frequency, intensity and severity. Frequency refers to fire occurrence, whether prescribed or a wildfire. Intensity determines which trees will be affected and to what extent. Intensity class is a function of stand biomass, Canadian Fire Weather Index and a random element. The fire impact on forest succession is a function of intensity class, species tolerance to fire and tree size. Fire severity refers to the depth of burn and is related to the Duff Moisture Code. The effect of severity on succession is a function of species requirements for establishment, and a random element.

Simulating the role of fire in the long-term tree dynamics of the Acadian Forest: II) Model testing and conclusions

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Testing a computer model (BURN) against reality was carried out at different levels: i) comparing single species' behavior or individual stand dynamics to what is known about each; ii) comparing the forest types produced by the model to those existing in the Acadian Forest, and the logical converse, comparing forest types in the Acadian Forest to those produced by the model; and iii) comparing outputs of modelled forest dynamics produced by different climatic conditions and wildfire frequencies. The model was found to successfully simulate forest types that resemble some found within the Acadian Forest region in both space and time. The complexity of the successional patterns produced by the model for this forest does not support the classic theories of succession originating with Clements. Potential model applications are discussed.

Les mousses des îles St-Pierre-et-Miquelon.

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C.p. 328, St-Pierre, Iles St-Pierre-et-Miquelon
et
GUY R. BRASSARD et MARC FAVREAU
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Les îles françaises de St-Pierre-et-Miquelon sont situées à proximité de la côte sud de Terre-Neuve. Elles ont reçu l'attention de plusieurs bryologues depuis la fin du XIXième siècle et pourtant, des récoltes récentes ont permis d'ajouter 45 espèces de mousses aux listes précédentes.

Malgré sa faible superficie (242 Km carrés), l'archipel a une flore riche de 170 espèces de mousses et composée d'éléments phytogéographiques très variés. Plusieurs des espèces présentent une importante disjonction d'aire avec la partie nord de l'île de Terre-Neuve.

The mosses and liverworts of the Gaspé Peninsula sugar maple forests.

MARC FAVREAU
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In the Gaspé Peninsula of Québec, forests dominated by sugar maple occur as discrete patches within the predominant coniferous forest. Such stands represent a northern margin of the Deciduous Forest Biome.

Extensive collections at 6 representative sites revealed a bryophyte flora of 96 moss and 20 liverwort species. About 60% of these are widespread in the Boreal Forest Biome. The remaining species have more temperate North American distributions that roughly correspond to the Deciduous Forest, or extend in various ways to western North America.

Taxonomic and life history studies in the genus Acrothrix Kylin (Phaeophyceae, Chordariales) with specific reference to A. novae-angliae Taylor.

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Morphological and antomical comparisons were made between the types of the three N. Atlantic species of Acrothrix (A. gracilis Kylin 1907 (the type of the genus), A. novae-angliae Taylor 1928 and A. norvegica Levring 1937) and a population of Acrothrix studied over a whole season at Topsail, Conception Bay, Newfoundland. Variations in external morphology and internal anatomy in the Topsail population embrace the range of characters currently employed to separate the three N. Atlantic species. It is therefore proposed that there is only a single species, A. gracilis Kylin in the N. Atlantic Ocean. Culture studies of Newfoundland Acrothrix revealed an asexual cycle, with an alternation between a macroscopic, unispore producing thallus and a microscopic, recycling plurispore producing thallus.

Physical and Ecological Characteristics of Alexandra Fiord, A High Arctic Oasis on Ellesmere Island, Canada

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Physical and ecological features of an atypically lush high arctic lowland, on Ellesmere Island, are described. Site topography, moisture supply, drainage patterns and radiation input combine favorably to create a highly productive biological oasis amidst a polar desert setting. Growing season radiation and energy balance parameters were higher than those of sites at similar latitudes. Thirteen distinctive lowland plant communities were recognized and divided into a xeric-mesic to mesic lichen-heath-cushion plant dominated series associated with a seasonally discontinuous moisture supply, and a mesic to hydric sedge dominated series associated with a relatively continuous moisture supply. Community species composition, standing crop, and primary production reflected changes in habitat moisture conditions.

Peatland Metal Contamination in the Vicinity of Sudbury, Ontario.
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Bog vegetation and, in particular, Sphagnum species exhibit a dramatic change in cover and composition around the smelting centre of Sudbury. Samples from 18 peatlands, situated up to 60 km ENE of Sudbury, were analysed for Cu, Ni, Fe, Al, Ca and Mn. In the surface peat high Cu and Ni concentrations exhibit a decrease with distance from the smelters, whereas, Al, Fe, Ca and Mn show no such pattern. However, water samples from the same sites contain low amounts of these elements. Within sites that possess a distinct marginal lagg and drier central zone metal levels varied across the peatland. The distribution of Sphagnum species is discussed with regard to the observed metal levels.

Ecology of high arctic sedge meadow communities, Alexandra Fiord, Ellesmere Island.
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The vegetation and production ecology of sedge-dominated communities of a high arctic oasis (Alexandra Fiord, Ellesmere Island (78 53' N, 75 55' W)) is described. These communities are characterized by mesic to wet soils, and are co-dominated by two sedge species (Carex membranacea and C. aquatilis subsp. stans) and Eriophorum angustifolium subsp. triste. There is also a frequent dwarf shrub component including Dryas integrifolia, Cassiope tetragona and Salix arctica, and a minor forb component (e.g. Polygonum viviparum). The aboveground standing crop of vascular plants (220 $g/m^2$) is largely composed (50%) of litter and attached dead plant material. This is due to the lack of grazing by large herbivores (e.g. muskox). The annual aboveground net production (23 $g/m^2$) is similar to more southerly arctic sites such as Truelove Lowland on Devon Island.

La productivité végétale des battures de la région de Québec. - HÉLÈNE GILBERT. (Sans affiliation institutionnelle) 241 La Tourelle, Québec G1R 1C7.

La productivité primaire des battures de la région de Québec est évaluée. Durant une campagne de terrain s'étendant de juin à octobre 1983, 24 stations de biomasse aérienne et souterraine de 0,25 $m^2$ (0,5 X 0,5 m) ont été échantillonnées une fois par mois. Un total de 10 stations comportaient du Scirpus pungens en dominance ou en sous-dominance, 10 de la Zizania aquatica, 10 du Najas flexilis, 9 de la Sagittaria rigida. Ces espèces ont été analysées plus en détail quant à leur production et à leur productivité aérienne, souterraine et totale. On obtient un modèle de production mensuelle fondamentalement différent entre les espèces vivaces (e.g. scirpe) et les espèces annuelles (e.g. zizanie). La productivité primaire nette totale d'une superficie connue des battures de la région de Québec est estimée.

Subvention du Fonds F.C.A.C., programme A.C.S.A.I.R.

Uptake of phosphorus from inositol hexaphosphate by mycorrhizal and non-mycorrhizal jackpine.
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*Pinus banksiana* Lamb. seedlings were raised in sterile agar for one month then transferred to growth pouches, inoculated with *Paxillus involutus* or left uninoculated, and grown for 3 months. The insoluble ferric salt of inositol hexaphosphate (FeIHP) was supplied as a suspension on the paper wick over which the roots grew. Controls were supplied with $NaH_2PO_4$ or no phosphorus in the nutrient solution. Both mycorrhizal and non-mycorrhizal seedlings absorbed phosphorus (P) from FeIHP. Mycorrhizal seedlings absorbed more P from $NaH_2PO_4$ and there was some evidence that they also absorbed more P from FeIHP. Most of the additional P absorbed from FeIHP remained in the roots.

Unexpected effects of port construction on plant growth and distribution in a seagrass bed
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After the first phase of construction of a coal-loading port south of Vancouver, channels eroded landward from a dredged area in the deeper part of an eelgrass bed; between 1969 and 1982 10% of the original area was lost. At the same time eelgrass colonized bare sediments at the landward edge of the bed and increased the area by 78%. A positive feedback mechanism involving deflection of silty river water, improved water clarity, denser plant growth, and resistance to the ebbing tide is proposed to account for the expansion. During the second phase of construction (1982) attempts were made to fill in the erosion channels but some plants were partially covered. Unexpectedly, plants with only a few centimeters of leaf above the sediment survived; their rhizomes quickly grew 10 to 15 cm vertically. The ability of eelgrass to adjust to major changes in sediment depth has been confirmed in the lab.

BOTANICALLY SIGNIFICANT AREAS OF NEW BRUNSWICK
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**Several areas in N.B. have been proposed as botanical sites of national significance according to Parks Canada criteria. These include Sisson Gorge, Wilson Brook Gypsum Cliffs Shore Island Strand, Little River Mouth, Moody Hill Eastern Deciduous Forest, Shea Lake White Cedar Glade and Fen, Miscou Island Sand Plain, Ross Island, Loch Alva Red Spruce Stand, and Peters River Saltmarsh.**

**The significance of these proposed sites is discussed and various means of their protection proposed.**

**The dispersal of plants to islands in the Great Lakes**

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There are many small islands in the Great Lakes and most have well developed native floras which have been derived by dispersal across the freshwater of the lakes. Some of the islands have large nesting colonies of sea birds and on these there is a rich flora of alien "weeds". However, many of these islands are remote and seldom visited by man, with few signs of human disturbance. The mode of dispersal of these "weeds" and of the native species is examined in this paper.

Ecological Evidence of Biphasic Nutritions In A Submersed Vascular Plant

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Recent evidence indicates that roots as well as shoots are an important site for solute absorption in hydrophytes. Although studies locating the primary site conflict, there is little evidence that the site, for a given species may change. In this study, the interaction of water fertility and the major site of absorption was tested with Ruppia occidentalis S. Wats. The sediment specificity of Ruppia was compared on different sediment types within two water bodies of different salinity. Also, specificity, equitability and location of response, of fresh water and saline lake populations were measured and compared on a gradient of sediment salinity to test the hypothesis that nutrient supply from the sediment is a more important selective force in fresh than saline water.

Development of an undescribed seaweed endemic to the Newfoundland southern coast.

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Populations of a previously undescribed alga have been located in St. Mary's Bay, Placentia Bay and Fortune Bay. The species is confined to moderately sheltered bays with sand and gravel sediments, full oceanic salinity, and light water currents. The plants appear in midwinter, when seawater temperatures are near 0°C, as uniseriate filaments with an intercolony meristem and irregularly alternate branching. Secondary cell divisions create the polysiphonous thallus. Plurilocular sporangia develop rarely; as axial swelling and subdivision of vegetative cortical cells. Most population growth results from copious production of primitive propagules. As seawater temperatures rise in April/May the plants degenerate and disappear. Taxonomic affinities of this species are discussed.

Morphometric Analysis of Tree-Rings of Eastern Canadian and Maine Softwoods

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Growth rings from coniferous species--jack pine, white pine, balsam fir, tamarack and northern white cedar--were assessed morphometrically using a Zeiss videoplan image analyzer, as had previously been done with red spruce. Cell lumen area, circularity index and diameter of a circle of equivalent area were measured on cell cross-sections along radial files of cells. Within-ring variability was assessed with each of these parameters in relation to growth rate, number of cells produced, earlywood/latewood percentages, transition latewood and false growth rings. The methods show promise for quantifying within growth ring variation in dendrochronological studies.

HOULE, F. and L. BROUILLET. Institut botanique, Université de Montréal. - Aster sect. Brachyactis (Asteraceae) : cladistic and evolutionary studies.

Aster sect. Brachyactis (= Conyzopsis) is comprised of three diploid, annual taxa. Authors agree that they are closely related to some western, foliaceous, x = 8 species of sect. Symphyotrichum, notably diploid A. occidentalis. However, they differ as to the time and order of origin of the group. A cladistic analysis of the group, based on morphological features, was done using the perennial A. occidentalis as out-group. The following relationships were established : A. occidentalis → A. frondosus → A. brachyactis → A. laurentianus. This pattern was also related to actual geographical and ecological distribution. The hypothesis thus formulated can be further tested using other kinds of data. It also allows the determination of the processes that were involved in the evolution of characters and in the pattern of speciation within the group.

**The Atlantic coastal plain flora of southwestern Nova Scotia: a nationally significant botanical area.**

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The presence of Atlantic coastal plain plants in Nova Scotia was first documented by M.L. Fernald in the early 1920's. Many of those species occur solely in southwestern Nova Scotia within Canada (e.g. Clethra alnifolia, Coreopsis rosea, Hydrocotyle umbellata, Woodwardia areolata). Almost all are freshwater shoreline species, and, where they occur, they do not replace widespread species (e.g. Eriocaulon septangulare, Lobelia dortmanna, Lysimachia terrestris), but rather coexist with them. What is it that results in such a rich flora? These shorelines have two special characteristics. First, there is a very wide range of substrate types, from clay through to sand, through to boulders, and different species coexist through occupying different substrates and different water depths. Superimposed upon this is natural disturbance from fluctuating water levels and wave and ice damage; this disturbance may prevent competitive exclusion.

Response of Balsam Fir Regeneration to Removal of Competing Hardwoods with Herbicide

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Cleaning with phenoxy herbicide (2,4-D/2,4,5-T) ten years after clearcutting resulted in an immediate growth increase by suppressed understory balsam fir (Abies balsamea (L.) Mill.), with no shock effect or lag time in growth response. Comparison of control and cleaned areas demonstrated that the continued presence of dense pin cherry (Prunus pensylvanica L.f.) and other hardwoods over the period of ten to nineteen years after clearcutting had no impact on balsam fir density and stocking but a very significant impact on balsam fir growth. Cleaning increased height growth by 9 to 34 percent, and volume growth by 142 to 257 percent. This growth response was strongly and negatively influenced by balsam fir density between 11 000 and 22 000 stems per ha. Release from competing hardwoods resulted in a rapid shift from inter- to intraspecies competition amongst balsam fir stems, indicating a need for thinning at the time of release. Specific volume increment displayed great sensitivity to intraspecies competition.

Some observations on morphogenesis of beech stool shoots after clearcutting

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Morphogenesis of beech (Fagus grandifolia Ehrh.) stool shoots was observed following clearcutting, at different times of year, of tolerant hardwood stands in the Nashwaak Experimental Watershed Project, New Brunswick. Callus tissue developed between the xylem and periderm of cut stumps. Callus tissue was first visible as a thin, white, continuous band which became green then orange-brown, increased in width and became bumpy in appearance. In time, green, dome-shaped adventitious meristems emerged and produced miniature shoots which bore scales and then leaves. Leaf and internode expansion was rapid. Lateral buds or sylleptic shoots developed in leaf axils. Date-of-cut influenced adventitious meristem production and winter-readiness of stool shoots.

The development of dermal features on the wheat grain.

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A scanning electron microscopic study of the developing ovule of wheat grains was conducted with special reference to dermal differentiation of the pericarp. The stigma and macrohairs began to differentiate at the distal end of the carpel approximately two weeks pre-anthesis. Macrohair formation is essentially completed within a week while stigma growth continues to near the time of anthesis. The few stomata which develop in the crease near the brush end of the grain only become evident as cell patterns on the day of anthesis, but have fully open stoma four days post anthesis.

The response of hobblebush following clearcutting

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Numbers and heights of hobblebush (Viburnum alnifolium Marsh.) were recorded in each of three $4m^2$ permanent sub-plots in each of fifteen 400 $m^2$ vegetation plots in tolerant hardwood stands of the Nashwaak Experimental Watershed Project, New Brunswick, immediately before clearcutting of the forest overstory and in the first, third and fifth years following clearcutting. In the fifth year, after shoot growth had ceased, hobblebush clones were excavated from areas adjacent to vegetation plots. Height and age were determined for each ramet of a clone and method of clonal expansion was described. Age was also determined every 10 cm along the stem of the oldest ramet of a clone. Numbers, heights and index of importance of hobblebush increased in the years following clearcutting. Clones expanded by layering of decumbent stems. Rate of height growth of ramets was rapid following clearcutting. Results indicated that this typically shade-tolerant species can function effectively in open conditions.

Indol-3-ylacetic acid and the control of cambial activity and dormancy in balsam fir

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Although cambial activity depends on a continuous supply of basipetally transported IAA, the cambium nevertheless ceases activity, i.e., enters the resting stage of dormancy, in the presence of abundant IAA. Moreover, the dormant cambium's response to exogenous IAA under favourable growing conditions increases from negligible during complete rest to maximum during full quiescence. Thus the annual cycle of activity and dormancy is controlled by changes in cambial sensitivity to IAA rather than by changes in IAA concentration. The resting cambium's insensitivity to IAA cannot be attributed to an inhibited IAA transport system or an accumulation of abscisic acid, nor can it be overcome with exogenous gibberellin or cytokinin. It may be caused by a deficiency in critical RNAs or proteins, a blockage of the cell cycle, or a change in nuclear protein or membrane function.

Response of a Typha marsh community to draining, flooding and seasonal burning

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A Typha marsh community was subject to draining and seasonal burning treatments. Treatments lead to an increased total number of species. Cover and frequency of Aster novi-belgii, Calamagrostis stricta, Brachythecium salebrosum, Pleurozium schreberi and Cladonia cristatella increased appreciably on the drained treatments whereas that of Carex spp., Lysimachia terrestris, Epilobium pelustris, Sphagnum squarrosum, Drepanocladus exannulatus and Helodium blandowii increased on the flooded treatments. Of all treatments, draining plus summer burning produced the lowest cover, stem density, plant height and stem base diameter of Typha. An attempt has been made to interpret the effects of disturbance on the natural paludification process which leads to bog development in marshes.

A phytosociological comparison of an old field system at Erindale, Ontario with one near Cracow, Poland.
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A 5h old field community of 50 years duration at Erindale, Ontario is compared floristically, compositionally and ecologically with a 2h 35 year old system near Cracow, southern Poland. Presence and frequency and estimated cover in $m^2$ random quadrats in homogeneous areas were recorded.

Of 35 species common to both fields 7% may be native at Erindale which included 118 species, whereas 26% are indigenous at Lubocza which had 103 species. Of the 118 at Erindale 52% are native whereas in Poland 83% are indigenous. In terms of cover, introduced species contribute as much as 85% in Ontario, whereas in Poland these values are reversed. Goldenrods (Solidago canadensis, S. altissima, S. gigantea) seem most capable of coping with exotics both in eastern Canada and in southern Poland.

Pinus banksiana: microsporangia to microspores
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A histochemical study of the microsporangium of Pinus banksiana Lamb. from initiation to pollen maturation and release is reported. Differentiation of the tapetum is shown to be from sporogenous cells. The apparent flow of large amounts of fluid into the sporangium is associated with changes in microsporocytes and in the tapetum. Pollen mother cells are followed through meiosis, the tetrad period, and release of microspores into thecal fluid when changes, as determined by staining techniques occur in the outer pollen wall and the orbicules. A callose-fluorescing intine is present. The uninucleate microspores develop into mature pollen grains as the tapetum dissolves and sporopollenin is released.

Analysis of the seed dispersal patterns of six biotypes of Panicum miliaceum L.
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Seed dispersal patterns or seed shadows have traditionally been described by a single parameter (e.g. mean dispersal distance). In this study, seed frequency was recorded in 600 triangular grid sections within 1 meter of each individual of Panicum miliaceum, an annual grass. These detailed maps were prepared for six weedy biotypes of P. miliaceum as grown in two crop environments. Combining this data into a series of contingency tables allowed for multivariate evaluations of the differences between seed shadows using concentration analysis. Significant differences were found between the biotypes and between the environments. Much of the variation between seed shadows was explained by the number and average height of the infructescences of the parent plants.

Variation in Stellaria calycantha.
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Stellaria calycantha (Ledeb.) Bong. is common throughout most of the boreal and arctic regions and in the mountains of North America. It is very variable and much of this variation has been named. The species is consistently tetraploid (2n = 52) except for some diploid populations in western Canada and the U.S. These are morphologically distinct and referable to S. simcoei (Howell) C.L. Hitchc. Cultivation experiments have shown that all the variations named by Fernald from eastern North America are the product of environmentally controlled plasticity. Taxonomic problems in the group arise from hybridization with other species, particularly S. longifolia.

Soil seed reserves by depth in a Typha latifolia-dominated freshwater marsh
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The size and species composition of the viable seed bank by depth within an impounded marsh at the head of the Bay of Fundy was estimated to determine the potential revegetative capacity after draining. Samples collected in the spring following draining of the area showed a viable seed reservoir of approximately 15,000, 7,000 and 4,500 seeds/$m^2$ for 3 separate vegetation zones (determined from growth chamber studies); however, samples taken in the autumn showed a decrease to 600, 56 and 288 seeds/$m^2$ for the same areas. This decrease was postulated to be due to germination and establishment, in situ germination and seed death as a result of changed soil conditions following draining. Monocots were the most abundant species with Scirpus spp. and Typha latifolia making up 90% of the total. The main dicot species included Potentilla palustris, Viola pallens and Galium palustre.

Leaf development in the anisophyllous shoots of Pellionia daveauana (Urticaceae).
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The dorsiventral shoot system of Pellionia daveauana is characterized by opposite pairs of dimorphic leaves. The small dorsal leaves differ from the large ventral leaves by having a reduced leaf blade, fewer tissue layers in the epidermis and mesophyll, a reduced vascular system and significantly smaller cell size in all tissue layers. The observations reported here document the developmental basis of these morphological and histological differences. Although both ventral and dorsal leaves are initiated simultaneously, volume of the ventral leaf primordium is greater, and laminar growth is by plate meristem activity which is absent in dorsal leaf primordia. Development of the ventral leaf is characterized by a relatively long period of cell division and enlargement. In contrast, early cessation of cell division and precocious cell maturation result in the distinctive structural features of the dorsal leaf.

Xylotomy of *Bruguiera gymnorhiza* Lam.
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The mangrove forests, widely distributed along the Tanzanian coast are dominated by plants of Rhizophoraceae, Avicenniaceae, Sonneratiaceae and the Sterculiaceae. These mangroves are close to areas of major human settlement and the *Bruguiera* wood is often used as firewood.

The wood of *Bruguiera* shows several primitive features. The vessel elements occur as solitary, in pairs or radial multiples. The oblique, scalariform perforation plates contain upto twenty gyres. The basic wall thickening of vessel members is scalariform, but they also show transitional tendencies from scalariform to simple and bordered pits. Pits occur on radial and tangential walls. The wood also shows scanty apotracheal parenchyma, multiseriate homocellular rays and highly thick walled non-libriform aseptate fibers. Energy Research Unit Contribution No. 78.

Vegetative and sexual reproduction in Hydrocharis morsus-ranae L. (Hydrocharitaceae)
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Actively growing vegetative shoots produce precocious repeating modules. Usually two vegetative appendages develop followed by an almost equal bifurcation of the apex. One of the branches quickly bifurcates again resulting in three closely spaced meristems. In vegetative shoots, one of the three apices becomes a stolon, one seems to abort (or grows very slowly) while the third becomes a repeating, renewal shoot. In flowering shoots the stoloniferous apex becomes the first flower of the male inflorescence or the solitary female flower. In male flowers the primary pattern of organogenesis is trimerous with successive alternating whorls of sepals, petals, three stamen whorls and a whorl of staminodes. In the female flower, all six carpels develop simultaneously. Paired or single staminodia are initiated opposite each petal. A trimerous whorl of antipetalous nectaries arise as stylar appendages shortly before anthesis.

Plant dispersal by savannah hares (Lepus crawshayi de Winton) in Queen Elizabeth National Park, Uganda
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Sixty-four of 96 savannah hares carried a total of 434 propagative dispersules belonging to 23 plant species. 324 dispersules from 15 plant species were found on 36 female hares; 110 dispersules from 8 plant species came from 26 males. Significantly more dispersules were collected in the dry season and this peak was related to the female hares. Males showed no significant seasonality in their zoochorus activity. More grass species (most commonly Hyparrhenia filipendula) than herbaceous species (most commonly Tribulus terrestris) were involved in the zoochory and as expected the magnitude of ectozoochory was related to the zoochorus features rather than the abundance of dispersules. The significance of zoochory is discussed in relation to plant dissemination on disturbed sites.

Patterns of development in balsam fir crowns
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Crown development during establishment of balsam fir (Abies balsamea (L.) Mill.) is variable because the species can grow relatively rapidly in the open or can exist for decades in dense shade. Common conditions during establishment result in three patterns of height growth. Once the grand period of height growth is reached in any one of them, crown-development patterns stabilize and can be related to acrotony among contemporary buds on single shoots because extension growth is preformed. A mechanistic pattern of control of shoot lengths and numbers of leaves and buds per shoot results. Regular cone bearing occurs when height-growth rate slows. Patterns of seed-cone size are similar to those of shoots. Seed-cone and pollen-cone bearing affects the patterns among the shoots and this leads to biennial cone bearing. Individual branches produce seed cones two or three times then change to pollen-cone production. The change is related to patterns of decreasing shoot vigor. As height growth decreases further, seed-cone-production capacity lessens.

EFFECT OF ROOT AGE ON DEVELOPMENT OF THE ENDODERMIS AND HYPODERMIS IN CORN AND ONION ROOTS.
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Endodermal cells pass through three stages of development. In State I, suberin and/or lignin is laid down in their anticlinal walls. In State II a suberin lamella is deposited on the inner face of the primary wall; in State III, a lignified secondary wall is deposited inside the suberin lamella. Both endodermal and hypodermal Casparian bands were observed in cleared cross sections stained with Chelidonium majus root extract. Deposition of suberin lamella was detected by viewing uncleared cross sections with an epifluorescence microscope. State II endodermis and State I and II hypodermis matured further away from the root tip with increased age. In the endodermis there is a lag between the maturation of Casparian band and deposition of suberin lamella while in the hypodermis, the Casparian band matures a short distance before the deposition of a suberin lamella. Corn and onion roots grown in vermiculite or hydroponics showed no significant difference in their root length or suberization.

The aleurone cells of wild oats (Avena fatua L.) - A light microscopic study
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The aleurone layer isolated from mature caryopsis of wild oats is heterogeneous comprising the cuboidal walled-cells and the radially compressed wall-less cells. The free cells of the aleurone remain cohered to form a continuous envelope around the embryo-endosperm complex. They are closely glued to the nucellar epidermis, which persists as a membranous envelope. The walls of aleurone cells contain predominantly hemicelluloses and lack plasmodesmata. On drying, the non-vacuolate protoplast produces abundant, radially protruding "spiny vesicles" some of which may coalesce to form larger cytoplasmic strands resembling the Hechtian strands; the thick aleurone cell walls become thin by losing water. The structure and behaviour of aleurone cells suggest that the aleurone layer is important in maintaining water balance and also in protecting the caryopsis from microbial attack. This work was supported by a grant from Agriculture Canada.

Shoot preformation and neoformation in relation to crown architecture patterns in Larix laricina saplings

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A model describing patterns of crown development in Larix laricina (Du Roi) K. Koch (tamarack) saplings revealed that extension of first-order (long-shoot) axes was correlated with main-stem leader length and position in the crown. Current-year shoot lengths tended to decrease with depth in the crown. Among branches of the same age, current-year extension decreased basipetally. Short-shoot production was also related to crown position. Analysis of winter bud contents from various crown locations showed that the numbers of each primordium type (bud scales, basal and axial leaves) tended to be positively related to parental shoot length but there were also patterns along each shoot. Both preformed and neoformed leaf initiation increased with the length of the associated long shoot but the proportion that was neoformed increased with shoot vigour. Other comparisons between preformed and neoformed segments revealed differences in mean interleaf distances, proportions of lateral buds and axial-leaf lengths.

The effects of drought and abscisic acid on the development of the root apex in sunflower.

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Ten-day-old sunflower (Helianthus annuus var. Russian) seedlings were slowly droughted in an aeroponic chamber over a seven day period. This treatment produced the following changes in the root apex: 1) a reduction in the number of highly cytoplasmic cells; 2) reductions in the mitotic and labelling indices; 3) a reduction in the number of periclinal divisions in the ground meristem. Drought also induced an increase in the level of abscisic acid (ABA) at the root apex. Exogenous application of $10^{-5}$ M ABA produced effects similar to drought-induced effects. This strongly suggests that ABA may be involved in the response of root apices to drought.

Needles of balsam fir

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Needles produced on balsam fir (Abies balsamea) trees immediately following severe defoliation by spruce budworm (Choristoneura fumiferana) appeared to be morphologically distinct from normal needles (Piene & Percy 1984 Can. J. For. Res. in press). They appear very similar to needles produced on lateral shoots of trees following removal of the terminal bud cluster. These needles vary in arrangement, length, and colour from normal sun and shade needles and appear similar to needles from well-established seedlings. Needle characteristics for field and nursery grown plants were studied following bud or foliage removal. Needles from young trees have little or no hypodermis and marginal resin canals. Needles from older trees have well-developed hypodermal layers and medial resin canals. Injury brings about a degree of rejuvenation in needle characteristics.

Post-fire regeneration of Acacia sieberiana DC. from seed in Queen Elizabeth National Park, Uganda

ELLY N. SABIITI, ROSS W. WEIN AND ERIC L. EDROMA
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Post-fire regeneration of A. sieberiana from seed was studied both under laboratory and field conditions to determine the influence of fire on seed germination. There was a significant increase in laboratory germination rates from seeds collected from burned areas in the field and, in general, germination increased with increased heating as monitored by grass biomass consumed. Burning also significantly increased seedling emergence in the field. It was hypothesized that burning late in the dry season released sufficient energy to crack the seed testa and this improved permeability of the seeds to water during the rainy season. This partly explains the current profuse Acacia regeneration noted in the Park since the recent decline in grazing pressure and subsequent fuel build-up, which in turn, leads to more severe and widespread fires.

The distribution and growth of larch, Larix laricina (Du Roi) K. Koch in Newfoundland

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Eastern larch has the widest range of any North American coniferous tree. Prior to this study little was known of the distribution and growth of larch in Newfoundland. Using a biophysical approach sites were divided into three physiognomic groups and seven ecological types were recognized. Group I: Bog and fen areas, (1) Mesotrophic and (2) Eutrophic. Group II: Alluvial alder swamps, (1) Carex alder, (2) Lycopodium alder, and (3) Typical alder. Group III: Upland areas, (1) herb and moss rich, and (2) ericaceous. The herb and moss rich type is the most productive. Stands on this type have the best height-age and height-diameter relationships and typically yield about 100 tonnes/ha of total above-ground, oven-dry biomass at 35-55 years breast height age. Corresponding yields for the other types are: 79 tonnes/ha for the alder types; 47 tonnes/ha for the fen; and 36 tonnes/ha for the eriaceous type.

Immature fruit loss in Amelanchier alnifolia Nutt.: Is sink competition a factor?

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The production of a fruit crop by Amelanchier alnifolia, a native prairie shrub, is variable. An abrupt and significant loss of immature fruit occurs shortly after petal drop. Much of this loss can be attributed to damage by frost and a sawfly. An apparently undamaged residual loss was thought to be associated with sink competition for a limited resource. The relationship between # fruit aborted and # florets/inflorescence, # inflorescences/long shoot, and dry leaf weight/spur shoot was determined experimentally. An analysis of covariance indicated that fruit abortion was associated with sink competition only under conditions of considerable defoliation or pruning. Stored reserves were indicated to be more important for fruit maturation than were current assimilates.

Effects of gaseous fluorides on seed production in Balsam fir

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and
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Levels of gaseous fluorides released from a phosphorus production plant at Long Harbour, Newfoundland averaged 349.1 and 3.4 µg F/dm$^2$/7 day period at 1.4 and 18.7 km from source, respectively. Trees of Abies balsamea growing in the most polluted area showed a 67% reduction in seed production per fertile tree, and the proportion of fertile trees fell from 80 to 7%. F-sensitivity of Abies balsamea is compared with that of Pica mariana and Larix laricina.

A comparison of shoot development patterns in Zostera and Halodule.

A.R.A. Taylor
Biology Department, University of New Brunswick, Fredericton, N.B., E3B 5A3

The anatomy of leaf, branch and internode initiation was studied for five species of Zostera L. (Monocotyledoneae, Zosteraceae) and showed developmental patterns in each of the three Subgenera to be essentially similar. Separation of the developing branch from the subtending leaf node occurred by the formation of the internode. This pattern differs from the more usual retention of the branch bud in the axil of the subtending leaf and the expansion of the internode above the level of the branch; this latter pattern occurs in the superficially similar seagrass Halodule uninervis and another large-leafed Halodule from Shark Bay, Western Australia.

Interference competition among fungi.

D. STRONGMAN AND N.J. WHITNEY
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Two groups of marine fungi, one of twenty-four and one of ten, were screened for interference competition. Fungi, in pairs, were inoculated, each fungus on a balsa (Ochroma lagopus Swartz) chip (2.5 x 3.0 x 0.5 cm). The chips were placed on an agarose-artificial seawater (28°/oo) medium in petri dishes. Each petri dish contained one pair of chips 2.5 cm apart. The fungi,using the balsa chips as a food base, grew out into the agarose. Observation of the zone where the colonies met was used to detect interference competition. Fourteen isolates from the group of twenty-four and five from the group of ten showed some degree of antagonism towards other fungi. Eight of the fourteen and four of the five antagonistic fungi had slower growth rates, on balsa chips, compared to the other fungi screened. These results are discussed in terms of interference competition theory.

The crystal form of cellulose in standard samples and in cell walls of algae and higher plants.

IAIN E. P. TAYLOR and ALEX MACKAY
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We have used proton magnetic resonance to measure second moment and various relaxation parameters of cellulose in purified cotton and filter paper. We can distinguish crystallite cellulose from material of reduced crystallinity which we interpret as being paracrystalline cellulose.

The results of these experiments have been applied to studies of cellulose in cell wall preparations from etiolated bean hypocotyls, celery petiole parenchyma, celery petiole collenchyma, Nitella sp., Entermorpha sp. and black spruce wood.

(Supported by NSERC of Canada).

Stability, Diversity and Ecological Sensitivity to Disturbance in boreal forests: what can we learn from Clements?

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In landscapes routinely suffering catastrophic disturbance, a mosaic of ecosystems results in which each can be characterised by age, size, health, productivity etc. This does not obviate an individualistic (Gleasonian) approach within individual ecosystems. For such a 'landscape demography' the age-class distribution is a useful model, especially for negative exponential distributions. Of 15 typical distributions from Ontario boreal and Great Lakes forests, 11 were negative exponential. In this model, N. In $Area_o$ (where $Area_o$ = proportion of an N-celled landscape in pioneer ecosystems) defines total landscape instability (I). The sum of ecological sensitivity to disturbance (S$\bar{x}$ , Suffling 1980) for all cells is shown to equal beta diversity (Shannon Information Statistic H) plus I.

Matacil Insecticide spraying, pollinator mortality, and plant fecundity in New Brunswick forest.

G.R. THALER (Botany), R.C. PLOWRIGHT (Zoology), U. of Toronto, and J.D. THOMSON (Systematics & Evolution), S.U.N.Y., Stony Brook, N.Y.

The susceptibility of pollinators to the two main insecticides, fenitrothion and Matacil, used in the New Brunswick spray program, has been found to vary among insect taxa. In particular, while solitary bees and flies appear vulnerable to Matacil, bumble bees (Bombus spp.) seem unaffected by aerial sprays of this insecticide. This suggested a fine-grained test of the hypothesis that insecticide-induced mortality of pollinators causes reduced fecundity in entomophilous plants: plants with similar reproductive biologies, but visited by different pollinators, should vary in the effect of spraying on seed production according to the susceptibility of their insect visitors. The fecundity of Maianthemum canadense, which is visited primarily by susceptible pollinators, was lower in Matacil-sprayed than in unsprayed areas, while no difference was found for Cornus canadensis, whose principal visitors are bumble bees.

Water relations of the willow pine cone gall induced on Salix discolor Muhl.

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The literature indicates that there has been virtually no work done on the water relations pertaining to insect-plant galls. A preliminary study was initiated to investigate some aspects of the water relations of the gall induced by a willow pine cone gall midge in the terminal bud of Salix discolor Muhl.

The osmotic potential at both full saturation and turgor loss point are characteristically higher in galled twigs than in normal (control) twigs. Similarly, the tissue water was found to be higher in galled twigs than in controls. The higher osmotic potential and water content could be attributed largely to the gall itself because both the osmotic potential and water content of leaves from galled twigs were either slightly lower, or similar, to that of controls. The complexity of this gall and the effect that this has on the interplay of solute concentration, and degree of tissue hydration. is discussed.

Fire severity and the post-fire tree seedling community

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For fire to be used as a management tool, fire behaviour must be linked to the biological consequences. A model, in diagram form, is presented, linking fire severity (the depth of organic matter removed) with the establishment of conifers from seed; the model is based upon experimental evidence of the effect of post-fire shelter and published evidence of the effect of post-fire organic matter depth. From the model it is established that fire severity is important in determining the composition and size of the post-fire seedling community.

The use of tolerant plant species in determining the impact of land reclamation practice on biogeochemical cycling of potentially toxic metals on acid, metal-contaminated land.

M.R.TODD and E.K. WINTERHALDER
Department of Biology, Laurentian University,
Sudbury, Ontario P3E 2C6.

Revegetation of acid, metal-contaminated soils in the Sudbury area is usually carried out by the use of agronomic grass-legume mixtures which are unable to survive unless the land is heavily limed. Because of the lack of survival of such grasses on unlimed sites, it is not possible to determine the effect of land reclamation practices such as fertilization and liming on toxic metal uptake and cycling. In barren sites that have been sparsely colonized by tolerant Deschampsia caespitosa (L.)Beauv., however, it is possible to measure metal uptake before and after treatment. Such studies on the uptake of iron, copper, nickel and aluminum have shown that a depression of uptake of all metals (especially aluminum) occurs in treated plants, even though the pH change involved is of the order of 0.3 units.

Aberrant cone production in tamarack

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Tamarack (Larix laricina (Du Roi) K. Koch) trees are normally monoecious; however, bisporangiate cones were found frequently during a study of cone production on young trees. In bisporangiate cones, there was a gradual change from the proximal microsporophylls to the distal ovuliferous scales, but proportions of each, and of transitional structures varied. Occasionally, microsporophylls were also formed distally to the ovuliferous scales. Bisporangiate cones occurred in mid- to lower crown positions. Proliferation, the growth of a vegetative shoot from the apex of a cone, was observed on many seed cones. Such cones tended to contain more ovuliferous scales than did normal cones. They commonly occurred on short-shoot axes situated distally on vigorous long shoots in the mid- to upper crown. Basal leaves are normally associated only with seed cones, but pollen cones with basal leaves were also encountered. These aberrant cone forms are discussed in relation to patterns of distribution of normal cones.

Effects of fungi on root morphology

JAMES A. TRAQUAIR
Research Sttion, Agriculture Canada, Harrow, Ontario
NOR 1GO

Interaction of fungi with the roots of woody plants can lead to disastrous or beneficial results, either of which are expressed as microscopic and macroscopic changes in root morphology. Disease symptoms include discoloration, necrosis and rotting of roots. The morphogenetic influence of fungi on woody plant roots is best expressed in the establishment of symbiotic (mutualistic) associations called mycorrhizae. Endomycorrhizal fungi have no effect on the external appearance of roots but they permeate the cortex where intercellular hyphae and specialized intracellular structures are connected to a network of external hyphae which facilitate uptake of nutrients from the soil. Fewer root hairs are found on mycorrhizal roots. Short, stubby, dichotomously branched, and colored ectomycorrhizal roots are characterized by a cortical network of intercellular hyphae and a mantle of hyphae around the root and extending into the soil.

Influence of microbial epiphytes on rust fungi

J. A. TRAQUAIR
Research Station, Agriculture Canada, Harrow, Ontario
NOR 1GO

Fungal pathogens of plants are frequently accompanied by several other micro-organisms which may or may not exert an apparent influence on the development of disease symptoms. The relationships range from commensalism to aggressive antagonism by means of toxin production and/or direct invasion of mycelium. These types of microbial interactions are reported here from light and scanning electron microscope studies of Cladosporium and Puccinia species grown in slide cultures and on leaves of Viola or Asparagus species. The exploitation of such antagonistic interactions is interesting as a mechanism for the biological control of plant diseases.

On the generic status of Symphysia

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Nova Scotia, BOP 1XO

Transferring Symphysia to Vaccinium expands the circumscription of the latter in terms of pedicel morphology, calyx tube enlargement before anthesis, floral plasticity and seed shape. Although Vaccinium is a diverse genus comprising about 30 sections, adding Symphysia is tantamount to making the genus a dumping ground for any Thibaudiaea or Vaccinieae of uncertain affinity.

Seed character variation in North American material of Rhinanthes minor L.

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Dept. of Biology, Bishop's University, Lennoxville, Québec J1M 1Z7

North American material of the genus Rhinanthus satisfies the description of Rh. minor in the Flora Europaea. We analyzed differences in seed proteins as well as morphological variation in material from different parts of Canada and Europe. Seed proteins in material from Southern Canada were similar to those in European seeds whereas material from Northern Canada proved rather different. Of the morphological traits only seed characters exhibited analyzable multivariate structures: they support the classification based on seed proteins.

Phytosociology of forests along the Niagara Escarpment, from the Niagara River to Manitoulin Island, Ontario.

S. Varga and P.F. Maycock, Department of Botany, University of Toronto, Erindale Coll.,Mississauga, Ont.

135 stands were sampled along the 950 km. length of the Escarpment using the point-quarter method and random 1 m. sq. quadrats. The data was subjected to Detrended Correspondence Analysis (DECORANA), an ordination technique most effective and robust when dealing with heterogenous and difficult data sets. Soil moisture, fire history, and latitude/longitude exhibited the strongest trends in the stand/species ordinations. There are less well defined trends for a number of correlated soil features eg. calcium/magnesium content, Ph, organic content and substrate type. Floristically, the shale/limestone derived slopes and dolomite rim/plain cuesta are well differentiated from forests off the Escarpment. This is illustrated by a comparative study of Escarpment stands and 106 stands in proximity to it, which found the following tree species to peak in importance on the Escarpment: Ulmus rubra, Juglans cinerea, Betula papyrifera, Thuja occidentalis and Tilia americana.

GILLES VINCENT et YVES BERGERON. Jardin botanique de la Ville de Montréal et Centre de Recherches Ecologiques de Montréal . - Weed synecology and dynamics in urban environments.

Forty vacant lots within the City of Montreal were studied during the summer of 1983 for floristic composition and some physical parameters. Despite a low floristic diversity per site - number of species/site varies around 22 - the whole sampling allowed us to record 136 taxa. Among these taxa, very few appear in more than 40% of the sites, suggesting a good discrimination between the 40 vacant lots. The date were analysed using principal coordinate analysis and hierarchic agglomeration cluster analysis. A study of the ordination and of the dendrogram reveals nine principal groups among which the most important are those dominated by Agropyron repens, Poa pratensis, Ambrosia artemisiifolia, Melilotus alba and Hordeum jubatum. Finally, dynamic relationships were identified between these groups wich go from annual-dominated communities towards perennial-dominated communities.

Development of isolated leaf primordia of a clone of Matteuccia struthiopteris in vitro

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Fern leaf development was investigated using young sporophytes of a previously unexplored species. Leaf primordia were isolated and raised in culture. In striking contrast to other work on ferns our results clearly show that extant leaf primordia in the clone behave as determined leaves.

Further observations on the succession of drastically disturbed ecosystems.

M. K. WALI
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Our long-term studies of abandoned and managed landscapes after coal mining in the Northern Great Plains reveal that all three pathways of succession postulated by Connell and Slatyer may be operational conjunctively. Their relative roles, however, may vary depending upon geographic location, types of parent materials, and prevailing species composition of the neighboring areas. The facilitation and tolerance pathways are both exemplified as one considers the dispersion of 2,000 plant populations in 600 sample quadrats representing 1-45 year old sites. The operational significance of the inhibition pathway is not readily discernible on abandoned sites but clearly so on sites that have been recontoured, have received topsoil, and have been fertilized and seeded. However, its importance is apparent only when it is considered in reverse than hypothesized by Connell and Slatyer, i.e. early species may inhibit themselves.

Morphogenetic influence of fungi on woody plants. Cankers and galls.

R.E. WALL
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Fungi causing cankers and galls have a wide variety of effects: necrosis often accompanied by toxin production as in diffuse cankers; alternating necrosis and host callus growth as in target cankers; hypertrophy and hyperplasia as in galls. Closely related fungi can cause different types of host responses (e.g. Nectria spp.) and symptom expression in some diseases can vary according to the resistance of the host or the virulence of the fungus (e.g. beech bark disease, chestnut blight).

Problems of correlating stem age and environmental factors in stressed coppices of Red Maple, Acer rubrum, from Sudbury, Ontario.

L.T. WALLENIUS and G.M. Courtin
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Tree age is necessary when comparing net primary productivity from uneven age stands. Previous attempts to age stems of coppiced White Birch and Red Maple from the acid, metal-contaminated communities of Sudbury, Ontario, were inconclusive because they did not reveal the presence of very narrow rings and incomplete rings that are known now to exist.

Wood from stems that had been aged accurately by counting bud scale scars was aged by ring count from thin sections using light transmission microscopy. Cross-matching of ages by the two methods confirmed that there were no missing rings. Conventional aging of the same samples under-estimated the tree age significantly.

It is now recognized that in stressed sites extreme suppression is common and that only by aging thin sections can one reliably discuss vegetational history in terms of climatic and environmental influences.

The Morphogenetic Influence of Fungi on Woody Plants: Foliage Problems.

N.J. WHITNEY
Department of Biology, University of New Brunswick, Fredericton, N.B., E3B 6E1.

Fungous diseases of tree foliage may affect leaf development directly as evidenced by necrotic spots, stunting, galls, blisters, and cracks. They may affect tree development indirectly by limiting photosynthesis as well as providing an avenue of fungal entrance into other parts of the tree, viz., stems and trunks. These latter two occurrences may cause stunting and/or death of trees, as well as blisters, galls and witches brooms to form on the stems and trunks. Leaf galls, supposedly caused by insects, are discussed in relation to possible interaction between insects and fungi. Control of foliage diseases by breeding for resistance is discussed.

A study of fungal toxins and the 'unknown death syndrome' of spruce budworm.

N.J. WHITNEY, J. David Miller[1] and D. Strongman
Department of Biology, University of New Brunswick, Fredericton, N.B., E3B 6E1 and [1]Chemistry and Biology Research Institute, Agriculture Canada, Ottawa, K1A 0C6.

Approximately 650 isolates of saprophytic Deuteromycetes were isolated from spruce needles infested by the spruce budworm Choristoneura fumiferana Klem. Most of the isolates were species known to be colonizers of the spruce needle phytoplane, though many have not been reported from healthy needles. It appears that the presence of the spruce budworm altered the normal needle mycoflora. Some isolates (23) associated with the needles, frass and larvae were cultured in vitro and solvent extracts of the fermentation beer of some of these were cytotoxic to HeLa 229 cells. The results of this study suggest that further work on the issue of mycotoxins and the death of a small part of the spruce budworm population is justified.

Saltmarshes in the Maritimes: an interpretive approach to plant communities

ALEX A. WILSON
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The role of the Nova Scotia Museum in environmental studies and interpretation is well established. Recently, we have produced a multi-media exhibit on saltmarshes which is travelling in Canada. It is presented in four parts; the natural marsh, the animals, the plants, and the marsh and man. The research and planning for this exhibit have revealed the extent of our knowledge of this valuable coastal community.

The museum has also co-operated with the provincial Department of Lands and Forests to prepare a Natural History of Nova Scotia. This resource subdivides the province into "theme regions" and provides descriptions of the topics and habitats found in these regions. It is hoped that this will provide a reference point for future natural history research and education in the province.

The importance of physiological response in determining the within-lake distribution of Juncus pelocarpus: a field experiment.

SCOTT D. WILSON and PAUL A. KEDDY
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The distribution of Juncus pelocarpus along a gradient of substrate organic content was measured in 6 central Ontario lakes. Its abundance changed significantly along the gradient ($\chi^2$=71.11, $p<.01$): J. pelocarpus occurred most frequently on substrates with low organic content. This distribution could result either from a physiological preference for these substrates or from competitive displacement from the highly organic end of the gradient. We attempted to distinguish between these mechanisms by growing ramets of J. pelocarpus in the absence of neighbours along the gradient on a lakeshore. Biomass accumulated over one growing season varied with position on the gradient ($F$=10.05, $p<.01$); maximum biomass was accumulated on substrate of low organic content. These results suggest that the within-lake distribution of J. pelocarpus reflects a physiological preference for substrates with low organic content.

A ten-year colonization study on an acid, metal-contaminated soil seeded to Canada Blue Grass (Poa compressa L.).

E.K. WINTERHALDER
Department of Biology, Laurentian University, Sudbury, Ontario P3E 2C6.

A sandy, barren valley-bottom near Coniston, Ontario, was limed, fertilized and seeded to Poa compressa in August, 1974. Colonization by Redtop (Agrostis gigantea Roth), together with a number of other herbaceous species, occurred almost immediately. Early colonists also included woody species such as Willows (Salix spp.), Trembling Aspen (Populus tremuloides Michx.) and White Birch Betula papyrifera Marsh.). During this period, the limiting macronutrient element appears to have shifted from phosphorus to nitrogen, with a concomitant increase in the importance of symbiotic nitrogen fixers such as Alsike Clover (Trifolium hybridum L.) and Sweet Fern (Comptonia peregrina (L.)Coult.). Interesting recent colonists include Rattlesnake Ferns (Botrychium spp.) and Ladies' Tresses (Spiranthes spp.).

Phyllotactic transitions and the direction of the ontogenetic helix in Abies balsamea

BEATA ZAGÓRSKA-MAREK
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The phyllotactic pattern, as indicated by the number of helices in the opposed parastichy pair, was determined in elongated shoots. Six different patterns were found, one was tetrajugy, which has not previously been reported. Typically the same pattern was repeated each year along a particular axis. Changes in pattern occurred between years except in one case where the change happened within one year. Pattern changes were not random, rather they occurred so as to minimize the change in the number of helices in the opposed parastichy pair. A reversal in the direction of the ontogenetic helix often accompanied a pattern change. The cause of pattern changes will be discussed.

Use of Understory Vegetation to Classify Forest Site Based on Spruce (Picea sp.) Productivity

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A method for discriminating and recognizing forest sites based on spruce (Picea sp.) productivity was developed for the New Brunswick Lowlands Ecoregion. Vegetation data were ordinated by detrended correspondence analysis, and a two-way indicator species key developed through a polythetic divisive technique. Vegetation types were refined by maximizing between-type differences in site productivity class and those edaphic variables that were found to be the best discriminators of productivity class based on discriminant analysis. The vegetation classificiation had a 72 percent success rate in predicting site productivity. Error analysis indicated that understory vegetation tended to overate site class 2 plots because of an inability to detect moisture deficit situations arising from root-restricting layers near the soil surface in moisture shedding locations, or excessive drainage resulting from coarse soil textures. These errors, therefore, could be compensated for by including some simple soil measures.

## Mid-Conference Field Excursions

(Tuesday, June 26)

(1) Botany of the Saint John River Valley
(2) A brief look at the Fredericton region botanical and touristic
(3) Kings Landing Historical Settlement
(4) Heritage walking tour of Fredericton
(5) Tours of laboratories and research stations: Canada Agriculture Research Station, Canada Forestry Service Research Laboratory and the University of New Brunswick

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