THE CANADIAN BOTANICAL ASSOCIATION

BULLETIN

DE L'ASSOCIATION BOTANIQUE DU CANADA

August / août 2001 34(3) Montréal

On the inside / À l'intérieur

President's Message

The past year has been a relatively uneventful one for the CBA President. Letters were written on behalf of CBA to NSERC, concerning plant systematics members in grant selection committes, and to the Smithsonian Instutution concerning changes in their research focus in tropical ecosystems. Letters written by the chair of the Conservation Committee were endorsed and sent to various parties in PE.I concerning proposed changes to a local National Park, and in Newfoundland, concerning a proposed incinerator and its possible effect on a rare lichen.

We had two excellent nominations for the Lawson Medal this year, both in the category of lifetime contributions to Canadian botany. I thank all members of the Awards Committee for their careful consideration of each nomination. The Lawson Medal was presented this year to Bryce Kendrick (page 32). The Mary E. Elliott Award was presented this year to Hughes Massicotte (page 32).

Nominations are needed for next year's Lawson and Elliott Awards. There is one Lawson nomination which will be carried over to next year for consideration. New nominations should be sent to me, if possible, by the end of January 2002. Requirements for submission of nominations for either the Lawson Medal or the Elliott Award will be found on the CBA website.

The highlight of the year, as it always is, was the Annual Meeting, held this year at Okanagan University College in Kelowna, BC. Everyone I have spoken to or have received comments from agreed that this was one of the most well organized and enjoyable Annual Meetings we have had. On behalf af all who attended, I want to thank Melanie Jones and all of the people on the local organizing committee for being such great hosts. I am glad, however, that I don't have to hike up that hill to the student residences any more (OUC students must be REALLY fit!!).

We look forward now to the 2002 Annual Meeting, which will be one of our periodic joint meetings with the Botanical Society of America. Also meeting at the same time will be the American Fern Society, American Society of Plant Taxonomists, and the Phycological Society of America. Both Jean and I attended the BSA Annual Meeting at Albuquerque, New Mexico, where we were brought up-to-date on preparations for the 2002 Meeting. The Meeting will be held at the Pyle Center on the campus of the University of Wisconsin, Madison, August 3-7, 2002. At our Annual Meeting in Kelowna the CBA Executive chose Jean Gerrath, University of Northern Iowa, as our "local" representative and Vice President. She has been active in committees of the BSA during the last few years and already knows many of the people with whom she will interact during the preparations for the 2002 meeting.

Continued on page 31

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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.
Les textes doivent être enregistrés sous « Word » et les illustrations sous le format « TIFF ».
N'hésitez pas à contacter le rédacteur pour toute information sur l'envoi de documents.

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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.

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To ensure continuous delivery of the Bulletin please notify the Treasurer promptly of any change of address.
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If you have any comments or suggetions 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 plaît contacter le rédacteur à l'adresse mentionnée plus haut.

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Texts for the November issue must be received before October 31, 2001. Les textes pour le bulletin de novembre doivent arriver au plus tard le 31 octobre 2001.

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President's Message (continued)

I visited Madison in August and located the Pyle Center at the northeast corner of the sprawling UW campus, near the lake. There is a student residence close by which may be available for accommodation and there are several nearby motels. There is a large parkade about three blocks away for anyone who wishes to stay in suburban motels. The student center is about a block away from the Pyle Center with food and pub facilities (I ate at the Ratskeller and found the food to be pretty good).

The huge University Library is just across the street from the Pyle Center. However, you will find a good selection of botanical books and journals in a branch library in the Botany Building, which is a bit of a hike from the Pyle Center. Anyone interested in historical research, especially into any relatives who may have lived in the United States, will find an immense store of information at the State Historical Society, which is across the square from the University Library. It contains complete sets of U.S. Federal Census microfilms and has a huge collection of newspapers on microfilm.

State Street near the University is a semi-pedestrian street, but is not blocked off. Buses and bicycles are allowed, along with vehicles which serve the various stores (watch out for the garbage trucks!). State Street has several ethnic eateries and there are also fast food places, pubs and stores there which serve the local students.

Madison itself is well supplied with restaurants for every taste. It is the state capital and the domed Capitol Building is very impressive, especially looking at it down State Street at night. According to Money Magazine, Madison is one of the best cities in the U.S. to live. I think we should enjoy our Annual Meeting at Madison and I look forward to meeting many of you there.

Joe Gerrath, President

Jennifer Shay Officer of the Order of Canada

Dr. Jennifer M. Shay, a long-time member of the CBA, was promoted from Member to Officer of the Order of Canada on November 18, 2000. Her citation reads:

'An ecologist of national and international distinction, she is committed to the protection and maintenance of our world ecosystem. Professor Emerita of Botany in the Faculty of Science, she also contributed to the design of the University's graduate program in Landscape Architecture. Appointed to many national advisory committees, she has been honoured for her contributions to environmental policy, for her ongoing research and for her efforts to improve our understanding of ecological and environmental issues.'

Jennifer may be best known by ecologists for her leading role in establishing the University of Manitoba Field Station at Delta Marsh as a research and teaching facility in 1966. The citation for her appointment as Member of the Order of Canada on November 17, 1988 reads:

'An internationally respected field scientist and wetlands expert, she was instrumental in the development of Manitoba's Delta Marsh from a run-down collection of sheds, barns and dilapidated cottages into one of the foremost research and teaching stations in Canada. She is deeply committed to the preservation of lands which will maintain our ecological heritage for enjoyment and research, to environmental education and the maintenance of a quality urban, rural and wilderness environment.'

In addition to her dedication to wetland ecology, Jennifer is known for her research on paleoethnobotany in the Western Mesara, Crete, and on the Northeastern Plains, as well as ecological studies on fire in mixed grass prairie and boreal forest.

Other awards include the Mary E. Elliott Award (CBA) in 1984 and the James Bernard Harkin Conservation Award (Canadian Parks and Wilderness Society) in 1992.

Keith Winterhalder, Laurentian University

Book Reviews

The following publications have not yet been spoken for. If you are willing to review one of these books please contact the Editor at the address indicated at the beginning of the bulletin (page 30). On request, the book you wish to review will be sent to you.

Les publications suivantes n'ont pas encore été réclamées. Si vous voulez faire la critique d'un de ces ouvrages, veuillez contacter le rédacteur du bulletin à l'adresse indiquée à la page 30.

Weeds of Canada and the Northern United States
by F. Royer and R. Dickinson
Lone Pine Publishing & The University of Alberta Press, 1999

Herb-CD Herbal Remedies CD
by T. Brendler, J. Grunwald and C. Janicke (Eds.)
Medpharm Scientific Publishers, 2001

Tibetan Medicinal Plants
by C. Kletter and M. Kriechbaum
Medpharm Scientific Publishers & CRC Press, 2001

Seagrass Ecology : An Introduction
by M.A. Hemmings and C.M. Duarte
Cambridge University Press, 2000

Biological Thermodynamics
by D.T. Haynie
Cambridge University Press, 2001

Wetland Ecology. Principles and Conservation
by P.A. Keddy
Cambridge University Press, 2000

The Ecology of Trees in the Tropical Rain Forest
by I.M. Turner
Cambridge University Press, 2001

A Dictionnary of Plant Pathology
by P. Holliday
Cambridge University Press, 2001

Spatial Patterns in Catchment Hydrology. Observation and Modeling
by R. Grayson and G. Bloschl
Cambridge University Press, 2001

The George Lawson Medal to Dr. Bryce Kendrick

The Lawson Medal is the most prestigious award given by the Canadian Botanical Association and is named in honour of George Lawson, regarded as Canada's first professional botanist. This year the Medal is given in recognition of cumulative, life-time contributions to Canadian botany by a senior researcher and teacher. This person would be a strong candidate for being called "Mr. Canadian Mycology", but he does have a name which should be familiar to everyone here. In his letter to me accepting the Medal, he wrote, regarding his name, that, "it is, as far as I am aware, unique among biologists" Indeed, there is only one Bryce Kendrick.

Bryce received his Ph.D. from the University of Liverpool in 1958 and then spent several years as NRC Postdoctoral Fellow and Research Scientist at the Plant Research Institute in Ottawa. In 1965 he joined the faculty at the University of Waterloo and remained there until his retirement in 1994, becoming Full Professor in 1971 and Associate Dean for Graduate Affairs in 1985. He is now Distinguished Professor Emeritus at Waterloo and was, until recently, an Adjunct Professor at the University of Victoria.

Although retired, he continues to teach Mycology, as a distance education course, using his universally admired text-book, The Fifth Kingdom, which is now available in a CD ROM Version. For this course, I am told that Bryce has constructed one of the largest Mycological websites: http://www.mycolog.com. Bryce was also very active in establishing the Southern Vancouver Island Mycological Society and has lead many fungal forays for this group, as well as serving terms as President and Newsletter Editor.

22 Graduate students have completed their degree research under his supervision and he has been author or coau-thor of some 217 publications, with more on the way [both students and publications]. During his long career, Bryce has received many academic awards and distinctions. In 1974 he received a U.K. Science Council Senior Visiting Scholarship. In 1979 he was awarded a Guggenheim Fellowship and was Distinguished Visiting Scholar at the University of Adelaide. In 1980 he received a Doctor of Science from Liverpool University and in 1981 he was elected Fellow of the Royal Society of Canada.

In 1990 and 1992 he was named Distinguished Research Fellow and Visiting Fellow, respectively, by the Foundation for Research Development, South Africa. In 1993 he was named Sir C.V. Raman Visiting Professor at the University of Madras. In 1995 the Mycological Society of America gave him their Distinguished Mycologist Award. In 1996 he was one of only 3 Canadians named Centenary Fellows by the British Mycological Society in recognition of their contributions to Mycology. And now, I am very pleased to ask Bryce Kendrick to come to the podium to receive his Lawson Medal.

Joe Gerrath, President

The Mary E. Elliot Medal to Dr. Hugues Massicotte

The Mary Elliott Service Award is given to a person for meritorious service to CBA. It is named in honour of the late Mary Elliott, who was a former Secretary, Vice-President, and President of the Association. This year's recipient of the Award has been a member of CBA since his student days. He has been active in the Structure and Development Section and has served several terms as a Director of the Association. He also received the Weresub Award for 1988.

However, this year's recipient is better known to you all for his skills as an auctioneer. He has been responsible during several previous Annual Meetings for adding to the Association's general revenue during the auctions held at the Annual Meeting. I refer, of course, to Hugues Massicotte, of the University of Northern British Columbia. Hugues was unable to be at Kelowna to accept his award. It will be accepted by Jen Catherall.

Joe Gerrath, President

The XVIIth International Congress on Sexual Plant Reproduction

The XVIIth International Congress on Sexual Plant Reproduction will be held at Maria Curie-Sklodowska University at Lublin, Poland, from July 9-13, 2002.

The theme of the congress is Sexual Plant Reproduction in Nature and Laboratory. The contact person is:

Dr. Ewa Szczuka
Department of Plant Anatomy and Cytology
Maria Curie-Sklodowska University
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Poland
E-mail: plantrep@biotop.umcs.lublin.pl

Vipen Sawhney, University of Saskatchewan

2001 Award Winners

John MacounTravel Burseries

(travel burseries for student presenting an oral paper in the Lionel Cinq-Mars Competition)

Stacey Lee Thompson

Department of Botany
University of British Columbia

Nicole Fenton

Department of Biology
University of New Brunswick

Lionel Cinq-Mars Award

(best student oral paper at the CBA Annual Meeting)

Stacey Lee Thompson

Department of Botany
University of British Columbia

Thompson, S.L., Dlugosch, K.M. & Whitton, J. Recurrent origins of apomixis in the genus *Townsendia* (Asteraceae).

Honourable Mentions

Cindy Ross

Department of Botany
University of Manitoba

Ross, C., Sumner, M.J. & Punter, D. The use of computer-assisted ploidy analysis to verify the triploid state of the endosperm and to determine the origin of the cap region within the fruit of dwarf mistletoe.

M. A. Fallu

Departement de Geographie, Université Laval, and
Departement of Biology, Okanagan University College

Fallu, F.A., Pienitz, R. & Walker, I.R. Using freshwater algae to reconstruct limnologic, lake-catchment and climatic change in two lakes from Quebec-Labrador.

Iain and Sylvia Taylor Award

(best student poster at the CBA Annual Meeting)

S. J. Robertson

Department of Forestry
University of Northern British Columbia

Robertson, S.J. & Massicotte, H.B. Ectomycorrhizal fungi associated with naturally regenerating black spruce (*Picea mariana*) seedlings in wetland and upland forests in central British Columbia.

Honourable Mention

Michael Rose

Department of Biology
Memorial University

Rose, M. & Hermanutz, L. Factors influencing non-native plant invasion in a boreal ecosystem.

J.S. Rowe Award

(best student paper in ecology)

Stéphanie Pellerin

Département d'aménagement
Universite Laval

Pellerin, S. & Lavoie, C. 2000. Peatland fragments of southern Quebec: recent evolution of their vegetation structure. Canadian Journal of Botany 78: 255-265.

L.K. Weresub Award

(best student paper in mycology)

Patricia Crane

Canadian Forestry Service
Edmonton

Crane, P., Hiratsuka, M. & J.A., Summerbell, R.C. & Currah, R. 1999. Reproductive biology and evidence for water dispersal of teliospores in *Chrysomyxa weirii*, a microcyclic spruce needle rust. Mycologia 92: 754-763.

Taylor A. Steeves Award

(best student paper in Structure & Development)

Gordon Lemon

Depertment of Botany
University of Guelph

Lemon, G. & Posluszny, U. 2000. Shoot development and evolution in *Pistia stratiotes* (Araceae). International Journal of Plant Science 161: 721-732.

A.E. Porsild Award

(best student paper in taxonomy and biogeography)

Felix Forest

(presently at Royal Botanic Gardens, Kew)
Institut de recherche en biologie végétale
Université de Montréal

Forest, F., & Bruneau, A. 2000. Phylogenetic analysis, organization and molecular evolution of the non-transcribed spacer of 5S ribosomal RNA genes in Corylus (Betulaceae). International Journal of Plant Science 161: 793-806.

Poorly Known Economic Plants of Canada - 30. Butternut (*Juglans cinerea*) and black walnut (*J. nigra*)

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

Latin Names

The name *Juglans* is derived from *Jovis glans*, meaning nut of Jupiter, the classical king of the gods, and an indication that the ancient Romans considered the nuts extremely tasty. The royal character of the principal Old World walnut, *J. regia* L., is also reflected in the epithet *regia*, meaning royal. *Ailantifolia*, the epithet of the Japanese walnut, is Latin for "walnut with leaves of an *Ailanthus*," i.e. like the very large pinnately compound leaves of *A. altissima* (Mill.) Swingle, the tree-of-heaven. *Juglans ailantifolia* is often known as *J. sieboldiana* Maxim. Its hearnut variety, *J. ailantifolia* var. *cordiformis* (Maxim.) Rehd. (sometimes referred to as *J. cordiformis* Maxim.) employs the epithet *cordiformis*, meaning "heart-shaped," for the shape of the nut and also the kernel. The principal taxa of interest here are the two native Canadian species, *J. cinerea* L. (*cinerea* is Latin for "ashes" and refers to the characteristic ash grey colour of the trunk and limbs), and *J. nigra* L. (*nigra*, black, for the dark appearance of the bark).

English Names

The word walnut has been said to come from the Old English *wealhhnutu*, literally "foreign nut" or "Gaul nut" (the Gauls or Welsh were considered foreigners) because the walnut was imported into England during the old Roman period, at which time it was indeed considered foreign. Another interpretation is that the name walnut comes from the drying of the nuts on top of English garden walls.

J. ailantifolia: Japanese walnut.

J. ailantifolia var. *cordiformis*: heartnut.

J. cinerea: butternut. The butternut is so named for its buttery, oily seeds; it is also called the oilnut. The name white walnut is also applied, a reference to its light-coloured bark.

J. nigra: black walnut, eastern black walnut.

J. regia: European walnut, English walnut, Persian walnut. *Juglans regia* is usually known as the English walnut in the New World, and as the Italian, French, or Chinese walnut in the Old World, all in spite of the fact that it appears to be Persian in origin.

French Names

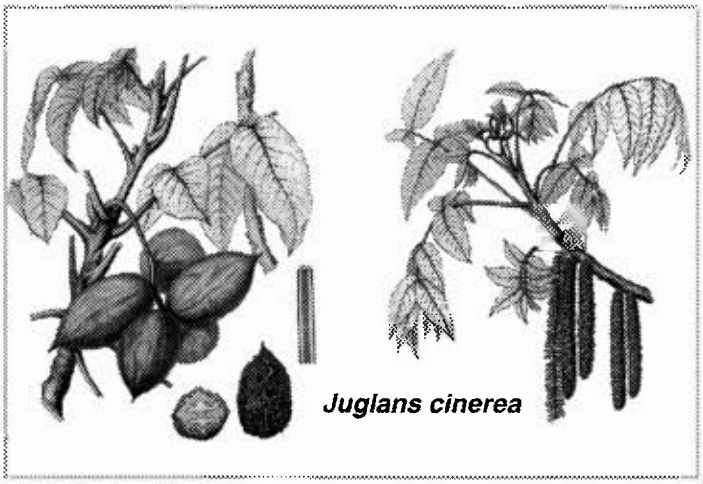
J. ailantifolia: noyer de Siebold

J. ailantifolia var. *cordiformis*: ?

J. cinerea: noyer cendré, noyer tendre

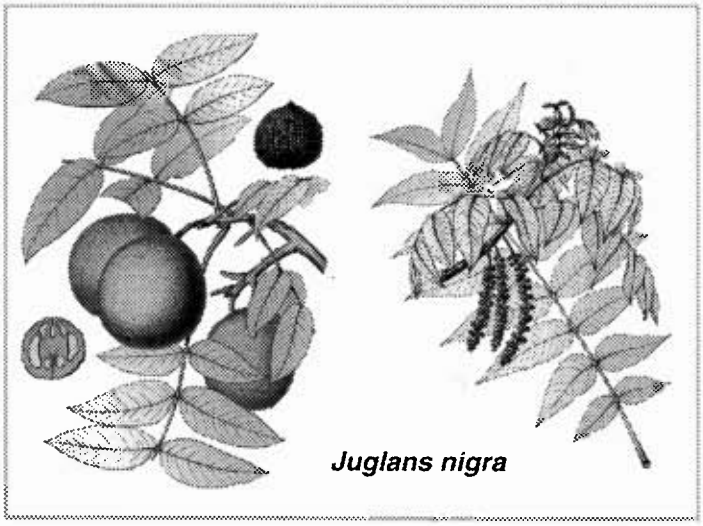
J. nigra: noyer noir, noyer noir d'Amérique

J. regia: noyer commun, noyer royal, noix royale



Morphology

Species of *Juglans* are rather open trees with scaly or ridged bark. The pinnately compound leaves have 5 to 23 leaflets, depending on species. Male and female flowers develop on the same trees, in the spring along with the foliage. The openness of the trees in the spring facilitates wind pollination. The male flowers occur on drooping catkins from twigs of the previous year. Female flowers occur in small erect clusters on new branches. The pith of the branches has alternating cavities and partitions, and this chambered pith serves to distinguish walnuts from the closely related hickories (*Carya*). The fruit is a large one-seeded indehiscent nut enclosed in a fleshy husk. The fleshy husk surrounding the nut separates from it in some species or wears off in others. The fruits of *J. cinerea* are ellipsoid where-



as those of *J. nigra* are spheroid except in var. *oblonga* (Marsh) Fern., an unusual variant with ellipsoidal fruits. Vegetative trees of black walnut and butternut can usually be distinguished by the tendency of the terminal leaflet of black walnut leaves to be much shorter than the adjacent leaflets, or missing. Black walnut can (rarely) live for 250 years, sometimes reaches 50 m in height, and may develop a trunk diameter of 2 m. Butternut sometimes reaches 35 m in height and has a trunk up to1 m in diameter, but seldom survives for more than 80 years. The Persian walnut has been known to reach a height of 60 m, a trunk diameter of 3 or more m, and 300 years of age, but about 15 m in height is typical, and trees hundreds of years old and with huge trunks are extremely rare. Japanese walnuts can reach 20 m and live for 100 years or more under favourable conditions. The heartnut varieties rarely grow taller than apple trees and have a lifespan of about 30 years. Black walnut produces a long, smooth trunk and a small rounded crown when growing in forests, but in the open the trunk forks much nearer the base, producing a few major ascending, spreading branches. Although young trees tolerate some shade, butternut is less able to compete with surrounding trees, grows in the open and develops the appearance of an open-grown tree: a short trunk that divides into a few ascending limbs with large, spreading branches.

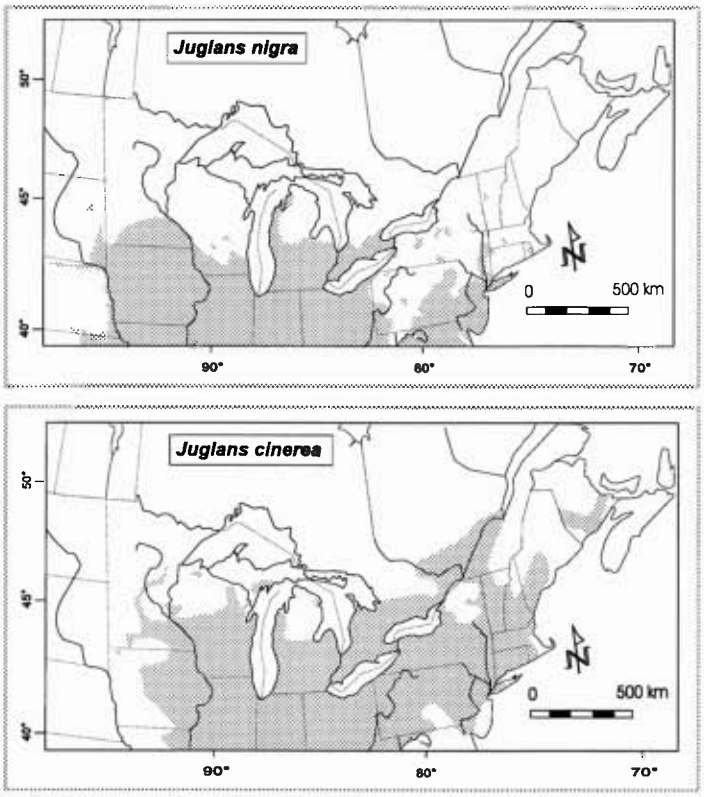
Key to taxa of *Juglans* encountered outside of cultivation in Canada

1a. Leaflets 5-9 and entire — ***J. regia***
1b. Leaflets 11-21 and toothed : 2
2a. Fruit with non-glandular hair (pubescent, not sticky); leaf scars without a pubescent band on upper edge; nut 4-celled at base — ***J. nigra***
2b. Fruit with glandular hair (pubescent and sticky); leaf scars with a pubescent band on upper edge; nut 2-celled at base : 3
3a. Fruits in a cluster of 2-5; leaflets with spreading teeth — ***J. cinerea***
3b. Fruits in groups of 5-25 on an elongated axis (raceme); leaflets with teeth directed forward : 4
4a. Nut prominently ridged — ***J. ailantifolia***
4b. Nut nearly smooth — ***J. ailantifolia*** var. ***cordiformis***

The above taxa not only occur outside of cultivation in Canada, but are also cultivated here. As well, the Chinese walnut (*J. mandshurica* Maxim.) may be grown in parts of southern Canada. It is similar to Japanese walnut, but the nuts are in a short racemes, while those of the former are in long, pendulous racemes.

Classification and Geography

The genus *Juglans* includes about 20 species of deciduous trees of North and South America and Eurasia. Some of the western North American, Mexican, and South American species of walnut are restricted to very small geographical areas.



Butternut and black walnut are the only species native to Canada, and are found in southern Canada as well as the eastern United States. Butternut occurs from southern New Brunswick west to South Dakota and south to northern Georgia and Tennessee. Black walnut occurs from Massachusetts west through southern Ontario to southern Wisconsin and south to eastern Texas and the Florida Panhandle. The two native Canadian species are sometimes planted in Canada outside of their natural range, and persist where established. Such is the case with butternut in Nova Scotia. Black walnut also grows well in Quebec City far to the north of its native Carolinian range in southwestern Ontario. Persian Walnut from the mountains of central Asia, and Japanese walnut and heartnut, both from Japan, are cultivated in Canada and may persist after cultivation or establish local populations in southern British Columbia and Ontario.

Ecology

Black walnut does best on deep, well-drained but moist, rich, nearly neutral soils. It thrives on alluvial soils or bottomlands and in limestone areas. The butternut is rather similar in its soil preferences, occurring in moist, loamy areas, preferring deep, calcareous, rich soils. Butternut grows best in valleys, along river banks, and on hillsides, but occurs occasionally in dry, stony habitats, particularly if the soil is chalky. Both black walnut and butternut are intolerant of shade. Black walnut occurs in mixed forest stands, generally as scattered single trees in open areas. Butternut also does not develop large stands, and grows in mixed stands, but tends to be less frequent where it occurs than black walnut.

The nuts of *Juglans* are distributed mostly by rodents, particularly squirrels, and to some extent by birds. Black walnuts make up about 10% of the diet of eastern fox squirrels. Squirrel caches are the principal means of seed distribution of black walnut and butternut. Black walnut produces fruit abundantly about twice in 5 years, and butternut similarly fruits heavily on an irregular basis over several years..

Because both black walnut and butternut are intolerant of shade, they do not form large, pure stands, or constitute a climax forest. Their presence tends to be an indication that forest stands are relatively young, especially with the less shade-tolerant butternut. Butternut is sometimes a weed of open flower beds wherever a nut-producing tree is nearby. Both walnut and butternut are often successional species that invade savanna in the absence of fire and colonize old field and forest clearings and gaps. Squirrels that bury nuts in open prairie at some distances from the trees are responsible for colonization of open areas. Butternut and black walnut were much more abundant and dominant in the eastern North American forests in presettlement times, suggesting that the forests were widely disturbed in the past.

Use as Food

Although all 20 species of walnuts produce edible fruits, only four, all of which occur in Canada, are important commercially. Persian walnut is one of the leading nut trees worldwide. For many decades it has contributed up to a third of total world nut production. More localized industries have developed around black walnut, butternut and heartnut. Persian walnuts are most popular as a snack food, and are widely incorporated into bakery ingredients, particularly during the winter holiday season. Walnut oil can be used as a substitute for olive oil and other oils in cooking. Black walnut is used in candies, baked goods and ice cream. In New England the butternut is popularly combined with maple sugar to produce maple-butternut candy, which is sold at the roadside. The sap has also been gathered in the spring like maple sap. Native North Americans used butternut and black walnut extensively as food, and both nuts have been found at several archeological sites in southern Ontario. They also made walnut milk by grinding walnut and butternut kernels and adding water. Oil from the nuts was used in food preparations, as well as for rubbing on body and hair. Many people prefer the flavour and crispness of fresh walnuts, and harvest them directly from trees for consumption. If this is done it should be noted that the pellicle or kernel skin of fresh walnuts is often very bitter, and should be removed. As the nuts age, this bitterness disappears. Also keep in mind that fresh black walnuts leave a brown stain on bare hands, that some have described as "impossible to remove."

Chemistry

Kernels of various kinds of walnuts contain 15-18% protein, and 58-64% fat, particularly oleic and linoleic acids. Recent experimental studies have demonstrated that the cholesterol-lowering capacity of walnuts exceeds that of olive oil, considered to be a key dietary contributor of the "Mediterranean diet" that is enormously healthier than the artery-clogging foods rich in saturated fats that are typical of North America. It does now seem clear that eating a handful of walnuts a day can reduce the risk of heart disease (by 11% in a recent study). Of course, nuts are a high source of calories, and if not eaten in moderation will produce weight gain.

Toxicity

Black walnut is a bad neighbour for other plants. The toxic substance juglone is present in the roots, leaves and seed husks, and this has been reported to kill several species of pines when they grow nearby. Such crops as alfalfa, potatoes and tomatoes are easily injured by juglone, and fruit trees such as apple may not bear fruit if planted too close to walnut trees. Members of the heath (Ericaceae) family, such as rhododendrons, azaleas, blueberries, and mountain laurel, are particularly susceptible. The toxic zone from a mature tree occurs on average in a 15 to 18 m radius from the trunk, but can be up to 24 m. Juglone isn't just harmful to plants, it is also toxic to animals. Horses hauling logs or lumber at sawmills or bedded on sawdust or wood shavings from black walnut sometimes suffered from lameness due to an inflammation of the hoof (laminitis). Still an occasional problem today, this is believed to be caused by juglone and perhaps other chemicals present in large amounts in the heartwood.

Walnuts are among the most allergenic of nuts, and can cause serious or life-threatening reactions in persons with walnut allergies. Food products sold as free of nuts, but accidentally contaminated with walnuts, are recalled fairly regularly.

Walnut pollen is generally considered to be moderately allergenic. Pollen shedding from walnut trees can cause allergic reactions in people and livestock. Fortunately the pollen is relatively large (twice the diameter of common ragweed) and does not travel far. However, in areas where the trees are cultivated commercially, heavy exposure to the pollen can cause allergy symptoms.

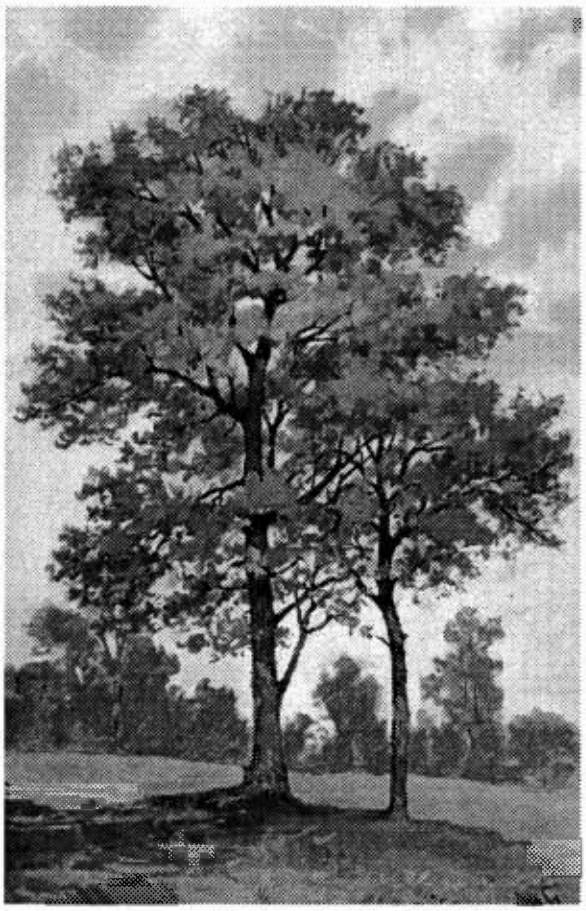
Non-Food Uses

In European folk medicine, Persian walnuts were employed as remedies for a wide variety of conditions, such as asthma, backache and cancers. North American Indians used butternut bark in medicines to treat toothache, muscular pains, and wounds. Several North American Indian tribes used butternut bark as a laxative, and so did many European settlers in North America before the 1900s. Indeed, the French botanist A. Michaux renamed the tree *J. cathartica* because he considered the laxative use of the bark to be more important than its ashy colour. Juice from black walnut hulls was used in North American folk medicine to treat ringworm and sores.

Black walnut is prized for its durable, easily worked wood, which has an attractive straight grain pattern. The dark

brown wood has been extensively used for fine furniture, including china cabinets and pianos, as a luxurious interior finish of buildings, and for coffins, boats, and gunstocks. Butternut wood is paler, lighter, softer, weaker and more coarsely-grained, and much less sought after for construction. It has been used in furniture, and perhaps more often than black walnut in church pews. Its relatively light wood was advantageous for use in building rafts and boats.

Among the miscellaneous uses of walnuts are the following. Walnut trees, particularly black walnut, are popular ornamental trees in parks (in home gardens the toxic effects of juglone can be a problem). Oil pressed from the fruit is edible, and is used in paints and soaps. Walnut oil resembles linseed oil in its drying properties, and has been used for centuries in the making of fine paints for artists. Brown and yellow dyes from the outer fleshy husk of the fruit were used by native people and early settlers. Indeed, actors once used yellow dye from walnut fruits and a dark brown dye from the tree's roots to stain their skins. Walnut bark is used as tooth paste in Pakistan.



Juglans nigra

Agricultural and Commercial Aspects

Persian walnut is one of the most widely consumed of nuts, and among dessert nuts only the almond (*Prunus dulcis* (Mill.) D.A. Webb) and the Brazil nut (*Bertholettia exelsa* Humb. & Bonpl.) exceed walnuts in quantities traded in the world's markets. The United States and China produce 70% of the world supply of walnuts (most Persian), each harvesting approximately 250 MT. The US is the largest exporter with exports of the order of 200 million dollars annually. Canada imports over $10 million dollars of the US crop annually.

Over 10,000 MT of black walnuts are harvested annually in North America. The entire harvest is from native stands. Nuts are taken to buying stations, hulled and bagged for shipment to a sheller. Approximately 50% is retailed, and the remainder is sold to baking and ice cream manufacturers. Lower kernel yields in black walnut compared to Persian walnut due to the much thicker and tougher shells (a black walnut can be 90% shell) has stimulated the development of products from the shells and kernel fragments. The shells are ground for use in metal cleaning and polishing, oil well drilling, and as an ingredient in paints, explosives and cosmetics.

Cultivars & Germplasm

Persian walnuts with desirable fruit qualities were selected at least by the first century AD. Cultivars of Persian walnut and heartnuts have relatively soft and thin shells, the result of a long history of selection (wild nuts of these species have thick shells). By comparison, the native Canadian species of *Juglans* are far less domesticated, but are more cold-hardy. Canadian Presbyterian minister Paul C. Crath of Toronto became well known during the 1920s and 1930s for introducing hardy strains of Persian walnut from the Carpathian mountains in Poland. His work was featured in many newspaper and magazine articles with headlines such as "Greatest tree find of the century." Cold-hardy strains of Persian walnuts in North America generally became referred to as "Carpathians." They are as cold tolerant in Ontario as most commercial apple varieties. Persian walnuts originally from Odessa in southern Russia have been grown successfully in the northern Okanagan valley of southern British Columbia. Breeding programs involving Persian walnut in the United States and various parts of Europe have resulted in numerous cultivars, many of which are characterized by improved yield. The dwarf and early flowering "Hansen" Persian walnut has been one of the most popular.

Heartnuts have been cultivated in southern Ontario and British Columbia since the 1920s and there are several varieties. Hybrids of heartnut and butternut have been called "buartnuts." These have been considered the most useful walnut hybrids for northern areas. They combine the desirable kernel flavour and cold tolerance of butternut with the yield and crack ability of heartnut. In 1978, the Society for Ontario Nut Growers (SONG) obtained a great deal of public support for a program aimed at distributing and evaluating heartnut.

Over 400 cultivars of black walnut have been selected but most of these are for timber quality, rather than nut yield and quality.

Butternut is one of the most cold-hardy species of *Juglans*, and the northern Canadian populations are particularly useful in this respect, and can be grown in the Canadian prairie provinces. The northernmost natural population is near Fitzpatrick, Quebec (47E 29' N, 72E 46' W). At least 25 cultivars of butternut have been selected from natural populations for their relatively thin shells and high yield. The kernels in some of these can be readily cracked into halves. Throughout much of its North American range butternuts are being killed by butternut canker disease (also termed butternut decline), caused by the fungus *Sirococcus clavigignenti-juglandacearum* Nair et al. Spores from dying branches are spread by rainwater to the stems of healthy trees, and after infestation stem cankers develop 1 to 3 years later. Some trees in eastern Ontario have evidently survived the infection suggesting the presence of resistant genotypes. There is no known control for this fungal disease. Although butternut is particularly susceptible, black walnut and black walnut hybrids are also vulnerable to the disease.

Genetic improvement for nut production has been relatively limited. Several programs are underway in the US and Europe and major walnut germplasm repositories have been established in the US (University of California, Davis and USDA - Corvallis), France and Italy. Many cultivars of the native butternut and black walnut have been submitted to the US National Repository in Corvallis. The Forestry Department of Laval University assumed responsibility for a 9 ha plantation of black walnuts established near Quebec city in 1880. The North American Nut Growers Association and the Society of Ontario Nut Growers have produced many reports on cultivation in Canada of the native black walnut and butternut and the introduced heartnut and Persian walnut.

Prospects

The butternut is seriously threatened by disease and, pessimistically, its future could be as bleak as that of the American chestnut and elm. Butternuts have never achieved much commercial importance, and would not seem to be a good choice for economic development under the circumstances. However, butternut germplasm is of potential value for the future improvement of the walnuts, and needs to be preserved.

Black walnut has been described as "the money tree," and its prospects are much more promising. It is the most valuable timber species in temperate North America. Although there has been dreadful over-exploitation and decimation of wild black walnut trees, this is an under-exploited crop from the point of view of cultivation. The demand for both black walnuts and black walnut timber exceeds the supply. Thin-shelled cultivars of black walnut, from which the kernels could easily be extracted, have not been adequately developed. At present most of the supply of nuts comes from wild trees, but this is a vanishing resource. Integrated forestry-farming (agroforestry), coupling both walnut and timber production, and additionally combining such a system with intercropping of agricultural crops has been described as "one of the best investment opportunities available in the profession of forestry."

Myths, Legends, Tales, Folklore, and Interesting Facts

-Nuts in general are a high calorie food and in many cases 0.45 kg provides sufficient energy for a person for a full day. Satisfying this basic energy need with steak requires 1.7 kg; potatoes 5.6 kg; oranges 6.8 kg; and bread 11 kg.

-In the 17th century in parts of Europe, a young man was not allowed to marry until he had planted a sufficient number of walnut trees that his prospective father-in-law and the commun ty at large were convinced of his worth.

-The French explorer Samuel de Champlain (1567-1635) wrote that Indians constructed dugout canoes in what is now Massachusetts by charring and scraping one side of a large butternut log. In the state of New York, Indians were commonly observed making river canoes from one or two butternut logs.

-The famous gray coats of the Confederate Army in the American Civil War were not always gray. Soldiers dressed in light-brown or butternut-colored uniforms began showing up in Confederate ranks after Union blockades shut off virtually all commerce to the southern states. The southerners were nicknamed "butte nuts" because the dye used on their often home-made uniforms for a time was made of butternut, creating a light brown khaki color.

-North American homespun cloth pants of the 1800s stained brown with butternut husks were called "butternut jeans." The word jeans is derived from Genoa, in Italy, and was first applied to a fabric made there of a blend of cotton, linen and/or wool. By the 18th century, rugged workpants called jeans were made co pletely out of cotton, and by the early 19th century, blue became a popular color.

-Walnut wood to this day is considered excellent for gunstocks. In 1806, 12,000 walnut trees were reportedly needed annually in France for manufacturing muskets.

-The Gardener's Chronicle of London of 1852 described a 7.7 m wide table made out of a single plank of walnut, that was used for a banquet given by the Emperor Frederick III in Lorraine. The same source mentioned a 1000-year old tree in the Crimea that yielded 80,000 to 100,000 nuts annually, and was shared by five Tartar families. Persian walnut trees this large or old are impro able. More reliable is a report of a walnut from Norfolk, England, which had a trunk circumference near ground level of 10 m, a

height of 27 m, a branch spread of 110 m, and produced 54,000 nuts in one season.

-A black walnut tree in Tennessee produced more than 6,000 nuts in one season.

-In primitive times, medicinal practice was more often than not based on the "Doctrine of Signatures" - the idea that characteri tics of plants reminiscent of human organs could cure diseases of those organs. The ancient Greeks interpreted the walnut's shell as a human skull (their word *caryon* for the walnut meant head) and the nut as a human brain (the joined halves of a kernel of a wa nut certainly looks like the brain). Accordingly, they believed that walnuts cured headaches. Others have thought that low intellect and madness could be cured by eating walnuts.

-A paste of ground Persian walnuts mixed with white lead was a recommended cure for baldness in China. In North America, burnt kernels of black walnut in red wine was supposed to stop hair from falling out. (Again, note the association of the walnut with the human head. Also note the astonishing parallel adoption of walnuts to treat baldness.)

-Mediterranean varieties of the English walnut were brought to California in the 18th century by Spanish missionaries, and became known as "mission walnuts."

-The walnut has been associated with marriage since early times, probably because the two halves of the shell suggest a union of two. The French *noces* (nuptials) originates from this association. During Roman weddings it was customary for the bridegroom to strew walnuts about, to be scrambled for by boys, the practice signifying that he had abandoned childish amusements.

-The ancient Greeks dedicated the walnut to Diana, the Goddess of the Chase. The practice of strewing walnuts at weddings was also practised by the Greeks. To the bride, it symbolically repre- sented her departure from the Goddess Diana to Hymen, the God of Marriage in Greek mythology.
The nuts and leaves of the black walnut are thought to repel insects to some degree, and have been used, both by Native Americans and colonists, as an insect repellent. Walnut leaves were sometimes rubbed on the faces of cattle and horses to repel flies.

-Walnut lumber is highly valued. Walnut veneers may be sliced less than 1 mm in thickness after the wood as been softened by hot water and steam. A veneer company paid $39,000 for a black walnut tree growing near Johnson City, Iowa. There have been cases of highly organized "rustling" of mature trees from their owners' properties.

-At one time, airplane propellers were made of walnut wood.

-The Persian walnut cultivar Bijou produces large nuts, 4-5 cm in diameter. As the name of the cultivar indicates, the shells were once in demand as jewel boxes. The shells were polished, fitted with a metal hinge and clasp, and lined with velvet. They were also used to hold gloves as presents, and made up as cradles for miniature dolls. Reminiscent of these practices, the Chinese employed walnut shells as snuff-boxes. The Chinese also used intricately carved walnut shells to transport musically-trained, singing crickets, believed to be good omens.

-A variety of the Persian walnut called the "Titmouse walnut" has been described from France, so named because the shell is so thin that birds, especially the titmouse, can break it and eat the kernel.

-The shell of the black walnut has intricate internal cavities. It has been suggested that these are an adaptation to confuse rodents trying to locate the edible nut inside the shell.

-American horticulturist Luther Burbank (1849-1926) was a geuine but erratic genius when it came to creating amazing new hybrid varieties of plants. In 1891 he apparently crossed the black walnut and Hind's black walnut (*J. hindsii* (Jeps.) Rehd.) to produce the "royal walnut" - a huge tree that received sens tionalistic press coverage. Burbank in fact had usurped the name "royal walnut" from the Latin (*Juglans regia*) and French (noyer royal) names for the Persian walnut.

-The shells of walnuts were a valuable war material. In the First World War, the shells were converted to high-quality charcoal that was used extensively in gas mask filters. In the Second World War, ground nutshells proved excellent as an abrasive for cleaning aircraft pistons and cylinder heads.

-In Polish folklore, on the Eve of St. Andrew's Day (November 29th) young Polish girls seeking marriage engage in a number of fortune telling rituals. In one tradition, girls stand in a circle lea ing over a bowl of water with a floating walnut shell containing a lighted candle. Each girl writes the name of her desired hus- band on a piece of paper, which is fixed to the edge of the bowl. A marriage proposal would be in the future of the girl whose piece of paper is burned when the lighted candle sails to it.

-A single black walnut tree on the Lower Missouri was said to have furnished two hundred fenceposts.

-"Nougat," the French confection, literally means "made from walnuts," and indeed the walnut was originally used in its prepa- ration.

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