The Canadian Botanical Association Bulletin

Bulletin de l'Association Botanique du Canada

Volume 55 Number 1 - March/mars 2022

Highlights

President's Message

A winter of extremes

Rain, snow, cold, Omicron, blockades, Olympics in China, Ukraine, Russia. As we move towards spring my head is still spinning with everything that has happened since December, and this list includes only events occurring at a national or international scale. To this we can all add our own personal events, sickness, teaching flip-flops, administrative overload, exhausted colleagues and loved ones, shut downs.

At times it can be difficult to see the pertinence or find the energy to continue the work of the association; promoting the importance and ultimately the conservation of plants, which are the supporting structure of almost all our ecosystems. However, this work is more important than ever as the hand of climate change can be seen in many of the events of the last year and the task of conserving plants and using them to their full potential is of greater importance than ever as the IPCC once again warns that we are on the threshold of no return.

As the Omicron wave recedes and spring approaches, there is some light at the end of the tunnel as in person gatherings are once again allowed. In order to benefit from the collective energy of our membership and recharge our motivation in research, teaching and conservation, I invite all of our members, whether you work or study in universities and colleges, in museums, in consulting firms, or in NGOs, to join us physically or virtually in Rouyn-Noranda in June. We are planning an event filled week, with workshops, symposia, contributed papers and field trips. Macoun Travel awards will be available to facilitate student travel, and we will help coordinate trips from Ottawa and Montreal to Rouyn.

I look forward to sharing our corner of the beautiful boreal landscape with all of you.

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 website: www.cba-abc.ca

Executive Editor

Dr. Erin Zimmerman

cba.abc.bulletin@gmail.com

Published in Dutton, March 8th 2022 ISSN 0008-3046 (paper) ISSN 1718-8164 (electronic)

Next issue

Texts for the next issue, 55(2), must be received by August 1, 2022

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 I'ABC.

Soumission de textes

Tous les membres de I'Association sont invités à envoyer des textes de toute nature concernant 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 I'ABC à l'url suivant: www.cba-abc.ca

Rédactrice en chef

Dr. Erin Zimmerman

cba.abc.bulletin@gmail.com

Publié à Dutton, le 8 mars 2022 ISSN 0008-3046 (papier) ISSN 1718-8164 (électronic)

Prochain numéro

La date de tombée des textes du prochain numéro, le no 55(2), est le 1 août 2022

Un hiver des extrêmes

Pluie, neige, froid, Omicron, blocus, JO en Chine, Ukraine, Russie. Alors que nous nous dirigeons vers le printemps, ma tête tourne encore avec tout ce qui s'est passé depuis décembre, et cette liste ne comprend que les événements qui se produisent à l'échelle nationale ou internationale. À cela, nous pouvons tous ajouter nos événements personnels, la maladie, les volte-face pédagogiques, la surcharge administrative, les collègues et proches épuisés, les fermetures.

Parfois, il peut être difficile de voir la pertinence ou de trouver l'énergie pour continuer le travail de l'association; promouvoir l'importance et finalement la conservation des plantes, qui sont la structure de soutien de presque tous nos écosystèmes. Cependant, ce travail est plus important que jamais car la main du changement climatique peut être vue dans de nombreux événements de l'année dernière et l'importance de la conservation des plantes et de leur utilisation à leur plein potentiel est d'une plus grande importance que jamais alors que le GIEC avertit à nouveau que nous sommes sur le seuil de non-retour.

Alors que l'onde Omicron recule et le printemps se pointe du nez, il y a de la lumière au bout du tunnel, car les rassemblements en personne sont à nouveau autorisés. Afin de bénéficier de l'énergie collective de nos membres et de recharger notre motivation dans la recherche, l'enseignement et la conservation, j'invite tous nos membres, que vous travailliez ou étudiez dans des universités et collèges, dans des musées, des cabinets de conseil ou des ONG, pour nous rejoindre physiquement ou virtuellement à Rouyn-Noranda en juin. Nous prévoyons une semaine remplie d'événements, avec des ateliers, des symposiums, des contributions et des sorties sur le terrain. Des bourses de voyage Macoun seront disponibles pour faciliter les déplacements des étudiants, et nous aiderons à coordonner les voyages d'Ottawa et de Montréal à Rouyn.

J'ai hâte de partager notre coin du magnifique paysage boréal avec vous tous.

Sincerely,

Nicole Fenton

Université du Québec en Abitibi-Témiscamingue

New Member Publications

Please note that the articles preceded by an asterisk were published in a special issue of the Journal of Systematics and Evolution, Volume 59, Issue 4, "Cyperaceae in a Data-Rich Era: New Evolutionary Insights from Solid Frameworks." All twelve articles therein are open access and can be downloaded for free.

Cui, H., Ford, B., Starr, J., Reznicek, A., Zhang, L., & Macklin, J.A. (2022) Authors' attitude toward adopting a new workflow to improve the computability of phenotype publications. Database https://doi.org/10.1093/database/baac001

*Larridon, I., Zuntini, A.R., Léveillé-Bourret, É., Barrett, R.L., Starr, J.R., Muasya, A.M., Villaverde, T., Bauters, K., Brewer, G.E., Bruhl, J.J., Costa, S.M., Elliott, T.L., Epitawalage, N., Escudero, M., Fairlie, I., Goetghebeur, P., Hipp, A.L., Jiménez-Mejías, P., Sabino Kikuchi, I.A.B., Luceño, M., Márquez-Corro, J.I., Martín-Bravo, S., Maurin, O., Pokorny, L., Roalson, E.H., Semmouri, I., Simpson, D.A., Spalink, D., Thomas, W.W., Wilson, K.L., Xanthos, M., Forest, F., & Baker, W.J. (2021) A new classification of Cyperaceae (Poales) supported by phylogenomic data. Journal of Systematics and Evolution 59:852-895.

Nieto-Blázquez, M.E., Quiroga, M.P., Premoli, A.C., & Roncal, J. (2022) *Podocarpus* in the palaeogeographically complex island of Hispaniola: A stepping-stone colonization and conservation recommendations. Diversity and Distributions 28:214–226.

*Starr, J.R., Jiménez-Mejías, P., Zuntini, A.R., Léveillé-Bourret, É., Semmouri, I., Muasya, M., Baker, W.J., Brewer, G.E., Epitawalage, N., Fairlie, I., Forest, F., Sabino Kikuchi, I.A.B., Pokorny, L., & Larridon, I. (2021) Targeted sequencing supports morphology and embryo features in resolving the classification of Cyperaceae tribe Fuireneae s.l. Journal of Systematics and Evolution 59:809-832.

*Pender, J.E., Hipp, A.L., Hahn, M., & Starr, J.R. (2021) Trait evolution rates shape continental patterns of species richness in North America's most diverse angiosperm genus (*Carex*, Cyperaceae). Journal of Systematics and Evolution 59:763-775.

*Léveillé-Bourret, É., Eggertson, Q., Hambleton, S., & Starr, J.R. (2021) Cryptic diversity and significant cophylogenetic signal detected by DNA barcoding the rust fungi (Pucciniaceae) of Cyperaceae–Juncaceae. Journal of Systematics and Evolution 59:833-851.

*Global Carex Group, G.C., Roalson, E.H., Jiménez-Mejías, P., Hipp, A.L., Benítez-Benítez, C., Bruederle, L.P., Chung, K.-S., Escudero, M., Ford, B.A., Ford, K., Gebauer, S., Gehrke, B., Hahn, M., Hayat, M.Q., Hoffmann, M.H., Jin, X.-F., Kim, S., Larridon, I., Léveillé-Bourret, É., Lu, Y.-F., Luceño, M., Maguilla, E., Márquez-Corro, J.I., Martín-Bravo, S., Masaki, T., Míguez, M., Naczi, R.F.C., Reznicek, A.A., Spalink, D., Starr, J.R., Uzma, Villaverde, T., Waterway, M.J., Wilson, K.L., & Zhang, S.-R. (2021) A framework infrageneric classification of *Carex* (Cyperaceae) and its organizing principles. Journal of Systematics and Evolution 59:726-762.

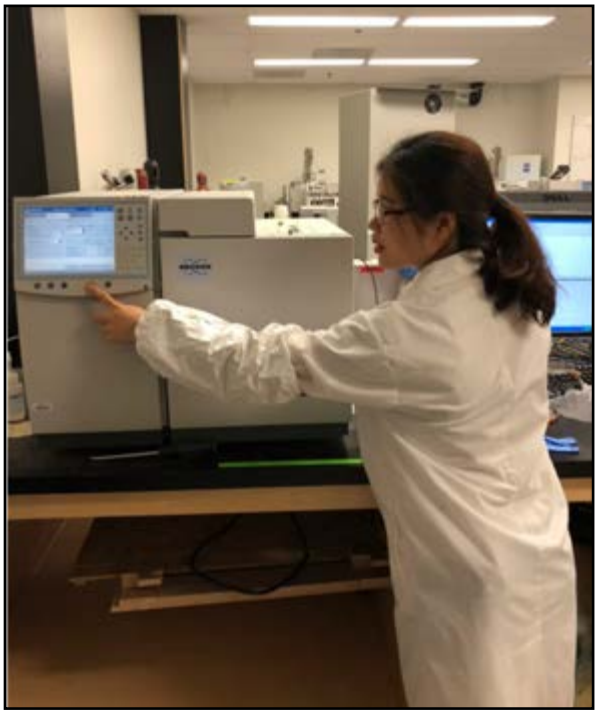
Zhang, L., Yang, X., Cota, Z., Cui, H., Ford, B., Chen, H.-l., Macklin, J.A., Reznicek, A., & Starr, J. (2021) Which methods are the most effective in enabling novice users to participate in ontology creation? A usability study. Database https://doi.org/10.1093/database/baab035

Graduations

Bouchard, Andréanne. (2021) Incorporating molecular data in the taxonomic study of diatoms: An example using two well-known genera, *Frustulia* and *Navicula* s.s. (Bacillariophyceae, Naviculales).

MSc. Université d'Ottawa /University of Ottawa.
Supervisor, Julian Starr; Co-supervisor, Paul Hamilton.

Andréanne Bouchard



Haoran Chen, shown measuring nitrogen fixation rate with acetylene reduction assay using a gas chromatograph.

Chen, Haoran. (2021) Nitrogen-fixing plant ecology: factors limiting the nitrogen fixing trait.

PhD. University of Manitoba.
Supervisor, John Markham.

Longert, Dylan. (2022) The adaptive significance of inflorescence pigmentation and its potential influence on the diversification dynamics of North American sedges (*Carex*, Cyperaceae). [Link not yet available.]

MSc. Université d'Ottawa /University of Ottawa.
Supervisor, Julian Starr; Co-supervisor, Étienne Léveillé-Bourret.

Dylan Longert

Renew your CBA membership online!

This is a friendly reminder to renew your membership online now at https://www.cba-abc.ca/membership/. As we move to be compliant with all federal laws we will be obliged to remove people who have not renewed their membership three months after the New Year from our membership list. Of course, we will welcome you back after that date, but you might miss a bulletin!

Renouvelez votre adhésion à l'ABC en ligne!

Ceci est un rappel amical pour renouveler votre adhésion en ligne maintenant à https://www.cba-abc.ca/membership/. Alors que nous nous efforçons de nous conformer à toutes les lois fédérales, nous serons obligés de retirer de notre liste de membres les personnes qui n'ont pas renouvelé leur adhésion trois mois après le Nouvel An. Bien entendu, nous vous accueillerons à nouveau après cette date, mais vous risquez de manquer un bulletin!

PhD position in subarctic terrestrial ecology

Subarctic regions are experiencing some of the greatest rates of climate change on the planet. However, some subarctic regions are experiencing a change in plant communities while others are not, suggesting that communities are not in equilibrium with the climate. The woodlands and tundra habitats of the subarctic are characterized by slow-growing plants and nutrient-poor soils that have large pools of organic matter. We are interested in how the feedback between plants and soil uncouples communities and ecosystem processes from the regional climate. We are also examining how the consumer food chain alters nutrient availability and creates feedbacks in ecosystem productivity and community composition. We conduct manipulative experiments using fertilizer additions and plant exclusion, and observational studies on animal redistribution of nutrients in woodland and tundra habitats. Our field sites are in Wapusk National Park and near the Churchill Northern Studies Center.

At present, there is a position for a PhD student. An MSc in the biological sciences with an emphasis in ecological or environmental studies is a must. Students should have an interest in ecophysiology, community ecology, and ecosystem processes. Experience working in the field in remote settings is an asset.

Contact John Markham (john.markham@umanitoba.ca) for more information.

Tales from the Field

Guts & Grasshoppers

By Julian Starr

One of the pleasures of fieldwork is that you never really know what you are going to get from one day to the next. Will it be sun, rain, or maybe hail? Do you fancy a moose or two, or everybody's favourite, a beaver on the bank? Well, only the day can tell, and on this fine day in southeast Saskatchewan, it was going to be plague - a biblical cloud of grasshoppers right to the horizon, bumpin', thumpin', and scrunchin' all over our windshield. Assuming you are not a local farmer, can I say that it is hard not to chuckle when whizzing at 100 plus kilometers per hour through such a pestilence?

Once again, I found myself "en voiture" with the ever-faithful Simon Joly as wingman on maps and pressing as we continued our epic trip collecting roses in the wilds of southeastern Saskatchewan and beyond (See *Can. Bot. Assoc. Bull.* 53(3) and 54(1) for other episodes). Yes, there was a chuckle or two as we barreled through our cloud of Caelifera (the grasshopper suborder), but let's say the chuckling ended the moment we stopped to collect (Fig. 1). Have you ever tried collecting roses – well, let's say, just collecting - with a grasshopper up every private avenue you own? It's unsettling, but it was only going to get worse with an assault on yet another vulnerable sense.

"Whaff! What's that smell!? Yacko!" Almost every time we stopped the car to collect, this evil smell would appear. It was like nothing I had ever smelt before – a sort of mashed potatoes with baked bark and buffalo crushed on beans. The weird part was that it didn't always show up. Sometimes we'd stop the car and beg for mercy from the stench, but on others we smelt…well…nothing. With time, though, the car became ever more suspect, but we had finished our collecting, so the mystery of this Augean stink would remain unsolved for at least the next 28 hours on the road home to Montréal.

However, just as we were about to return the rental in town, the whiff of Beelzebub returned, and there was no doubt now that it was coming from the car. In fact, you could pinpoint it – it was under the hood. As a postdoc mindful of danger, I pulled rank, and ordered Simon (PhD candidate) to lift the bonnet. There on the radiator was the thickest, grossest, and smelliest grasshopper bake I have ever seen. No wonder the car had been overheating. You couldn't peel this horror off the rad or at least I wasn't going to try – it was back to Budget…with a smile! Let's say that I'm one of the biggest fans of the modern quick-drop-off system used by Rentals these days. Why I haven't been banned, I'll never know, but if they ever knew where and what I was up to with their cars, I'm sure they would never let me leave the shop!

Figure 1. Collecting in the wild, *Rosa woodsii* country of southeast Saskatchewan circa 2002.

Ecology & Conservation Section Update

- The Ecology and Conservation Section is currently planning a symposium for the CBA-ABC 2022 Annual Meeting, with details to come shortly.
- Applications are now being accepted for the CBA-ABC 2022 J Stan Rowe Award for the best student paper in plant ecology. The deadline to apply is March 31. The award comes with a $500 prize and the winner will be announced at the annual meeting. Please share widely among colleagues and students who may be interested in applying. Application guidelines can be found on the CBA-ABC website. Application submissions and questions about the award can be sent to the Ecology and Conservation Section Chair, Richard Caners (Richard.Caners@gov.ab.ca).
- The Ecology and Conservation Section web page on the CBA-ABC website has been updated, with more new content to follow.

News from the Inclusion, Diversity, Equity and Accessibility (IDEA) Committee

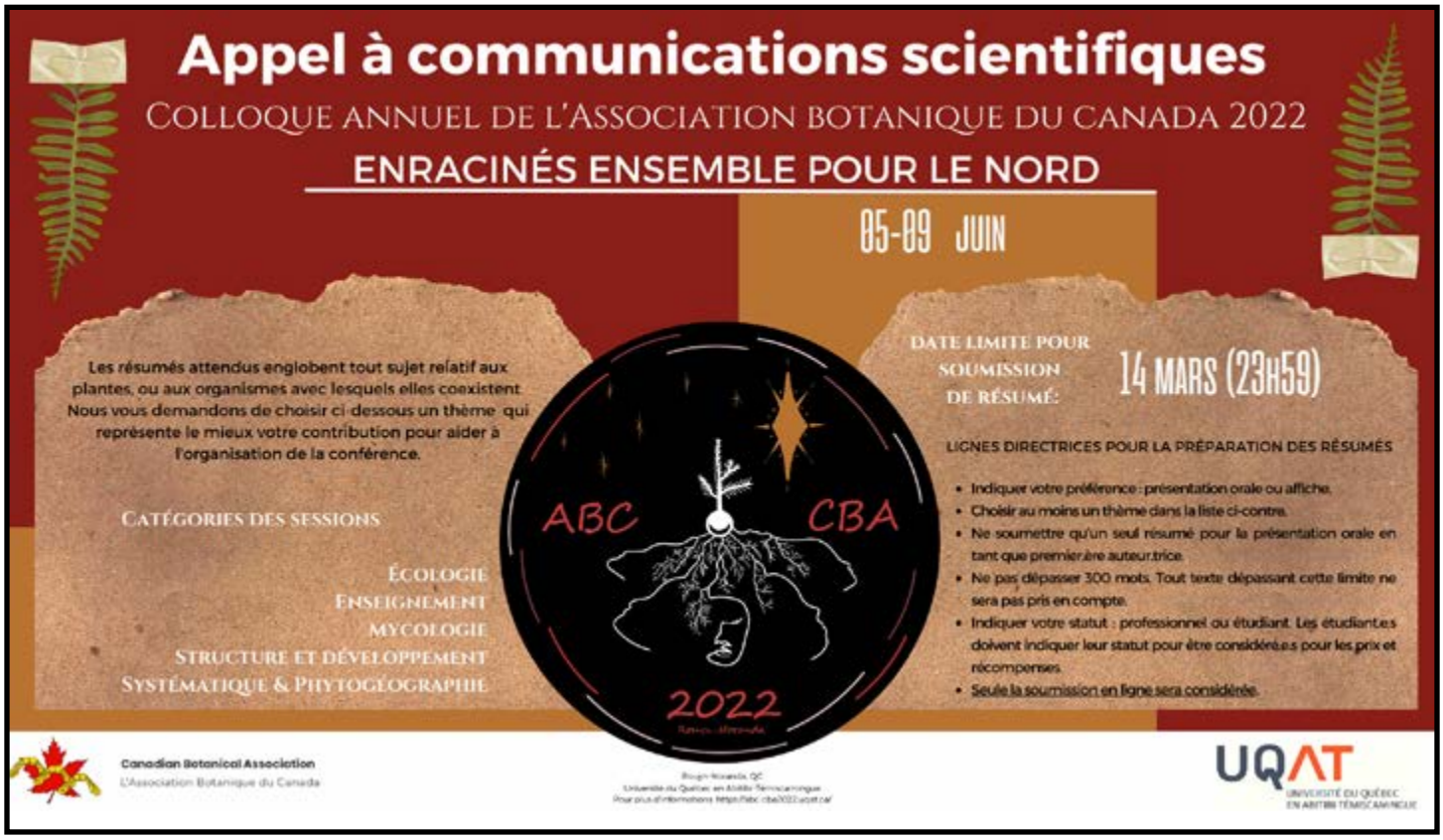
The CBA-ABC committee has been very busy over the last few months. We set several objectives for this year and are well on our way to reaching them. Our first objective is to develop a document for Local Organising Committees (LOCs) that will include information on two overarching subjects: 1) how to facilitate the inclusion of different types of knowing into our annual meetings via the inclusion of local First Nations and underrepresented groups; 2) how to ensure that there are as few barriers as possible for people with diverse realities to participate in our meetings. This document is well under way and should be available for the organisers of future meetings. Our second objective was the completion of the a "Best practices code" for participants during meetings, to ensure everyone can participate in a safe and welcoming environment. Finally, we are working on describing the current composition of our membership via a survey. Expect to see a link to a voluntary survey arrive in your email boxes in a few weeks!

If you are interested in our work, please contact Nicole Fenton: Nicole.fenton@uqat.ca

Nouvelles du comité Inclusion, diversité, équité et accessibilité (IDEA)

Le comité ABC-ABC a été très occupé au cours des derniers mois. Nous nous sommes fixés plusieurs objectifs pour cette année et sommes en bonne voie de les atteindre. Notre premier objectif est de développer un document pour les comités organisateurs locaux (COL) qui comprendra des informations sur deux sujets généraux : 1) comment faciliter l'inclusion de différents types de connaissances dans nos réunions annuelles via l'inclusion des Premières Nations locales et des groupes sous-représentés ; 2) comment faire en sorte qu'il y ait le moins d'obstacles possible pour que les personnes aux réalités diverses participent à nos réunions. Ce document est en bonne voie et devrait être disponible pour les organisateurs de futures réunions. Notre deuxième objectif était l'achèvement d'un « code de bonnes pratiques » pour les participants lors des réunions, afin de s'assurer que chacun puisse participer dans un environnement sécuritaire et accueillant. Enfin, nous travaillons à décrire la composition actuelle de nos membres via un sondage. Attendez-vous à voir un lien vers un sondage volontaire arriver dans vos boîtes mail d'ici quelques semaines !

Si vous êtes intéressé par notre travail, veuillez contacter Nicole Fenton: Nicole.fenton@uqat.ca


Appel à communications scientifiques
Colloque annuel de l'Association botanique du Canada 2022
ENRACINÉS ENSEMBLE POUR LE NORD
05-09 JUIN
Les résumés attendus englobent tout sujet relatif aux plantes, ou aux organismes avec lesquels elles coexistent. Nous vous demandons de choisir ci-dessous un thème qui représente le mieux votre contribution pour aider à l'organisation de la conférence.
Catégories des sessions
Écologie
Enseignement
Mycologie
Structure et développement
Systématique & Phytogéographie
ABC
CBA
2022
Date limite pour soumission de résumé: 14 mars (23h59)
Lignes directrices pour la préparation des résumés
• Indiquer votre préférence : présentation orale ou affiche.
• Choisir au moins un thème dans la liste ci-contre.
• Ne soumettre qu'un seul résumé pour la présentation orale en tant que premier.ère auteur.trice.
• Ne pas dépasser 300 mots. Tout texte dépassant cette limite ne sera pas pris en compte.
• Indiquer votre statut : professionnel ou étudiant. Les étudiant.es doivent indiquer leur statut pour être considéré.e.s pour les prix et récompenses.
• Seule la soumission en ligne sera considérée.
Canadian Botanical Association
L'Association Botanique du Canada
UQAT
UNIVERSITÉ DU QUÉBEC EN ABITIBI-TÉMISCAMINGUE


Call for abstracts
Canadian Botanical Association Annual Meeting 2022
ROOTING TOGETHER FOR THE NORTH
JUNE 05-09
Abstracts are accepted on any subject pertaining to plants, or the organisms with which they co-exist. We ask you to choose below a theme that best represents your contribution to help organize the conference.
Session categories
Ecology
Teaching
Mycology
Structure and development
Systematic and Phytogeography
ABC
CBA
2022
Abstract submission deadline: March 14 (11h59 PM)
Guidelines for the preparation of summaries
• Indicate your preference oral presentation or poster.
• Choose at least one theme from the list opposite.
• Submit only one abstract for oral presentation as first author.
• Do not exceed 300 words. Any text exceeding this limit will not be taken into account.
• Indicate your status, professional or student. Students must indicate their status to be considered for prizes and awards.
• Only online submission will be considered.
Canadian Botanical Association
L'Association Botanique du Canada
UQAT
UNIVERSITÉ DU QUÉBEC EN ABITIBI-TÉMISCAMINGUE

A Tribute to Dr. Jacques Cayouette

By Ernest Small, with translation below by Tyler Smith

Our esteemed colleague Jacques has retired after 37 years of continuous employment with Agriculture and Agri-Food Canada. Fortunately for us, he is continuing his association with AAFC as an emeritus scientist. In honour of Jacques' remarkable career, we take this occasion to review his accomplishments and contributions.

Jacques' love and passion for plants probably began at birth, since his father, Richard Cayouette, was one of Quebec's most well-known botanists. Before his career with AAFC started in 1984, Jacques pursued seminary religious training, and the expertise in Latin that he acquired there has been much appreciated by his colleagues who were required to describe new species in the old language. Before coming to AAFC, Jacques was also involved in university teaching. His research areas have included documentation of the flowering plants of North America, with special reference to the grass and sedge families, Quebec, and northern Canada; agriculturally important forage and field crops; plant conservation with special reference to rare and endangered wild plants, rare crop germplasm, and rare habitats; and botanical history, notably of eastern Canada, and the accomplishments of Canadian women botanists. Additionally, Jacques has considerable expertise in edible fungi, and as president and vice-president of Mycologues amateurs de l'Outaouais, he has stimulated interest in mushroom education.

Jacques is a model scientist. He works with tireless dedication to the accuracy of his published findings. His ability to notice the smallest differences is extraordinary, and has been important to his success in clarifying some of the most difficult botanical problems. Jacques' personal characteristics have also made him the most valued of colleagues. He is extremely cooperative and patient, and has been a constant source of information and assistance.

Jacques has played a key role in the development of AAFC's herbarium, Canada's largest and most important reference and research collection of vascular plants. For many years he was the acting or associate curator of the collections, and he has personally contributed thousands of collections. Jacques' knowledge of Canadian plants is unsurpassed, and he has provided countless correct identifications for the herbarium. He has similarly been an authoritative source of plant identifications for the Identification Service associated with the herbarium, and he has supplied innumerable identifications for other government departments, poison plant medical services, legal personnel, industry, universities, and the public.

The fields of plant classification and identification require publication, in order that the work of specialists such as Jacques become permanently available for other scientists and indeed society at large. Jacques has published hundreds of scientific papers. His co-authored books and contributions to major botanical reference encyclopedia represent particularly outstanding achievements. Several of his more important publication activities are listed in the following.

Major contributor, editor, and or reviser to the following encyclopedic works:

- *Flore laurentienne 3e edition*, (2002, Chenelière éducation)
- *Flore nordique du Québec et du Labrador* (2013-2022, Presses de l'Université Laval)
- *Flora of North America* (1993+, Oxford University Press)
- *Manual of Grasses for North America*, (2007, Utah State University Press)
- Le Groupe Fleurbec (book publisher)
- FloraQuebeca (book publisher)

Co-author of major book publications:

- *Audubon: Beyond birds. Plant portraits and conservation heritage of John James Audubon* (2009, Canadian Science Publishing)
- *Curieuses histoires de plantes du Canada* [Curious stories of Canadian plants] - Winner of the 2015 prix Marcel-Couture and short-listed for the Governor-General's Literary Prize. (4 volumes, 2014-2019, Septentrion)
- *À la découverte du Nord : Deux siècles et demi d'exploration de la flore nordique du Québec et du Labrador* [Discovering the North: Two hundred and fifty years of exploration of the flora of northern Québec and Labrador] Awarded the 2019 Lawson Medal – the most prestigious award of the Canadian Botanical Association – "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." (2014, Édition MultiMondes)

Retraite de Jacques Cayouette, Ph. D.

Notre estimé collègue Jacques a pris sa retraite après 37 ans de service continu à Agriculture et Agroalimentaire Canada (AAC). Heureusement pour nous, il poursuit sa collaboration avec AAC à titre de scientifique émérite. Pour honorer la carrière remarquable de Jacques, nous profitons de l'occasion pour passer en revue ses réalisations et ses contributions.

C'est probablement depuis sa naissance que Jacques a développé un amour et une passion pour les végétaux puisque son père, Richard Cayouette, était un des botanistes les plus connus au Québec. Avant le début de sa carrière à AAC en 1984, Jacques a fréquenté un séminaire, où il a acquis une expertise en latin qui a été fort appréciée de ses collègues, qui devaient décrire de nouvelles espèces dans cette langue ancienne. Avant de se joindre à AAC, Jacques a également participé à l'enseignement universitaire. Ses recherches ont notamment porté sur la documentation des plantes à fleurs de l'Amérique du Nord, et plus particulièrement des familles de graminées et de cypéracées et des plantes à fleurs du Québec et du Nord canadien, sur les cultures fourragères et les grandes cultures importantes au plan agricole, sur la conservation des végétaux, notamment des plantes sauvages rares et en voie de disparition, du matériel génétique de grande culture et des habitats rares et sur l'histoire botanique, surtout de l'Est du Canada, et les réalisations des femmes botanistes canadiennes. Jacques a également une expertise considérable dans le domaine des champignons comestibles et a stimulé l'intérêt à l'égard de l'étude des champignons à titre de président et de vice-président de Mycologues amateurs de l'Outaouais.

Jacques est un chercheur modèle. Il travaille avec un souci infatigable d'exactitude à l'égard des résultats qu'il publie. Sa capacité de remarquer les plus petites différences est extraordinaire et lui a permis de résoudre certains des problèmes botaniques les plus complexes. Les qualités personnelles de Jacques en ont également fait un collègue des plus estimés. Il est extrêmement coopératif et patient et est une source constante d'information et d'aide.

Jacques a joué un rôle clé dans l'établissement de l'herbier d'AAC, qui est la plus grande et la plus importante collection de plantes vasculaires de référence et de recherche au Canada. Jacques a été conservateur par intérim et conservateur adjoint des collections pendant de nombreuses années et a contribué personnellement à la création de milliers de collections. Les connaissances de Jacques dans le domaine des végétaux canadiens sont inégalées et il a identifié correctement d'innombrables espèces pour l'herbier. Il a en outre agi à titre de source faisant autorité en matière d'identification des végétaux pour les Services d'identification de l'herbier et a identifié d'innombrables végétaux pour d'autres ministères, des services médicaux liés aux plantes toxiques, du personnel juridique, des représentants de l'industrie, des universités et le grand public.

Le domaine de l'identification et de la classification des végétaux exige de nombreuses publications pour veiller à ce que les travaux des spécialistes comme Jacques deviennent accessibles en permanence à d'autres chercheurs et à la société dans son ensemble. Jacques a publié des centaines de documents scientifiques. Les livres qu'il a corédigées et ses contributions à d'importantes encyclopédies botaniques de référence sont des réalisations particulièrement exceptionnelles. Vous trouverez ci-dessous plusieurs de ses plus importantes publications.

Contributeur majeur, éditeur et/ou réviseur des travaux encyclopédiques suivants :

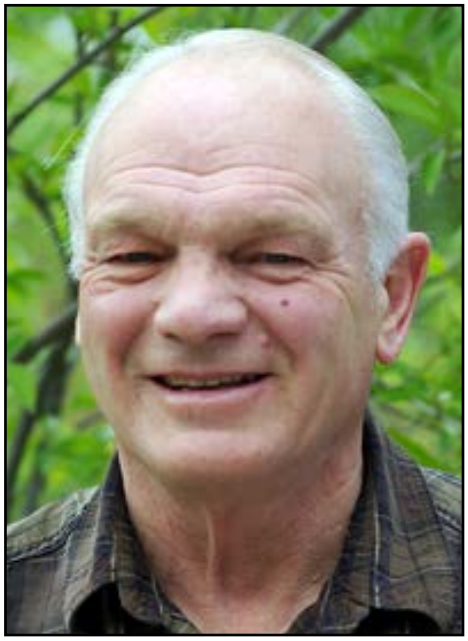
- *Flore laurentienne 3e édition*, (2002, Chenelière éducation)
- *Flore nordique du Québec et du Labrador* (2013-2022, Presses de l'Université Laval)
- *Flora of North America* (1993+, Oxford University Press)
- *Manual of Grasses for North America*, (2007, Utah State University Press)
- Le Groupe Fleurbec (éditeur)
- FloraQuebeca (éditeur)

Co-auteur des grandes publications suivantes :

- *Audubon : Beyond birds. Plant portraits and conservation heritage of John James Audubon* (2009, Canadian Science Publishing)
- *Curieuses histoires de plantes du Canada* – Gagnant du prix Marcel Couture 2015 et finaliste au Prix littéraire du gouverneur général. (4 volumes, 2014-2019, Septentrion)
- *À la découverte du Nord : Deux siècles et demi d'exploration de la flore nordique du Québec et du Labrador.* Gagnant de la médaille Lawson 2019, soit le prix le plus prestigieux de l'Association botanique canadienne, qui vise à « 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 » (2014, Édition MultiMondes)

Dr. Richard J. Staniforth, an Inspired and Inspiring Botanist

By Nicole Fenton, Jill Hamilton, Mason Kulbaba, Kate Frego, and Jacques Tardif



Dr Richard J. Staniforth, originally from Devon UK, was an exceptional botanist, all round naturalist, and professor in the department of Biology at the University of Winnipeg for 32 years. Having arrived at the University of Winnipeg with impressive research credentials from his PhD at the University of Western Ontario under the supervision of Paul Cavers, he continued research projects on the description and conservation of the Flora of Manitoba and reproductive ecology of arctic and boreal plants. This included many years of work in northern Manitoba in part based at the Churchill Northern Studies Center and has over 30 peer-reviewed articles.

Richard Staniforth also made it his mission to collect the flora of Manitoba. Essentially building the UWinnipeg herbarium from scratch, it now houses over 6500 specimens. After his retirement, the herbarium was given his name, the Richard J. Staniforth Herbarium. Richard Staniforth was also an active CBA member and was the Chair of the Conservation committee, a member of the ecology and conservation section and the systematics and phytogeography section, among other activities. He was also active regionally, as a founding member of the Manitoba Association of Plant Biologists, sitting on the Endangered Species Committee of Manitoba, scientific director of the Churchill Northern Studies Center, and a consultant for a number of groups and agencies; for example, National Parks Canada.

Even after retiring, Richard Staniforth continued to describe and document the flora (and fauna! – particularly birds and butterflies) of Manitoba, publishing records in *Blue Jay* a naturalist journal published by Nature Saskatchewan, including "*A New Annotated List of Manitoba Ferns*" (Spring, 2016, https://doi.org/10.29173/bluejay235). He continued this work right up to the last year, working on a new manuscript on ferns in Manitoba.

Despite these accomplishments, many botanical professionals across Canada and the world will remember Dr Staniforth for his passion for teaching and mentorship. He taught ecology and botany courses and was particularly well known for his "Flora of Manitoba" course (one of the authors still uses his notes!). His classroom was a place where theories from disparate parts of biology all began to come together. It was a thoughtful classroom where he meticulously layered ideas together like puzzle pieces, creating beautiful ecosystems that functioned together synchronously. The classroom was an inspiring place and sparked a lifetime passion for botany, ecology, and evolution in generations of students. However, beyond his teaching was the quality of his interactions with his students. Several past students fondly remember his mentorship and how he was able to foster students' belief in their own abilities through attention and kindness, which has led to many successful careers in botany, ecology and evolution, and conservation. With over 40 honours students supervised, his inspiring teaching attracted diverse students to botany and ecology. The University of Winnipeg honoured Richard Staniforth with the Robson Award for Excellence in Teaching in 2006 after being nominated in 2002, 2003, and 2004.

Richard Staniforth left us too soon in January 2022. The legacy effects of his teaching and mentorship for botany in Canada will continue to be felt for a long time to come.

A Tribute to Dr. Margaret (Peggy) Steeves

By: Vipen Sawhney and John Sheard, Biology Department, University of Saskatchewan

Dr. Margaret (affectionately known as Peggy) Steeves passed away on September 30, 2021 in Toronto from natural causes. Peggy, wife of the late Dr. Taylor Steeves, was a long time member of the CBA/ABC and over the years was actively involved in various affairs of the society.

Peggy was born in Amarillo, Texas on December 4, 1929 and moved with her family to New York City where her early education was at the Dominican Academy in Manhattan. She received her B.Sc. from Rutgers University, and then pursued graduate studies in geology, specifically in paleobotany, at Radcliffe College, Harvard. She did pioneering research on fossilized pollen and received her Ph.D. in 1959. Her research for a time became an important area of investigation for petrochemical exploration.

At Harvard, Peggy met Taylor Steeves, then a faculty member in the Department of Biology, and they married in 1956. After working on research projects in Costa Rica and at Stanford University, they moved to Saskatoon, Saskatchewan in 1959, where Taylor accepted professorship in the Biology Department at the University of Saskatchewan. Peggy was appointed an Associate member in the Geology Department where she pursued her research and supervised graduate students in geology and biology. Another area of her interest was to promote French language in education in western Canada. In 1966, she along with Taylor and a small group of parents and members of the community founded the Saskatoon French School. Peggy served for many years as the Saskatoon French School's vice-president and played essential roles in the hard day-to-day work of recruiting teachers from France, finding money to support the school, and in the development of the curriculum. The school became very successful, and it continues to this day under the aegis of the Saskatoon Separate School Board.

After working for a decade or so at the Saskatoon French School, Peggy returned to the Biology Department where she was a senior laboratory instructor in a number of courses, including junior courses in non-vascular and vascular plants; in the latter course she would enthrall students with plant fossils that she and Taylor had collected from the Rhynie Chert in Scotland, and with her skills of making slides with cellular detail of coal seam fossils. Peggy also taught senior courses in plant cells and tissues, plant development, and economic botany, and in the economic botany course, she would bring all sorts of exotic plant foods which to the delight of students they got to sample; this course was highly popular among biology students. Her breadth of knowledge and the quality of her work was of the highest standard and she earned the utmost respect of her students for her warmth and caring nature.

Peggy was an active member of the CBA/ABC. In early years, she played a major role in the Paleobotany section of the society, and was its Chair from 1970 – 1973. However, the section gradually faded in time, as has been the case with some other areas of botany. Nevertheless, Peggy was an active member of the society and participated fully by attending the annual meetings, along with Taylor, and whenever asked to perform duties, e.g., judging of student oral papers or posters, she did so enthusiastically and with perfection. Colleagues admired her for excellent work and for her supportive nature and kindness.

Peggy will be remembered for her gentle disposition, self-effacement and sacrifice, her warmth and kindness, and for her unfailing efforts to enrich the lives of others. She was predeceased by Taylor, her husband of 55 years, in 2011. She is survived by her daughter Elizabeth, a veterinarian in Yorkshire, UK, and sons Thomas, a neurologist

in Toronto, and Timothy and his wife Nancy Dahn, who are both professors of music in St. John's, NL; grandchildren Clara and Sasha, and her younger brother Philip Wolfe of Minocqua, Wisconsin.

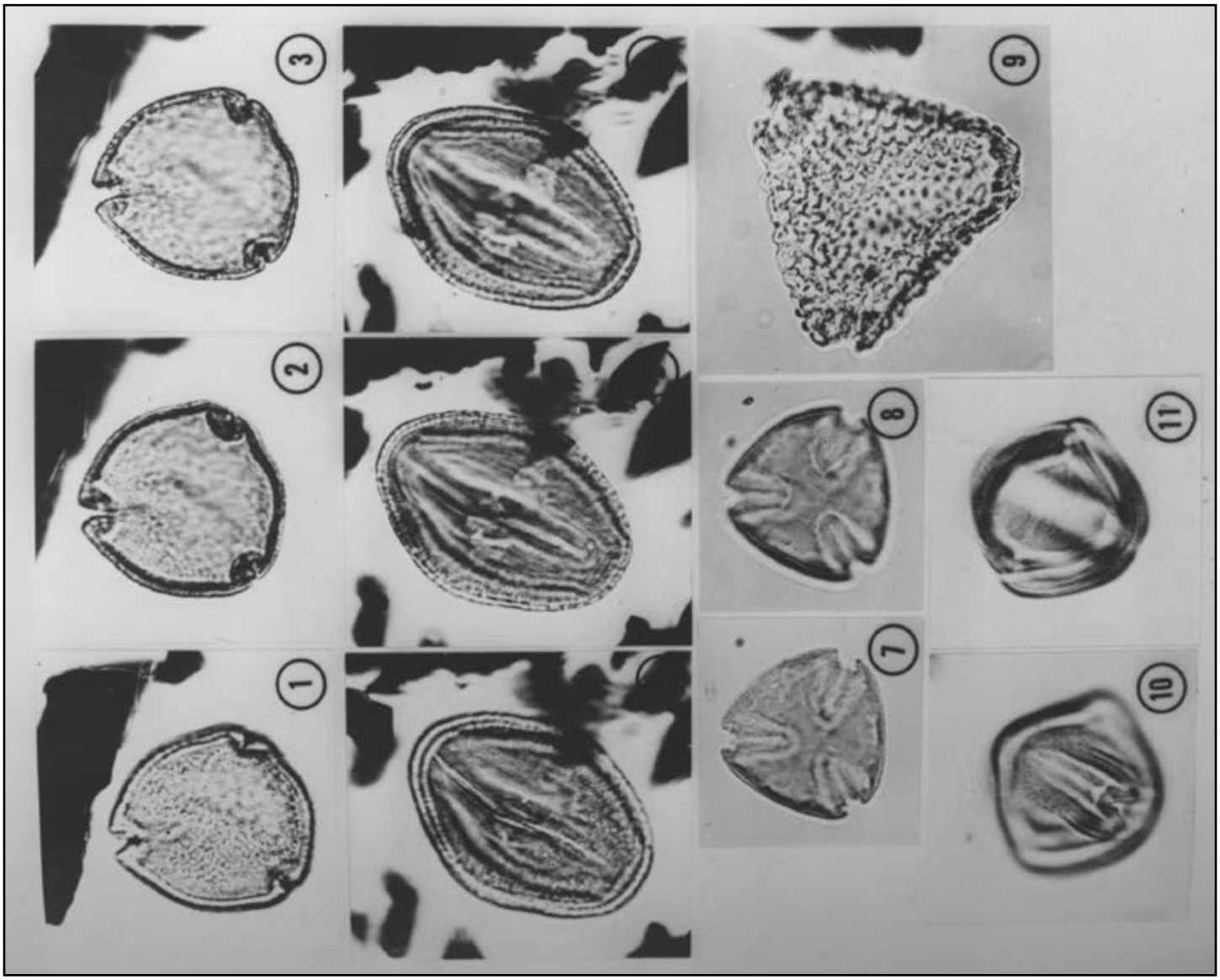
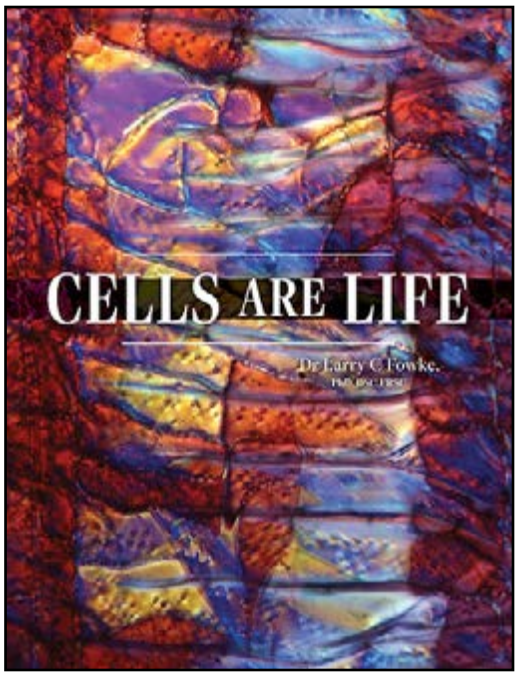


Figure legend: Samples of pollen microfossils demineralized and cleared from cores collected from Long Island, New York. Figs. 1-3 Fagaceae (?); 4-6 Anacardiaceae; 7,8 Cyrillaceae; 9. Symplocaceae, 10,11 Nyssaceae.
Plate from Dr. Margaret Steeves's Ph.D. thesis, Harvard University, 1959.

Book Publication: Cells are Life, by Dr. Larry C. Fowke



All organisms on earth are composed of cells. They come in many shapes and sizes and are involved in a wide range of activities. Cells are the smallest structures that can divide independently (reproduce) and are therefore the smallest structures to be alive. This book considers the structure and function of plant and animal cells, with an emphasis on plant cells.

Cells contain many organelles that interact to allow function. For example, plant cells (unlike animal cells) contain chloroplasts that enable them to take energy from the sun to be used for growth and development. They manufacture energy-rich sugars that are sent to the mitochondria, where the energy is removed as ATP that can be used to do work in the cell. Meanwhile, animals depend upon plants for their energy source.

Cells are Life provides answers to better understand the plant life all around us. Do plant cells have muscles? Why should children not eat the leaves of the common house plant, Dieffenbachia? Is it true that structures inside plant and animal cells move using tiny motors? Why do animal cells need a skeleton and plant cells don't? Is it true that rubber comes from a specialized plant cell?

Arming readers with this deeper understanding, Cells are Life then addresses controversial topics, such as genetic engineering, cloning, and the nature of stem cells.

To purchase: Friesen Press

Photo Submission

Large areas of the lava plain in the Nass Valley of northwestern B.C. remain dominated by carpets of *Stereocaulon paschale* and *Racomitrium lanuginosum*, more than 250 years after the lava cooled.

UNBC researchers have concluded that primary succession to forest vegetation has been repeatedly set back by wildfires, but has been facilitated where local flooding has deposited silt.

(Photo by Phil Burton)

Call for Papers

Advances from Early Career Researchers in Plant Sciences

This special issue aims to highlight the work of researchers at the beginning of their academic career working in the fields of climate change relating to all segments of plant sciences. We encourage submissions that are interdisciplinary in nature and focus on aspects like physiological adaptation, ecological response, and development of plants.

Submission guidelines:

- This special issue accepts manuscripts in the form of an original research article where the first author is an early researcher at the time of submission.
- Manuscripts from undergraduate students, masters, Ph.D. students and postdoctoral fellows who are first time authors must be accompanied by a letter from their supervisor or departmental chair, confirming the significance of the work achieved by the student. Faculty members in their first two years of employment are also eligible to submit manuscripts for this special issue.
- Maximum article length = 10,000 words (excluding title page & references).
- The manuscript must report new (should not be considered for a publication elsewhere) and previously unpublished results.
- Manuscripts must be submitted by May 31, 2022 to be considered for the issue.
- Six papers will be accepted for this special issue and will be published in the journal as open-access papers (100% open access fee waiver).
- Authors are asked to send an email to the editors-in-chief (Dr. Christian Lacroix: lacroix@upei.ca and Dr. Liette Vasseur: lvasseur@brocku.ca) with the tentative title of the manuscript andan abstract in order to confirm the suitability of the submission for this Special Issue.
- Evaluation and selection criteria of submissions will be based on novelty, thematic relevance, and motivation for the work.
- Authors guidelines: Follow Botany Authors Guidelines at cdnsciencepub.com/journal/cjb/authors#guidelines

For any other queries, please contact:
Sherestha Saini (Managing Editor, Botany)
sherestha.saini@cdnsciencepub.com

Guest Editors

Dr. Christian Lacroix, Editor-in-Chief, University of Prince Edward Island, Canada

Dr. Liette Vasseur, Editor-in-Chief, Brock University, Canada

SUBMISSION DEADLINE: May 31, 2022

Learn more: **canscipub.com/ECR-special-issue**

Botany
An International Journal for Plant Biology

How to make kindness pedagogy work in large botany classes using multimodal teaching

Patrick von Aderkas
Centre for Forest Biology, Department of Biology
University of Victoria, Victoria BC V8W 3N5
Email: pvonader@uvic.ca

The pandemic inevitably brought about a sea change to course delivery, particularly large courses. I taught botany to hundreds of students. First-year general biology (Evolution and Biodiversity) had around 900 students. In my upper-level non-majors course, Plants and People, there were 160 students. There was a great emphasis on new teaching technologies and platforms. I will not discuss small courses, because it was in the large courses where new approaches were needed most. There is one other reason why this might interest instructors of botany. The courses in which I applied kindness pedagogy in the context of multimodality were courses designed for students who were encountering plant biology for the first time. These were first-year students who had been raised on the usual diet of high school biology in which plants do not figure much, or upper-level non-majors students who had no biology background to speak of. In these large courses, I am not preaching to the converted.

As many of us quickly noticed, online teaching platforms are fine until the class size gets over a certain threshold. When this point is reached, both engagement and learning suffer. To overcome these shortcomings and to better serve students, many of us turned to pedagogy, e.g. Universal Design for Learning (UDL), caring pedagogy and so on. Large classes definitely have problems that test the limits of even these approaches. For example, caring pedagogy doesn't work well at scale. A large course is a complex challenge as there is not one solution. I decided to try a combinations of ideas, including kindness pedagogy.

What is kindness pedagogy?

Kindness is defined as the quality of being friendly, generous and considerate. Because kindness is a behaviour that brings benefit to others, it is more than mere chirpy positivity. In a 2018 paper titled "*The influence of affirming kindness and community on broadening participation in STEM career pathways*" the authors (Estrada, Eroy-Raveles, and Matsui) presented ideas that revolved around reducing macroaggressions and microaggressions, providing dignity, and affirming social inclusion. Their emphasis was on building community while you teach. Kindness pedagogy takes these elements and builds them into the structure.

Consider a pair of opposites, aggression and kindness. To counter macroaggressions, blatant acts of inclusion are required, and these must be reinforced with cues of inclusion. When kindness cues are used, the sense of belonging is made overt. This isn't subtle. It requires that you build a course that is as intentionally inviting, friendly, inclusive and safe as it is possible to create. To stick with this example, you can decrease the occurrence of macro- and micro-aggressions by overtly creating a sense of belonging. How do you then include kindness in course design?

A student's first impression

I applied kindness pedagogy to the front end of the course. To be blunt, I spent a lot of time building the opening week and its associated materials. I designed my Plants and People course so that it gave a powerful first impression. Students needed to feel that they would have a high likelihood of success and that the content would provide delight. Importantly, they also needed to know that their opinions would be heard. This was because the pandemic had isolated students from one another and from their professors. In some form or another, everyone was experiencing social dislocation. Putting something together that would provide a welcoming and inclusive tone was just what was needed.

Front end materials needed to be enticing at different levels. I designed a course syllabus that used graphics and plant illustrations extensively. A short video introduced students to what they could expect the first week. Another video outlined course expectations and goals. In a final video, I briefly introduced myself to them by outlining some things that I am passionate about as a botany professor.

I also included some materials that were not directly related to the course, but which gave students out-of-class choices. For example, I included maps for self-guided walks. Providing extras gives an impression to a student that there is more to botany than the class. They could, if they wanted to, see plants on their own while exploring local natural areas around campus. I found that these walks grounded them with experiences that they later shared with me. University learning during the pandemic had students chained to their computers. In a poll that I ran in one course, 40% of students claimed that their lives were boring. Getting outside was a must. As it turned out, most students love to talk about the flowers and trees that they had encountered.

Stating that I valued their opinions, e.g. saying it in a video, helped to build trust. It also broke down some of the barriers forced on us by the pandemic. I found students were more at ease when they did get in touch. They knew that they would be treated fairly. I had said so. If this seems obvious, well, that is one of the lessons of teaching via a socially distanced medium. You need to state the obvious. They should know how a professor feels about them when the course starts, otherwise fair treatment and flexibility in accommodation become part of a hidden curriculum that is only revealed on demand.

To help them find their voice, I started the first week by running a poll in Google Forms. I asked students to name their favourite and least favourite plants. They had to write why they had selected these two. As this survey identified individual students, I then requested permission of individuals whose answers I wished to highlight in class. This information was then presented to the class. A survey like this is low-stakes information and acts as an icebreaker. The benefit is that a survey acts as a mirror that students hold up to themselves. A survey also creates massive buy-in. In this way, the first steps in community-building begin.

Multi-modality

A key element in kindness pedagogy is making it clear at the outset that more than one style of learning will be accommodated. It makes students feel safe. I begin by considering the types of students. The larger the class, the more of each type of learner, e.g. more visual learners, more students with learning challenges. Multimodal approaches provide choice, especially to students who might otherwise feel marginalized. It is important to state that you intend to accommodate everyone. Students do not take accommodation for granted: in fact, they believe the opposite, namely that the default position is that they will not be accommodated. Unfortunately, the pandemic had many instructors run ragged and the belief that isolated students were more marginalized than usual was reinforced. I had to think about how to counter this and kindness pedagogy gave me those tools.

One approach was to allow students to explore one another's ideas about plants. Because nearly every online forum requires a great deal of curation, I don't much like the typical online forum available in my institution's teaching platform. I wanted students to be able to express themselves freely and creatively without the heavy hand of professorial curation. I used a commercial forum-style platform called Packback that lends itself well to this goal. It works much like an "ideas lab," that is to say a tutorial given by interested students for themselves. Most importantly, I chose it because of its power to contribute not insignificantly to my goal of building the course of 160 students into a community. Each week, students were required to ask one question and answer two questions. To score well, they needed to articulate their positions. They could include pictures, graphs, academic sources and other information. The weekly subjects were usually related to the lecture topics, but it was easy to get them to go somewhere, e.g. a park or garden. Their outdoor experience generated ideas. Participation rates were very high, so it was an excellent way to generate participation marks. Students told me that shared interests led to friendships. The back-and-forth provided amazement and rewarded curiosity.

Shared experience doesn't need to be intellectual: it can be tactile. Giving a potted plant (this year it was a chrysanthemum) to each student works brilliantly. In botany, if you want to connect to students in a way that they will never forget, give them their own plant! The students who knew more about plants provided tips to neophytes. Getting students to write about their plants in any online forum was easy.

Kindness pedagogy, like UDL, can be used to add flexibility in assessment. For example, getting rid of the bogeyman – the final exam – with best four out of five quizzes results in more consistent student involvement.

Multimodality changed lecturing, too. Having a non-majors course was a good place to experiment. The course was scheduled for an 8:30 am slot. That is a significant problem for some students. It is known that university-aged students perform better in courses later in the day. It is a given that provided with a choice, most of the class would rather not be in class at that time. During the online portion of the pandemic, I created the lectures in podcast form. These forced my writing. I developed a better narrative arc. Clarity was key to podcasting. Did you know that the average 50-minute face-to-face lecture beautifully shrinks to around 20 minutes in a podcast? Students will listen to a podcast at 1.5 times normal speed, making the lecture even shorter. When we switched back to face-to-face lectures, I kept podcasts. They were stored in a sub-folder called Safety Net, where students could find all the lectures in podcast form as well as practice questions. Attendance in face-to-face lectures plummeted (students voted with their pajamas!), but quiz results improved. Delivering alternative lectures was twice the work, but it was a one-time investment. Were students happy to have this choice? They were delighted. How do you build a community of students who want to study botany? One happy student at a time.

Do students have to succeed to be happy, or do they have to be happy to succeed? During the pandemic, making students happy was key, and it was a good idea to do that at the very beginning of the course. Get that right and the rest follows. Using kindness pedagogy also got me thinking quite easily about how to implement indigenization of course material, as well as how to show how discussing plants and people brings us around to issues of equity, diversity, inclusivity, intersectionality. After all, if you're not using kindness pedagogy, how are you going to tackle these issues? To attract students to embark on a career in STEMM requires more than just providing the science; we must add some heart.

Benefits to you, the instructor

Advantage 1: The tone that you create will encourage students to come forward more readily. Earlier is better than later when it comes to identifying weak or vulnerable students. You will then have more time to come up with accommodations or flexible options. Again, during COVID, calls for help from students definitely increased. Mental health issues were frequent.

Advantage 2: A big advantage of an online forum, such as the one described above, is that students are more likely to help one another throughout the course if they have been doing it from the very start of the course. You do not need to curate the forum if it is well designed. For large courses, simple solutions like these saved me time.

Advantage 3: Protecting yourself and your time is important if you're not to burn out. The warning here is that front-end design is a lot of work, but the investment tends to be one-time. Once mastered, the template of ideas carries over easily into the next year, and even into other courses.

Concluding thoughts

Large classes are always going to be challenging. If we want to continue to attract students into botany, we need to add heart to the science. The good news is that as pedagogy and technology change to meet the needs of diverse students, better tools are becoming available.

South Africa – a growing plant poacher's paradise

by Tammy Elliott, with input from Muthama Muasya and Ute Schmiedel

South Africa has long been a botanist's paradise. The Cape Floristic Region on the southern tip of Africa is noted for its high species richness, endemicity, and turnover. Many special lineages of plants are found there, some of which we can find in our Canadian gardens. It is a wonderful experience to venture into the 'veld' to find various species of *Pelargonium, Gladiolus* and *Gazania* in their native habitats. One gets excited when they see *Amaryllis belladona* in full flower in the wild, as well as the hundreds of other beautiful monocot species which arise from underground bulbs early each austral spring. In addition to these charismatic monocots, eye-catching succulents species are also present in high numbers in the South African flora.

Aside from South Africa's amazing botanical diversity, the country also tops the world in wealth inequality. A quick browse on the internet and one will find that South Africa has amongst the highest crime rates in the world. Confounding this problem is that recent droughts and the covid-19 pandemic have led to more desperation to make easy money. The poverty experienced by the majority of people in this part of the world has contributed to a growing poaching problem—both in animals and in plants. It is important to point out that this illicit activity is often driven by demand for specific animal and plant products/species in wealthier nations, and the problem is exasperated by a lack of willingness for fair trade in the spirit of the Nagoya protocol by certain foreign countries.

Figure 1: Vegetation adapted to the arid and nutrient poor conditions of the Western Cape Province of South Africa. Photo credit – Tammy L. Elliott

As a Canadian botanist, I was relatively naive about the entire subject of plant poaching until I started a post-doctoral research position at the University of Cape Town. My introduction of the topic was from a newspaper article that I continuously looked at while pressing plant specimens, which reported on the poaching of 24 live *Encephalartos latifrons* plants from Kirstenbosch National Botanical Garden in Cape Town on a rainy night in August 2014. These dioecious 'Critically Endangered' cycads are native to eastern regions of South Africa and have large, pinnate leaves arranged in a crown at the apex of a trunk, as well as huge cones. From our university botany courses, we should all remember that the cycads are an evolutionarily distinct lineage of gymnosperms, and thus, are special plants.

Figure 2: *Esterhuysenia alpina* — a beautiful succulent endemic to the Western Cape Province of South Africa. This species, from the family Aizoaceae, is occasionally used in rock gardens.
Photo credit – Tammy L. Elliott

The illegal poaching of cycads is fuelled by the fact that they can be prized garden plants by collectors both in South Africa and abroad. The ecological services that these plants provide to their natural habitats are not important to the collectors who buy them on the underground market. Nor is the fact that by poaching them, they could be decimating populations and possibly eliminating tens of millions of years of evolutionary history.

In recent years, there has been a large increase in the poaching of succulent plants in southern Africa. I recently talked with Ute Schmiedel, a Research Associate at the University

of Hamburg, who is involved in a long-term study on vegetation changes over time in western South Africa and Namibia—the neighbouring country to the north. Ute has witnessed the effects of recent droughts on the vegetation and local communities in this area, and she is well-informed about the poaching of succulents, since many species are endemic to the regions where her plots are located. According to Ute, poaching succulents is not a new problem in this region, but the scale of operations has escalated since the start of the covid-19 pandemic. Originally, operations were focussed on the poaching of certain plant groups by foreigners who entered South Africa as tourists, collected the plants themselves and then attempted to smuggle them back in parcels through the mail. These poachers were primarily from Europe and eastern Asia.

The covid-19 pandemic has changed how these poaching operations function. Since the poachers could not travel into these African countries because of pandemic travel restrictions, they hired local citizens to do the poaching for them. Ute mentioned that the internet and social media have played a large role in these poaching operations, as syndicates can easily share their specialized knowledge of the target plants with local people who are desperate to make money. However, it is now these local people who are getting caught and not the ones guilty of running the poaching operations. For the locals, the risk can be worth the monetary payback they receive. Because most poaching syndicates operating out of foreign countries do not get caught by law enforcement, and local poachers are hesitant to reveal information about the syndicates hiring them, there is no idea of the actual extent of the problem, according to Ute. Poachers also do not waste their energy: once they are at a site, they make sure to collect every specimen possible, decimating populations and their potential contribution to the seed bank.

A moving target

Human demand, often based on collecting 'trendy' plants, fuels this illicit activity. In areas of eastern Asia, some collectors desire plants that show their unique character, which can only be captured if a plant originates from a natural habitat. However, it is likely that the majority of collectors are less selective and focus on what they have seen posted on social media or other websites. Because it is a demand-driven illegal industry based on trends, the target is constantly changing. Recently, the trends have been *Conophytum* and *Lithops*, but this might have already changed.

Figure 3: Seized *Conophytum* plants from the Cape Floristic Region of South Africa, illustrating their small size and resemblance to small rocks.
Photo credit – CapeNature

The poaching of various *Conophytum* species has received recent attention in the media, including articles written in 2021 published in the *New York Times* and *The Guardian*. The article in *The Guardian* mentions a case where two South Koreans were caught in 2020 with 60,000 *Conophytum* individuals. CapeNature (the governmental organization responsible for protecting the natural environment of the Western Cape Province of South Africa) also has an informative site that describes the extent of the problem; for example; they mention a case where well over 50,000 *Conophytum comptonii* plants were intercepted at the Tambo International Airport in Johannesburg. Unfortunately, many of the *Conophytum* species that are targeted by poachers are already also endangered: the article in *The Guardian* mentions that 30 different species of *Conophytum* are on the South African National Biodiversity Institute's 'Red List of South African Plants,' while Ute noted that many more species will be upgraded to a higher Red List status because of poaching activities.

This raises the question – how can law enforcement and conservation authorities become aware of the current

Figure 4: Bag full of various species of succulents seized from a poacher. Photo credit: CapeNature

poaching trends before it is too late? Ute informed me of ongoing research by a major botanical organization into an artificial intelligence tool that can monitor internet traffic based on keywords such as botanical names. Since most botanical words are not in the average person's daily vocabulary, an increase in the frequency of such words on the internet might suggest a growing trend of interest in a specific target plant species. Initiatives such as this one bring hope to the situation.

Another issue is what to do with the hundreds of thousands of poached plants that are confiscated. Ute told me that this is not a straightforward task, as it remains challenging to replant them into the field. One reason is the inter-population genetic diversity present in most of the target species – indicating that existing populations are adapted to their specific environmental conditions. Ute, together with some German colleagues and a group of researchers based in Cape Town, are thinking of ways to identify the population genetic patterns of the target species to ensure that the transplanted plants will be returned to their original population. Transplants into other populations would result in a genetic hybridization of different populations, which might have a negative effect on how the plants can cope with their harsh environmental conditions. Unfortunately, scientific funding and study execution cycles are more long-term commitments than short-term trends in popular house plants.

What can we do here in Canada?

Education: Several things can be done here in Canada to alleviate the problem of plant poaching both abroad and even within our own country. Education is key — it is likely that many of those buying illegally acquired plants are not aware of the criminal activity behind the purchase. As botanists, we know that 'plant awareness disparity' – or being ignorant of the plant life that surrounds oneself – is common in some western cultures. This unawareness leads to a disconnect with the crucial roles that plants play at various geographic scales, and that their presence in the natural habitats provides both essential ecosystem services and is important to the healthy functioning of ecosystems.

A critical message to also communicate is that, be it plant or animal, owning a particular organism should not be a trend.

Be watchful of what is on the internet: An important message to spread is that social media sites are not reputable sources of interesting plants to grow at home. If one sees an internet site (e.g. Facebook or Instagram) advertising illegally collected plants, it is advisable to report the site as soon as possible. Citizen scientists also have a role to play: when posting your images to a site such as iNaturalist, do not include the geographic co-ordinates if a species is of conservation concern, and if you are in doubt about an identification, also refrain from posting the co-ordinates.

Buy local: It is important to have a little patience, as some of these 'trendy' plant species might be arriving in our local greenhouses in a few years. We just have to wait for them to raise enough legitimately-sourced plant stock to supply our demands.

Further reading:

- Botanic Gardens Conservation International. "Plant poaching is on the rise. What can we do?" https://www.bgci.org/news-events/plant-poaching-is-on-the-rise-what-can-we-do/

- CapeNature. “Save our biodiversity by helping us fight plant poaching!” https://www.capenature.co.za/news/2021/save-our-biodiversity-by-helping-us-fight-plant-poaching
- news24. January 12, 2022. https://www.news24.com/news24/southafrica/news/9-arrested-in-cape-town-for-allegedly-poaching-protected-plants-in-interprovincial-operation-20220112
- The Guardian. May 3, 2021. “Succulent smuggling: why are South Africa’s rare desert plants vanishing?” https://www.theguardian.com/environment/2021/may/03/drought-dust-storms-plant-theft-unique-botanical-landscape-peril-aoe
- The New York Times. July 31, 2021. “In South Africa, Poachers Now Traffic in Tiny Succulent Plants.” https://www.nytimes.com/2021/07/31/world/africa/south-africa-poachers-tiny-succulent-plants.html

Spring is Right Around the Corner!

Photos courtesy of Tyler Smith

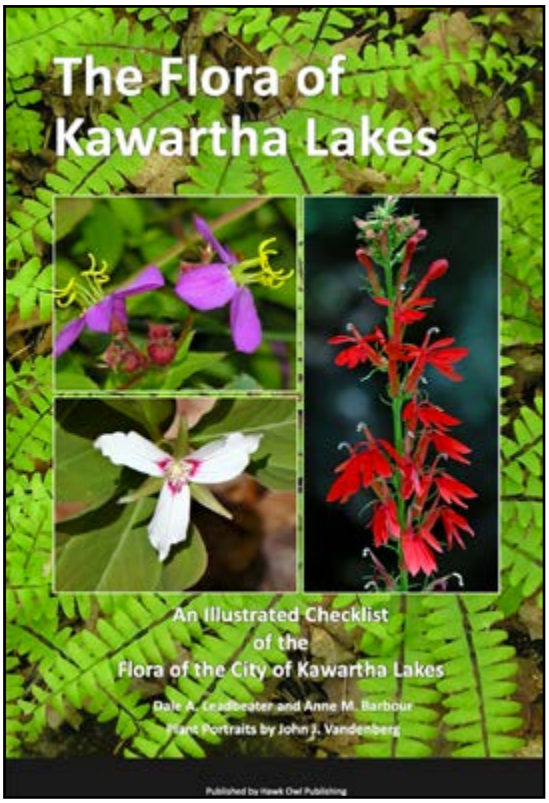
Book Review: The Flora of Kawartha Lakes

by Nadia Cavallin

THE FLORA OF KAWARTHA LAKES

An Illustrated Checklist by Dale A. Leadbeater and Anne M. Barbour. Plant Portraits by John J. Vandenberg.

Published by Hawk Owl Publishing



In their new book, *The Flora of Kawartha Lakes,* authors Dale A. Leadbeater and Anne M. Barbour offer a thorough and detailed description of the plants and landscapes that botanical explorers, whether amateur or professional, might encounter in the City of Kawartha Lakes, Ontario.

The authors place equal importance on explaining the geology, geography, and human history that set the stage for the flora of the region as they place on the checklist of vascular plants that follows. To help readers understand the context in which the flora developed, they describe the glacial processes that scraped, churned, flooded and shaped the landscape. Adding to that, they explain how the substrates the glaciers left behind as they receded control hydrology and how the resulting landscapes became corridors along which plant species migrated. Bringing this all together, they describe the plant communities that characterise the City of Kawartha Lakes and the fundamental connections between these communities and their environment.

The major contributions of humans in shaping the current environment and flora of the City of Kawartha Lakes get their part in the book, too. Recognizing the millennia-long presence of First Nations and the relatively short presence of colonizers and subsequent settlers, the authors expose the sometimes drastically transformative effects of settler society's activities on the flora. Vegetation removal, groundwater drainage, river damming and altered flooding cycles leave the City of Kawartha Lakes with some new habitats, but many lost ones. Tracing human history of ecosystem alterations in the region, the authors weave together the story of landscape-shaping forces, from the Wisconsin glaciation to current culture. The result is the story of how the flora of the City of Kawartha Lakes came to be what a botanizer will now see. They don't stop at past plus present. They discuss the probable future of the flora, which will have to respond to the forces of climate change. Readers will learn how increasingly extreme weather will create environmental conditions to which the current vegetation communities are not adapted.

Before moving on to the checklist of vascular plants, the authors highlight the rare, protected and historical species in the flora, as well as the species which are most common and those which are invasive. They include instructions for submitting plant observations, via iNaturalist, EDDMapS or email, so that interested readers can contribute to the botanical knowledge of the area.

The authors ordered the checklist according to APG III and A New Classification and Linear Sequence of Extant Gymnosperms, 2011, with the 129 families listed alphabetically within their order and the 1218 species listed alphabetically within their family. In addition to the scientific classification, the checklist includes common names, provincial conservation status ranks (S-rank) and rarity ranked by number of population occurrences in the City of Kawartha Lakes. Readers will find clear photographs or illustrations for 58 species near their entries

in the checklist, each explaining important features of the plant, such as characteristics key to identifying it, its habitats and ecology, and its cultural uses. Following the primary checklist, the authors include a checklist of plant records by township.

Readers already familiar with glacial geomorphology will appreciate the review preceding the checklist; others will find it explained in enough detail to understand how it shaped the flora. Photographs of landforms and communities help readers to visualise them. However, for readers unfamiliar with the region's counties, roads and natural areas, there are too few maps to follow the location details of the discussion on the development of its landforms and flora. It is possible to plan a geographically informed botanical fieldtrip to the City of Kawartha Lakes using the information in the book, but finding the pages referring to the location the reader wishes to visit won't be quick. The index includes only species names.

The 216-page spiral-bound book with glossy pages is light but sturdy – perfect for carrying in a backpack. The layout of the checklist is easy to scan, and readers looking for taxa will find them quickly. Checkboxes in the primary checklist make it tempting to bring along a pencil to track the species seen. The lists of rare, protected and historical species in the flora, as well as the checklist of plant records by township take the guesswork out of which botanical observations are important to report for making valuable contributions to understanding the region's flora. Instructions on preferred methods for submitting observations take the guesswork out of how to do that.

The Flora of Kawartha Lakes, which brings together geological and human history with plant communities and the environmental conditions supporting them, will make readers' experiences of the region much richer ones, especially if they set out to explore its distinct flora. The $39.00 book is available at the Royal Ontario Museum in Toronto and at the Algonquin Park Visitor Centre; additional purchasing options are listed on the publisher's website: https://mattholderfund.com/product/the-flora-of-kawartha-lakes/. Happy reading and exploring!

From the Archives

Forty years ago, in January 1982, the CBA/ABC treasurer went in search of a 'Mystery Member' who had paid their dues with a $5 bill, but included no name! No word on whether the mystery botanist from Quebec was ever found...

MYSTERY MEMBER

Will the retired CBA/ABC member from Quebec who paid his/her 1982 dues with a $5.00 bill sent in a recycled envelope with "Save the Nfld pulp & paper" written on the outside, please identify him/herself to the Treasurer. There was no name on the outside of the envelope nor on the membership renewal form!

TOP CANADIAN ORNAMENTAL PLANTS. 31. Hippeastrum (Amaryllis)

ERNEST SMALL[1, 2]

Ornamental plants are grown mostly for their displays of colourful flowers – frequently developing either a large number of small flowers or a small number of large flowers. "Amaryllis" (preferably called hippeastrum as explained here) exemplifies the latter pattern, and indeed few herbaceous plants produce equally ostentatious, indeed stunning, attention-getting, giant blooms. In Canada, hippeastrums are mostly cultivated indoors as house plants, and this 'queen of winter bulbs' provides wonderful displays during our often bleak winters.

Names

Scientific name: This article reviews cultivated forms of the large South American genus (over 90 species) *Hippeastrum*, usually termed "amaryllis." This has led to confusion with the related genus *Amaryllis*, which includes only two South African species, *A. belladonna* and *A. paradisicola*. The use of the name amaryllis for two different genera traces to past failure to recognize their separateness. The name amaryllis is thought to trace to a classical Greek tale for a shepherdess, who shed her blood (to impress the man she loved), which turned into the flower. The name *Hippeastrum* was coined by English botanist William Herbert from the Greek hippeus (knight) and astron (star). One explanation of the name's origin is that the flower supposedly resembles a 'knight's star,' a spiky ball on the end of a long handle, employed as a medieval weapon. The name "*H. hybridum* Hort." (= *H.* × *hybridum* Hort.; Hort. = "of horticulture," not a person; the name does not have official nomenclatural status) is encountered as a collective phrase for the cultivars.

English names: Amaryllis, hippeastrum. Grammatical websites usually give the plural of amaryllis as amaryllises, but in practice amaryllis is frequently treated as both singular and plural (like the genus name *Amaryllis*). Similarly, hippeastrum is often treated as both singular and plural like the genus name *Hippeastrum*, although "hippeastrums" is also common as the plural. Although the name amaryllis is predominant in common usage for cultivated *Hippeastrum*, the more accurate name hippeastrum is employed in this article. Some of the species are termed "lilies," such as Barbados lily and St. Joseph's lily. "Cluster amaryllis" refers to species of *Lycoris*; 'blue amaryllis" is *Worsleya*; "orchid amaryllis" is *Sprekelia* (all of which are also in the Amaryllidaceae).

Figure 1. A display of hippeastrums (amaryllis). Painting (public domain) by Beatrice Parsons. Source (public domain): Wright, H.J. and Wright, W.P. 1922. Beautiful flowers and how to grow them. T.C. & E.C. Jack, Edinburgh. Credit: Biodiversity Heritage Library.

Figure 2. Amaryllis the shepherdess, after whom the plant name allegedly originated. Painting (public domain) by English artist William Holman Hunt (1827–1910).

French names: amaryllis, hippeastrum, hippéastre.

1 Science and Technology Branch, Agriculture and Agri-Food Canada, Neatby Bldg., Central Experimental Farm, Ottawa ON, K1A 0C6

2 © Government of Canada. Verbatim redistribution for personal, non-commercial use is permitted.

Symbolism

The "amaryllis" is employed internationally as a symbol of the fight against Huntington disease, a genetic neurodegenerative brain condition. The flower is an emblem of the non-profit Huntington Society of Canada, and bulb kits are sold during its annual fundraiser (generally well before December, allowing bulbs to be planted for Christmas flowering). Depending on season, orders can be placed at https://www.huntingtonsociety.ca/amaryllis-campaign/; or in Quebec, at https://www.huntingtonqc.org/campagne-amaryllis

Floriography, the use of flower arrangements to communicate secret, often sentimental messages, traces to ancient times. In Britain, a form of floriography called the Victorian Language of Flowers became particularly popular during the Victorian Age (roughly 1820–1880). Depending on authority, the flowers (and different colours) may have different meanings, and for the more popular flowers, several interpretations became accepted. Today, the gift flower industry employs the Victorian symbolism to sell its products (as one would expect, only nice meanings are listed). "Amaryllis" (i.e. mostly hippeastrum) is claimed to have the meanings pride, determination, and radiant beauty.

Appearance

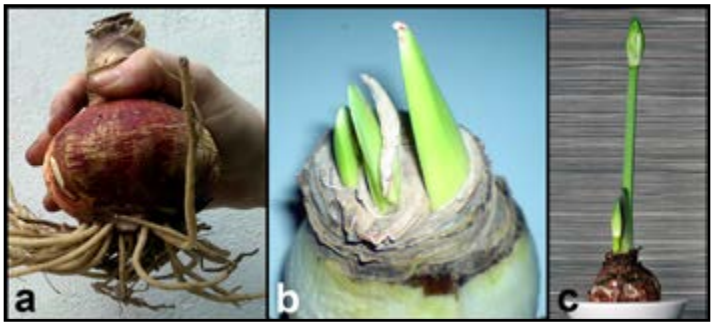


Figure 3. *Hippeastrum* (amaryllis) bulbs. (a) Dormant bulb. Photo by Simon Lee (CC BY SA 2.0). (b) Bulb with three floral stalks in very early development. Photo by Teebeutel (CC BY SA 3.0). (c) Bulb with two developing floral stalks, one much maturer than the other. Photo by Böhringer Friedrich (CC BY SA 3.0).

Most cultivated plants are started from dormant storage bulbs, which are usually 5–12 cm in diameter. Hippeastrum bulbs are tunicate (with a tunic, i.e. a protective dry outer layer, and fleshy concentric inner scales or leaf bases), like onions, tulips, and daffodils. The leaves are typically about 60 cm long (occasionally up to 1 m), usually strap-like (typically about 5 cm wide, sometimes

Figure 4. *Hippeastrum* (amaryllis) exhibits at a flower show. Photo by Laura Blanchard (CC BY SA 2.0).

up to 10 cm, but sometimes linear), evergreen, and produced from the base. When grown from bulbs, the foliage may be produced simultaneously with the flowering stalk, or (quite frequently) afterwards. The flowers are borne on a leafless stalk (a scape with an umbel on top), typically 50–90 cm tall, which in most cultivars bears one or several flowers (often 2–5). Hippeastrum bulbs can simultaneously or sequentially produce more than one flower stalk. Cultivars typically have large (often up to 25 cm in diameter), trumpet-shaped flowers, available in shades of white, pink, purple, red, orange, and salmon (rarely, some cultivars have yellow or purple flowers although these colours are characteristic of some of the wild species). The flowers of some cultivars are bi-coloured, spotted, streaked, or variegated, and doubled flowers (i.e. with extra petals) are also available.

The 'true amaryllis' (*Amaryllis*)

Figure 5. *Amaryllis belladonna* – often confused with hippeastrums. (a) Flowering tops. Photo by Gailhampshire (CC BY 2.0). (b) Flowering plants. Note that flowers have developed on the stalks well before the basal foliage has appeared. Photo by Stan Shebs (CC BY SA 3.0).

One of the only two species of the genus *Amaryllis*, *A. belladonna* (belladonna lily, March lily, naked lady, Madonna lily, Jersey lily) is widely cultivated in warm climates as a garden ornamental. Its provocative name "naked lady" is based on the plant producing flowers before it is clothed with leaves (sometimes hippeastrums are also called naked ladies for the same reason). The "belladonna" (meaning beautiful lady) in the scientific name is reminiscent of the quite toxic *Atropa belladonna*, unadvisedly used by women in Renaissance Italy to enlarge their pupils and so appear more alluring (but also legitimately used medicinally).

Amaryllis belladonna is frequently confused with the hippeastrums – even in scientific publications. It is quite reminiscent of hippeastrums, but has solid rather than hollow stalks, tends to have more than six flowers/scape, lacks scales between the filaments, and lacks black-coloured seeds. When grown outdoors, *Amaryllis* flowers in the autumn, *Hippeastrum* usually in the winter or spring. The bulbs have been overwintered outdoors as far north as New York State, although like the hippeastrums it is considered to be tender to low temperatures. *Amaryllis belladonna* has become naturalised throughout the world in many Mediterranean climates of winter rainfall and summer drought, including Mexico, California, Australia, Spain, New Zealand, and the Channel Island of Jersey.

Wild *Hippeastrum* species

The genus *Hippeastrum* is native to Central and South America. The species occur especially in eastern Brazil and the central southern Andes of Bolivia, Peru, and Argentina. Lara Rico *et al.* (2021) provide the number of species for these countries: Brazil (38), Bolivia (34), Peru (21), and Argentina (10). Several species extend north to Mexico and the West Indies. Unfortunately, many of the species are threatened by urban development. The genus is mostly tropical and subtropical. The species are adapted to a long, moist growing season, followed by a shorter dry season. At the start of the rainy season the storage bulb produces its foliage and flowers. Flowering lasts 2 to 3 weeks, but the foliage grows throughout the moist season, allowing new flower buds to form within the bulb. The old bulb is perennial, but annually buds off new bulblets. Although the foliage is shed annually in the wild, it is termed "evergreen," and in moist environments can persist for more than a year. At the close of the rainy season the plant becomes dormant.

Domesticates

Figure 6. Some of the many colours available for hippeastrum flowers. Source (public domain): Germain Seed and Plant Company 1947 catalogue "Bulbs plants seeds for autumn planting." Photo credit: U.S. Department of Agriculture, National Agricultural Library.

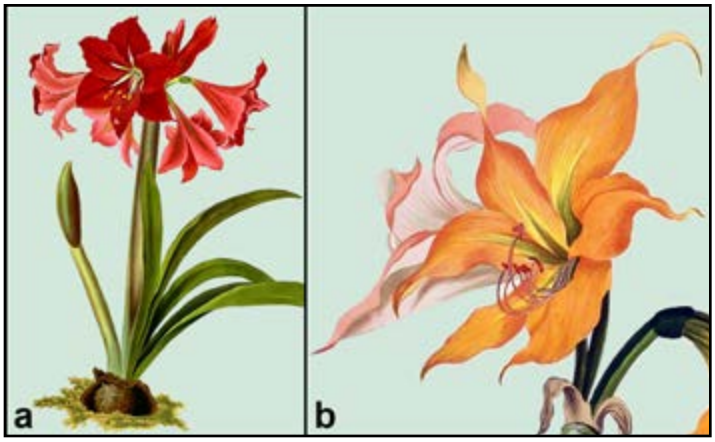


Figure 7. Paintings of *Hippeastrum* by English botanist Priscilla Susan Bury (1799–1872). (a) *Hippeastrum* × *johnsonii.* (b) *Hippeastrum striatum*. Yellow flowers are rare in the genus.

Early domestication of *Hippeastrum* involved interspecific hybridization using a very limited number of species. *Hippeastrum* × *johnsonii*, a hybrid of *H. vittatum* and *H. reginae* made in England in 1799, is thought to have been the first hybrid. Early hybrids were produced mainly from *H. aulicum*, *H. psittacinum, H. puniceum, H. reginae, H. reticulatum, H. striatum,* and *H. vittatum*. Hybridization has been ongoing for over 200 years, particularly selecting mostly for large flower size and colour, but there are also recently created multi-flowered and double-flowered varieties. Most wild species and most cultivars do not have fragrant flowers, but there have been recent efforts to breed for pleasant scent. Most wild species are diploid (with 22 chromosomes), but almost all hybrid cultivars are tetraploids (with 44 chromosomes; doubling the chromosome number tends to produce larger flowers, which is probably why the

condition is common among cultivars). The number of cultivars is difficult to determine – perhaps over 1,000. Breeding programs have been conducted primarily by private companies in the Netherlands, and South Africa, with interest developing more recently in the United States.

Intergeneric hybrids involving *Hippeastrum* are extremely difficult to generate. Sterile but viable hybrids of *Hippeastrum* and *Sprekelia* are available. Narain and Khoshoo (1977) listed reports of hybrids between *Hippeastrum* and *Amaryllis belladonna* (but these are questionable). Jirakiattikul (1999) in a thesis reported experimental hybrids between *Hippeastrum* and *Amaryllis belladonna*, and between *Hippeastrum* and *Brunsvigia*. By contrast, hybrids between *Amaryllis belladonna* and other genera are easier to generate, and several have been produced.

Cultivated hippeastrums are sometimes propagated by seeds, but some are infertile or partly so. Usually named varieties are reproduced vegetatively, since the seeds will not produce plants true to type. Commercial reproduction is by vegetative techniques (offsets, scaling, and tissue culture) employing bulb tissues.

Economic importance

Figure 8. A display of hippeastrum for sale in an Amsterdam store. Photo by Thierrytutin (CC BY 2.0).

Hippeastrum is considered to be among the world's top 20 commercial flowering ornamentals. Principal exporting countries include the Netherlands, the U.S., Brazil, Japan, Israel, and South Africa. The bulbs are produced commercially in field culture, and sometimes also in greenhouses. In various countries harvested bulbs are grown by greenhouse producers for potted plants marketed for major holidays, notably Thanksgiving, Christmas, and Mother's Day. There is also a substantial market for 'cut flowers' (i.e. cut flowering stems), and in the Netherlands tens of millions are sold annually. Hippeastrums are also often sold to consumers as dry bulbs for planting and growth in homes, marketed both by retail outlets and online suppliers.

Ornamental use

Figure 9. Hippeastrums grown outdoors in ornamental borders. (a) *Hippeastrum correiense* in Texas. Photo (public domain) by Surely Shirly. (b) Hippeastrum in Hawaii. Photo by Forest & Kim Starr (CC BY 3.0).

In Canada, hippeastrums are grown primarily as house plants, or as potted plants protected indoors during the winter. By contrast, they are grown as in-ground perennial garden plants in North America in regions rated at no colder in winter than -12°C (USDA climate zone 7b; https://www.gardeningknowhow.com/planting-zones/hardiness-zone-converter.htm). In cold climates they can be established in the spring in soil outdoors, but will need to be lifted in the fall. Occasionally they are also grown as outdoor annuals.

Although hippeastrums are described as "evergreen," some so-called deciduous species must be allowed to go into a dry winter dormancy, in which case the foliage senesces and dies. If these are forced to continue growing by watering, they may refuse to flower or the bulbs may rot.

Medicinal use

The Amaryllidaceae contain unique alkaloids, most commonly lycorine, which has been found in almost all species of *Hippeastrum*. Alkaloids are responsible for the toxicity of the genus. Although the folk uses of various species are not accepted in modern medicine, the alkaloids are under investigation for a wide variety of potential therapeutic applications.

Toxicity

All parts of hippeastrums are toxic and can cause nausea, vomiting, and diarrhea if ingested. The plants should be kept out of the reach of children and pets. They are safe to handle for most people but the sap may cause skin irritation in sensitive individuals.

Care of indoor plants

Figure 10. Potted hippeastrum cultivars. Photos by Dwight Sipler (CC BY 2.0).

Purchasing

Hippeastrums are available from nurseries and retail stores as potted plants and as dormant bulbs intended for forcing. Bulbs are especially sold in the fall for early winter bloom. Kits with dry bulbs already potted along with directions included are also available. Specialty online distributors usually provide a much wider choice of bulbs. Larger bulbs usually provide bigger plants, more flowering stalks, and/or bigger flowers, and sometimes produce new flowering stalks after the flowers of the early flowering stalks fade. Generally, bulbs larger than 7.5 cm in diameter are recommended (although some cultivars have naturally smaller bulbs).

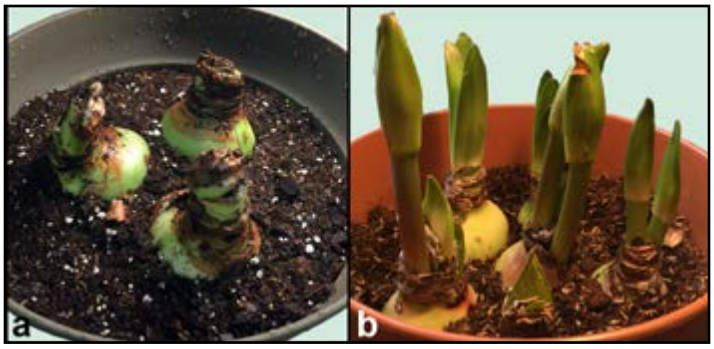


Figure 11. Bulbs planted as a group for a mass potted display. (a) Dormant bulbs. (b) Bulbs in early production of flowering stems. Photos by Laura Blanchard (CC BY SA 2.0).

Planting the bulbs

Purchased dry bulbs should be established in pots of soil 6–8 weeks before the desired time of flowering (individual flowers last 1–2 weeks). Suitable pots for single bulbs can be small (the plants grow best when slightly pot-bound), allowing 5 cm of soil around the sides of the bulb. For more impressive displays, several bulbs can be planted close together (even touching). The flowering stalks can become top-heavy when in bloom, so the container should be heavy or gravel should be added to the bottom to add weight to prevent tipping. One-third to two-thirds of the pointed end of the bulbs should remain above the soil. Place the container in a cool room. When the stalk(s) begins to grow, the container should be in a location where it will receive several hours of direct sunlight and temperatures close to 24°C (reflecting its origin from warm climates).

Soil & moisture conditions

Containers employed should have drainage holes, and the soil should be porous (well-draining), for example prepared with equal parts garden loam, peat moss, and Perlite or sand. Circumneutral (pH 6–8) soil is recommended. Water when the soil becomes dry to the touch. Water-logged soil induces fungal diseases. Fertilization is unnecessary if the plant is to be discarded after flowering.

Maintaining plants after flowering

Recycling the spent plants requires effort, but for those who are willing, the following steps are suggested. After flowering the stalk should be cut away, 5–8 cm above the bulb. The foliage will continue to grow. Watering of the vegetative plant should continue as needed, taking care not to overwater. A balanced fertilizer is

recommended. After several months of indoor growth (under the best light that can be provided) the plant can be induced to become dormant by restricting water. The senescent leaves can be cut within 5 cm of the bulb and discarded. A minimum of 2–3 months of dormancy is recommended (stored dry in a cool place). The plant can be induced to flower again by rewatering. Alternatively, assuming the plant flowered indoors during the winter, the potted vegetative plant can be moved outdoors for the summer (it can be plunged into the ground), and will enter dormancy (the leaves senesce) naturally in late summer or early fall. The dormant bulb can be stored dry, in its pot, at 5–7°C, and (as noted above) induced to flower again by rewatering. Repotting is usually not needed for 3 or 4 years, and indeed should be avoided earlier.

Tips

During the growth of the stalk while the plant is on a window sill, turn the pot daily to promote even upward growth. If the stalk becomes very tall, it may require stalking.

Curiosities of science and technology

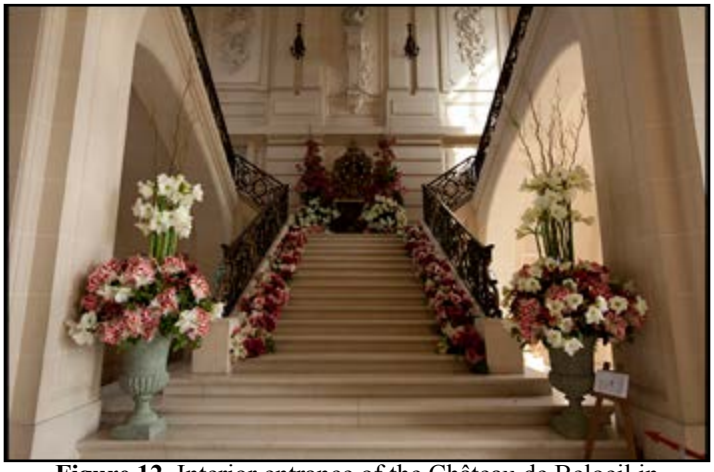


Figure 12. Interior entrance of the Château de Beloeil in Belgium, decorated with hippeastrum plants during the annual amaryllis competition. Credit: Paul M.R. Maeyaert, photographer (CC BY SA 3.0).

- The Château de Beloeil (a refurbished ultra-luxurious castle) in Belgium is a major tourist attraction. It is the site of an annual competition lasting more than a week, among professional florists with the goal of preparing the best "amaryllis" (hippeastrum) bouquet (http://www.chateaudebeloeil.com/en/event/amaryllis-competition-2018/).

- "Waxed amaryllis bulbs" are, true to the phrase, bulbs that have been covered in wax (usually brightly coloured, and often moulded into attractive shapes), except for the uppermost part to allow the flower stalks to develop. They are self-standing, and no potting is required. The wax cover minimizes water loss. The refrigerated bulbs are more or less dormant when sold or shipped, so they merely need to be brought into a warm location in advance of the desired flowering time. It is claimed that the plants don't require light, but at least medium light should be provided to prevent legginess. After flowering, they are discarded (like Christmas trees, often brought into the house at the same time). Waxed bulbs are expensive (usually at least $20.00 for a single bulb, and often considerably more), which is why cheaper bulb species are rarely available in this form. Self-respecting botanists might consider waxed bulbs as a product for the very lazy.

Figure 13. "Waxed amaryllis bulbs" (bulbs in ornamental wax containers, for use as care-free, temporary flowering houseplants). The bulbs in these containers are in the early phase of developing flowering stalks. Photo by Angelbattle Bros (CC BY ND 2.0).

- The purpose of biological nomenclature is to have unambiguous labels for organisms, but the field itself can be ambiguous. A "hemihomonym" is a scientific name occurring in more than one kingdom. The plant genus *Amaryllis* is a hemihomonym of the crustacean genus *Amaryllis*. Hemihomonyms that designate both an animal and plant are valid within their context. Some sources employ the term "parahomonym"

for such repeated names, but in botany parahomonyms usually designates names within a nomenclatural code that are so similar in spelling or pronunciation that they are likely to be confused. Neither term occurs in the International Code of Nomenclature for algae, fungi, and plants (https://www.iapt-taxon.org/nomen/main.php).

Key publications

Azimi, M.H. and Alavijeh, M.K. 2020. Morphological traits and genetic parameters of *Hippeastrum hybridum*. Ornamental Hortic. 26: 579–590.

Barnhoorn, F. 1991. Cultivars of *Hippeastrum*: Their evolution from the past and their development for the future. Herbertia 47: 76–79.

Bell, W.D. 1973. New potentials in amaryllis breeding. Proc. Florida State Hortic. Soc. 86: 462–466.

Bell, W.D. 1977. More potentials in amaryllis breeding. Plant Life 33: 65–69.

Khaleel, T.F., Haven, S., and Gilg, T. 1991. Karyomorphology of amaryllis hybrids. Cytologia 56: 31–41.

Lara Rico, R.F., Vásquez Chávez, R., and Atahuachi Burgos, M. 2021. The Genus *Hippeastrum* (Amaryllidaceae) in Bolivia. Pacific Bulb Society, Leonia, New Jersey. 137 pp.

Meerow, A.W. 2000. Breeding amaryllis. In: Breeding ornamental plants, edited by Callaway, D. and Callaway, P. Timber Press, Portland. pp. 174–195.

Meerow, A.W. 2009. Tilting at windmills: 20 years of *Hippeastrum* breeding. Isr. J. Plant Sci. 57: 303–313.

Meerow, A.W. 2014. The Florida series of hybrid amaryllis: Five new *Hippeastrum* cultivars. Hortscience 49: 1102–1107.

Meerow, A.W., Broschat, T.K., and Kane, M.E. 1992. Breeding of new *Hippeastrum* cultivars using diploid species. Acta Hortic. 325: 583–590.

Narain, P. and Khoshoo, T.H. 1977. Origin and evolution of garden amaryllis Indian J. Hortic. 34: 80–85.

Ockenga, S. 2002. Amaryllis. Random House, New York. 96 pp.

Okubo, H. 1993. *Hippeastrum* (*Amaryllis*). In: The physiology of flower bulbs, edited by DeHertogh, A.A. and M. LeNard. Elsevier, Amsterdam. pp. 321–334.

Read, V.M. 1999. *Hippeastrum* hybridization developments. Herbertia 54: 84–109.

Read, V.M. 2004. *Hippeastrum*, the gardener's amaryllis. Timber Press, Portland. 344 pp.

Sandler-Ziv, D., Cohen, A., Ion, A., Efron, H. and Amit, D. 1997. A two-year production cycle of Israeli-grown hippeastrum bulbs from bulb chipping to Christmas flowering. Acta Hortic. 430: 361–368.

Shields, J.E. 1979. The ancestors of the amaryllis. Amaryllis Bull. 1: 2–6.

Tallini, L.R., Giordani, R.B., de Andrade, J.P., Bastida, J., and Zuanazzi, J.A.S. 2021. Structural diversity and biological potential of alkaloids from the genus *Hippeastrum*, Amaryllidaceae: An update. Rev. Bras. Farmacogn. 31: 648–657.

Traub, H.P. and Rosse, A. 1958. The amaryllis manual. Macmillan, New York. 388 pp.

Vijverberg, A.J. 1981. Growing amaryllis. Grower Books, London. 57 pp.

Wang, Y., Chen, D., He, X., Shen, J., Xiong, M., Wang, X., et al. 2018. Revealing the complex genetic structure of cultivated amaryllis (*Hippeastrum hybridum*) using transcriptome-derived microsatellite markers. Scient. Rep. 8: 1–12. https://doi.org/10.1038/s41598-018-28809-9

Xiong, M., Wang, Y., Chen, D., Wang, X., Zhou, D., and Wei, Z. 2020. Assessment of genetic diversity and identification of core germplasm in single-flowered amaryllis (*Hippeastrum hybridum*) using SRAP markers, Biotechnology & Biotechnological Equipment 34: 966–974.

Key websites

Holmes, W.C. *Hippeastrum*. Flora North America. – http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=115497 [Only one species has become naturalized, in the southern U.S.]

Jirakiattikul, Y. 1999. Study of intergeneric hybridization in *Hippeastrum*. Ph.D. thesis. University of Tasmania, Hobart. 203 pp. – https://eprints.utas.edu.au/20454/1/whole_JirakiattikulYaowapha1999_thesis.pdf [Has extensive reviews of various aspects of *Hippeastrum*.]

Krumm, S.J. and Taylor, J.L. Forcing amaryllis. Michigan State University Extension document E1848. – https://www.plantgrower.org/uploads/6/5/5/4/65545169/e1848_forcing_amaryllis.pdf [A basic guide on forcing hippeastrum bulbs, including how to maintain the plants after flowering.]

Pacific Bulb Society. Hippeastrum. – https://www.pacificbulbsociety.org/pbswiki/index.php/hippeastrum [A basic but authoritative account, with many photos.]

Steinegger, D. and Watkins, J. E. 1990. Amaryllis Culture. University of Nebraska-Lincoln Extension document G74-188. – https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1971&context=extensionhist [Another basic guide on forcing the bulbs.]

Stewart, M. How to plant and care for amaryllis flowers. – https://www.marthastewart.com/1534797/plant-and-care-amaryllis [A competent guide.]

Sullivan, S. 2019. Make your own waxed amaryllis bulbs. – https://www.greenhomediy.co/make-waxed-amaryllis-bulbs/ [A guide of interest mostly to those who can generate bulbs outdoors.]

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): http://creativecommons.org/licenses/by/2.0/; CC BY 3.0 (Attribution 3.0 Unported): http://creativecommons.org/licenses/by/3.0/; CC BY ND 2.0 (Attribution NoDerivs 2.0 Generic): https://creativecommons.org/licenses/by-nd/2.0/; CC BY SA 2.0 (Attribution ShareAlike 2.0 Generic): https://creativecommons.org/licenses/by-sa/2.0/; CC BY SA 3.0 (Attribution ShareAlike 3.0 Unported): http://creativecommons.org/licenses/by-sa/3.0/.

Figure 14. Artistic photo (public domain) of a hippeastrum. Credit: ArtsyBee/Pixabay.com.

Board of Directors CBA/ABC 2021-2022

President	Dr. Nicole Fenton Université du Québec en Abitibi-Témiscamingue, 445 Boulevard de l'Universite Noranda, QC J9X 4E5, Canada nicole.fenton@uqat.ca
President Elect	Dr. Mihai Costea Department of Biology Wilfrid Laurier University 75 University Avenue West, Waterloo, ON, N1L 3C5 Canada mcostea@wlu.ca
Past President	Dr. Julian Starr Department of Biology University of Ottawa, Rm 160, 30 Marie Curie, Ottawa, ON K1N 6N5, Canada jstarr@uottawa.ca
Vice President	Dr. Annie Desrochers Institut de Recherche sur les Forets, Univ. du Quebec en Abitibi-Temiscamingue, 341 Principale Nord, Amos, QC J9T 2L8 Canada annie.desrochers@uqat.ca
Secretary	Ms. Deborah Metsger Botany, Department of Natural History Royal Ontario Museum 100 Queen's Park, Toronto, ON M5S 2C6 Canada debm@rom.on.ca
Treasurer	Dr. Shelley Hepworth Department of Biology and Institute of Biochemistry, Carleton University 1125 Colonel By Drive, Ottawa, ON K1S 5B6 shelleyhepworth@carleton.ca
Director, East	Dr. Jeffery M. Saarela Research and Collections Canadian Museum of Nature 240 Mcleod St., Ottawa, ON K2P2R1, Canada jsaarela@nature.ca
Director East	Dr. Etienne Leveille-Bourret Institute recherche en biologie vegetale Université de Montreal 4101 Sherbrooke St. E., Montreal QC, H1X 2B2 Canada etienne.leveille-bourret@umontreal.ca
Director East	Ms. Jennifer Doubt Research and Collections Canadian Museum of Nature 240 Mcleod St., Ottawa, ON K2P2R1, Canada jdoubt@nature.ca
Director West	Dr. Jana C. Vamosi Department of Biological Sciences University of Calgary 2500 University Drive NW, Calgary, AB, T2N1N4 Canada jvamosi@ucalgary.ca
Director, West	Ms. Christine Petersen Biological Sciences, Thompson River University Kamloops, BC, V2C0C8 Canada cpetersen@tru.ca
Director, West	Dr. Bruce Ford Dept. of Biological Sciences, University of Manitoba, Winnipeg MB R3T 2N2, Canada bruce.ford@umanitoba.ca
Student Director (West)	Ms. Jacalyn Grey Department of Biological Sciences University of Manitoba, 501 Buller Building, 45 Chancellors Cir., Winnipeg, MN, R3T 2N2 Canada greyj@myumanitoba.ca
Student Director (East)	Mr. Corey W. Burt Department of Biology Wilfrid Laurier University 75 University Avenue W. Waterloo, ON N1L 3C5 Canada burt7030@mylaurier.ca
Bulletin Editor	Dr. Tyler Smith Central Experimental Farm Agriculture and Agri-Food Canada 960 Carling Avenue, Ottawa, K1A 0C6 Canada tyler@plantarum.ca
Webmaster	Dr. Zoe Panchen Department of Geography University of British Columbia 67 Second Ave., Ottawa, ON K2P2R1 Canada zoe.panchen@sympatico.ca