

THE CANADIAN BOTANICAL ASSOCIATION
BULLETIN
DE L'ASSOCIATION BOTANIQUE DU CANADA

August / août 1998

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Patron / Président d'honneur
His Excellency the Right Honourable / Son excellence le très honorable
Roméo Leblanc, P.C., C.C., C.M.M., C.D.
Governor General of Canada / Gouverneur général du Canada



On the inside / À l'intérieur

Page 34

Editors / La rédaction
CBA Section and Committee Chairs

**1998 CBA Annual Meeting /
Congrès annuel de l'ABC 1998**

Page 35

1998 Awards' Winners

Page 36

The George Lawson Medal

Page 37

The Mary E. Elliot Medal

Page 38

The Banquet Pictures

Page 40

Poorly Known Economic Plants of Canada

Page 43

Releasing Genetically Modified Plants:
Risk and Environmental Ethics

Page 45

Canadian Museum of Nature /
Musée canadien de la nature

Page 47

Book Reviews

Page 51

IUCN Medicinal Plant Specialist Group

Page 52

CBA Boards of Directors /
Bureau de direction de l'ABC
Future Meetings / Prochains congrès

Editor's comment / Le mot du rédacteur

The CBA Annual Meeting held at Saskatoon was a complete success. Dr. Vipen Sawhney and his team did a remarkable job in every area: scientific, social, and gastronomic... Congratulations! During the meeting, several changes were made to the CBA Board of Directors (see page 52). We should mention that Denis Barabé is now the CBA's new president. In this Bulletin, you will also find a list of all the recipients of CBA Awards. With the goal of initiating discussion about biotechnologies, the text of the poster presented by Katherine Barrett and Iain Taylor at the CBA Meeting is reproduced on page 43. Don't hesitate to send us your comments on this subject.

Le congrès annuel de l'ABC tenu à Saskatoon a connu un franc succès. Le Dr Vipen Sawhney et son équipe ont fait un travail remarquable, et ce, sur tous les plans : scientifique, social et gastronomique... Félicitations! Durant le congrès, quelques changements ont été apportés au Bureau de direction de l'ABC (voir page 52). Mentionnons que Denis Barabé est maintenant le nouveau président de l'ABC. Dans le présent bulletin, vous trouverez la liste de tous les récipiendaires des prix de l'ABC. Dans le but d'amorcer une discussion sur les biotechnologies, le texte du poster présenté au congrès de l'ABC par Katherine Barrett et Iain Taylor est reproduit à la page 43. N'hésitez pas à nous faire part de vos commentaires sur le sujet.



From left to right / de gauche à droite :
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Information for submitting texts /

Soumission des textes

Texts and illustrations for the Bulletin must be sent to the Editor preferably via the electronic mail (attached file) or on a diskette. Texts should be saved under "Word" and illustrations under the "TIFF" format.

If you have any question about text submission please contact the Editor.

Les textes et les illustrations pour le bulletin doivent de préférence être envoyés par courrier électronique (sous forme de fichier attaché) ou encore sur une disquette.

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CBA Bulletin / Bulletin de l'ABC

The CBA Bulletin is issued quarterly (February, May, August, November) and sent to all CBA members.

Le Bulletin de l'ABC paraît quatre fois par année (février, mai, août, novembre) et est envoyé à tous les membres de l'ABC.

To ensure continuous delivery of the Bulletin please notify the Treasurer promptly of any change of address.

Veuillez communiquer tout changement d'adresse au trésorier afin de recevoir tous les numéros du bulletin.

If you have any comments or suggestions about the Bulletin, please contact the Editor at the above address.

Si vous avez des commentaires ou suggestions concernant le bulletin, veuillez s'il-vous-plait contacter le rédacteur à l'adresse mentionnée plus haut.

Texts for the November issue must be received before October 1, 1998. Les textes pour le bulletin de novembre doivent arriver au plus tard le 1^{er} octobre 1998.

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1998 Awards' winners

(pictures on pages 37, 38 and 39)

George Lawson Medal

(for lifetime contribution to botany)

Dr. Kathleen Cole

Department of Botany
University of British Columbia
(see pages 36-37)

Mary E. Elliot Medal

(for meritorious service to CBA)

Dr. Christian Lacroix

Department of Biology
University of Prince Edward Island
(see page 37)

Lionel Cinq-Mars Award

(best student paper presented at the CBA Meeting)

Michelle A. Woodvine

Department of Botany
University of Toronto

Honorable mentions

D.X. Simon Choung

Department of Biological Sciences
University of Calgary

Michael P. Downs

Department of Plant Sciences
University of Western Ontario

Macoun Travel Awards

(travel bursaries for students presenting
an oral paper in the Lionel Cinq-Mars Competition)

Sean Abbott (Ph.D. student)

Department of Biological Sciences
University of Alberta

Joanne Golden (M.Sc. student)

Department of Biology
University of Lethbridge

J. S. Rowe Award

(best student paper in ecology)

Ricardo Scarosati

Department of Botany
University of British Columbia

Taylor A. Steeves Award

(best student paper in structure and development)

Gordon Lemon

Department of Botany
University of Guelph

Weresub Award

(best student paper in mycology)

Sean Abbott

Department of Biological Sciences
University of Alberta

Ag-West Biotech Best Student Poster Prize

(best student poster)

Susan Gilmer

Department of Biology
University of Saskatchewan

Best song

Iain Taylor

Department of Botany
University of British Columbia

Gene Engineering

(sung to the tune of 'Waltzing Matilda')

First performed, CBA Banquet, Saskatoon, June 1998

Chorus

Gene engineering, gene engineering,
Who'll come a-gene engineering with me?
Brassicas, pine trees, Round-Up-Ready soya beans,
Who'll come a-gene engineering with me?

Once a jolly botanist went out on a field trip
Strode across a landscape, plants to see.
Collected specimens, found a great diversity.
Who'll come a-gene engineering with me?
(Chorus)

Out in the countryside, flourishing and healthy,
Plants for medicine and food grew free.
Up jumped the weed types, fungi bad and ug-a-ly.
Who'll come a-gene engineering with me?
(Chorus)

Biocontroller steps up to the podium,
Insects and fungi in a bag held she
Worked out the life style and host specificity.
Who'll come a-gene engineering with me?
(Chorus)

Up jumped a chemist, backpack full of pesticides,
Round-Up, Paraquat, DDT
Just spray everything, get rid of all the nat'l stuff,
Who'll come a-gene engineering with me?
(Chorus)

Drug company scientist, walking through the boreal,
Show me the medicines you use said he
I'll patent ginseng, Echinacea, snake root,
Who'll come a-gene engineering with me?
(Chorus)

Gene jockey stallions brought herbicide resistance,
We'll solve your problems, you shall see
Arabidopsis mutants, regulated properly,
Who'll come a-jumping the genomes with me?
(Chorus)

Back came the botanist, checking the diversity,
Found the ecosystems changed did she
Genes had jumped, just as McClintock said they would,
Who'll come a-gene engineering with me?
(Chorus)

(Copyright 1998, Iain Taylor)

The George Lawson Medal to Dr. Kathleen Cole

The Canadian Botanical Association is presenting the George Lawson Medal to recognize a lifetime contribution to a botanist with an extraordinary academic career.

Dr. Kathleen M. Cole, born in Vancouver, did her B.A. in Biology and Mathematics. Her M.Sc. degree was on the genetics of *Drosophila*. Both diplomas were obtained from the University of British Columbia. She then decided to go the United States to do her Ph.D. She worked on *Datura stramonium* (Solanaceae), my second favorite plant, a wonderful system to study the cytogenetics of trisomics. After completing her Ph.D., Dr. Cole took up a position at the Department of Botany of the University of British Columbia as an instructor in 1952. She moved up the ranks and retired as Professor of Botany in 1987. Presently, Dr. Cole holds the position of Professor Emerita, and maintains a research lab.

During her career, she held a Killam Senior Fellowship, was Elected Fellow of the Linnean Society of London, was Editor of *Phycologia*, Journal of the International Phycological Society, and Chairperson of the NSERC Plant Biology Grant Selection Committee. She also held many more positions. In 1955 her first grant application to the NSERC, then the NRC, was to investigate male sterility in broccoli. She then decided to switch her research interest to the marine algae. I wonder why, there must be a good reason for that.

To have spent over 40 years at the University of British Columbia working on algae, to have published over 100 research papers and trained over 25 graduate students and post-doctorates, to be recognized internationally as an outstanding phycologist, is indeed a major contribution to the development of algal research in Canada. Dr. Cole has made significant contribution to the field of phycology as a researcher, as a teacher, and as an editor. She is internationally known and respected for her work in two distinct fields of algal biology: chromosomal cytology and electron microscopy.

Earlier in her phycological career, Dr. Cole worked primarily with brown algae. Dr. Cole is perhaps even better known for her work on the red algae, especially *Porphyra*, one of the most commercially important genera of red algae, and *Bangia*, a closely related genus. Her studies, alone and in collaboration with numerous colleagues and students, have greatly advanced our understanding of the biology of these important and endemic organisms. Dr. Kathleen Cole was amongst those who made the University of British Columbia a world-renowned center for the study of algae. She was an advisor and early influence on some of the most successful phycologists in the latter half of this century.

There was a nomination from one of her former students, and so many overwhelming supporting letters. I did not think I could cover all the wonderful things mentioned about her. So to summarize, I would like to quote a few statements

from those supporting letters:

- 1) "Always self effacing, Dr. Cole seldom added her name to the formative papers published by her students";
- 2) "Her original publications are uniformly of excellent quality, and she has been amazingly productive";
- 3) "One point that always stands out about Prof. Cole is her enthusiasm for her research and for the people that she works with. Her enthusiasm spills over to anyone who works with her";
- 4) Just one more from the President of the International Phycological Society, Carolyn Bird. "In my wide acquaintance with phycologists around the world, I have never heard anyone speak of her, with other than esteem and affection. She is truly one of Canada's great botanists".

So my dear friends, I am honoured to present this year's George Lawson Medal to Professor Kathleen Cole. Dr. Cole was unable to attend the meeting to receive this award in person. So I invite Sylvia Taylor to read the letter that Dr. Cole sent to Dr. Vipen Sawhney.

C.C. Chinnappa, Past-President

To the Canadian Botanical Association: an expression of appreciation from Kay Cole for the Lawson Award

My sincere thanks and appreciation to the Canadian Botanical Association for awarding me the George Lawson Medal. I am Greatly honoured to be included with the previous recipients of this award.

I was born in Vancouver and have lived in Canada most of my life. Following my Ph.D. studies in Plant Genetics with Dr. Albert F. Blakeslee in Massachusetts, I was happy to return to Canada and join the Botany Department at U.B.C. As you know, I taught and researched genetics and cytology until retirement from my official duties, and continue to conduct cytological research at U.B.C. in my post-retirement days.

Early in my career at U.B.C., I was encouraged by a colleague to turn my great enthusiasm for chromosomes and other cytological studies from higher plants to the marine algae that are so abundant on the coasts of the great Pacific Northwest. This proved to be most rewarding. I appreciate and am most grateful to all who have worked with and supported me, the graduate and undergraduate students, as well as the post-doctorates, many of whom are now my valued colleagues and friends.

We have kept up-to-date with all the new techniques and shared the excitement of our various discoveries. Speaking of discoveries, in "Cole's Chromosome World" as we called our lab so many years ago, I posted a statement by an anonymous

See Lawson Medal, page 37

The Mary E. Elliot Medal to Christian Lacroix

The Mary E. Elliot Award was created in 1978. This Award recognizes meritorious service to the Canadian Botanical Association by an individual member.

What can I say about this charming young man whom you all know. Christian Lacroix has a long history of involvement in the affairs of the Canadian Botanical Association, beginning in his graduate student days at the University of Guelph, where he obtained his Ph.D. degree in 1990. He assisted with the French translations for the CBA Bulletin. Then he acted as the Bulletin's Associate editor (French Section). He was a member of the CBA's Board of Directors from 1990-93 and then chaired the Structure and Development Section in 1991-94.

In 1993, he took on the onerous position of Treasurer, which he held until 1997. Four years of not only dealing with the day-to-day minor technicalities of fees and awards, but handling the association's investments and financial security in a responsible and creative fashion. If you look at the financial status of the CBA to day I must say, thank you Christian, for your keen interest.

In 1996, Christain chaired the organizing Committee for the Annual Meeting of the CBA/ABC, held at the University of Prince Edward Island. The organization of a national meeting at relatively small institution is a particularly daunting task, but Christian along with his colleagues met the challenge with hard work and good grace. That was a conference if you remember, which combined high academic and organizational standards, with laid-back, friendly maritime atmosphere.

In 1997, Christain chaired one of the symposium committees at the CBA/AIBS conference in Montreal. Quite apart from the energy and dynamism that Christian has injected into all of his activities with the CBA, he has somehow maintained a calm, friendly manner. And then last year he confessed: "I do not mind continuing as the treasurer, but I want some one to learn the job". So we have a new Treasurer now.

Christian we appreciate your contribution to the Canadian Botanical Association. Please accept the award.

C.C. Chinnappa, Past-President



The Mary E. Elliot Medal presented to Christian Lacroix by C.C. Chinnappa



The Lawson Medal to Kathleen Cole received by Sylvia Taylor from C.C. Chinnappa

Lawson Medal (continued from page 36)

intellectual which is particularly meaningful in our microscopic work. The statement is: "What we see depends mainly on what we look for!" Looking at our earlier data from a different aspect or with more modern techniques, we often find that significant discoveries emerge that were not noted originally. Lesson: don't throw away your data, no matter how old they may be.

I also want to express my thanks to the Department of Botany at U.B.C. The Heads of Department, currently Iain

Taylor, have always encouraged me and supported my research, even up to the present day. This has meant so much to me. I also acknowledge with much appreciation the continuous NSERC financial support which has made it possible for my post-doctorates, students and me to carry on our marine algae studies for so many years.

I shall treasure the George Lawson Award. Thank you again, Kay Cole.



Lionel Cinq-Mars Award

(best student oral paper at the CBA Meeting)

Michelle A. Woodvine

(Department of Botany, University of Toronto)

receiving her prize from Denis Barabé

Woodvine, M.A. & N.G. Dengler. Cellular correlates of leaf expansion in the heterophyllous freshwater buttercup, *Ranunculus flabellaris*.



Weresub Award

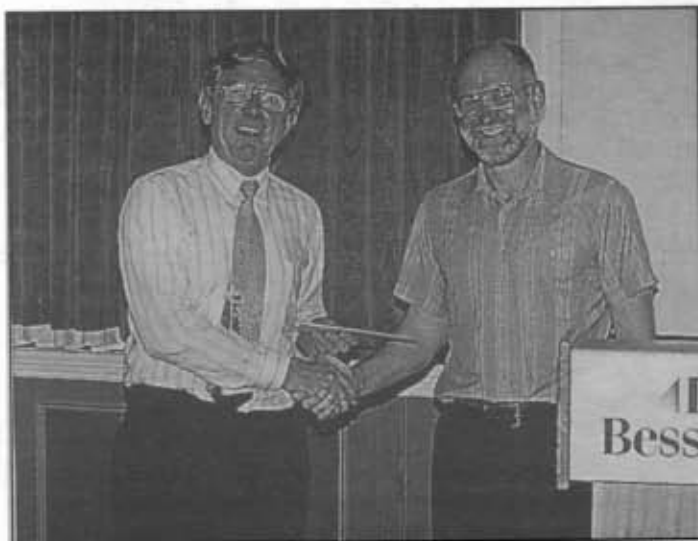
(best student paper in mycology)

Sean Abbott

(Department of Biological Sciences, University of Alberta)

receiving his award from Shannan Berch

Abbott, S.P. & R.S. Currah. 1997. The Helvellaceae: systematic revision and occurrence in northern and northwestern North America. *Mycotaxon* 62: 1-125.



J. S. Rowe Award

(best student paper in ecology)

Ricardo Scarosati

(Department of Botany, University of British Columbia)

Iain Taylor accepting Ricardo's Award from Ed Reekie

Scarosati, R. & R. E. DeWreede. 1996. Dynamics of the biomass-density relationship and frond biomass inequality for *Mazzaella cornucopiae* (Gigartinaceae, Rhodophyta): implications for the understanding of frond interactions. *Phycologia* 36: 506-516.



Taylor A. Steeves Award

(best student paper in structure and development)

Gordon Lemon

(Department of Botany, University of Guelph)

receiving his award from Taylor Steeves

Lemon, G.D. & U. Posluszny. 1997. Shoot morphology and organogenesis in the aquatic floating fern *Sylvania molesta* D.S. Mitchell, examined with the aid of the laser scanning confocal microscopy. *Int. J. Plant Science* 158(6): 693-703



Ag-West Biotech Best Student Poster Prize

(best student poster at the CBA Meeting)

Susan Gilmer

(Department of Biology, University of Saskatchewan)
receiving her prize from the President of Ag-West Biotech Inc.,
Peter McCann

Gilmor, S.G., P. Clay, T.H. Macrae & L. Fowke. Microtubule
arrays in conifer cells contains acetylated -tubulin.



Macoun Travel Award

(travel bursary for students presenting
an oral paper in the Lionel Cinq-Mars Competition)

Joanne Golden (M.Sc. student)

(Department of Biology, University of Lethbridge)
receiving her award from C.C. Chinnappa



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Sean Abbott (Ph.D. student)

(Department of Biological Sciences, University of Alberta)
receiving his award from C.C. Chinnappa



Best song

Iain Taylor

Department of Botany
University of British Columbia

Gene Engineering

(sung to the tune of 'Waltzing Matilda')
First performed, Canadian Botanical
Association Banquet, Saskatoon, June 1998

Poorly Known Economic Plants of Canada - 18. Witch Hazel, *Hamamelis virginiana* L.

E. Small and P.M. Catling, Eastern Cereal and Oilseed Research Centre, Agriculture and Agri-Food Canada, Saunders Bldg., Central Experimental Farm, Ottawa K1A 0C6

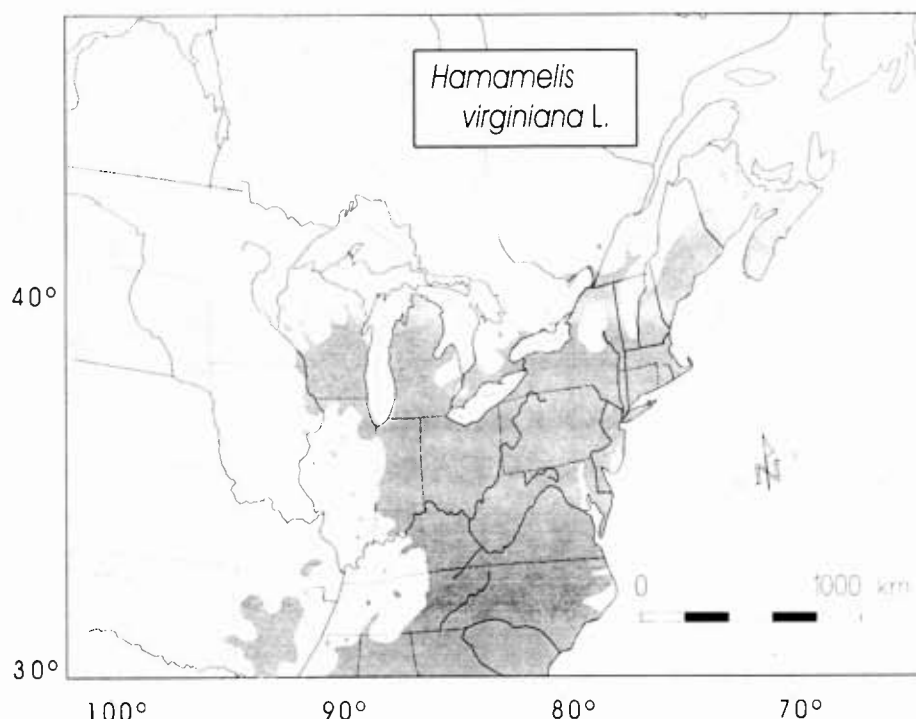
Common Names: Witch Hazel (also Witch-hazel, Witchhazel), Virginian Witch Hazel, Common Witch Hazel. French: hamamélis de Virginie, café du diable.

The genus *Hamamelis* consists of about six species of deciduous shrubs or small trees. *Hamamelis virginiana* extends from Minnesota, northern Michigan, southern Ontario, southern Quebec and southern Nova Scotia, southwards to Texas and central Florida. A number of varieties have been described from this extensive region based on characteristics of leaves, but their taxonomic status requires more study. The other North American species, *H. vernalis* Sarg. (Ozark Witch Hazel) occurs from southeastern Missouri through Arkansas to southeastern Oklahoma.

The genus *Hamamelis* exhibits two interesting biogeographical patterns: (1) the eastern Asian/eastern North American disjunctions from the Arcto-Tertiary Forest, which encircled the Northern Hemisphere 15-20 million years ago, like *Panax* (Ginseng) and *Hydrastis* (Goldenseal); (2) the disjunction of temperate eastern North American elements into the high elevation temperate regions of Mexico. The Mexican disjunctions are believed to be remnants of a more recent and continuous Pleistocene distribution.

Witch Hazel grows in dry to mesic woods of eastern deciduous forests, usually among mixed hardwoods. It is shade-tolerant and grows well as an understorey species, preferring deep, rich soils. Even shade-tolerant species often benefit from an increase in light, and Witch Hazel was found to respond to canopy gaps in a central Pennsylvanian oak forest by increasing sexual and vegetative reproduction. It may be found on hills or in stony places, rocky slopes, on the banks of streams, along ravines, trails and forest edges. In the western and southern areas of its range, it is distributed mostly in moist cool valleys and flats, northern and eastern slopes, coves, benches and ravines. In the northern area of its range, it occurs on drier and warmer sites of slopes and hilltops. The species appears to tolerate both acidic and alkaline substrates, but in Canada is mostly associated with sandy, slightly acid substrates.

Witch Hazel is a deciduous several-stemmed shrub or small tree, 1-5 (very rarely 10) m in height, with smooth, brown, thin, scaly bark and numerous long, flexible, forking, branches. The branches zigzag at the leaf nodes, and this has been interpreted as a way to separate the leaves to achieve maximum exposure to the limited sunlight under the canopies of taller trees. The distinctive hazel-like leaves (i.e. like those of *Corylus* or true hazel species) are wavy or scalloped on the sides, 5-15 cm long, and have an asymmetrical base. The species can spread to some extent by suckering, but reproduces mostly by seeds. It is often shallow-rooted. In well-grown specimens the trunk may achieve a diameter of 10 (very rarely 30) cm. The largest trees are found in the southern portion of the range. In the middle part of its range, Witch Hazel sometimes forms a solid understorey in second-growth and old-growth forests. In the northern part of its range, it is often found as scattered, small colonies.



temperatures drop, and unfurl when temperatures rise and pollinators are available. The flowers often survive several frosts. Witch Hazel produces a very attractive flush of flowers, which are conspicuous because most deciduous species have lost or are losing their foliage, and (at least in northern woods) virtually all other plants are not in flower, or are well past their peak flowering period. In the northern part of the range, flowering occurs from October to as late as early December, while in the South, blossoms may be present as late as March.

Staminodes in the flowers secrete small amounts of nectar, serving to attract pollinating insects. Because of the late season, cold often limits the availability of pollinators. Experiments have shown that Witch Hazel can self-pollinate effectively, so that it is not dependent on the unreliable pollinator pool. However, when the weather is favorable, a large variety of insects may be available to cross-pollinate the flowers, and Witch Hazel is one of the few woodland plants to serve nectar-foraging insects in late fall and early winter. The flowers are clearly adapted to pollination by a range of insect species. Although pollination occurs in the fall, fertilization is delayed until the following spring because of pollen and ovule dormancy.

The fruit ripens in the following summer, maturing into paired, 2-horned, fuzzy brown, woody capsules, 1-1.5 cm long, each generally producing a single oblong, hard seed (or sometimes two seeds). Ripe seeds are dispersed in late autumn, simultaneous with flowering. The seeds are disseminated by mechanical expulsion from the dehiscent capsule. Seeds may be shot to a distance of 10 m (claims of 15 m have been made, although in most cases less than 5 m is achieved), and this has given rise to the name "Snapping Hazel." An audible pop accompanies the explosive discharge. The seeds are black and shiny on the outside, white, oily, and farinaceous on the inside, and although quite small, they are edible like the related hazelnuts and filberts (*Corylus* species). Many animals have been reported to eat the fruits of Witch Hazel, including ruffed grouse, northern bobwhite, ring-necked pheasant, white-tailed deer, beaver, cottontail rabbit, and black bear. Birds are thought to have a limited role in dispersing the seeds. The seeds germinate the second year after dispersal. A study in Michigan revealed that successful seed production was irregular, with large numbers of seeds in the occasional good fruiting years related to satiation of host-specific beetles that eat the seeds.

There are a number of garden forms of Witch Hazel, although hybrids of the Asian species are more popular as ornamental cultivars. Unlike the northeastern North American Witch Hazel, the Asian species and the Ozark species are all late winter-flowering (February-March). They also have leaves that turn red or orange in the fall instead of yellow, and are consequently more often cultivated than our native species. Propagation by both seeds and cuttings is possible, but the seeds require dormancy and the cuttings require a few months under mist. Ornamental cultivars are propagated by grafting onto



Witch hazel is very unusual in that it flowers in late fall, often after the first frosts. Fragrant, yellow flowers in small axillary clusters appear as the foliage yellows, and the flowers persist after the leaves have fallen. Witch Hazel is the only tree in the woods of North America which has ripe fruit, flowers, and the following year's leaf buds on the branch at the same time. The flowers have four twisted, strap-like petals 1.5-2 cm long, which can curl up as if to protect the flower from the cold when the

seedling understock. Utilization of suckers is also a means of propagation. Species with a relatively strong tendency to sucker, such as *H. vernalis*, and races of *H. virginiana* that are more prone to suckering, are potentially useful in this regard.

Witch Hazel has often been described as "strange" and "mysterious," mostly for its unusual feature of flowering in the late fall. However, it also acquired a reputation for having mystical powers. The Menominee Indians (whose former range included northern Wisconsin and adjacent upper Michigan, through which runs the Menominee River) used Witch Hazel seeds as sacred beads in medicine ceremonies. The origin of the "witch" in Witch Hazel has been attributed to an Old English term for pliant branches (which are characteristic of the plant). Nevertheless, Witch Hazel is often associated with witchcraft, an apparent misunderstanding of how the name originated. Historical analysis has shown that the name Witch Hazel was likely originally applied to English elms with flexible Y-shaped forked branches that were used as the source of divining rods, and the name became transferred by colonists to *H. virginiana* which has similar branches. Divining rods were used to search for water and ores, especially by charlatans (recommended technique: find a branch with forks pointing north and south; twirl it between the fingers and thumbs of the two hands, and point the base of the Y downwards; find a location where the base is attracted by water or minerals, especially gold). Those who dowsed for water by this technique were called "water witches."

Witch Hazel is one of the most popular of medicinal plants, and has been much in demand for centuries. Poultices and infusions of the leaves and (to a much greater extent) the bark have long been used externally to treat wounds and bleeding, including every kind of abrasion, as well as menstrual and hemorrhoidal bleeding. This medical knowledge was first acquired by North American Indians, then by colonists, followed by Europeans. In early times, Witch Hazel was also employed to treat tumors and inflammations, especially of the eye, and as a liniment. Extracts of Witch Hazel were also used internally to treat diarrhea. Most of these usages have persisted to the present. About the middle of the 19th century, a product prepared by steam-distillation of the dormant twigs, to which alcohol was added, became extremely popular under the name "hamamelis water." This was intended for external treatment of various skin conditions, and is still marketed today. Alcoholic extracts are popular in Europe for treating varicose veins, and the effectiveness of these extracts in constricting veins has been demonstrated. Modern medicinal uses today also include treatment of inflammation of the gums and mucous membranes of the mouth. The most common present usage is in soothing skin lotions. Witch Hazel is employed in toilet water, aftershave lotions, mouth washes, skin cosmetics and the like, and ointments to treat sunburn, chapping, insect stings and bites. Long before such brands as "Obsession," "Passion" and "Old Spice," Witch Hazel was used as an aftershave. There is some indication of value for treating aging or wrinkling of skin, an application with

considerable market potential. As with most medicinal plants, usage in Europe considerably exceeds that in North America. Nevertheless, more than a dozen preparations with Witch Hazel are marketed in Canada.

The medicinal value of Witch Hazel appears primarily due to its astringency, which seems mostly related to the high tannin content of the plant. The leaves can contain up to 10% tannin, and the bark has up to 3%. Tannins are astringent because they fix proteins, and while this is not helpful to the proteins (which are denatured) it can be helpful to healing of broken or irritated skin by creating a protective covering or constricting the area of injured tissue that is exposed. The numerous personal care products containing Witch Hazel that are applied to the skin are presumably useful because of the pronounced styptic qualities of the plant. There is some evidence that not just tannins, but other astringent agents are present, and that flavonoids may also play a curative role. Hamamelis water is traditionally prepared as a steam extract (alcohol is subsequently added), and this has very little tannin content, but still considered to be astringent. *Corylus avellana* (hazel or hazelnut of Europe) is rarely used to adulterate Witch Hazel, and occasionally it is claimed that the two species have similar medicinal properties.

Witch Hazel herbal preparations are often sold in health food stores, for consumption as a bitter tea. Internal consumption should be done cautiously, as the plant has minor amounts of toxic chemicals (such as eugenol, acetaldehyde, and the carcinogen safrole), and an internal dose of as little as a gram can cause nausea, vomiting and constipation. In rare cases, liver damage has been attributed to consumption of Witch Hazel. External use should also be done cautiously, as a concentrated tincture can be sufficiently astringent as to disfigure skin, and contact dermatitis is possible in susceptible individuals. Despite some potential toxicity and misgivings by some that its medicinal value is limited, Witch Hazel has a long history of popularity.

A small amount of Witch Hazel is harvested from plants cultivated in Europe, but most of the world's supply is obtained from wild plants in the eastern United States. The state of Connecticut is a principal supplier of material for production of aqueous Witch Hazel which is made from twigs collected in autumn, winter and early spring. The Witch Hazel in cosmetic products comes from stripped leaves and bark collected in summer and early fall in the southern Appalachians. Witch Hazel production is a substantial industry. In some years more than a million gallons of hamamelis water has been produced. Given the growing popularity of medicinal plants, it is unlikely that Witch Hazel will become obsolete. To improve production efficiency, more information is needed on patterns of variation in chemical composition and the influences of ecological factors. With the growing trend to protect wild plants from overharvesting, cultivation of this medicinal crop appears to have considerable promise.

Releasing Genetically Modified Plants : RISK AND ENVIRONMENTAL ETHICS

by Katherine Barrett and Iain E.P. Taylor

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This text is a reproduction of a poster presented at the 1998 CBA Annual Meeting.

Please let the Editor know what you think about it. This could be a good way to start a discussion about plant biotechnologies

1. What Are Genetically Modified Plants?

Genetically modified plants (GMPs) may be defined as plants developed using recombinant DNA technology. This distinguishes GMPs from plants derived through traditional breeding practices. However, there are no simple guidelines for defining or categorizing the products of "biotechnology". This has significant consequences for risk assessment and policy-making.

For example, Agriculture and Agri-Food Canada (AAFC), the federal agency who drafted existing regulations for agriculture biotechnology, places GMPs in a broad category of "plants with novel traits". This category includes all plants that "demonstrate neither familiarity nor substantial equivalence to those present in a distinct, stable population of a cultivated species of seed in Canada" (AAFC Regulatory Directive 94-08, 1994). In 1997, Canadian Food Inspection Agency (CFIA) assumed responsibility for regulating GMPs.

Under the Canadian government's definition, GMPs require no special regulations or risk assessment processes. GMPs are assessed according to their similarity to existing plant species, and are regulated on the basis of the end product rather than the process by which they are developed. Is this an adequate approach?

2. What Is Here... And What May Be Coming

As of April 1998, thirty-four types of GMPs have been approved for unconfined environmental release in Canada. The crops types are listed below. The actual number of releases may be higher since CFIA does not list the varieties of each crop type (www.cfia-acia.agr.ca/english/food/pbo/okays.html).

Canola
Potato
Corn
Soy
Cotton
Flax
Wheat

Many more GMPs are being developed in Canada and the U.S. including: rice, cucumber, strawberry, grape, squash, alfalfa, raspberry, plum, watermelon, kiwi, carrot, wheat, pea, papaya, cranberry, endive, peanut, beet, sunflower, broccoli, onion, lettuce, cabbage, barley, sweet potato, asparagus (Rissler, J., Mellon, M. 1996. *The Ecological Risks of Engineered Crops*. MIT Press).

3. Environmental Hazards

Four specific types of GMP-related environmental hazards have been identified and discussed among scientists, policy-makers and members of the public.

3.1 Increased weediness or invasiveness: The GMP may become a pest in agricultural ecosystems or may invade wild ecosystems. Weedy species such as canola are of particular concern.

3.2 Spread of the transgene: The modified trait may be transferred to related wild or crop plants through introgression, as demonstrated by Mikkelsen *et al.* (1996. *Nature*. 380:31).

3.3 Evolution of pest resistance: Crops engineered for pest resistance, such as potatoes containing *Bacillus thuringiensis* (Bt) toxin genes, may select for populations of resistant insects. In 1996, fields of genetically modified cotton were significantly damaged by bollworms, despite the presence of a bollworm-resistant Bt gene. This suggests that resistance may develop rapidly in insect populations continuously exposed the Bt toxin (Nature Biotechnology. 1996. 14:1070).

3.4 Development of new viruses: Crops engineered with viral genes, such as virus resistant squash approved in the United States, remain susceptible to secondary infections by other viral types. Recombination between the two sources of viral genetic information may result in altered virulence or host ranges (Greene, R.E., Allison, R.F. 1994. *Science*. 263:1423-1425).

These specific hazards point to larger problems posed by the widespread use of GMPs: Perpetuating the use of agri-chemicals; loss of biodiversity through monocultures and long-term effects on ecosystems; increased monopoly of, and

continued on page 44

dependence upon, large corporations through patenting, licensing and contractual processes.

4. How To Assess the Risks?

Definitions of risk are not straight forward. The following terms highlight some of the difficulties in making decisions about the hazards of GMPs.

4.1 Hazard: A hazard refers to a specific undesirable outcome, or a specific event.

4.2 Risk: In traditional risk assessments, risk is the probability that a hazard will occur multiplied by the consequences of that event: risk = probability X consequences. Calculations of risk therefore require predictable, stable and well characterized systems.

4.3 Uncertainty: When the probability of a hazard is NOT known, the situation is "uncertain". Here, assessments more explicitly include individual biases such as familiarity with the hazard, whether the hazardous situation was accepted voluntarily, or whether the hazard signals greater danger.

4.4 Indeterminacy: When the probability AND the consequences are unknown, a situation is "indeterminate". Here, estimates are complicated by local conditions such as weather patterns, social and individual values, and cultural conventions (see Wynne, B. 1992. *Global Environment Change*. 2:111-127).

Arguably, the hazards of GMPs are indeterminate. How, then, should decisions be made?

5. Making Scientific and Ethical Decisions

The complexity of risk outlined above suggests that the environmental hazards of GMPs are not strictly a scientific issue and cannot be resolved on the basis of "sound science" alone.

Scientific methods cannot adequately predict probability or consequences. Therefore, solutions must be social as well as technical, i.e. the ethical issues inherent in scientific practice must be actively and openly addressed.

These issues include:

Authority: Whose voice counts? Who should be included in decision-making processes? People with direct experience and an inherent interest in growing, choosing and eating food can make a valuable contribution to decisions. This means, for example, that farmers and members of the general public can, and should, provide an informed perspective in an open and transparent decision-making process.

Accountability: Should GMPs continue to be released until the hazards are "proven" (possibly through an ecological or health disaster), or should release of GMPs be restricted in the face of unknown, indeterminate effects? Where does the burden of proof lie? Who should accept responsibility for the decisions and for the consequences?

6. Alternatives

Alternative approaches to responsible environmental decision-making are outlined below. Application of these principles to GMPs could have profound repercussions for the environment, human and non-human health, and social justice.

6.1 The Precautionary Principle states that an activity should not be pursued if there is reasonable threat of harm, even if there is no "scientific proof" of cause and effect relationships. Adopted by many international declarations on the environment, the Precautionary Principle aims to anticipate and prevent harm, and is an alternative to decisions based on cost- or risk-benefit trade offs.

6.2 Consensus conferences have been used extensively in Europe to reach decisions on environmental, health and technology issues. Conferences are similar to public trials where a jury of citizens present questions to a panel of academic, government, non-government and industry representatives. The jury then attempts to reach consensus on specific issues and drafts a report. A consensus conference on plant biotechnology was held in Britain in 1994.

6.3 Community-based research addresses questions of public interest through direct collaboration between universities and citizens' groups. For example, Dutch "science shops" began in 1970's and have since spread to universities around the world. Through science shops, communities present environmental concerns to university science departments. If possible, a research project to address the concern is undertaken as part of an existing research program and tangible results are brought back to the community. A network of community-based research is currently being established in the United States through the Loka Institute (www.loka.org). In Canada, the Humanities and Social Sciences Federation has recently approved a Community Research and Information Crossroads (CRICs) program and will create eight university-community links in 1999-2000 (www.hssff.ca).



Looking Toward a Better Natural History Museum

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Last fall, the Canadian Museum of Nature (CMN) began a strategic planning process with the goal of defining the appropriate role of a national museum of the natural sciences. Because we share with other museums, universities and scientific agencies a fundamental concern about our ability to address the crisis in systematics and in biodiversity from a reduced resource base, we wanted to consult with other interested parties in the process of determining CMN's role. We were very pleased to receive the perspectives and advice of Dr. C. C. Chinnappa and other members of the CBA at our consultation sessions across Canada. Jerry Fitzgerald also had the opportunity to meet with the CBA executive at your annual meeting in Saskatoon. These very productive meetings laid the ground-work for us to work more closely together in the future.

An important topic is to establish means to make collections and information accessible to the community. Since May 1997 when the move into our new facility, the Natural Heritage Building, was complete, the CMN has been processing specimen loans and information requests and the collections are open to researchers who wish to visit.

The CMN is undertaking to establish a collection development plan. While the CMN has a base of research expertise for many of its collections, we will rely on others for advice on how the remaining collections should be developed for the greatest value to Canada. Therefore, for this endeavour to be successful, we will count on constructive working relationships with professional bodies, like the CBA. As part of this, we should develop a cooperative arrangement to evaluate orphaned or new collections, and determine the most appropriate actions in caring for them.

There have been many changes to the CMN in the past several years, not the least of which has been the consolidation of all of the museum's collections into one magnificent, new building in Aylmer, within the National Capital Region. All of the collections now have optimal conditions for their care. The facility also houses our research laboratories. This initiative was created through an agreement with a private developer, did not

require new government appropriations, and dramatically improved the working conditions of our 160 staff: some educators still work in our established display facility, the Victoria Memorial Museum Building, in downtown Ottawa.

The CMN has been working with the National Sciences and Engineering Research Council of Canada (NSERC), some provincial museums and other organizations in pursuing an opportunity to establish a partnership for Systematics Research Graduate Supplements (SRGS) similar to the one between NSERC and the National Forest Service. The purpose of the SRGS is to promote graduate research in systematics in Canada; to encourage and support graduate students to carry out all, or part, of their research at centers of excellence in systematic research; and to maintain and strengthen the base of expertise for systematics research in Canada. We expect to have this programme in place for the year 1999-2000. The SRGS will provide financial support to high-caliber students working towards a master's or doctoral degree in systematics. There will be a maximum of 10 supplements at any one time. Each supplement will be \$5000 per year (provided by the center), in addition to the base NSERC postgraduate supplement.

For a graduate student to be eligible for SRGS they must be studying or planning to study in a university faculty where they are/will be working on a research project directly related to systematics, a faculty or research scientist from one of the centers must be on their supervisory committee and they must carry out all or part of their research in conjunction with one of the centers. This list is still being finalized but to date the Royal British Columbia Museum, Alberta Provincial Museum, Lyman Museum (McGill, St. Anne de Bellevue), Nova Scotia Provincial Museum, Environment Canada (St. Lawrence laboratory, Montreal), Eastern Cereal and Oilseed Research Center (AAFC, Ottawa) and the Canadian Museum of Nature have expressed interest. For additional information on how your organization can be included as a partner, please contact Mark Graham.

This is but a brief introduction to some of the work in progress. In future editions of the newsletter we hope to provide a more in-depth report on research activities, our collections and how researchers can utilize our facilities. Information about research, collections and public program activities at the CMN is available to you from our web site, <http://www.nature.ca>.

Vers un meilleur musée d'histoire naturelle

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L'automne dernier, le Musée canadien de la nature (MCN) a entrepris un processus de planification stratégique dans le but de définir le rôle que devrait jouer un musée national de sciences naturelles. Comme nous partageons avec d'autres musées ainsi que des universités et des organismes scientifiques le souci fondamental de savoir si nous pouvons, avec des ressources de plus en plus rares, faire face à la crise actuelle qui touche la systématique et la biodiversité, nous avons voulu consulter d'autres parties intéressées dans le cadre de ce processus de définition du rôle du MCN. Nous avons été heureux de connaître les points de vue et de recevoir les conseils de M. C.C. Chinnappa et des représentants de l'Association botanique du Canada (ABC) qui ont participé à nos séances de consultation à travers le Canada. Jerry Fitzgerald a ensuite eu le plaisir de rencontrer les membres de l'exécutif de l'ABC à leur réunion annuelle à Saskatoon. Ces réunions très productives ont confirmé notre volonté de travailler en étroite collaboration à l'avenir.

Trouver des moyens de rendre les collections et l'information accessibles à la communauté est un important sujet de préoccupation. Depuis mai 1997, date d'achèvement de son déménagement au nouvel édifice du patrimoine national, le MCN a recommencé à traiter des prêts de spécimens, à répondre aux demandes d'information et à recevoir les chercheurs venus visiter ses collections.

Le MCN a entrepris de formuler son plan de développement des collections. Le MCN compte déjà ses propres experts sur un bon nombre de collections, mais il fera aussi appel à d'autres pour voir comment les autres collections doivent être enrichies de manière à ce que le Canada en retire le meilleur avantage possible. C'est pourquoi, si l'on veut que ce projet réussisse, nous compterons sur la collaboration des organismes professionnels comme l'ABC. Dans ce cadre, nous devons trouver une formule de collaboration pour évaluer les collections abandonnées et les nouvelles collections, et pour déterminer quelles formes d'entretien conviennent le mieux à chacune.

Ces dernières années, le MCN a subi de nombreux changements, l'un des plus marquants s'étant traduit par le regroupement des collections nationales d'histoire naturelle du Canada dans un nouveau et magnifique édifice à Aylmer, dans la région de la capitale nationale. Toutes nos collections se retrouvent ainsi sous un même toit, dans des conditions optimales pour leur préservation. Le nouvel édifice abrite également les laboratoires de recherche du MCN. Ce projet de regroupement a été réalisé en coopération avec un promoteur privé, n'a pas nécessité de crédits gouvernementaux supplémentaires et a grandement amélioré les conditions de travail des 160 membres

de notre personnel. Certains éducateurs travaillent encore à notre centre d'exposition, l'édifice commémoratif Victoria, au centre-ville d'Ottawa.

Le MCN a collaboré avec le Conseil de recherches en sciences naturelles et en génie du Canada (CRSNG) pour établir un partenariat visant à offrir des subsides aux diplômés menant des recherches en systématique (SDRS), ce partenariat étant similaire à celui qu'entretiennent le CRSNG et le Service national des forêts. Les SDRS ont pour objet d'encourager les diplômés à mener des recherches en systématique au Canada, à mener la totalité ou une partie de ces recherches dans des centres d'excellence en systématique et à maintenir et renforcer le noyau d'experts en recherche sur la systématique au Canada. Nous espérons mettre ce programme en oeuvre pour l'année financière 1999-2000.

Les SDRS fourniront un appui financier à des étudiants de haut calibre qui préparent une maîtrise ou un doctorat en systématique. Le nombre maximum de subsides offerts en même temps sera de dix. Chaque subside sera de 5 000 \$ par année (fournis par le centre) en plus du subside déjà versé aux diplômés par le CRSNG.

Pour être admissible aux SDRS, un diplômé devra étudier (ou prévoir s'inscrire) dans une faculté universitaire et y mener des recherches directement reliées à la systématique. De plus, l'étudiant devra compter, parmi son comité de supervision, un chercheur de l'un des centres, et il devra mener la totalité ou une partie de ses recherches en collaboration avec l'un des centres. La liste suivante reste à compléter, mais l'on compte déjà, parmi les institutions ayant manifesté leur intérêt, le Musée royal de la Colombie-Britannique, le Musée provincial de l'Alberta, le Musée Lyman (McGill, Sainte-Anne-de-Bellevue), le Musée provincial de la Nouvelle-Écosse, Environnement Canada (Laboratoire Saint-Laurent de Montréal), le Centre de recherche de l'Est sur les céréales et les graines oléagineuses (AAC, Ottawa) et le Musée canadien de la nature. Pour plus d'information sur la manière dont votre organisation peut devenir l'un de nos partenaires, veuillez communiquer avec Mark Graham.

Ce qui précède ne constitue qu'une brève introduction à un projet de collaboration en cours; nous espérons pouvoir, dans les prochains numéros du bulletin, rendre compte plus en détail de nos activités de recherche et de gestion des collections, et des utilisations possibles de nos installations par les chercheurs.

Pour plus de renseignements sur les activités de recherche, les collections et les programmes publics du MCN, veuillez consulter notre site Web, <http://www.nature.ca>.

**Flora of Great Britain and Ireland.
Volume 5: Butomaceae – Orchidaceae.**

by Peter Sell and Gina Murrell
Cambridge University Press
Cambridge, 1996.

(US \$100,00)

The last issue of this Bulletin contained a review of Clive Stace's *New Flora of the British Isles, Second Edition* (see *CBA/ABC Bulletin* 31(2): 30, 1998). Both it and this book are published by Cambridge University Press and the immediate questions are: how do these Floras differ and is there a place for both?

It should be said at the outset that either the authors of this Flora or its publishers are guilty of some slight misrepresentation in the title they have chosen. In so far as there is a difference between "the British Isles" and "Great Britain and Ireland", it is that the Channel Islands and the Isle of Man, while included in the British Isles, should be excluded from this work, in that they are neither part of the United Kingdom of Great Britain and Northern Ireland nor of the Republic of Ireland – but in fact the two books cover **exactly** the same geographical area! So what is the difference between the two Floras?

This is made clear by Peter Sell in his Preface to the Flora, in which he refers to an attempt in the 1970's to prepare a "critical Flora" of the British Isles that failed through lack of funding. He goes on to say "Stace's Flora is to my mind an excellent field guide, which it would be difficult to better, but it does not give the detailed descriptions which are needed to confirm the identification of a plant which is new to you." The aim of this Flora is to give "a full description of all the species in Stace's Flora and to add all the apomicts and many of the infraspecific variants".

So what does this mean in practice? Well, most obviously, the size of the publication: the two publications use a similar font, but with a larger format (25 x 17.5 cm), Sell and Murrell's volume provides about 2 times the space devoted to the monocotyledonous families in the second edition of Stace's Flora. This extra space is utilized primarily for clear, intelligible, yet detailed descriptions. Undoubtedly this is the hallmark of the work and the feature that most distinguishes it from Stace's Flora.

Surprisingly, the taxonomic treatments in the two works are extraordinarily similar, and where there are differences at the species or subspecies level, this is often due to additional taxa in the more recently published second edition of Stace's Flora, as, for example, the New Zealand sedge, *Carex buechananii*, self-sowing and spreading near Glasgow, which, along with the subspecific treatment of *C. flava*, appears to represent the only significant difference in the two treatments of the 74/75 species

of sedge recognized in the British Isles – numerically, the largest genus in this volume.

There is, however, one clear taxonomic difference: Stace's Flora does not recognize any taxa below the rank of subspecies, whereas Sell and Murrell do include varieties, forms, and apparently even cultivars, although this reviewer did not discern any in the current volume. But those who expect (or fear) an Ascherson & Graebner-style Flora (*Synopsis der mitteleuropäischen Flora*. Leipzig. 12 vols. 1896-1939, incomplete) enumerating all the infraspecific epithets ever applied to the plants of the British Isles, will be disappointed. Sell & Murrell use infrasubspecific ranks sparingly, and, at least in this volume dealing with the monocotyledonous families, they are few and far-between. Rather unusually, the authors do describe their usage of infraspecific ranks, saying: "Infraspecific variation is usually recorded by the recognition of subspecies, varieties, formas [sic] and cultivars. These taxa differ chiefly in ecology and distribution. A **forma** is a plant with a one or two gene difference which occurs with one or more other forms in a mixed population for most or all of its range. A **variety** is when one of these formas [sic] become more or less dominant in a particular ecological area, i.e. an *ecotype*. A **subspecies** is when one of these formas [sic] becomes dominant in a geographical area, i.e. a *race*. A **cultivar** is a forma which is selected by horticulturalists and perpetuated, usually vegetatively." Even if this description is not one that would be universally accepted, it is good to see such an explicit account of the philosophy behind the taxonomic treatment.

In addition to more extensive infraspecific treatments, the authors' stated intention was "to add all the apomicts". It is perhaps in forthcoming volumes dealing with the Rosaceae and Asteraceae, that we shall see the full impact of this, but the effect in this volume is minimal. Indeed there is no evident difference between Stace's Flora and this one in the treatment of the, at least partially, apomictic genus *Poa*.

In summary, whereas Stace's Flora is very much a "Student's Flora" (or "Manual" in the North American tradition), this is a book for the Herbarium and Library, and one which has value not just in the British Isles, but throughout the North Temperate region. It is a most attractive book to use and one that I strongly commend to Canadian libraries with interests in plant biodiversity.

John McNeill, Royal Ontario Museum, Toronto.



**Flora of the Russian Arctic.
Volume 1: Polypodiaceae – Gramineae.**

by A.I. Tolmachev

English Edition, edited by J.G. Packer

University of Alberta Press

Edmonton, 1995

(Cdn \$ 65,00)

Whereas European Floras have their greatest value to Canadian botanists for their treatments of wide-ranging North Temperate species and of plants introduced to North America from Europe, here is a Flora in English of Canada's relatively near neighbour across Alaska and the Bering Strait. It is, therefore, of great interest and value to Canadians in assessing the variation patterns in our native Arctic species where these extend westward into Asia, as so many do.

Although Hultén's *Flora of Alaska and neighboring territories* (Stanford, 1968) is extremely helpful in this regard, the detailed information on taxonomy and distribution presented in the 10-volume *Arkticheskaya Flora SSSR*, published in Russian (in 12 parts – two of the "volumes" were in two parts) between 1960 and 1987, reflects a detailed knowledge of this region by Russian botanists that not even Hultén could match. Although *Arkticheskaya Flora SSSR* has distribution maps and a clear lay-out of accepted names and synonyms, it has remained in large part a closed book to those many Canadian botanists who do not read Russian readily.

A start towards rectifying this has now been made in the publication, under the editorship of Dr. John Packer (University of Alberta), of the first volume of an English translation by Dr. Graham Griffiths, also of the University of Alberta. This first volume of the English translation represents volumes 1 & 2 of the original work and covers the ferns and fern-allies, the gymnosperms, the pondweeds and other small aquatic families, and the grasses, representing coverage up to the first few families of monocotyledons in the Englerian system. The remainder of the monocotyledons were in volumes 3 & 4 of the original work and will make up the second volume of the English translation.

Whereas the Russian Flora was published in paper back in a rather narrow 25 x 16.5 cm format, the English translation appears as an attractive hard-bound volume in a wide 25 x 20.5 cm format. As a result the maps, that were frequently printed in the Russian version at 90° to the text, are presented in the English translation across the page, greatly facilitating their use. Although this reviewer is not competent to judge the faithfulness of the translation to the original text, careful perusal of the volume confirms that the translator has fulfilled his aim of providing a strict translation and trying "to preserve the flavour of the original edition". This does mean, for example, that where taxa in the original edition were designated as "sp. nova" or

"comb. nova", these appellations are maintained in the English translation. And, of course, although this English version was published just in 1995, the taxonomic judgements that it presents are those of 1960 and 1964, when the two original Russian volumes were published. Despite this time lapse, the taxonomic introduction to genera such as *Poa* has a surprisingly modern tone!

The English editor and translator and the University of Alberta Press are to be congratulated on a very fine start to this project and we look forward to the publication of all six volumes projected for the translation. The support of the Natural Sciences and Engineering Research Council of Canada (NSERC) through a publication grant shows an excellent appreciation of the importance of this work in the understanding of Canadian biodiversity.

John McNeill, Royal Ontario Museum, Toronto.

**Plants of British Columbia. Scientific and
Common Names of Vascular Plants,
Bryophytes, and Lichens.**

by Hong Qian and Karel Klinka.

University of British Columbia Press

Vancouver, 1998.

(Cdn \$65,00)

This book intends to be an update of the lists of native and naturalized plants (vascular plants and bryophytes) and lichens published in British Columbia (e.g. Taylor and MacBryde 1977) with the aim of standardizing the nomenclature and correcting misapplied names. It uses as standards Kartesz (1994) for vascular plants, Anderson (1990), Anderson et al. (1990) and Stotler and Crandall-Stotler (1997) for bryophytes, and Esslinger and Egan (1995) for the lichens. At the outset, the authors acknowledge that any such compilation is bound to be incomplete, considering the size of the province and of its flora, and the extent of our knowledge of the latter. Nevertheless, the extensive review of the literature makes this the most up-to-date published checklist of the province.

In a brief introduction, the authors provide instructions on how to use the book and a table of statistics about the flora of British Columbia, as given in their list: 2105 vascular plant, 955 bryophyte, and 1289 lichen species. The book is divided into three sections. Part I includes the list of scientific names arranged alphabetically by family. The taxonomic order is Vascular Plants, Bryophytes and Lichens. Each name is followed by a unique code and a single vernacular name. A code or acronym is useful particularly for databasing purposes. Under

Book reviews

the scientific name, synonyms pertinent to B.C. are listed; the latter are cross-referenced within the section itself. Alien taxa are distinguished from native ones by an asterisk. Part II is an alphabetical list of all taxa irrespective of the major group to which they belong, including synonyms but excluding common names. Part III is an alphabetical list of vernacular names with the accepted scientific name. An appendix of 1090 excluded names is provided. The book is attractively made, printed on acid-free paper and lightweight considering the number of pages. The format is relatively easy to use.

Our review concerns particularly the vascular plants, our area of expertise, but we assume that our comments would apply throughout. Currently, for the vascular plants, the choice of Kartesz (1994) as a standard appears unescapable, but one should be aware of the numerous shortcomings of this list, which does not always represent current thinking. The authors state that they departed occasionally from their standards when later publications occurred, such as in the case of *Sinosenecio newcombei*, but there is no way for the reader to identify these instances. We do not understand, however, why major references such as Flora of North America volumes 2 and 3 were not taken into consideration, as is shown by the treatments of Lycopodiaceae or Betulaceae, for instance, which were treated by North American experts of the groups. Although the work presented appears to be exhaustive, we found that some taxa reported for B. C. are missing or relegated in the list of rejected mentions. One notable case is *Ammania robusta* of the Lythraceae, a potentially endangered species in Canada that is being reviewed by COSEWIC and for which data are available at the B. C. Conservation Data Center; yet the authors exclude this taxon from the province. What is the basis for such an exclusion? It would have been useful that the authors provide a reason for the exclusions in their Appendix, perhaps using a symbol to indicate misidentifications, etc. Another issue is that of the indigenous or introduced status of particular taxa. *Achillea millefolium* is a point in case: the authors place an asterisk in front of the species and subspecific names, indicating that these taxa are introduced; this is mistaken, since some of the subspecies (whatever the status chosen for them ultimately) are indigenous. Other such cases were encountered. The choice of a single common name to designate a taxon is useful in principle but appears problematic when the selection of the name is extracted automatically from a single reference, as was done here, and is not based on a thorough evaluation of merits.

The list will certainly prove useful as a reference in many institutions, notwithstanding the mistakes mentioned above. Some of these mistakes leave us with the impression that the list was not extensively and thoroughly reviewed before publication. Kartesz is preparing a major update of his list of vascular plants for the very near future in an electronic format that will provide provincial distribution data. Given this and the price of Cdn \$65.00 a copy, it would appear that the usefulness of this book will be short-lived, at least insofar as individual

buyers are concerned. With the spread of the Internet, the publication in book format of such large floristic lists will soon appear outmoded. Indeed, how can they compete with readily and continuously updatable databases?

Luc Brouillet and Stuart Hay, Herbar Marie-Victorin, Institut de recherche en biologie végétale, Université de Montréal.

Vegetation of Southern Africa

Edited by R.M. Cowling,

D.M. Richardson and S.M. Pierce

Cambridge University Press

Cambridge, 1997

(US \$225.00)

I have grown to approach multi-authored books with apprehension as they often present a collection of poorly integrated chapters, varying in style and approach. Here is a complete and delightful exception, the more surprising as it is vast – over 600 pages – with 48 contributing authors! The idea of the book had a dual origin in the mid 1970s, separate from but with similar objectives to the IBP programmes running in other parts of the world, various national initiatives for ecosystem research grew rapidly in Southern Africa and produced a group of dynamic young ecologists working in the several biomes of this region, one of the most varied, rich and fascinating in the world; this book brings together in a balanced, well integrated manner the results of that period of active research. And secondly, apart from the late Frank White's (1983) descriptive memoir accompanying the Vegetation Map of Africa (UNESCO) that has served so well those of us who have worked in Africa, no comprehensive treatment of the southern sector of the continent has appeared for twenty years. The editors assembled the principal authors at a workshop in 1993 and they seem to have cracked the whip to good effect – the result has minimal overlap, and flows evenly and coherently through the ambitious compass of its surveys.

In geographical scope the book covers the region occupied by Botswana, Lesotho, Namibia, South Africa and Swaziland, equal almost exactly to the combined areas of Quebec and Ontario. In content, it consists of three parts – the first setting out in detail the geological history, modern physiography, climate, flora and vegetational history; Part 2, the central element of the book, is the systematic description of the plant cover of the region, organised into seven biomes – desert, forest, fynbos, grassland, Nama-karoo, Savanna and Succulent karoo, with ample explanations of the rationale for this arrangement, including useful indications of equivalent biome types from the northern Hemisphere; and Part 3, almost a book in itself, cuts across the biome boundaries to explore eight key ecological

themes that will be of intense interest to ecologists everywhere, however unfamiliar they might be with the actual landscapes and ecosystems of Southern Africa. The themes are : plant form and function, herbivory, fire, species diversity at the regional scale, human use of plants, human impacts on vegetation, alien plant invasions, and conservation.

The central organisational scheme into biomes has many advantages, and perhaps the most important is that, using the classical Raunkiaer life form system introduced over 60 years ago, it provides units that are used increasingly at global scales as categories with predictive content related to ecological function rather than floristic composition. The biome approach is being used extensively by palaeoecologists as the basis for applying knowledge of past vegetation to predictions of possible results of climatic change.

The chapters conclude with comprehensive reference lists, including the most modern themes in ecological methods and theory, as well as the voluminous source literature on the pertinent investigations. Unlike many multi-author books, this one can be read sequentially with enormous profit and pleasure. (I confess, that as the book arrived on my desk a few weeks after fieldwork in the Cape Province of South Africa, I dived straight into the chapter on species diversity, and absorbed eagerly the analysis of the floristic facts of this, one of the most species-rich areas on earth). The major parts are carefully and helpfully introduced by the editors, with emphasis on the links and continuities between the parts. Each chapter is fully illustrated by clear figures and tables, and many black-and-white photographs of landscapes and communities.

A review of this book is appropriate in the Bulletin, though it deals with a distant region that might not yet be directly familiar to many Canadian botanists. However, as I have tried to indicate, the book has been so well edited and so imaginatively organised, it will bring enormous insight and interest to phytogeographers, ecologists and others of our community, and those responsible for university courses in a wide range of biological domains will find a rich repository of facts and ideas linked to the most up-to-date approaches in the relevant fields.

The timing and impact of this book are curiously, though of course not causally analogous to the recent political transformations in South Africa, and the editors note with regret that of the authors " none is black and only eight are women ", but add their hope that " the next volume... which will probably be needed in about 20 year time, will have a list of contributors more representative of southern Africa ". The publishers got it right in their blurb: " This impressive work is the first comprehensive account of the vegetation of southern Africa ".

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Plants and UV-B: Responses to Environmental Change.

Edited by P.J. Lumsden,

Cambridge University Press

Cambridge, 1997

[Soc. Exp. Biol., Seminar Ser. 64]

(\$US 105,00)

Plants and UV-B: Responses to Environmental Change is a comprehensive review of research involving aspects of plant responses to UV-B. Invited papers are divided into three major areas of research: physical aspects of the ozone layer and UV-B radiation, plant response to UV-B at the cellular level, and finally the responses of whole plants and communities to UV-B radiation.

The current general assumption is that over the next 30 years, stratospheric ozone will decline about 15% from current values, which will lead to a corresponding increase in UV-B of approximately 30%. Pyle investigates this assumption in the first chapter, making clear that there is insufficient information about the mechanisms of ozone reduction in some parts of the world and that future recovery cannot be accurately predicted. In the second chapter, Webb discusses the difficulties experienced in measuring UV-B radiation, such as atmospheric factors and instrumentation, and determining the nature of exposure of a target organism. Webb also discusses the implications of the absence of long term data bases for global UV-B. Holmes discusses action spectra and weighting functions, stressing that it is the amount of UVB that reaches the photoreceptive site that is important, not the radiation reaching the plant's exterior. This section provides an important context for the following two sections on plant responses induced by UV-B radiation.

Effects of UV-B on plants include direct and indirect responses. Direct effects include DNA damage and cellular membrane damage. Taylor *et al.* discuss plant protective mechanisms against DNA damage including DNA repair pathways, while Britt discusses the use of UV-B sensitive mutants to investigate the biochemical basis of UV-B induced growth inhibition. Britt shows that sensitive mutants can be used to distinguish between programmed response to environmental influences and response to generalized stress. The role of PSII photoinhibition in the depression of CO₂ assimilation induced by UV-B exposure of plant leaves is explored in the chapter by Baker *et al.* Mackerness *et al.* discuss the molecular aspects of UV-B radiation on photosynthesis and conclude that there is evidence of selective and specific regulation of gene expression (ie, Rubisco) by UV-B. The cellular processes of UV-B perception and signal transduction is presented in the chapter by Jenkins *et al.* This chapter is particularly concerned with the

Book reviews

production of protective flavonoid pigments. Bornman *et al.* explore this topic further by demonstrating the role that protective plant pigments play in the tolerance of plants to UV-B exposure.

The final section deals with effects at the whole plant and community level in several chapters which cover a broad variety of communities and ecosystems. UV-B effects on aquatic ecosystems are presented by Häder; the impact of UV-B on subarctic vegetation is explored by Bjorn *et al.* Moody *et al.* deal with the effects of elevated UV-B and CO₂ on heathland communities while McLeod & Newsham review UV-B effects on forest ecosystems. Rozema *et al.* investigate the effects on plants from agro- and natural ecosystems. Corlett *et al.* look at the important issue of whether the growth and yield of field crops are altered by enhanced UV-B radiation and show that the response of plants to increased UV-B might confer increased drought tolerance on affected plants.

The overall impression of this section is that increases in UV-B within the margin predicted for the near future will cause subtle changes to affected plants. These subtle effects, while not causing significant damage to individual plants, may lead to shifts in competitive balance because small advantages gained by a tolerant species may translate to larger gains at the community level. These issues are dealt with by Caldwell. In the final chapter, Paul discusses the impact of UV-B on plant-microbe interactions.

This book constitutes an excellent review of current knowledge in the area of the changing UV-B environment and plant responses. Most authors present a realistic picture of the field, emphasizing both important research achievements and deficiencies. This is an excellent source of information and further references on the subject of plants and UV-B.

Dawn Gordon, Department of Biology, University of New Brunswick, Fredericton.

IUCN Medicinal Plant Specialist Group

The Medicinal Plant Specialist Group (MPSG) of the World Conservation Union (IUCN) is a global voluntary network of approximately 50 individual scientists, field researchers, government officials, and conservation leaders whose work supports the conservation and sustainable use of medicinal plants. The MPSG was established in 1994 within the family of more than 100 specialist groups that make up the IUCN Species Survival Commission (SSC). The group was established in response to an increased concern about the impact of trade in medicinal plants on conservation and sustainable use of these species. Through a broad range of research and educational activities, the MPSG's mandate is to identify threats to medicinal plant species, and to promote conservation action.

The World Conservation Union (IUCN) is a global union of approximately 900 members drawn from States, government agencies, and non-governmental organizations (NGOs). The Union's mission is to influence, encourage, and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. The IUCN functions through a Global Secretariat based in Gland, Switzerland, and more than 40 regional and country offices throughout the world, including a Canadian office in Montreal. More than 8 500 individuals participate in the work of the IUCN as voluntary members of the Union's six expert Commissions, of which the largest is the Species Survival Commission (SSC).

The MPSG welcomes two new Canadian members: Prof. John T. Arnason, Department of Biology, University of Ottawa; and Dr. Ernie Small, Agriculture and Agri-Food Canada

(ECORC). As we build our network of individuals and institutions whose work includes medicinal plant conservation, we are looking for ways to support national and regional efforts in a global programme. We are currently developing a "Top 50" programme that would support local conservation research on global and regional priority species of medicinal plants.

Members of the MPSG are involved in proposals to and implementation of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), trade surveys of medicinal plants (in collaboration with the WWF/IUCN TRAFFIC network), and in independent research efforts on medicinal plant conservation. Many of these activities are reported in our newsletter, *Medicinal Plant Conservation*, which will soon be available on the internet through the IUCN/SSC website (<http://www.iucn.org/themes/ssc>).

Our *Medicinal Plant Conservation Bibliography* (U. Schippmann, 1997), is currently being updated for the internet, and our *Directory for Medicinal Plant Conservation* is now available on the internet as a searchable database: (<http://www.dainet.de/genres/mpc-dir>).

Dr. Danna J. Leaman

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