The Canadian Botanical Association Bulletin

Bulletin de l'Association Botanique du Canada

Vol. 52 Number 2, September/septembre 2019



Tamarack, *Larix laricina* (Du Roi) K. Koch ©Tyler Smith

Highlights in this issue:

CBA Diversity Statement page 16

Les médaillés Lawson de 2019 page 20

Top Ornamental Plants: Alstroemeria page 25

In this issue:

President's Message 15

Inclusion and Diversity Statement 16

Déclaration en matière de diversité et d'inclusion 16

Equity and Diversity: Gender Statistics 17

The CBA Bulletin Needs a New Editor! 17

2019/20 CBA Board of Directors and Section Chairs 18

Les médaillés Lawson de 2019 20

The Lawson Medalists for 2019 21

2019 CBA Student Awards 22

Assistant Professor - Canada Research Chair Tier 2 in Plant Chemical Biology 24

Professeur adjoint - Chaire de recherche du Canada de niveau 2 en chemobiologie des plantes 24

Top Canadian Ornamental Plants. 23. Alstroemeria (Peruvian lilies) 25

The Canadian Botanical Association Bulletin

The CBA Bulletin is issued three times a year (March, September and December) and is freely available on the CBA website. Hardcopy subscriptions are available for a fee.

Information for Contributors

All members are welcome to submit texts in the form of papers, reviews, comments, essays, requests, or anything related to botany or botanists. For detailed directives on text submission please contact the Editor (see below). For general information about the CBA, go to the web site: www.cba-abc.ca

Editor

Dr. Tyler Smith
K.W. Neatby Building, 960 Carling Avenue
Ottawa ON, K1A 0C6
cba.abc.bulletin@gmail.com

Published in Ottawa, October 8th 2019
ISSN 0008-3046 (paper)
ISSN 1718-8164 (electronic)

Next issue

Texts for the next issue, 52(3), must be received by December 1, 2019

Unless otherwise stated, all content is released under the Creative Commons Attribution Share-Alike 4.0 license. Copyright remains with the authors.

Bulletin de l'Association Botanique du Canada

Le Bulletin de l'ABC paraît trois fois par année, normalement en mars, septembre et décembre. Il est envoyé à tous les membres de l'ABC.

Soumission de textes

Tous les membres de l'Association sont invités à envoyer des textes de toute natureconcernant la botanique et les botanistes (articles, revues de publication, commentaires,requêtes, essais, etc.). Tous les supports de texte sont acceptés. Pour des renseignements détaillés sur la soumission de textes, veuillez consulter le rédacteur (voir ci-dessous). Infos générales sur l'ABC à l'url suivant: www.cba-abc.ca

Rédacteur

Dr. Tyler Smith
K.W. Neatby Building, 960 Carling Avenue
Ottawa ON, K1A 0C6
cba.abc.bulletin@gmail.com

Publié à Ottawa, le 8 octobre 2019
ISSN 0008-3046 (papier)
ISSN 1718-8164 (électronic)

Prochain numéro

La date de tombée des textes du prochain numéro, le no 52(3), est le 1 decembre 2019

President's Message

My professional life is devoted to biodiversity, and I consider myself among the fortunate because I spend my working days doing something I truly enjoy, plants systematics. Discovering what you really love to do and getting paid for it is undoubtedly one of the hardest obstacles to a fulfilling professional life. To this day, I can literally get chills up my spine when I see a plant that blows away my concept of what that genus should be. I have literally jumped for joy when I have been a part of the discovery of an unexpected sister group or have giggled madly when an unidentified specimen in an herbarium led to a 2,400 km range extension. I hope you have had similar experiences in your professional life or you will one day get there because it is marvelous. For me, the joys of biodiversity have been infinite, but we often take diversity for granted. We wholly depend on the diversity we have inherited, but we often neglect it and overly exploit it, and the consequences are dire.

In this issue of the Bulletin, the CBA-ABC is publishing a statement on Diversity and Inclusivity (page 16) among its members. It is a statement of the way we would want to be treated by others and how we expect our members to treat each other regardless of ethnic origins, gender, sexual orientation, age, health or socioeconomic background. I sincerely hope that one day such a statement would no longer be necessary, but until then, I see our current statement as a model for the present that will be modified and updated as our Association and our society evolves over time. Given the enormous social changes I have witnessed over my lifetime, I would say that changes to the statement are inevitable.

I hope that all members will agree that this statement is an affirmation that just like biodiversity, human diversity is a strength. The statement is but the first of many small steps towards righting a wrong - the exclusion of persons from achieving their full potential simply because of innate traits and other factors not under their control. But it is also a step towards better science. Prejudice and exclusion mean lost opportunity, and this means that the best possible minds in science may never have had the chance to flourish or even participate.

If you believe that such a statement is unnecessary, I would disagree. We are all affected by discrimination, either directly or indirectly through our family members. For my mother, as a single woman in the 1970's and 80's, she faced the stigma of being divorced; her career options were limited by the mere fact she was female, and even if she had male colleagues, they were paid more. To boot, she came from a poor Newfoundland background, which means you can cue the inevitable jokes once her "Newfie" origins were discovered. How did this affect me? I have no idea, but I doubt it had a positive effect on any future prospects.



Julian at Kew

To me, discrimination translates to lost opportunities and wasted human capital. I see it every day as I pass a large number of homeless people on my way to work. Some look like me, but many are of Native American, Inuit or of other origins. It is important to remember that among them there are undoubtedly some that had the potential to become a university professor or any other profession if only they had been given the chance. I was fortunate in that the right person arrived in my life at just the right time, otherwise becoming a university professor would have been inconceivable. But I was also fortunate to be a white male; it would be ridiculous to suggest that my path was not eased by this fact. Hopefully this will change, but one step forward is acknowledging the problem and working within ourselves to mitigate our biases and prejudices so that they open opportunities for all. It can only make us a richer and stronger society – imagine if more than half your potential brain-force was not tolerated in science? Not so long ago that was the case.

In summary, I hope you will all embrace and work to improve our diversity and inclusivity statement for the future. I would like to thank the CBA-ABC Board of Directors and all our members for contributing to the success of this statement, but in particular, Liette Vasseur and her students, for proposing the statement at our annual meeting at Wilfrid Laurier University in 2016. With modifications and approval of the membership over the past three years, we can finally present our unified statement to all in this Bulletin and on our website.

Julian Starr
University of Ottawa

Inclusion and Diversity Statement

The CBA/ABC represents Canada's researchers and scholars in the plant sciences from various disciplines including ecology, genomics, classification, development, and teaching. CBA/ABC provides formal, expert, peer-reviewed and credible input to national, provincial and local governments on matters pertaining to botany. In executing its mission, CBA/ABC confirms its will to foster a culture of inclusivity and equity in all of its activities. These include but are not limited to participation to conferences, equitable representation in major symposia, eligibility of prizes, bursaries and awards, and memberships. CBA/ABC is pleased to welcome and encourages participation by members regardless of gender, gender expression, sexual orientation, ethnicity, nationality, disability, religion or age.

As part of its commitment, CBA/ABC will encourage organizers of symposia or panels to ensure a balanced female and male representation in the invited speakers; promote diverse representation on the board of directors and any other committees; and strive that when seeking nominations for prizes and awards, both male and female nominations are encouraged to be submitted and shall be considered equally.

Déclaration en matière de diversité et d'inclusion

La CBA-ABC représente les chercheur(e)s et praticien(e)s dans les sciences végétales provenant de différentes disciplines, incluant l'écologie, la génomique, la classification, le développement et l'enseignement. La CBA-ABC offre des avis d'experts, crédibles, formels, et évalués par les pairs aux gouvernements locaux, provinciaux et nationaux sur les enjeux reliés à la botanique. En exécutant sa mission, la CBA-ABC confirme sa volonté d'encourager une culture d'inclusivité et d'équité dans toutes ses activités. Cela inclut, sans s'y limiter, la participation aux conférences, la représentation équitable dans les symposiums majeurs, l'éligibilité aux prix et bourses, et l'adhésion des membres. La CBA-ABC est heureuse d'accueillir et encourage la participation des membres sans préjudice quant à leur genre, expression ou orientation sexuelle, ethnicité, nationalité, handicap, religion ou âge.

À titre d'engagement, la CBA-ABC encouragera les organisateur(trice)s des symposiums ou sessions à assurer une représentation balancée de femmes et d'hommes pour les présentations invitées; promouvra une représentation diversifiée sur le comité de direction et tout autre comité; et s'efforcera à ce que, dans le processus de nomination pour les prix et bourses, les femmes et les hommes soient encouragés à soumettre des nominations et que celles-ci soient évaluées équitablement.

Equity and Diversity: Gender Statistics

In the interests of equity and diversity within our Association, it was decided by the Board to publish gender statistics for CBA-ABC board members, section chairs, and award winners for each fiscal year in the Bulletin. The Board decided to do this in order to make it easier to follow any trends that may develop over time. We recognise that gender represents just one element of diversity and that some members may not identify with either sex, but feel this is a positive step that may help identify problematic trends.

I am happy to inform our members that our President-Elect, Nicole Fenton, who has an interest in gender in science, has told me that the statistics given in Table 1 are very positive by comparison to other scientific societies in Canada ("enviable" in her words). However, I should caution that this is simply a snapshot for 2018-2019. Whether our numbers have been so enviable over time is hard to tell, but if there is any member out there that would like to go through past issues of the Bulletin and tally such figures, it would be very interesting to know how things have changed or – hopefully - not!

I can say that by looking at the list of names for major CBA-ABC awards on our website, men clearly outnumber women. To win an award you need to be nominated; and thus I strongly encourage our members to nominate deserving botanists, especially women, for future awards. It is quite simple, if they are not nominated, they cannot win, so we all bear some responsibility for making sure that those that have made an exceptional contribution to Canadian botany are duly recognised.

Table 1: CBA-ABC Board Members, Section Chairs, and Award Winners by Gender for 2018-2019

	Women	Men	% Women
Major Awards	1	1	50.0 %
Student Awards	9	4	69.2 %
Board Members	7	7	50.0 %
Section Chairs	6	4	60.0 %

The CBA Bulletin Needs a New Editor!

I have been editing the CBA Bulletin since volume 46 (2013), and I'm ready for a change. If anyone is interested in taking over the reins, please contact me at cba.abc.bulletin@gmail.com. The bulk of the work is processing submissions for each issue, a few days' work spread over the month preceding each of our three issues each year.

The bulletin layout uses a custom LaTeXtemplate that I wrote. This is an interesting, powerful, and very esoteric typesetting system. I'd be happy to help you get started with it. Alternatively, you could use something more conventional like Adobe Illustrator, like a normal person would. In that case, I could offer you a variety of opinions and speculation for you to consider as you create your own design.

Tyler Smith
Ottawa



How the sausage is made: the code that produced Ernie Small's article on page 25.

2019/20 CBA Board of Directors and Section Chairs

President/Président
Dr. Julian Starr (2018–2020)
Department of Biology
University of Ottawa
Rm 160, 30 Marie Curie
Ottawa, ON K1N 6N5
Tel: 613-562-5800 x6100
Fax: 613-562-5486
jstarr@uottawa.ca

Past-President/Président sortant
Dr. Art Davis (2018–2020)
Department of Biology
University of Saskatchewan
112 Science Place
Saskatoon, SK S7J 2A7
Tel: 306-966-4484
Fax: 306-966-4461
art.davis@usask.ca

President-Elect/Président élu
Dr. Nicole Fenton (2018–2020)
Université du Québec en
Abitibi-Témiscamingue,
445 Boulevard de l'Université
Rouyn-Noranda, QC J9X 4E5
Tel: 819-762-0971 ext. 2312
Fax: 819-797-4727
nicole.fenton@uqat.ca

Vice-President/Vice-présidente
Dr. Annie Desrochers (2018–2019)
Université du Québec en
Abitibi-Témiscamingue,
341, rue Principale Nord,
Amos, QC J9T 2L8
Tel: 819-732-8809 ext. 8327
Fax: 819-732-8805 or 819-797-4727
annie.desrochers@uqat.ca

Secretary/Secrétaire
Ms. Deborah Metsger (2018–2020)
Royal Ontario Museum
Collections and Research
100 Queens Park
Toronto, ON M5S 2C6
Tel: 416-586-5610
Fax: 416-586-7921
debm@rom.on.ca

Treasurer/Trésoriere
Dr. Shelley Hepworth (2018–2020)
Department of Biology and Institute
of Biochemistry, Carleton University
1125 Colonel By Drive
Ottawa, ON, K1S 5B6
Tel: 613-520-2600 ext. 4214
ShelleyHepworth@cunet.carleton.ca

Directors/ Directeurs
Dr. Jeffery M. Saarela (2019–2022)
Research and Collections
Recherche et collections
Canadian Museum of Nature / Musée
canadien de la nature
Tel: 613-364-4080
Cell: 613-608-7989
Fax: 613-364-4027
jsaarela@nature.ca

Dr. Julissa Roncal (2017–2022)
Department of Biology
Memorial University
232 Elizabeth Avenue,
St. John's, NL A1B 3X9
Tel: 709-864-2093
Fax: 709-864-3018
jroncal@mun.ca

Dr. Patrick von Aderkas (2017–2022)
Centre for Forest Biology
Department of Biology
University of Victoria
PO Box 3020, Station CSC
Victoria, BC V8W 3N5
Tel: 250-721-8925
Fax: 250-721-7120
pvonader@uvic.ca

Dr. Richard Caners (2019–2022
Royal Alberta Museum
12845 – 102 Ave
Edmonton, AB T5N 0M6
Tel: 780-453-9104
Fax: 780-454-6629
Richard.Caners@gov.ab.ca

Ms. Nadia Cavallin (2018-2020)
Herbarium, Royal Botanical Gardens
680 Plains Road West
Burlington, ON L7T 4H4
Tel: 905-527-1158
Fax: 905-577-0375
ncavallin@rbg.ca

Dr. Bruce Ford (2018-2020)
Department of Biological Sciences
University of Manitoba
Winnipeg, MB, R3T 2N2
Tel: 204-474-6994
Fax: 204-474-7604
Bruce.Ford@umanitoba.ca

Student Representative (West)/ Représentant étudiant (Ouest)
Ms. Haoran Chen (2019–2022)
Department Of Biological Sciences
212B Bio-Sci Bldg.,
University of Manitoba,
Winnipeg, MB, R3T 2N2
Tel: 204-474-9245
Fax: 204-474-7604
chenh318@myumanitoba.ca

Student Representative (East)/ Représentant étudiant (Est)
Ms. Georgia Denbigh (2019–2022)
Biology Department
Dalhousie University
Life Sciences Centre,
1355 Oxford Street,
Halifax, NS B3H 4R2
Tel: 647-219-5316
gr292387@dal.ca

Bulletin Editor/Éditeur Bulletin
Dr. Tyler Smith (2013–2019)
AAFC, Central Experimental Farm
960 Carling Avenue
Ottawa, ON K1A 0C6
Tel: 613-694-2446
cba.abc.bulletin@gmail.com

Webmaster/Page Web
Dr. Zoe Panchen (2017–2020)
Department of Geography
University of British Columbia
Vancouver, BC, V6T 1Z2
Tel: 604-822-9105
zoe.panchen@ubc.ca

Ecology Section (Chair)/Écologie (président)
Dr. Nicole Fenton (2016-2020)
Université du Québec en Abitibi-Témiscamingue
445 Boulevard de l'Université
Rouyn-Noranda, QC J9X 4E5
Tel: 819-762-0971 ext.2312
Fax: 819-797-4727
nicole.fenton@uqat.ca

Plant Development Section (Chair/président)
Dr. Moira Galway (2013-2019)
Department of Biology
Saint Francis Xavier University
Antigonish, NS B2G 2W5
Tel: 902-867-3841
Fax: 902-867-2389
mgalway@stfx.ca

Systematics and Phytogeography Section (Co-Chairs)/ Systématique et Phytogéographie (Co-présidentes)
Dr. Geraldine Allen (2017-2022)
Department of Biology
University of Victoria
PO Box 1700, Station CSC
Victoria, BC V8W 2Y2
Tel: 250-721-7110
Fax: 250-721-7120
gallen@uvic.ca

Ms. Deborah Metsger (2017-2022)
Royal Ontario Museum
Collections and Research
100 Queens Park
Toronto, ON M5S 2C6
Tel: 416-586-5610
Fax: 416-586-7921
debm@rom.on.ca

Teaching Section (Co-Chairs)/Enseignement (co-présidents)
Dr. Martha Mullally (2018–2020)
Biology Department
Carleton University
1125 Colonel By Drive
Ottawa, ON K1S 5B6
Tel: 613-520-2600 ext. 6007
marthamullally@cunet.carleton.ca

Dr. Adam Brown (2018–2020)
Department of Biology
University of Ottawa
Rm 160, 30 Marie Curie
Ottawa, ON K1N 6N5
Tel: 613-562-5800 ext. 6308
abrown@uottawa.ca

Mycology Section (Chair)/Mycologie (président)
Dr. Hugues Massicotte (2006-2020)
Ecosystem Science & Management
College of Science and Management
University of Northern British Columbia
Prince George, BC V2N 4Z9
Tel: 250-960-5813
Fax: 250-960-5538
hugues@unbc.ca

Executive Assistant/Assistante de l'Exécutif
Ms. Vanda Wutzke (1996-2020)
Box 160
Aberdeen, SK S0K 0A0
Tel: 306-253-4654
Fax: 306-253-4744
vanda.wutzke@sasktel.net



Gaultheria hispidula (L.) Muhl. ex Bigelow, ©Tyler Smith

Les médaillés Lawson de 2019

Ce fut un grand privilège en tant que président de l'Association botanique du Canada de décerner deux médailles Lawson cette année. C'est d'autant plus vrai que les deux médaillés ont eu un impact significatif sur ma carrière.

La médaille Lawson est le prix le plus prestigieux remis par l'association botanique du Canada, et a été établi afin de « fournir une expression formelle et collective de l'admiration et du respect des botanistes au Canada dans l'excellence de leur contribution individuelle à la botanique Canadienne ».

Le prix a été nommé en l'honneur du Dr George Lawson, un des premiers botanistes du Canada, professeur à l'Université Queen's et plus tard à l'Université Dalhousie, et qui fut aussi membre fondateur de plusieurs des plus anciennes sociétés scientifiques canadiennes, notamment la Société Royale du Canada.

Cette haute distinction peut être décernée pour des mérites de deux types.

Catégorie A: La reconnaissance d'une contribution exceptionnelle à la science botanique (sous la forme d'une monographie, d'un livre ou d'une série d'articles)

Catégorie B: La reconnaissance d'une carrière entière dévouée au développement de la botanique canadienne.

Catégorie A - La reconnaissance d'une contribution exceptionnelle à la science botanique

La médaille Lawson de 2019 est décernée à M. Jacques Cayouette, Chercheur scientifique à Agriculture et agroalimentaire Canada (Ottawa), pour son ouvrage exceptionnel:

"À la découverte du nord: deux siècles et demi d'exploration de la flore nordique du Québec et du Labrador" (éditions MultiMondes, Québec, 363 pages).

Voici quelques extraits des lettres de nomination, pour illustrer à quel point cet ouvrage est exceptionnel. J'espère que cela vous encouragera à l'acheter et le consulter dès que possible.

« Ce volume, qui explore plus de deux cent cinquante ans d'histoire de la flore nordique du Québec et du Labrador, est réellement un chef d'œuvre, un ouvrage monumental représentant des décennies de recherche historique et botanique par M. Cayouette. Nous ne connaissons pas d'exemple similaire qui aurait été fait pour le Canada ou l'Amérique du Nord, et nous sommes sûrs qu'il s'agit là d'un ouvrage d'importance nationale et internationale. Ce qui fait les grandes œuvres, c'est la synthèse et l'attention au détail. Tirant profit d'une liste de références comptant plus de 35 pages, dont plusieurs qui sont méconnues, M. Cayouette traite des contributions de plus de 400 individus dans un ouvrage qui est abondamment illustré de photos de plantes, de personnes et de lieux. Avec ce seul ouvrage, l'histoire de la flore nordique du Québec et du Labrador est passé de l'une des plus méconnues de l'Amérique du Nord, à l'une de mieux connues du monde. »

Je connais Jacques depuis vingt ans, et je peux vous dire que je n'ai jamais rencontré un homme avec un amour et une passion si profonds pour les plantes. C'est un grand honneur pour moi d'être président l'année où il a reçu sa médaille Lawson.

Catégorie B - La reconnaissance d'une carrière entière dévouée au développement de la botanique canadienne

La médaille Lawson de 2019 est décernée à Mme Anne Bruneau de l'Institut de recherche en biologie végétale (IRBV) de l'Université de Montréal.

La nomination de Mme Bruneau pour cette médaille fut sans aucun doute une des mieux appuyée qu'il m'a été donné de voir. Plus de 16 lettres d'appui formelles, tant nationales qu'internationales, ont été reçues, ainsi que de nombreux courriels. Ces lettres étaient empreintes de respect pour la scientifique, et aussi de beaucoup d'amour pour la personne. Pour citer un des juges pour la médaille, "Parmi les botanistes de sa génération, elle a probablement le plus d'influence", et je suis tout à fait d'accord. Parmi ses nombreux accomplissements, elle a été directrice de l'Institut de recherche en biologie végétale de l'Université de Montréal, et elle est actuellement directrice scientifique du Centre sur la biodiversité au Jardin botanique de Montréal. Elle a d'ailleurs aidé à créer cette institution au moyen d'une subvention de la Fondation canadienne pour l'innovation, subvention qui a aussi aidé à créer Canadensys, le Consortium des universités canadiennes sur la biodiversité. Elle a reçu plusieurs récompenses prestigieuses, dont le Prix du Québec Armand-Frappier, pour accomplissement scientifique. Mais sa plus grande contribution fut peut-être de former les futurs botanistes du pays. Entre les 8 stagiaires postdoctoraux, 10 étudiants au doctorat et 16 étudiants à la maîtrise qui sont passés par son laboratoire, neuf sont maintenant des professionnels de la recherche, et je suis l'un d'eux. Il y a 17 ans, alors stagiaire postdoctoral sous sa supervision, elle m'a dit: "Julian, un jour tu seras président de l'ABC", et moi j'ai répondu, "Jamais!"; mais si vous avez déjà côtoyé Anne de près, vous savez qu'elle a souvent raison.

Mme Bruneau, avec cette médaille, nous vous remercions humblement pour tout ce que vous avez fait pour la botanique canadienne. Et plus à venir!

The Lawson Medalists for 2019

It was my great privilege as President of the Canadian Botanical Association - L'Association botanique du Canada to award two Lawson Medals this year. This is especially true because both medalists have had a significant impact on my career.

The Lawson Medal is the most prestigious award of the Canadian Botanical Association, and it was established "to provide a collective, formal expression of the admiration and respect of botanists in Canada for excellence in the contribution of an individual to Canadian botany".

The medal is named after Dr. George Lawson, one of Canada's earliest botanists as a professor at Queen's and later Dalhousie University. He was also a founding member of many of Canada's earliest scientific societies, mostly notably the Royal Society of Canada.

The Lawson Medal can be bestowed in one of two ways:

Category A: A single outstanding contribution to botanical knowledge, such as a monograph, book, or series of papers.

Category B: As a recognition of cumulative, lifetime contributions to Canadian botany.

Category A: a single outstanding contribution to botanical knowledge

The Lawson Medal for 2019 is awarded to Dr. Jacques Cayouette, Research Scientist at at Agriculture and Agri-Food Canada (Ottawa), for his exceptional book, "À la découverte du nord: deux siècles et demi d'exploration de la flore nordique du Québec et du Labrador" (éditions Multi-Mondes, Québec, 363 pages).

The book is written in French, so for those that are unfamiliar with the language, here is my loose translation of the title: "Discovering the North: two hundred and fifty years of exploration of the flora of northern Québec and Labrador"

Here are a few words taken from the nomination letters to give you an idea as to why this is such an exceptional work. I hope this will encourage you to purchase and read the work soon.

This book, which explores over two hundred and fifty years of the history of the Flora of northern Québec and Labrador, is truly a "chef d'oeuvre", a monumental work representing decades of historical and botanical research by Dr. Cayouette. We know of nothing similar that has been done for Canada or North America, and we are confident in saying that it is a work of national and international significance. The mark of a truly great work is synthesis and an attention to detail. Drawing on a bibliography of more than 35 pages, often comprising works that are poorly known, Dr. Cayouette treats the contributions of over 400 different persons in a work that is profusely illustrated with pictures of plants, people and the place. With this one work, the history of the Flora of northern Québec and Labrador has gone from being one of the most poorly known in North America, to one of the best known in the world.

I have now known Jacques for twenty years, and I must tell you that I have never encountered a man with such a deep love and passion for plants. It is a great honour for me to be President in the year that he was awarded his Lawson.

Category B: the recognition of an exceptional career in botany.

The Lawson Medal for 2019 is awarded to Professor Anne Bruneau from the Institut de recherche en biologie végétale (IRBV) at l'Université de Montréal.

Dr. Bruneau's nomination for this award was undoubtedly one of the best supported applications for the Lawson that I have ever seen. Over 16 formal letters of support both nationally and internationally were received, including numerous emails, and these letters were filled with a mixture of great respect for the scientist, but also great love for the person. To quote one of the judges for the award, "she is probably the most influential botanist of her generation", and I would agree. Among her numerous accomplishments, she has been the Director of the Institut de recherche en biologie végétale at the Université de Montréal and she is currently the Scientific Director of the Centre sur la biodiversité at the Montreal Botanical Garden, an institution that she helped create through a 19 million dollar CFI grant that also helped create Canadensys, the Consortium of Canadian Universities for biodiversity. She has won numerous prestigious awards, most notably the Prix du Québec, Armand-Frappier, for scientific achievement. But maybe her greatest contribution has been in training the future botanists of our country. Among the 8 Postdocs, 10 PhD and 16 MSc students she has trained, nine are now Research Professionals, and I happen to be one of them. Seventeen years ago as a postdoc in her lab she said to me, "Julian, one day you will be President of the CBA", and I replied, "Never!"; but if you have ever been around Anne long, you know she is often right.

Dr. Bruneau, through this award, we humbly thank you for all that you have done for Canadian Botany. More to come!

2019 CBA Student Awards

Macoun Travel Bursaries

The John Macoun Travel Bursary provides financial assistance to a student presenting a paper or a poster at the annual meeting of the CBA-ABC.

Our winners are:

- Georgia Denbigh, PhD candidate
  Department of Biology, Dalhousie University, Halifax
- Haoran Chen, PhD candidate
  Department of Biology, University of Manitoba, Winnipeg
- Kelton Braun, PhD candidate
  Department of Biology, University of Saskatchewan, Saskatoon
- Nathan Rowarth, PhD candidate
  Department of Biology, Dalhousie University, Halifax
- Paige Anderson, MSc candidate
  Department of Biology, University of Manitoba, Winnipeg
- Andréanne Bouchard, MSc candidate
  Department of Biology, University of Ottawa, Ottawa

Each student received $200 to$500 based on the cost of a flight to Toronto from their respective universities. A total of $2300 was dispersed to the students above.

Student Publication Awards

Porsild-Consaul Award in Systematics and Phytogeography

Named in memory of the eminent botanists Alf Erling Porsild (1901-1977) and Laurie Consaul (1960-2012), recognizes the best paper in Systematics and Phytogeography published by a student in the year preceding the CBA-ABC annual meeting.

Our winner is:

- Fritz José Pichardo-Marcano
  Department of Biology, Memorial University, St. John's

For his paper entitled:

"Phylogeny, historical biogeography and diversification rates in an economically important group of Neotropical palms: Tribe Euterpeae" by Fritz José Pichardo-Marcano, María Esther Nieto-Blázquez, Ashley Nicolle MacDonald, Gloria Galeano, Julissa Roncal. Molecular Phylogenetics and Evolution (2019) 133: 67-81.

J. Stan Rowe Award in Ecology

Named in memory of John Stanley Rowe, recognizes the best scientific paper recently published by a student in the field of Ecology or Conservation.

Our winner is:

- Dr. Caroline M. A. Franklin
  Department of Renewable Resources, University of Alberta, Edmonton

For her paper entitled:

"Combining aggregated and dispersed tree retention harvesting for conservation of vascular plant communities" by Caroline M. A. Franklin, S. Ellen Macdonald, and Scott E. Nielsen. Ecological Applications (2018) 28: 1830–1840.

Luella K. Weresub Memorial Award in Mycology

Named in memory of Luella K. Weresub, recognizes the best paper in mycology published by a student in the year preceding the CBA-ABC annual meeting.

Two winners this year!

- Adrian Forsythe
  Department of Biology, McMaster University, Hamilton

For his paper entitled:

"Phenotypic divergence along geographic gradients reveals potential for rapid adaptation of the White-nose Syndrome pathogen, Pseudogymnoascus destructans, in North America" by Adrian Forsythe, Victoria Giglio, Jonathan Asa, Jianping Xu. Applied and Environmental Microbiology (2018) 84: e00863-18.

And

- Corrina Thomsen
  Department of Biology, University of British Columbia Okanagan, Kelowna

For her paper entitled:

"Using invasion theory to predict the fate of arbuscular mycorrhizal fungal inoculants" by Corrina N. Thomsen and Miranda M. Hart. Biological Invasions (2018) 20: 2695–2706.

Laurie Consaul Northern Research Scholarship

Named in memory of Laurie Consaul supports undergraduate or graduate students doing botanical field research in northern Canada.

I would like to mention a special thanks to Mark Armstrong, Laurie's husband, who funds this award every year.

The winner is:

- Kirsten Reid
  Department of Geography, Memorial University, St. John's

For her PhD Project entitled:

"The influence of biotic and abiotic latitudinal gradients on tree range expansion in the subarctic"

I must admit that when I announced this award at our Annual General Meeting I got a little emotional. I worked with Laurie for a number of years, and when she was about to leave for Newfoundland to start her Assistant Professorship, she gave me a book on butterflies for my daughter who was about to be born. Although she ultimately focused on mushrooms and owls, my second daughter, Olivia, found the book and it has since been the source of her love of butterflies. We call them Ollieflies.

Lionel Cinq-Mars Award

Named in memory of Lionel Cinq-Mars, recognizes the best oral presentation by a student at annual meeting.

The winner is:

- Andréanne Bouchard
  Department of Biology, University of Ottawa, Ottawa

For her talk entitled:

"Molecular and morphological data reveal hidden diversity in common North American *Frustulia* species (Amphipleuraceae)"

There was also an Honourable Mention for the Cinq-Mars to:

- Magdelena Olszewski
  Department of Biology, Wilfred Laurier University, Waterloo, Ontario

For her talk entitled:

"Diversity and evolution of seeds in *Cuscuta* (dodders, Convolvulaceae): morphology and structure"

The abstracts for both talks above can be found here: www.cspb-scbv.ca/PlantCanada2019/pdf/PC2019_finalprogram.pdf

Iain and Sylvia Taylor Poster Award

Named in honor of Iain and Sylvia Taylor, recognizes the best poster presented by a student at the annual meeting.

The winner is:

- Samantha Mulholland
  Department of Biology, Wilfred Laurier University, Waterloo

For her poster entitled:

"Competition or facilitation: Examination of interactions between endangered *Sida hermaphrodita* and invasive *Phragmites australis*"

The abstract for posters can be found here: www.cspb-scbv.ca/PlantCanada2019/pdf/PC2019_finalprogram.pdf

Assistant Professor - Canada Research Chair Tier 2 in Plant Chemical Biology

The Department of Plant Science of McGill University's Faculty of Agricultural and Environmental Sciences invites applications for a tenure-track position, at the level of Assistant Professor, in the area of Plant Chemical Biology.

McGill's Faculty of Agricultural and Environmental Sciences is located on the Macdonald Campus, 30 km from the city of Montreal, where there is a concentration of life sciences and pharmaceutical companies. The Campus comprises 650 hectares of farm and forested lands, experimental field stations and state-of- the-art student learning facilities (library and computer laboratories). Additional information concerning McGill and its Faculty of Agricultural and Environmental Sciences and the Department of Plant Science can be found on their respective web sites (www.mcgill.ca, www.mcgill.ca/macdonald, www.mcgill.ca/plant).

The successful candidate who satisfies the eligibility conditions of the Canada Research Chair (CRC) program may be supported by the University for nomination to a Tier 2 Chair in Plant Chemical Biology which provides protected time for research within a full-time academic appointment.

Candidates who do not satisfy the CRC eligibility criteria for a Tier 2 Chair are nonetheless invited to apply for the position.

The ideal research approach will encompass basic discovery and translational research to improve crop traits, including but not limited to biotic and abiotic stress resistance, nutritional value, or post-harvest quality. High priority research areas include phenotyping/phenomics, plant imaging/microscopy, biostimulants, plant biomechanics, breeding, genomics, and highly regulated plant pests. The successful applicant is also expected to participate in all aspects of McGill's academic mission including teaching (undergraduate and graduate), graduate-student supervision, mentorship, and involvement in academic and administrative committees.

Application deadline is November 4, 2019. Full details are available at www.mcgill.ca/plant/positions.

Professeur adjoint - Chaire de recherche du Canada de niveau 2 en chemobiologie des plantes

Le Département des sciences végétales de la Faculté des sciences de l'agriculture et de l'environnement de l'Université McGill invite les candidats à postuler pour un poste de professeur(e) adjoint(e) pouvant mener à la permanence dans le domaine de la chemobiologie des plantes.

La Faculté des sciences de l'agriculture et de l'environnement de l'Université McGill est située sur le campus Macdonald, à 30 km à l'ouest du centre-ville de Montréal. Le campus comprend 650 hectares de terres agricoles et forestières, des stations expérimentales et des installations de pointe pour l'apprentissage des étudiants (bibliothèques et laboratoires informatiques). Des renseignements supplémentaires sur l'Université McGill, la Faculté, et le Département sont disponibles sur leur site internet respectif (www.mcgill.ca, www.mcgill.ca/macdonald, www.mcgill.ca/plant).

Si la personne choisie satisfait aux critères d'admissibilité du programme, sa candidature sera proposée par l'Université comme titulaire d'une Chaire de recherche du Canada (CRC) de niveau 2 en chemobiologie des plantes, laquelle prévoit du temps réservé à la recherche dans le cadre d'un poste professoral à temps plein.

Les candidats qui ne satisfont pas aux critères d'admissibilité des CRC de niveau 2 sont tout de même invités à postuler.

L'approche idéale englobera des recherches fondamentales et translationnelles visant l'amélioration des cultures à différents niveaux, incluant mais non limité à la résistance aux stress biotiques et abiotiques, la valeur nutritionnelle et la qualité après récolte. Les domaines de recherche hautement prioritaires comprennent le phénotypage, la phénomique et la génomique, l'imagerie et la microscopie, les biostimulants, la biomécanique des plantes, la sélection végétale ainsi que les phytoravageurs hautement réglementés. Le candidat retenu sera également appelé à participer à l'accomplissement de la mission académique de McGill à tous les niveaux, incluant l'enseignement (premier cycle et cycle supérieur), l'encadrement des étudiants aux cycles supérieurs, le mentorat et la participation à des comités universitaires et administratifs).

La date limite de candidature est le 4 novembre 2019. Tous les détails sont disponibles à l'adresse suivante: www.mcgill.ca/plant/positions.

Top Canadian Ornamental Plants. 23. Alstroemeria (Peruvian lilies)

Ernest Small[1,2]

Today, pots of ornamental plants are found in most residences and workplaces, but few people realize that the popularization of electric lighting in the early 20th century was the most important prerequisite for this. Another technological revolution that has also greatly widened the appearance of beautiful plants is the development of rapid air transportation in the last several decades. Vast quantities of gorgeous bouquets of cut flowering stems (referred to as "cut flowers" in the floral trade) are now cheaply transported from warm climates to northern countries like Canada. Because of their beauty and ability to survive after harvest, cut flowers of alstroemeria (species of the genus *Alstroemeria*) have become one of the florist's favourite flowers. This is remarkable, since alstroemeria is the plant most feared by florists for its ability to produce severe dermatitis. In mild climates cultivars are also grown as garden ornamentals and in public landscape beds, and there is potential for the breeding of new outdoor varieties suitable for Canadian conditions.

Scientific names: The genus *Alstroemeria* is based on Baron Claus von Alstroemer (1736–1794), a Swedish naturalist and student of Linnaeus. Also named for him is the cultivar *Alstroemeria* 'Red Baron'.

English names: Alstroemeria (sometimes misspelled alstromeria because Alstroemer can be spelled with a diaresis: Alströmer), Peruvian lily, Inca lily, lily of the Incas. Some species are called parrot lily and princess lily. The odd name "Ulster Mary" is a deliberate mispronunciation of "alstroemeria."

French name: Alstroemeria, alstroemère, lis de Incas, lys des Incas, lis du Pérou.



Figure 1: Baron Claus von Alstroemer (at age 35), Swedish naturalist commemorated by the genus name *Alstroemeria*, coined by his teacher and friend Carl Linnaeus, the father of biological nomenclature. Alstroemer collected plants in southern Europe for Linnaeus. Public domain painting.

Symbolism

Although many plants have naturally acquired symbolic meanings over the centuries, in recent times the florist trade has contrived inspirational symbolic associations of popular new offerings to stimulate sales. It has been alleged that alstroemerias symbolize friendship, and even that the six "petals" stand for understanding, humour, patience, empathy, commitment and respect.

Wild *Alstroemeria* species

Alstroemeria is a genus of about 80 species of South America, mostly southern South America and Eastern Brazil, with centres of diversity in eastern Brazil and central Chile. The species are found in diverse habitats, ranging from the Andes Mountains (up to 4500 m in altitude) and highland forests to deserts and ocean coastlines. Many are narrow endemics, and some are threatened by habitat degradation, especially from agricultural development. The genus was once included in the Amaryllidaceae or the Liliaceae, but is now placed in the Alstroemeriacae, a small family of four genera. The northernmost indigenous range includes southern Venezuela and north-west Brazil. Several species have become naturalized outside of their native South America, and some have become invasive.

The plants are mostly herbaceous perennials, growing both vegetative and reproductive shoots from creeping rhizomes or clusters of tuberous roots (true roots thickened to become storage and perennating organs like those of dahlias and sweet potatoes; by contrast, stem tubers like those of the common potato form from thickened rhizomes). The "tubers" can accumulate considerable starch. Inflorescences (with few to several dozen flowers) tend to be on the ends of flowering shoots. Sexual reproduction is by many small globose seeds produced in explosive capsules. The leaves are more or less elongated, often with-

[1]Science and Technology Branch, Agriculture and Agri-Food Canada, Saunders Bldg., Central Experimental Farm, Ottawa ON, K1A 0C6
[2]©Government of Canada. Verbatim redistribution for personal, non-commercial use is permitted.

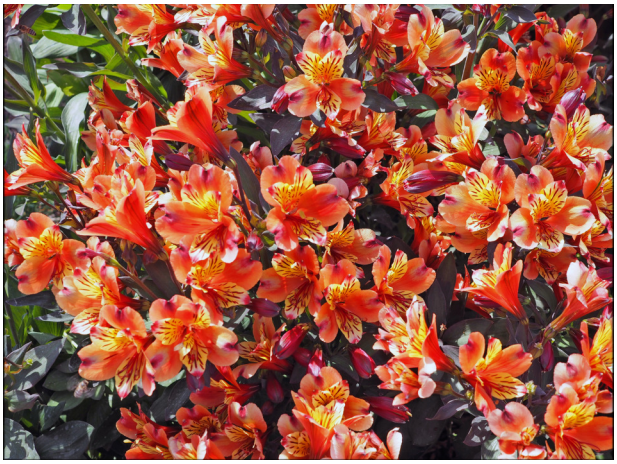


Figure 2: Alstroemeria 'Indian Summer', at Kew Gardens. Photo by Russell Harris (public domain).

out an evident petiole, and as they unfold they become *resupinate* (they turn upside down because of twisting at the base so that the lower and upper surfaces are reversed). The flowers are lily-like (trumpet-form), with six stamens and six petaloid tepals. The outer three tepals are uniform, while one of inner set of three is different from its companions. The flowers of the wild species vary considerably in colour, including shades of white, yellow, pink, red, purple and violet. The wild species are of quite limited commercial value because their flowers are often small, cut flowering stems have limited shelf life, and the plants often become dormant for part of the year.

Domesticated *Alstroemeria* species

Collections were brought back to Europe in the 16th century by explorers, and Linnaeus recognized the genus in 1762. Early breeding, especially by hybridization, involved *A. aurea* (*A. aurantiaca*), *A. ligtu*, *A. pelegrina* (all from Chile), and *A. psittacina* (from Brazil.) In more recent times, breeding has been conducted in several countries, notably the Netherlands, England, the U.S. and Japan, and at least a dozen more species have been employed as parents in the production of new hybrids. Some cultivars grow as tall as 2.5 m, but dwarf forms (about 30 cm in height) are also available (the "Princess" series is popular). Dormancy was a problem in some early cultivars, but this has been overcome. Hundreds of hybrids are available, some with very large solitary flowers, others with umbels of smaller blooms. Flower colours of cultivars may be lavender, orange, peach, pink, purple, red, white or yellow. The inner set of tepals has coloured lines, which are nectar guides for pollinators. Cut flowering stems bearing flowers with solid colours are often presented in uniform bouquets, or alternatively in mixtures of different colours. Many recent cultivars bear flowers with striking bi-colour and multi-colour patterns of streaks, freckles and spots. For growth of plants in pots or in warm climates, cultivars have often been selected that have evergreen foliage and bloom continuously. Most species and cultivars are not noticeably fragrant, but recent scented lines have been produced. Also recently, cultivars have been bred that are relatively cold-hardy, and capable of growing as outdoor perennials in the warmest regions of Canada.

Many alstroemeria cultivars are divided into two groups based on flowering habit. The "butterfly-type" flowers for 9–12 months annually, depending on cultivar and environment. These have shorter growth habits and larger, more open flowers, and are better suited to be potted plants. Most butterfly-type alstroemerias are polyploid, and can produce seeds. The "orchid-type" flowers mainly for a period of 3–5 months in the spring, with limited or no flowering at other times, remaining vegetative until the spring. These cultivars are tall and produce a large number of flowers in a short period, and so are employed mostly as cut flowers. Most orchid-type alstroemerias are diploid and sterile, and so propagated vegetatively.

Economic value

Alstroemeria is primarily of value as a cut flower used for bouquets and flower arrangement. It is among the world's ten leading commercial cut flowers. In Europe and North America, alstroemeria's popularity expanded considerably in the 1970s. Alstroemerias are rather similar to lilies (the flowers have also been compared to azaleas), and cut flower alstroemeria production in Canada is approximately similar in scale to cut flower lily production. Prior to 2016, the Canadian greenhouse industry produced over ten million alstroemeria cut stems annually, but domestic production has been decreasing for all Canadian cut flowers due particularly to South American competition. Alstroemerias are currently grown outdoors in warmer climates than in most of Canada, but their extremely attractive flowers, lasting for



Figure 3: Geographical distribution of *Alstroemeria* (after Sanso et al. 2005).

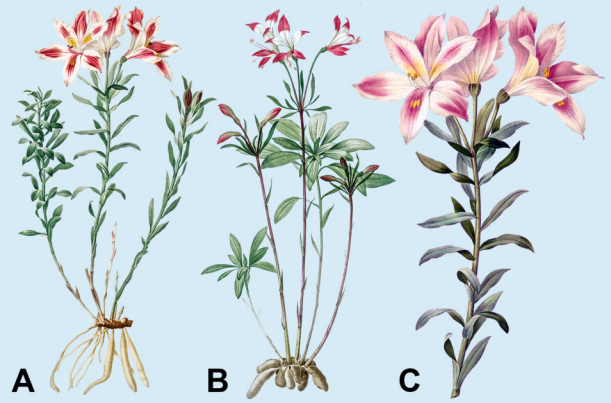


Figure 4: Alstroemeria paintings (public domain) by Pierre Joseph Redouté (1759–1840). Redouté, a Flemish painter specializing on flowering plants, is regarded as one of the finest botanical illustrators of all time. A: (*A. pelegrina*) and B (*A. ligtu*) from Les liliacées (1805), digitally enhanced, ©rawpixel (CC BY 4.0). C: from Choix des plus belles fleurs et des plus beaux fruits (1833), photo ©Swallowtail Garden Seeds (CC BY 2.0).

months, is stimulating development of cultivars suitable for perennial gardens in colder locations.

Cut flowers in historical perspective

Alstroemeria is primarily used as cut flowers for interior bouquets. In old times, harvested flowering plant species were placed indoors mostly as "strewing herbs" – fragrant plants especially employed at weddings, parties and funerals to mask household odours. By the 18th century, containers to hold cut flowers had become common.



Figure 5: *Alstroemeria aurea*. Source (public domain): Van Eeden, A.C. 1872–1881. Album van Eeden, Haarlem's flora, afbeeldingen in kleurendruk van verschillende bol- en knolgewassen, p. 79, t. 100.



Figure 6: *Alstroemeria ligtu* subsp. *incarnata*. ©Jean-Michel Moullec (CC BY 2.0).

Wealthy and noble families could even afford to establish "cutting gardens" (also private medicinal gardens), the counterparts of "kitchen gardens" which, much more practically, were designed to bring food into the house and not simply flowers for ornament. Common people in past times were mostly dependent on gathering pretty wildflowers from nature, rather than cultivating the plants. In Victorian times (the ruling era of Queen Victoria, 1837–1901), commercial cutting gardens were widespread and the trade in cut flowers was extensive. By the beginning of the 20th century, floriculture was well established, and today cheap cut flowers have now become ubiquitous commodities sold in supermarkets and by internet. More than a dozen countries have cut-flower industries valued at several billion dollars annually. Dramatically more than any other class of economic plants, the cut-flower industry is oriented towards female consumption.

Edibility and Toxicity

All parts of alstroemeria plants can cause significant contact dermatitis, especially for florists and growers (it has been claimed that the plant is the most common cause of allergic contact dermatitis among florists). The flowers contain the most concentrated amounts of allergens. The main allergens are 6-tulipalin A and tulipalin A. Tulipalins are also the cause of dermatitis due to tulips. Gardeners are advised to wear impermeable plastic gloves when working with the plants. The allergens can pass through vinyl, such as polyvinyl chloride gloves; nitrile gloves have been recommended, and for those who are concerned about the toxic potential of bouquets, the same advice is warranted. Although the American Society for the Prevention of Cruelty to Animals (ASPCA) website states that alstroemeria is non-toxic to dogs, cats and horses, this is contradicted by many other online sources, which indicate that pets ingesting the plant may experience mild to moderate gastric toxicity. Cutting or damaging the plant can even release allergens into the air, and although the risk of air-borne toxicity is limited, there is documentation showing that this has caused pulmonary difficulties in some people. Negative responses may take a day or more to develop, and sensitization (additional contact eliciting more severe reactions) may occur. While alstroemeria has toxic potential, except

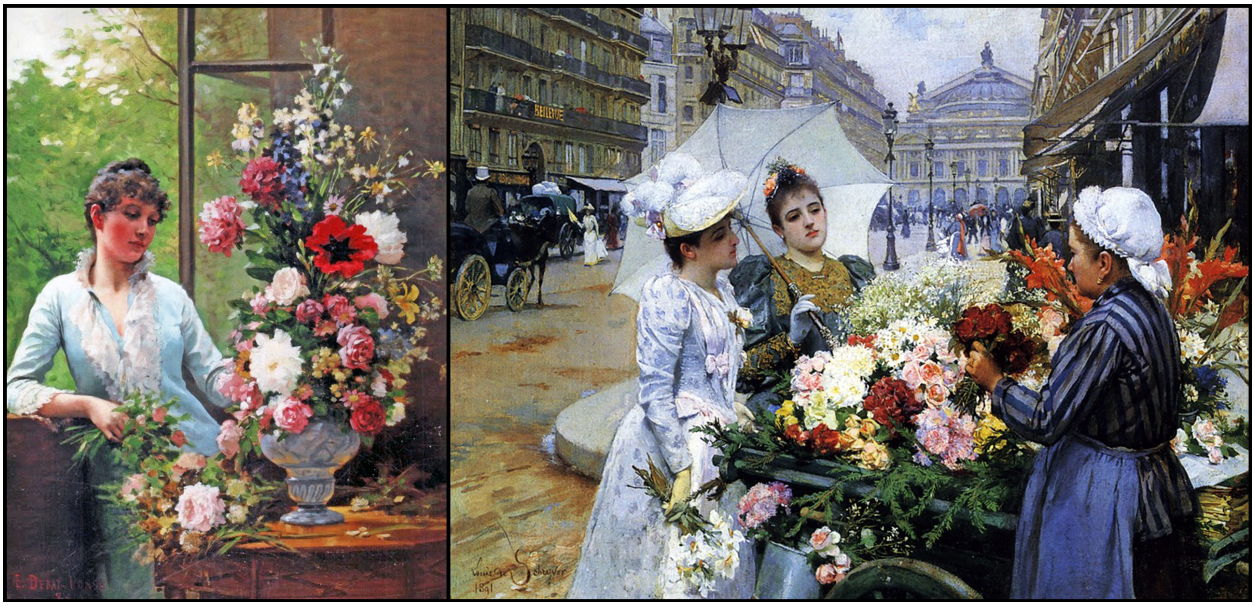


Figure 7: Illustrations (public domain) of cut flowers showing their importance in Victorian times. Left: "Preparing the flower arrangement," 1886 painting by Édouard Debat-Ponsan (1847–1913). Right: "The Flower Seller, Avenue de L'Opera Paris," 1891 painting by Louis Marie de Schryver (1862–1942).

for people who regularly handle it as part of their occupation, reports of adverse reactions are uncommon, and have not prevented the plant from becoming one of the world's top ten cut flowers. The dangers posed by alstroemeria are comparable to that posed by tulips (but tulip bulbs are more toxic than alstroemeria tubers). Alstroemerias are so widely handled as bouquets – even used as boutonnières and corsages – that contact with skin is inevitable. Nevertheless the plant has rarely has been a concern.

Starch employed as a medicinal food was obtained from the thicker roots of *A. ligtu* by indigenous peoples in South America. However, alstroemeria is not considered to be an edible plant. It may be noted that some extremely toxic cycads (species of the order Cycadales) store considerable starch, and aboriginal peoples learned how to process the starch to avoid being poisoned.

Maintaining Cut Flowers

The cut flowers can have a very long post-harvest vase life, lasting 2 weeks or longer. Indeed, alstroemerias are likely to be the last flowers enduring in vase bouquets. The following recommendations have been made to prolong vase life: Ensure that the vase is clean. Fill it with water at room temperature. Add cut-flower food. Diagonally trim away 3–5 cm from the bases of stems, using a sharp clean knife or secateurs. Ensure leaves do not hang in water. Place vase away from drafts, in full sun, and away from fruit (ethylene emissions hasten flower senescence, and alstroemeria is particularly sensitive). Regularly top up water in vase. Remove wilted flowers.

Maintaining Indoor Potted Plants

Alstroemerias grow well in pots, but as they do best in sunny locations, they are not ideal houseplants. When grown indoors, they are best maintained in a cool area.

Cultivation

Alstroemerias are mainly grown for the cut flower trade, but are also useful as outdoor container and garden plants, especially in warm climates. In cold climates such as in most of Canada, it is not feasible to grow plants outdoors from seeds, so plants that have been established indoors are transplanted, or tubers or rhizomes are planted. Tall varieties may require staking or trellising. Potted plants moved to gardens may bloom as early as late spring. Because of the limited hardiness of the hardiest cultivars, gardeners may prefer to grow the much more cold-tolerant Asiatic lily (*Lilium auratum*).

Purchasing

Tubers (tuberous roots) for planting outdoors in Canada are best obtained from specialty Canadian "bulb" suppliers, who are likely to provide the hardiest cultivars. Alstroemerias are not yet available for Canada in large amounts, so those interested in cultivating it are advised to place their orders well before the season begins.

Planting

The tubers or rhizomes are often brittle, and need to be handled gently. If a planting depth is not specified by the supplier, they may be placed 10–20 cm below the soil surface. Deep cultivation of the soil (to 35 cm or more) to improve drainage will reduce possible infection by root rot, to which alstroemeria is susceptible. If spacing is not specified by the supplier, the tubers may be positioned 30 cm apart.

Soil & moisture conditions

Cultivated alstroemerias grow best in moist, well-drained, rich organic soils. A pH between 5.5 and 6.5 is recommended. Well-rotted manure or compost is best. Alternatively, a balanced fertilizer may be applied occasionally (some say once per season, others every 2–3 weeks). Some



Figure 8: Alstromeria in vases. Left: ©Kowloonese (CC BY SA 3.0). Right: Bouquet with happy birthday card. ©ProFlowers (CC BY 2.0).

authorities recommend application of a half-strength soluble bloom-type fertilizer once flower buds are initiated.

Location

For outdoor growth, plants should be in locations that provide full sunlight or partial shade (filtered shade is recommended for hot climates), and are protected from wind. The plants do well in raised beds.

Temperature

In most of urban Canada, alstroemeria beds can be established in the spring for growth as annuals. Some garden catalogues offer cold-hardy cultivars claimed to be able to overwinter as far north as United States Department of Agriculture Hardiness Zone 5 (lowest winter temperatures of -23.5 to -28.8°C). However, most cultivars are cold sensitive, and rhizomes or tubers will only tolerate a few degrees of freezing. Overwintering outdoors in colder areas may be possible if planted against a warm foundation and a mulch is provided for insulation. For some species, excessive heat results in much better tuber development at the expense of sparse flowering.

Harvesting Flowers

It is widely thought that *cutting* alstroemeria flowers will slow the growth and flower production of the plant. Accordingly, to harvest the flowering stems for display in a vase, it has been strongly recommended that the stalks be grasped close to the ground, and *pulled* out of the rhizome or tuber with a rapid upward, twisting picking movement.

Curiosities of Science and Technology

- Extremely attractive flowers such as alstroemeria are sometimes employed as boutonnières. Some decades ago, several of the Agriculture Canada greenhouses in Ottawa were dedicated to ornamental plant research, and this included breeding of new alstroemeria cultivars. The most attractive flowers available were often harvested for use as boutonnières by a certain prime minister noted for his elegant attire.

- Humans universally are attracted to beautiful flowers like alstroemeria, and several reasons have been advanced to explain this in adaptive evolutionary terms. One theory holds that the occurrence of plants with impressive floral displays signalled to our ancestors that the habitat was conducive to good plant growth, including edible tubers and fruits. It has been demonstrated that the presence of attractive flowers lowers stress, which certainly has survival value for humans. In the past, when humans were primarily nomadic, finding temporary campsites where flowers indicated food was abundant would have been particularly beneficial for childbirth. This may explain the much greater appreciation of beautiful flowers by women, and consequently the value of flowers as gifts from men to women. (For an extensive discussion of why people love flowers, see Hůla and Flegr 2016.)

Key publications

Aagesen, L, and Sanso, M. 2003. The phylogeny of the Alstroemeriaceae, based on morphology, rps16 Intron, and rbcL sequence data. Syst. Bot. 28: 47–69.

Adams, R.M., Daily, A.D., Brancaccio, R.R., Dhillon, I.P., and Gendler, E.C. Alstroemeria. 1990. A new and potent allergen for florists. Dermatol. Clin. 8: 73–76.

Aker, S., and Healy, W. 1990. The phytogeography of the genus *Alstroemeria*. Herbertia 46: 76–87.

Aros, D., Suazo, M., Rivas, C., Zapata, P., Úbeda, C., and Bridgen, M. 2019. Molecular and morphological characterization of new interspecific hybrids of alstroemeria originated from *A. caryophlleae* scented lines. Euphytica 215:93. doi.org/10.1007/s10681-019-2415-4.

Babarabie, M., Zarei, H., and Varasteh, F. 2016. Potential of increasing the vase life and improvement of some physiological characteristics of *Alstroemeria* cut flowers by using non-harmful compounds environmentally. J. Chem. Health Risks 6: 1–8.

Bridgen, M.P. 2018. Alstroemeria. In Ornamental crops, handbook of plant breeding 11. Edited by J. Van Huylenbroeck. Springer International. pp. 231–236.

Bridgen, M. Kollman, E., and Lu, C. 2009. Interspecific hybridization of *Alstroemeria* for the development of new ornamental plants. Acta Hort. 836: 73–78.

Chacón, J, Camargo de Assis. M, Meerow. A.W., and Renner, S. 2012. From East Gondwana to Central America: Historical biogeography of the Alstroemeriaceae. J. Biogeog. 39: 1806–1818.

Finot, V.L., Baeza, C.M., Ruiz, E., Toro, O., and Carrasco, P. (2017. Towards an integrative taxonomy of the genus *Alstroemeria* (Alstroemeriaceae) in Chile: A comprehensive review. In: Selected studies in biodiversity. Edited by Şen, B. and Grillo, O. IntechOpen, doi: 10.5772/intechopen.71823. Available from: www.intechopen.com/books/selected-studies-in-biodiversity/towards-an-integrative-taxonomy-of-the-genus-alstroemeria-alstroemeriaceae-in-chile-a-comprehensive-.

Hofreiter, A., and Rodríguez, E. 2006. The Alstroemeriaceae in Peru and neighbouring areas. Revista Peruana de Biología 13: 5–69.



Figure 9: Mixed 19th century European Alstroemeria cultivars. Source (public domain): Revue horticole, serié 4, vol. 56, 1884.

Hoshino, Y. 2008. Advances in alstroemeria biotechnology. In: Floriculture, ornamental and plant biotechnology. Advances and Topical Issues. Vol. 5. Edited by da Silva, J. Global Science Books, Ikenobe, Japan. pp. 540–547.

Hůla, M., and Flegr, J. 2016. What flowers do we like? The influence of shape and color on the rating of flower beauty. PeerJ 4:e2106 doi.org/10.7717/peerj.2106.

Kim, J.S., and Kim J.H. 2013. Comparative genome analysis and phylogenetic relationship of order Liliales: insight from the complete plastid genome sequences of two lilies (*Lilium longiflorum* and *Alstroemeria aurea*). PLoS ONE 8(6): e68180. doi.org/10.1371/journal.pone.0068180.

Kristiansen, K., and Christensen, L.P. 1998. Allergen contents in *Alstroemeria* can be reduced by breeding. Euphytica 101: 367–375.

Lim, S.-S., Lee, S.-I., Kang, S.-C., and Kim, J.-B. 2012. *Alstroemeria* plants and its biotechnological applications. J. Plant Biotechnol. 39: 219–224.

Marks, J.G. 1988. Allergic contact dermatitis to *Alstroemeria*. Arch. Dermatol. 124: 914–916.

McCluskey, J., Bourgeois, M., and Harbison, R. 2014. Tulipalin A induced phytotoxicity. Int. J. Crit. Illn. Inj. Sci. 4: 181–183.

Muñoz, M., and Moreira, A. 2003. Alstroemerias de Chile: diversidad, distribución y conservación. Taller La Era, Santiago, Chile. 139 pp.

Nasri, F., Saba, M.K., Ghaderi, N., Mozafari, A.A., and Javadi, T. 2014. Improving germination and dormancy breaking in *Alstroemeria ligtu* hybrid seeds. Trakia J. Sci. 12: 38–46.

Park, T.-H., Han, I.-S., and Kim, J.-B. 2010. Review on the development of virus resistant plants in *Alstroemeria*. J. Plant Biotechnol. 37: 370–378.

Reid, A. 2006. Alstroemera. Bulletin 4688. Department of Agriculture and Food, Western Australia, Perth. 8 pp.

Sarwar, A.K.M.G., Hoshino, H., and Araki, H. 2010. Pollen morphology and infrageneric classification of *Alstroemeria* L. (Alstroemeriaeae). Grana 49: 227–242.

Sanso, A.M. 1996. El género *Alstroemeria* (alstroemeriaceae) en Argentina. Darwiniana 34: 349–382. (In Spanish, English abstract.)

Sanso, A.M., and Xifreda, C. 2001. Generic delimitation between *Alstroemeria* and *Bomarea* (Astroemeriaceae). Ann. Bot. 88: 1057–1069.

Sanso, A.M., Camargo de Assis, M., and Xifreda, C.C. 2005. *Alstroemeria*: a charming genus. Acta Hort. 683: 63–77.

Shahriari, A.G., Bagheri, A. and Shahriari, Z. 2013. In vitro regeneration of *Alstroemeria*: A review. In: Bulbous plants: biotechnology. Edited by Ramawat, K.G. and Mérillon, J.M. CRC Press: Boca Raton. pp. 270–283.

Uphof, J.C.T. 1952. A review of the genus *Alstroemeria*. Plant Life (Herbertia edition) 8: 37–53.

Vietzke, G.E.1992. Pretty posies: The colonial revival's influence on the use of flowers in historic interiors. Master's thesis. University of Pennsylvania. 95 pp. repository.upenn.edu/cgi/viewcontent.cgi?article=1235&context=hp_theses.

Wagstaff, C., Chanasut, U., Harren, F.J., Laarhoven, L.J., Thomas, B., Rogers, H.J., and Stead, A.D. 2005. Ethylene and flower longevity in *Alstroemeria*: relationship between tepal senescence, abscission and ethylene biosynthesis. J. Exp. Bot. 56(413):1007-16. doi: 10.1093/jxb/eri094.

Wilkins, H.F. 1986. The history of alstroemeria production in North America. Herbertia 41: 15–19.

Key websites

Hanks, G. 2017. Alstroemerias (*Alstroemeria* hybrids) as a tunnel-grown cut flower crop – horticulture.ahdb.org.uk/download/11866/file

Healy, W.E., and Wilkins, H.F. Alstroemera culture – hortscans.ces.ncsu.edu/file/2018/07/alstroem_537ba198e59b3.pdf

Pacific Bulb Society: Astroemeria – www.pacificbulbsociety.org/pbswiki/index.php/Alstroemeria

Acknowledgements
Brenda Brookes skillfully assembled and enhanced the illustrations for publication. Creative Commons Licenses employed in this article: CC BY 2.0 (Attribution 2.0 Generic): creativecommons.org/licenses/by/2.0/; creativecommons.org/licenses/by-nd/2.0/; creativecommons.org/licenses/by/2.0/; CC BY 3.0 (Attribution 3.0 Unported): creativecommons.org/licenses/by/3.0/. CC BY 4.0 (Creative Commons Attribution 4.0 International license): creativecommons.org/licenses/by/4.0/deed.en. CC BY SA 2.0 (Attribution ShareAlike 2.0 Generic): creativecommons.org/licenses/by-sa/2.0/; CC BY SA 3.0 (Attribution ShareAlike 3.0 Unported): creativecommons.org/licenses/by-sa/3.0.



Figure 10: "Alstroemeria palette" – a floral display at Malvern Spring Gardening Show 2013, Malvern Wells, Worcestershire, Great Britain. ©Jonathan Billinger (CC BY SA 2.0)



Labrador Lichens. Also pictured, *Vaccinium boreale* Hall & Aalders, ©Tyler Smith