The Canadian Botanical Association Bulletin

Bulletin de l'Association Botanique du Canada

Volume 53 Number 2 - September/septembre 2020

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President's Message



The last six months have shaken the foundations of our global society. The emergence of the inevitable global pandemic sent most people home for up to three months at the end of winter. As spring was getting underway in most of Canada, another collective sickness was highlighted with the re-emergence of the Black Lives Matter (BLM) movement following a brutal police killing in Minnesota. Along with the Wet'suwet'en solidarity protests, never-ending reports of police brutality aimed at Indigenous peoples, and the emerging research on how the global pandemic was negatively affecting the lives of women and racialized people in particular, these movements forced many of us sitting at home to think about privilege and how it shapes our lives.

But what does this have to do with Canadian Botany? First, I suggest that we use this moment of national reflection to start the transformation of our thinking, our teaching, our research. To reach a more just and hopefully more environmentally conscious society, I feel that it is imperative that the association gives voice to the greatest possible variety of perspectives and worldviews in order to collectively think about plants, their symbionts and habitats in a more holistic fashion.

A second botanical element to this global crisis is that the plant awareness disparity (PAD) – what was formerly referred to as 'plant blindness' – that afflicts modern society has fallen away as many people in their houses and apartments have decided to grow gardens this summer, allowing them to reflect about where their food comes from. Seed companies and garden centers have never been so busy. We should seize this moment of awareness to highlight that plants are the fundamental unit without which the ecosphere fails, and that they should be considered

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

Editor

Dr. Erin Zimmerman

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Next issue

Texts for the next issue, 53(3), must be received by November 15th, 2020.

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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

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Prochain numéro

La date de tombée des textes du prochain numéro, le no 53(3), est le 15 novembre 2020.

primordial by ALL people. While we still struggle with PAD as a global society, I feel that by acting in an inclusive holistic manner we can, as the Canadian Botanical Association, move plants back towards the spotlight during this time of change.

However, in order to take action on these issues we must work together! I am a statistic like everyone else (professional woman with children, feeling overwhelmed working at home) and cannot move these topics forward without your help. This fall we will be launching working groups of CBA members to take action on two subjects: broadening our botanical society to include marginalized groups and worldviews and seizing the current interest in plants to start to tackle the issue of PAD. I urge you to get involved so that together we can build a better society. Please contact me to get involved.

Despite the grim news and global outlook currently circulating, I am hopeful that with the help of our membership, we will move forward! I encourage new members to take advantage of this opportunity to shape the future face of Canadian Botany.

I wish a wonderful fall term to our academic members, and a wonderful fall to everyone.

Sincerely,

Nicole Fenton

Université du Québec en Abitibi-Témiscamingue

P.S. A short autobiographical note: I am an associate professor and co-Chair at the Institute of Forest Research at the Université du Québec en Abitibi-Témiscamingue. I have been a CBA member since 1998. I am interested in plant ecology at all scales, with a special passion for cryptogams. I have a husband, three children and three cats.

2020 Membership Fees

For many of us, the 2020 CBA renewal reminder is wasting away on a desk as we work from home.
This is a gentle reminder to our members to pay their 2020 fees. All the information you need to do so is at https://www.cba-abc.ca/membership/ and you can pay via an e-transfer.

New Member Publications

Chen, H. & Markham, J. (2020) "Using inexpensive microcontrollers and sensors to build a CO2 control system for growth chambers." Applications in Plant Sciences. *In Press*.

Chen, H. Renault, S. & Markham, J. (2020) "The effect of *Frankia* and multiple ectomycorrhizal fungal species on *Alnus* growing in low fertility soil." Symbiosis 81:207. doi.org/10.1007/s13199-020-00666-z

Halat L, Galway ME, & Garbary DJ. (2020) "Cell wall structural changes lead to separation and shedding of biofouled epidermal cell wall layers by the brown alga *Ascophyllum nodosum*." Protoplasma. doi.org/10.1007/s00709-020-01502-3

Otfinowski, R. & Coffey, V. (2020) "Can root traits predict communities of soil nematodes in restored northern prairies?" Plant and Soil. doi.org/10.1007/s11104-020-04624-y

Perron, M.A.C. & Pick, F.R. (2020) "Stormwater ponds as habitat for Odonata in urban areas: the importance of obligate wetland plant species." Biodiversity and Conservation 29: 913-931. doi.org/10.1007/s10531-019-01917-2

Racine, M., Saleem, A., & Pick, F.R. (2019) "Metabolome variation between strains of *Microcystis aeruginosa* by untargeted mass spectrometry." Toxins 11: 723. doi.org/10.3390/toxins11120723

Shao, J., Renault, S. & Markham, J. 2020. "Nitrogen fixation symbiosis and salt tolerance of the boreal woody species *Elaeagnus commutata*." Acta Physiologiae Plantarum. 42:100. doi.org/10.1007/s11738-020-03088-y

CBA supports Black Lives Matter and takes action to broaden the plant science community

CBA/ABC reaffirms its commitment to foster a culture of inclusivity, equity, and justice in all of its activities. To this end, we must speak out and take action against recent and ongoing anti-Black racism and violence in the United States, which also exists here in Canada and around the world.

We recognize our responsibility to support our Black students, coworkers, and colleagues, and to actively work to eliminate barriers to participation in our society and the wider scientific community.

We as the CBA first commit to updating our code of conduct to include explicit expectations regarding community safety, and secondly commit to establishing a working group that will be mandated to determine concrete actions to support recruitment and mentoring for the enhancement of equity, diversity, and inclusion of all underrepresented groups in our society.

Graduates

Renée V. Christie, M.Sc.



I am Renée V. Christie and I have completed my M.Sc. (2019) in Integrated Biology. My research was financed via the Ontario-China Research Innovation Fund, in collaboration with an industry, Boreal Agrominerals Inc., which mines the agromineral Spanish River Carbonatite (SRC) North of Sudbury, ON. My thesis was entitled "Going back to the soil: An integrated approach to farming" and was conducted under the supervision of Drs. Frédérique C. Guinel (Wilfrid Laurier University) and Liette Vasseur (Brock University); it can be found at https://scholars.wlu.ca/etd/2161/. During my thesis, I tested whether or not adding SRC to plants used as cover crops modified their rhizospheres. Following graduation, I assumed the position of Research Associate II, Plant Pathology, at Terramera Inc., an ag-tech Vancouver-based company. At Terramera, I use as my mantra our core question of "How can I use technology to unlock the intelligence in nature, to ensure an earth that thrives and provides for everyone?" I now do my part in contributing to one of the company's big, hairy, and audacious goals of reducing by 80% the global pesticide load by 2030.

I was not actively searching for a job when I came across the posting for the Research Associate position at Terramera. I was more focused on revising my final thesis document, but the company and what it offered, and the job description were "too good to be true," or so I thought. Although I had not taken specific plant pathology courses or worked with plant fungal pathogens, the objectives and what Terramera stood for aligned with my values and what I looked for in my career as a young, black scientist. I was excited at the prospect of working at Terramera so I made use of the resources available to me, e.g., my advisor and the university's career centre at WLU, to become the best candidate for the job. The HR department notified me that I had been short-listed, and things progressed quickly. I was nervous, yet confident going through the two rounds of interviews. But success favours the prepared and I was prepared; I believe that my passion and knowledge for the sustainable production of food was evident. A year later, I am still excited to show up for work.



Kayla Salive, M.Sc.

Wilfrid Laurier University; Department of Biology

Supervisors: Kevins Stevens & Mihai Costea

Title: Assessing threats and mitigation for Scarlet Ammannia (*Ammannia robusta*) in Southwestern Ontario.

I recently completed my M.Sc. at Wilfrid Laurier University in Waterloo, Ontario under the supervision of both Dr. Mihai Costea and Dr. Kevin Stevens. My work focused on assessing threats and mitigation for the species at risk Scarlet Ammannia (*Ammannia robusta*) in Southwestern Ontario (Leamington and Pelee Island). My family roots on Pelee Island along with my keen interest in conservation permitted collaborations with different organizations and landowners around the area to not only assess the population status of *A. robusta* but to also try to identify potential threats to the species. Results from this research contribute to the understanding of *A. robusta*'s ecology and biology, and ultimately fill knowledge gaps outlined in the federal recovery strategy for the species. Additionally, I am currently using this work to educate residents by partaking in an educational film focused on environmental issues surrounding species at risk. I look forward to using my education and professional experiences to pursue a career in the conservation field.

Graduates



James Jones, Ph.D.

Hello! My name is James M.C. Jones, and I was a student representative for the CBA from 2012-2017. I graduated with a Ph.D. in Biological and Chemical Sciences from Wilfrid Laurier University in 2019. My Ph.D. was advised by Drs. Pedro Antunes and Frédérique Guinel, and my dissertation title was "Context is everything: an investigation of Spanish River Carbonatite and its effects on soil-plant-microorganism systems."

My peer-reviewed publications are:

- Jones, J.M.C., Guinel, F.C. and Antunes, P.M. (2020) Carbonatites as rock fertilizers: a review. Rhizosphere 13: 100188.
- Jones, J.M.C., Webb, E., Lynch, M.D.J., Charles, T.C., Antunes, P.M. and Guinel, F.C. (2019) Does a carbonatite deposit influence its overlying ecosystem? FACETS 4: 389-406.
- Jones, J.M.C., Fredeen, A.L. and H.B. Massicotte. (2016) Calcium and pH co-restrict abundance of *Drosera rotundifolia* (Droseraceae) in a Sphagnum bog in central British Columbia. Botany 94: 139-146. (February 2016 Editor's choice).
- Jones, J.M.C., Clairmont L., Macdonald E.S., Weiner C., Emery R.J.N., and Guinel F.C. (2015) E151 (sym15), a pleiotropic mutant of pea (*Pisum sativum* L.), displays low nodule number, enhanced mycorrhizae, delayed lateral root emergence, and high root cytokinin levels. Journal of Experimental Botany 66: 4047-4059.

Project Announcement



Colleen Robertson

My M.Sc. research with the University of Winnipeg under the supervision of Dr. Rafael Otfinowski studies the impact of historic grazing on fescue grasslands on drought tolerance and climate change resilience. My research focuses on the fescue grasslands of Riding Mountain National Park, Manitoba, 50 years after grazing. Ninety percent of all grasslands in western Canada are impacted by grazing, however, the legacy effects of historic grazing on the function of grassland ecosystems are poorly understood. Plants that occur most frequently after grazing are characterized by rapid regrowth that may reduce their tolerance of drought. As a result, changes in the composition of dominant plants could increase the susceptibility to drought of intensely grazed grasslands. My research will expand on long term data and incorporate plant traits to determine whether legacies of historic grazing continue to impact the function of grassland communities, 50 years after grazing. This study will be the first to relate the legacies of grazing on the function and drought tolerance of northern fescue prairies. Results from this research will contribute to the understanding of the ecological role of grazing in the northern Great Plains grasslands, as well as help to define the management and restoration efforts of northern fescue prairies in Canadian National Parks.

A Few Questions for Dr. Tanisha Williams of #BlackBotanistsWeek



Dr. Williams is a Burpee Postdoctoral Fellow in Botany at Bucknell University in Lewisburg, Pennsylvania and the founder of Black Botanists Week. Learn more about the hashtag and movement at the website and Twitter accounts below.

CBA Bulletin: What is Black Botanists Week?

Tanisha Williams: First organized in 2020 to promote, encourage, create a safe space for, and find more Black people (and BIPOC) who love plants! Black Botanists Week is a celebration of Black people who love plants. This plant love manifests in many ways, ranging from tropical field ecologist to plant geneticist, from horticulturalist to botanical illustrator. We embrace the multiple ways that Black people engage with and appreciate the global diversity of plant life.

CBA: What motivated you to spearhead this event?

TW: During the height of the pandemic and the Black Lives Matter Movement, the #BlackBirdersWeek was formed in response to a white woman falsely calling the cops on a Black birder. I participated in this week and found such a sense of joy and pride in seeing the many beautiful Black people who were excited about science and nature. I wanted to create a similar space for Black people who loved plants.

CBA: What do you hope people will take away from Black Botanists Week and the huge response to it?

TW: Our ultimate goal is that people from all backgrounds, especially BIPOC backgrounds, take away a sense of belonging within the botanical and plant science fields. We had nothing but positive and supportive responses from individuals, celebrities, botanical societies, and more!

CBA: What's your vision for this hashtag and event going forward?

TW: This will be an annual celebration and recognition of BIPOC who love plants. We also want to make sure we are giving back through service and outreach. Many of the committee members are sharing their research, time, skills, and love for plants across a variety of platforms. We also are working to start a fund to support young and aspiring botanists with hand lenses and botanical field guides.

CBA: Do you have a favourite story or anecdote that came out of the event?

TW: We were excited to reach roughly 3,000 people on the first day of the event! This was a much broader reach than any of us imagined. We were (and still are) interacting with scientists, students, botanical societies, artists, writers, newspaper outlets, radio shows, botanical artists, and houseplant enthusiasts to name a few. We were also excited to be featured in The Daily Item, USA Today, Plant Love Stories, TreeHugger, Cape Talk, and Discover Magazine!

#BlackBotanistsWeek Website: https://blackbotanistsweek.weebly.com/
#BlackBotanistsWeek Twitter Page: https://twitter.com/BlkBotanistsWk

New co-Editor for *Botany*: Welcome to Dr. Liette Vasseur

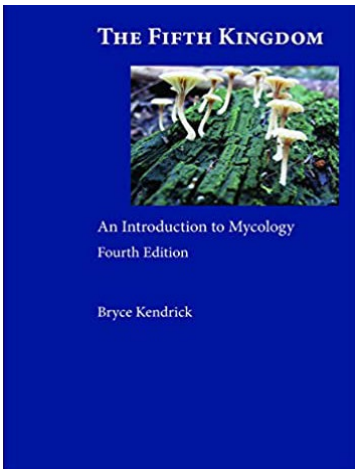


by Christian Lacroix

It's my pleasure to announce the appointment of Dr. Liette Vasseur as new co-Editor in Chief of *Botany*. Liette has been an Associate Editor with *Botany* for more than a decade. Like many of the long-time serving members of our Editorial Board, Liette comes with a wealth of experience and a great network of connections nationally and internationally. For the past few years, Canadian Science Publishing has been transitioning to this model of co-Editors for all its journals. The impact has been positive in terms of diversifying Editorial Boards, developing new journal-specific initiatives, and succession planning. Both Liette and I have been working together since April 1 to handle manuscripts submitted to our journal. We should be proud as an Association to be affiliated with this journal and I strongly encourage you to consider *Botany* for your next submission*.

Dr. Vasseur is a full professor in the Department of Biological Sciences at Brock University, where she is also a member of the Environmental Sustainability Research Centre. Since 2014, she holds the UNESCO (United Nations Educational, Scientific, and Cultural Organization) Chair on Community Sustainability: From Local to Global at Brock. Her research program is highly interdisciplinary and links issues such as community-based ecosystem management, climate change adaptation and resilience, and sustainable agriculture. In Canada, three major projects focus on organic and sustainable vineyards in the Niagara region where she studies responses of the ecosystem to alternative techniques and climate change adaptation in rural and coastal communities. She works in China, where she is a visiting scholar at Fujian Agriculture and Forestry University. Her work in Ecuador focuses on the community sustainability and ecosystem-based adaptation to climate change of rural native communities in the Andean region of the Chimborazo. She is also involved in women in Science (STEM) and is the current past president of the Canadian Coalition for Women in Engineering, Science, Trades, and Technology. She is the President of the Canadian Commission for UNESCO. She also is the vice-chair for the North America Region of the Commission for Ecosystem Management at the International Union for Conservation of Nature (IUCN) and leads the thematic group on Ecosystem Governance.

* The scope of the journal was also recently revised to include Methods papers, Plant Genomic Resources, and manuscripts written by (with or for) Indigenous Traditional Knowledge keepers. Please visit https://doi.org/10.1139/cjb-2020-0085 ["Botany revises its scope," by Christian Lacroix and Liette Vasseur. Botany, 2020, 98(6)]



CBA member Bryce Kendrick writes:

I know of at least one Mycology course in Canada that's using my newish text *The Fifth Kingdom*, published by Hackett.

Surely there are others that could benefit from a genuine home-grown, modern text by a Canadian author. There is also an associated web site with hundreds of additional illustrations... Have a look at www.mycolog.com

CBA 2020 Annual Conference – A first virtual event for the CBA!

By Nicole Fenton



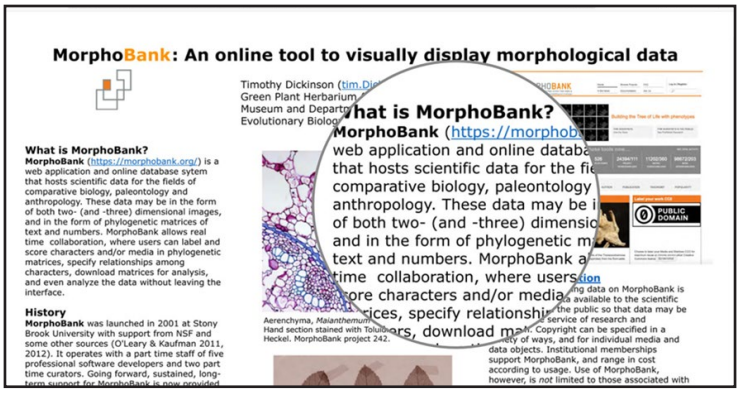
The plans for the 2020 CBA annual conference were very advanced when we had to cancel the physical event in mid-March. However, the organizing committee saw the opportunity to transform the conference into an online event. We identified three advantages: it would give an opportunity for students and post-docs to present their work, in a time when conferences were being cancelled daily; it would allow us to confer our awards and prizes and hold an AGM with the members in a difficult time; and it would allow us to highlight the diversity of talents of CBA members to a potentially larger audience due to the accessibility of the online format. There was, however, an element of risk – we did not know if the online platforms would perform as we hoped, or whether people would be interested in participating in an online-only conference!

The virtual conference was held on June 1st - 2nd. Over 350 people registered, and half of those were students. We had participants from all of the Canadian provinces and two territories. In addition, we had participants from eleven other countries. This was the largest CBA annual conference in several decades, if not since the formation of the association.



We had three excellent plenary conferences, Jennifer Baltzer (University of Waterloo), Alain Cuerrier (University de Montréal) and Julissa Roncal (Memorial University), and nearly 100 oral and poster presentations! Forty student presentations were evaluated by over ten judges to determine best poster and best oral presentation. The winner of the Iain and Sylvia Taylor award for best poster presentation was Jenna Rabley ("Differences in paper birch physiological strategies in a northern boreal common garden experiment," Université du Québec en Abitibi-Témiscamingue), with two honorable mentions, Enrique Hernandez-Rodríguez ("Effects of landscape fragmentation on boreal bryophyte diversity," Université du Québec en Abitibi-Témiscamingue) and Hana C. Thompson ("Investigating the impact of asexuality on species' range limits using *de novo* transcriptome assembly with a wetland plant," Queen's University). The winner of the Cinq-Mars best oral presentation award was Gulnara Tagirdzhanova ("Metagenome-derived predictions of the input of three fungal symbionts to a lichen," University of Alberta), with honorable mentions for Michael Dungey ("A broad-scale test of whether constraints on dispersal contribute to the northern range limit of a Pacific coastal dune plant," Queen's University) and Alice Rollini ("Investigating the inhibitory effects of anthocyanin extracts from Aponogeton madagascariensis leaves on human ovarian cancer cells," Dalhousie University).

Several issues were brought forward during the Annual General Meeting (with over 50 members participating). One was the categories and criteria for judging the student presentations. The style and substance of student presentations, both oral and poster, have changed over the years. In order to address this, over the next year, hopefully in time for the next conference, a committee of members will be looking at the descriptions of our awards and the criteria for choosing winners. If you are interested in participating, please contact Nicole Fenton.



A second issue that came to the fore during the conference and the AGM is the need to increase diversity in the representation of scientists and practitioners in the CBA-ABC but more importantly in botanical sciences. A working group is being struck to look at this issue over the next year with the aim of developing concrete actions in the short term. Again, we are looking for volunteers from the membership; if you are interested in participating, please contact Nicole Fenton.



After the conference, we collected information on the participants' perspectives on the different elements. Overall, people were satisfied, and while we need to work on how to facilitate casual or spontaneous discussions in the virtual model, the board of the CBA feels that hybrid models (virtual and physical) should be pursued in the future!

Overall, the 2020 annual meeting was a great success, in large part thanks to the enthusiastic participation of its members. Thanks again for a wonderful two days and I look forward to seeing you next year!

2021 Annual Meeting

The 2021 annual meeting of the Canadian Botanical Association will be a joint meeting with the International Association of Bryologists, American Bryological and Lichenological Society, The iMOSS Society and Societé québécoise de bryologie.

Location: Québec City Convention Center, Québec, Canada

Date: 23-25 June 2021

Student Award Winners

J. Stan Rowe Award in Ecology:

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



Mélanie Jean

Mme Mélanie Jean (PhD), Department of Biology, University of Saskatchewan, Saskatoon, for her article "*Broadleaf Litter Controls Feather Moss Growth in Black Spruce and Birch Forests of Interior Alaska*" by Mélanie Jean, April Melvin, Michelle Mack, and Jill Johnstone, published in ECOSYSTEMS (2020) 23: 18–33.



Jacqueline Dennett

Honourable Mention: Dr. Jacqueline Dennett, Department of Renewable Resources, University of Alberta, Edmonton, for her article "*Detectability of species of Carex varies with abundance, morphology, and site complexity*" by Jacqueline Dennett and Scott Nielsen, published in JOURNAL OF VEGETATION SCIENCE (2019) 30: 352-361.

Taylor A. Steeves Award in Structure and Development:

In memory of Taylor A. Steeves, for best scientific article by a student in the field of plant structure and development.

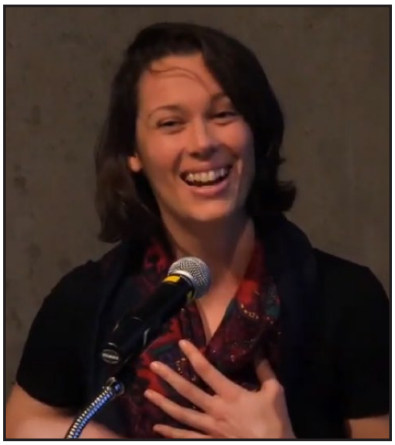


Nathan Rowarth

Nathan Rowarth (PhD candidate), Department of Biology, Dalhousie University, Halifax, for his article "*Hsp70 plays a role in programmed cell death during the remodelling of leaves of the lace plant (Aponogeton madagascariensis)*" by Nathan Rowarth, Adrian Dauphinee, Georgia Denbigh, and Arunika Gunawardena, published in JOURNAL OF EXPERIMENTAL BOTANY (2020) 71:907–918

Luella K. Weresub Memorial Award in Mycology:

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



Hayley Paquette

Hayley Paquette (MSc Project), Department of Biology, Carleton University, Ottawa, for her article "*The calicioids of Forillon National Park, Quebec, Canada*" by Hayley Paquette, Niels van Miltenburg, Steven Selva, and Troy McMullin, published in OPUSCULA PHILOLICHENUM (2019) 18: 58-73.

Student Award Winners

Iain and Sylvia Taylor Poster Award

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

Jenna Rabley, Université du Québec en Abitibi-Témiscamingue, Amos, Québec, for her poster "*Differences in paper birch physiological strategies in a northern boreal common garden experiment*"



Jenna Rabley

Honourable Mention: Hana Thompson, Queen's University, Kingston, Ontario, for her poster "*Investigating the impact of asexuality on species' range limits using de novo transcriptome assembly with a wetland plant*"



Gulnara Tagirdzhanova

Honourable Mention: Enrique Hernandez Université du Québec en Abitibi-Témiscamingue, Rouyn-Noranda, Québec, "*Effects of landscape fragmentation on boreal bryophyte diversity*"

Lionel Cinq-Mars Oral presentation Award

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

Gulnara Tagirdzhanova, University of Alberta, Edmonton, Alberta, for her presentation "*Metagenome-derived predictions of the input of three fungal symbionts to a lichen symbiosis*"



Alice Rollini

Honourable Mention: Alice Rollini, Dalhousie University, Halifax, Nova Scotia, for her presentation "*Investigating the inhibitory effects of anthocyanin extracts from Aponogeton madagascariensis leaves on human ovarian cancer cells*"



Mike Dungey

Honourable Mention: Mike Dungey, Queen's University, Kingston, Ontario, for his presentation "*A broad-scale test of whether constraints on dispersal contribute to the northern range limit of a Pacific coastal dune plant*"

Lawson Medal Winner – Dr. Yves Bergeron

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



Category B (Recognition of an exceptional career in botany).
Categorie B (Reconnaissance d'une carrière exceptionnelle en botanique)

Pr. Yves Bergeron
Institut de recherche sur les forêts,
Université du Québec en Abitibi-Témiscamingue

A Few Words About Dr. Bergeron, by Dr. John Markham

This year's Lawson medal winner is Yves Bergeron, for his outstanding contribution to botanical knowledge. By any measure, Yves is one of the most productive and influential ecologists Canada has ever produced. His publication record is massive, including 3 books, 30 book chapters and 485 peer-reviewed publications. His work is highly cited with 30,000 Google Scholar citations. He also has trained well over 200 students, many of whom have gone on to productive careers in the botanical sciences.

Yves has been the driving force in creating the Institute for forest research at UQAT and making it a world leader in forest research. He has held numerous research chairs and has had shared appointments both at UQAT and UQAM. One of Yves' main areas of research is the dynamics of boreal forest communities. Using dendrochronological methods, he reconstructs the demographics of forests. This has resulted in a deeper understanding of the importance of various types of natural disturbances in the boreal forest biome, and this understanding has allowed Yves to advocate for more sustainable forest management practices by applying natural disturbance regimes in forestry. Yves has been engaged and highly influential in affecting forestry policy, making him a model citizen scientist. As his research group has grown, his research has encompassed broader questions around the ecology of boreal forests. Besides his main focus area of forest dynamics, Yves and his team have made significant contributions to other areas of botany, including taxonomy, population genetics, land classification, paleoecology, climate change, and conservation. He has also forged strong collaborations with others working with avifauna, wildlife and aquatic systems. As one letter of support summed up his contributions: "His legacy in botanical research will be long-lasting both through his prolific and holistic publication record but also in the people that he has trained."



A few of the comments made by the judges:

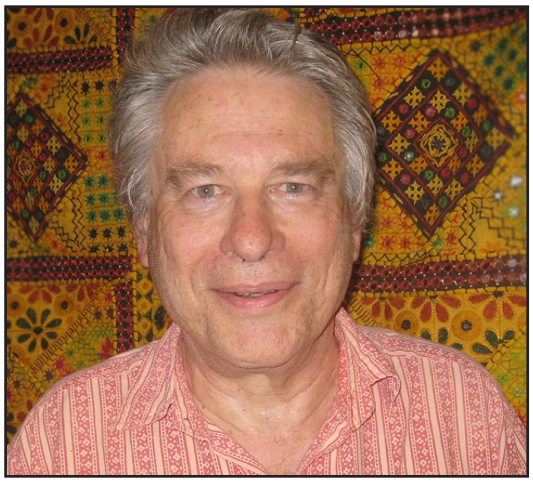
- "Dr. Bergeron's research on boreal forest dynamics, including reconstruction of past fire regimes, understanding the factors controlling treeline, and the development of sustainable management strategies based on natural disturbance regimes has contributed significantly to our knowledge of Canada's dominant forest community. As a result of his accomplishments, Dr. Bergeron has not only made a seminal contribution to the field of plant ecology, he has been highly influential in affecting change in management practices and policy in the forest industry. Dr. Bergeron's contribution to science and Canadian society are far reaching and unequivocal.

- "Yves is one of the pioneers of climate change effects on forest ecosystems. His lifetime scientific contribution is staggering, both in terms of quantity and quality.

Continued at bottom of next page

Mary Elliot Service Award – Dr. Timothy Dickinson

"*The Mary E. Elliott Service Award is given to an individual for meritorious service to CBA/ABC*."



Dr. Timothy Dickinson
Royal Ontario Museum (ROM)
& University of Toronto

A few of the comments made by the judges:

• "Dr. Timothy Dickinson has been a lifetime member of the Canadian Botanical Association, and he has provided meritorious service to the Association is his role of treasurer, chair of the systematics section, and organizer of workshops and conferences. In addition, Dr. Dickinson has always been a strong advocate for Canadian botany, herbaria, and plant systematics. I fully support his nomination for this year's Mary Elliot Service Award. "

• "Tim Dickinson: Definitely FOR. Tim has been one the most dedicated persons to CBA and has done a lot for the society throughout his career. "

• "Tim Dickinson has been a very active member in CBA at many levels, organizing symposia, fund raising and associate editor of CJB. He certainly deserves this award."

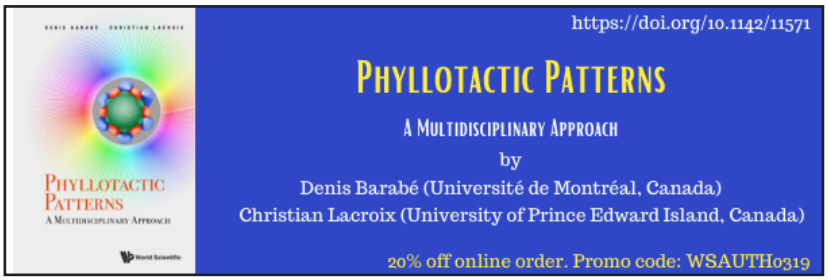
On a personal note, I would like to say that this is one of the most delightful things I have had the privilege to do since becoming a member and now President of the Canadian Botanical Association. Tim is undoubtedly an unusually deserving member for this award. I have seen him at almost every meeting I have ever attended, and at such meetings he has been a keen and strong contributor to the advancement of our society. I think his proposal during the AGM to support the Hungarian Natural History Museum is just one example. Thank you Tim, for all you have done and I say this not just as President of the CBA, but from the heart.

~Julian Starr

Continued from previous page

• "Yves Bergeron has been influential in shaping the scientific landscape in Canada and in Quebec, and he has been a leading contributor to developing new institutions and research groups. His close to 30,000 citations do not come from just a few influential papers, but from many. In addition, he has had over 200 students, of which at least one 100 were graduate students, many of whom have gone on to great scientific careers."

CBA-ABC Special Project Fund Inaugural Award – Final Update



The inaugural award recipients, Denis Barabé (Université de Montréal / Institut de recherche en biologie végétale) and Christian Lacroix (University of Prince Edward Island) are happy to announce the publication of their book entitled 'Phyllotactic Patterns: a Multidisciplinary Approach'. The authors are grateful to the CBA for the award they received in 2017. They used their funding to secure the services of a graphic artist to produce illustrations and figures for their book. They were hoping to showcase their publication at the 2020 annual meeting in Rouyn-Noranda but look forward to do so at the upcoming meeting in Québec city in 2021.

In the meantime, you can access a free preview of Chapter 1 entitled 'Phyllotactic Parameters' online from publisher World Scientific at: https://www.worldscientific.com/doi/pdf/10.1142/9789811211010_0001 or order a copy of the book at a 20% discount (use code: WSAUTH0319) at: https://doi.org/10.1142/11571

The main goals of the book are: (1) to provide a survey on recent developments in the study of phyllotaxis, (2) to highlight substantial advances within the discipline, and (3) to provide a comprehensive summary and insight into the discipline for novice as well as experienced students of phyllotaxis. The book is divided into six chapters:

Chapter 1, entitled Phyllotactic Parameters, outlines a comprehensive list of parameters (mainly geometrical) that have been developed and used to describe and analyse phyllotaxis. These parameters, which are essential for the description and understanding of phyllotaxis, are discussed in the context of current models.

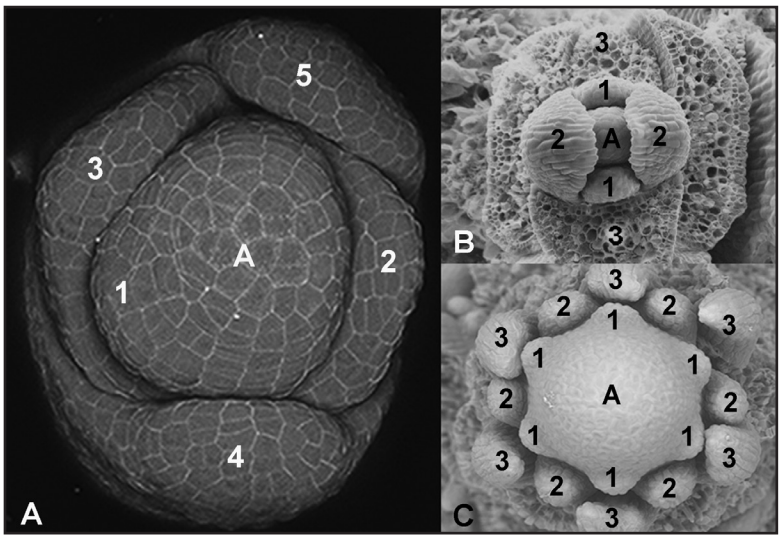


Fig. 1.4. Common phyllotactic patterns at the level of the shoot apical meristem (SAM) in angiosperms. The numbers on individual leaf primordia indicate the relative age of the leaf, with the lowest number corresponding to the youngest structure. (A) Top view of *Aponogeton madagascariensis* SAM (A) showing the spiral pattern. Magnification, 200x. Photo courtesy of A. Dauphinee, Dalhousie University. (B) Top view of *Thuja occidentalis* SAM showing the decussate leaf arrangement, in which leaves are initiated in successive pairs. Magnification, 200x. (From Lacroix et al., 2004; reprinted with permission from Canadian Science Publishing.) (C) Top view of *Myriophyllum aquanticum* SAM showing three whorls of six leaves. Magnification, 310x. (Photo courtesy of C. Lacroix, University of Prince Edward Island).

Chapter 2, entitled Dynamical Models, discusses theoretical phyllotactic models that are based on energetic principles and iterative processes and that can generate regular phyllotactic patterns. For example, we discuss Douady and Couder's as well as Levitov's novel dynamical models that served as a foundation for other approaches.

Chapter 3, entitled Statistical and Probabilistic Approaches, explores the probabilistic features of phyllotactic models and their predictive value. We focus on the manifestation of irregular patterns that appear in several plants, including mutants, and on statistical methods used to analyse the degree of order of these patterns.

Chapter 4, entitled Role of Genes in the Framework of Biochemical and Molecular Models, outlines the recent molecular findings that might explain the processes involved in pattern initiation, development, and establishment at the level of the SAM. We focus on theoretical models based on molecular data involving auxin and its feedback mechanisms, as well as genes implicated in phyllotactic patterning.

Chapter 5, entitled Biophysical Aspects of Phyllotaxis, discusses the biophysical processes involved in the establishment of phyllotactic patterns. In particular, we discuss recently developed biomechanical models in detail; these models are based on physical laws linked to compressive and tensive forces on a metallic plate. We also discuss the analogy between the appearance of primordia on a SAM and buckling on a plate and present joint models involving both biomechanical and biochemical processes.

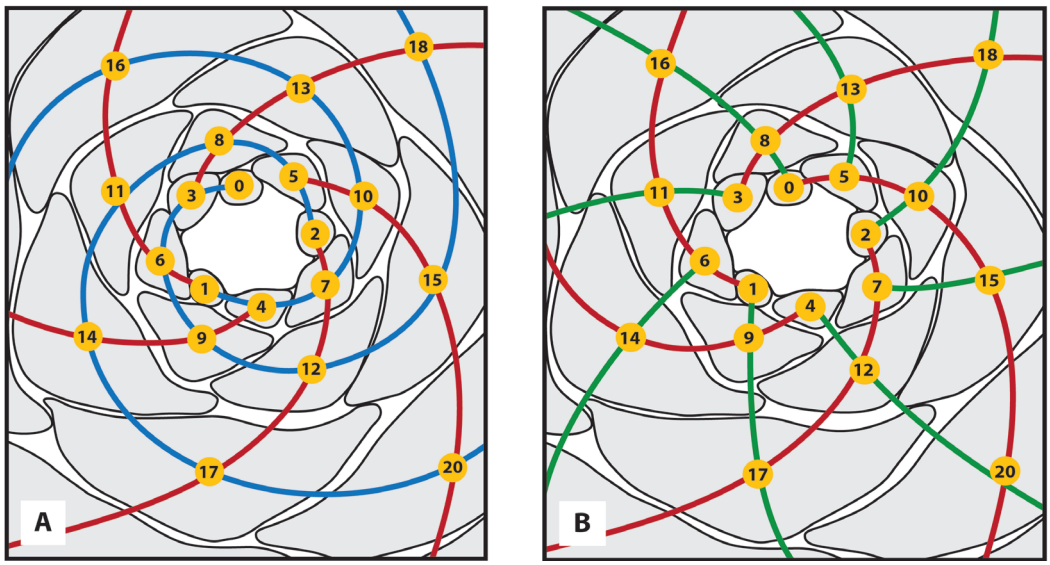
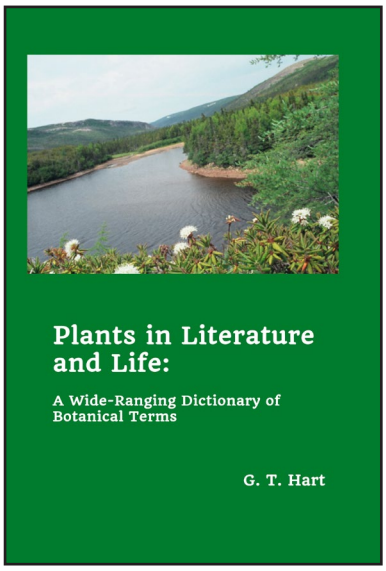


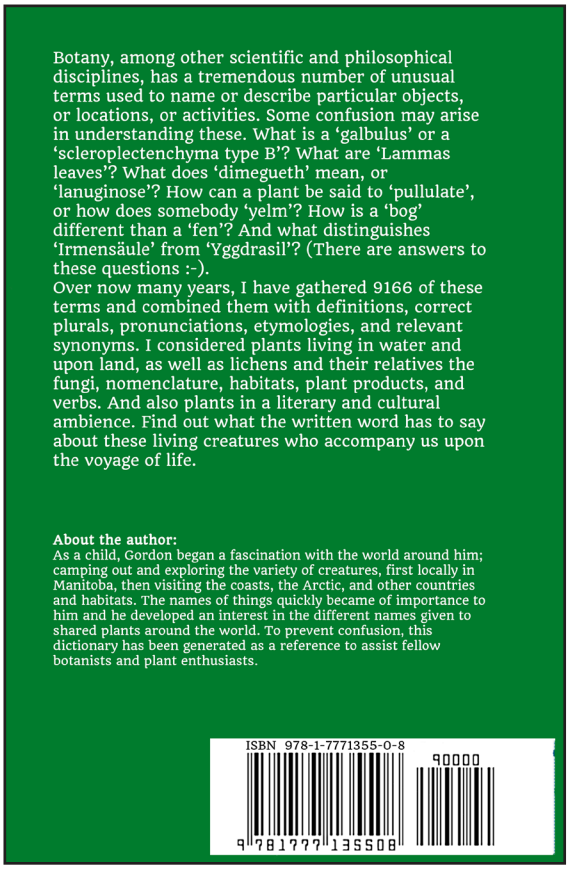
Fig. 1.10. Transverse section of the apex of *Sempervivum calacaratum*. (A) Phyllotactic system with a (5,3) contact parastichy pair. (B) The same phyllotactic system with a (5, 8) conspicuous parastichy pair. (Modified from Church (1920).

Chapter 6, entitled Concluding Remarks: Critical Analysis and State of the Discipline, summarises the inter-relationships between the various aspects and approaches discussed in this book. It also highlights unsolved problems in this field, such as the wide variety of SAM morphologies and associated unexplored lateral organs.



CBA member Gordon Hart writes:

I would like to contribute news of the recent publishing of a comprehensive dictionary of the terminology of botany *sensu lato*. Recently, new on-paper editions have been few, and works reported as 'dictionaries' (e.g. Beentje & Williamson, 2010) are often literal glossaries. ***Plants in Literature and Life: a wide-ranging dictionary of botanical terms***, available as a hardcover from lulu.com (ISBN 978-1-7771355-0-8) and in a hyperlinked edition through Apple Books (ISBN 978-1-7771355-1-5), provides definitions, pronunciation, correct plurals, more parts of speech than simply nouns and adjectives, and more.



Profile of a critically imperilled species in Canada: Scarlet Ammannia, *Ammannia robusta* Heer & Regel (Lythraceae)

Kayla Salive[1], Kevin Stevens[1], Mihai Costea[1]

[1] Wilfrid Laurier University

= *Ammannia alcalina* Blank.
 A. coccinea subsp. robusta (Heer and Regel) Koehne

Annual, glabrous; stems are decumbent to erect, simple or branched, 5–100 cm tall (Figure 1). Leaves are opposite, oblong to oblanceolate, 2–8 cm long, sessile and cordate-clasping (Figure 2). Inflorescences are axillary cymes with 1–3 flowers. Petals are pale-lavender, 3–5 mm long. Fruits are capsules with thin pericarp. Seeds are small, 0.4–0.5 mm long, 250 to 400 in each fruit.



Figure 1: A not so robust *A. robusta* plant flowering in Pelee Island, Ontario (June 2017).

Scarlet Ammannia is one of the four species of the genus native to North America. It is more common north of Mexico, from North Dakota and Western Minnesota to Oklahoma, extending sporadically into Texas, Northern Arkansas and Tennessee. In Mexico, it is confined mainly to coastal states from Northern Baja California, Sonora and Nayarit in the west, and Tamaulipas to Quintana Roo in the east.

The species is also present in the Caribbean and in SE Brazil.

Ammannia robusta has been commonly overlooked and mistaken in N. America with *A. coccinea* Rottb., which is the only other species present in Canada, in British Columbia. The morphological distinction between the two species is relatively difficult because *A. coccinea* is an amphiploid (n = 33) resulted from the hybridisation of *A. robusta* (n = 17) and *A. auriculata* Willd. (n = 15, 16). The identification key below is based on Graham (1985).

Cymes sessile with 1–3 flowers; petals pale lavender; anthers yellow; fruits 4–6 mm in diameter ……*A. robusta*

Cymes short- to long-pedunculate (rarely sessile) with 3 or more flowers; anthers deep yellow; petals deep rose-purple; fruits 3.5–5 mm in diameter……..*A. coccinea*



Figure 2: Flowers and leaf base. Pelee Island, Ontario, 2016.



Figure 3: *Ammannia robusta* fruit containing ~250-400 seeds; collected from plants grown from seed bank of soil from Pelee Island, Ontario.

In Canada, *A. robusta* is restricted to a few populations in Ontario and British Columbia. In the latter province, *A. robusta* is confined to the southern Okanagan Val-

ley. The populations found in Ontario are limited to the southernmost parts of Essex County, including Pelee Island in Lake Erie. Thus, the Canadian populations of Scarlet Ammannia represent the northernmost distribution limits of this species in North America.

Ammannia species, in general, tend to occur in wet or temporary inundated habitats. In the past 25 years, in southwestern Ontario, *A. robusta* has been found as a pioneer in mudflats, sand beaches, alluvial shores, wetland edges, seasonally dried-up pond bottoms, drainage canals/ditches and moist, sandy depressions. These habitats are normally submerged in early spring and plants germinate and establish when water levels recede in late spring and summer.

Scarlet Ammannia was reported to be predominately autogamous; however, we noticed that its flowers are visited by skippers and small bees which forage the nectar produced by the thickened glandular area that surrounds the base of the ovary (Figure 4), which suggests at least a potential for allogamy.



Figure 4: Bees (Hymenoptera) observed on *A. robusta* flowers growing in Leamington, Ontario during 2017 vegetation surveys indicating a potential for cross-pollination.

Ammannia robusta does not reproduce vegetatively and population survival depends on seeds and the seed bank.

Despite their small size, the seeds of Scarlet Ammannia possess some remarkable features. While initially smooth (Figure 5), upon hydration they develop specialized "trichomes" that emerge from inside the epidermal cells (Figures 6 and 8) on the dorsal face of seeds. In addition, abundant hydrogel globules are produced on the ventral face of seeds (Figures 6 and 7). As a result, seeds stick together and float in groups. When the water levels recede, the hydrogel helps seeds adhere to the substrate and maintains the humidity necessary for germination.

Following the COSEWIC assessments and status change in 2001, Scarlet Ammannia was designated as Endangered, schedule 1 in Canada (Species at Risk Act, 2003). The decision was based on the fewer than

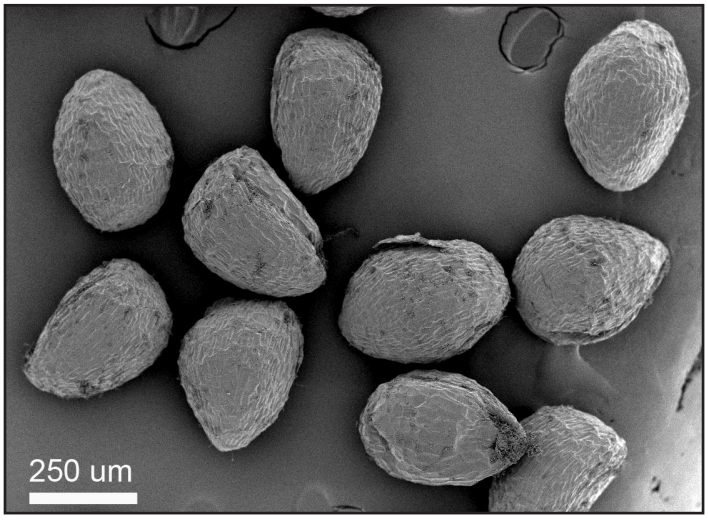


Figure 5. Scanning electron micrograph of seeds before hydration; note the absence of trichomes and hydrogel.

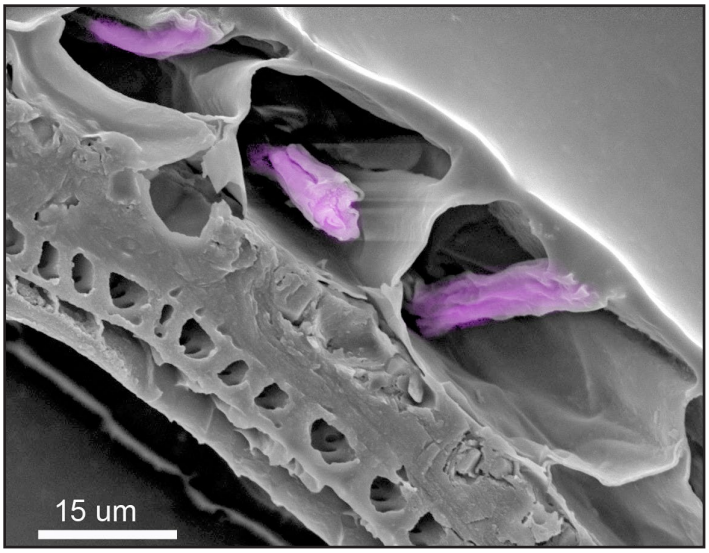


Figure 6. Evagination of "trichomes" inside seed coat epidermal cells during hydration. Eventually the expanding trichomes emerge on the surface of seed. SEM micrograph with trichomes artificially colorized.

five remaining sites and the vulnerability of species' critical habitat. In both Ontario and British Columbia, the riparian habitat of *A. robusta* is threated by altered hydrological regimes, destruction of natural shoreline and landscape developments, recreation activities, and the introduction of alien/invasive species. Federal and Ontario recovery strategies were outlined for the spe-

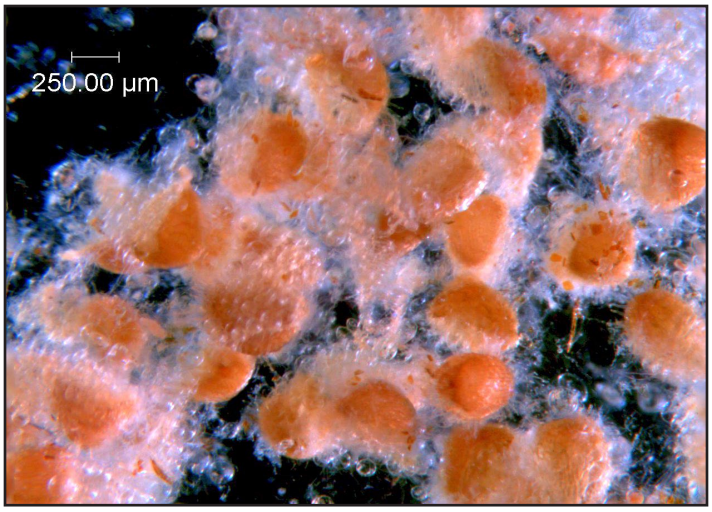


Figure 7. Masses of seeds agglutinated through their trichomes and hydrogel globules after hydration.

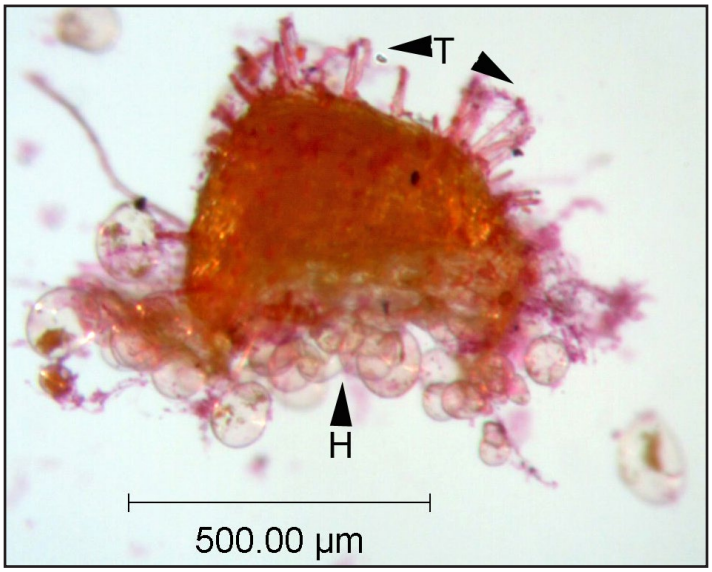


Figure 8: Evaginated trichomes (T) and hydrogel globules (H) produced after seed hydration. Staining with Ruthenium Red indicates a pectic nature for the trichomes but not for the hydrogel.

cies in 2015 and 2017, respectively. The main goal of these recovery strategies is to determine the status of extant populations as a foundation for determining future concrete recovery measures. In addition, the recovery strategies also identified as a priority research aimed at better understanding the ecology and biology of the species, especially during germination.

Working under the guidelines of the Ontario recovery strategy, we have assessed the status of *A. robusta* populations in the province, characterized the biotical and abiotical factors of historical sites, as well as explored and discovered new sites/populations in the area. This was achieved by conducting both vegetation surveys and seed bank assays over three consecutive years (2016–2018). Furthermore, to determine the effects of competition on *A. robusta* germination, seedling establishment and growth, field and greenhouse competitor removal studies were conducted at Wilfrid Laurier University. We also ran germination assays to determine the species' temperature and light requirements, which can be used to predict its time of emergence in natural habitats. We hope to publish our findings soon!

Acknowledgements

Funding was provided by the Government of Ontario through the Species at Risk Stewardship Fund. Additional assistance was received from the Ministry of Natural Resources and Forestry, Essex Region Conservation Authority, Ontario Parks, Parks

Canada and the Natural Heritage Information Centre.

References

Costea M, Stevens K, Rooney R. 2017. Habitat requirements, seed biology and dispersal Ammannia robusta. Species at Risk Research Fund for Ontario Report. 52 pp.

Douglas GW, Meidinger D, Penny JL. 2002. Rare native vascular plants of British Columbia. Second edition. British Columbia. 35 pp.

Douglas GW and Oldham MJ. 1997. Status report on Scarlet Ammannia (Ammannia robusta Heer & Regel). Committee on the Status of Endangered Wildlife in Canada. Ottawa. 22 pp.

Douglas GW, Straley GB, Meidinger D, Pojar J. 1999. Illustrated flora of British Columbia: Dicotyledons (Diapensiaceae through Onagraceae). British Columbia: Ministry of Environment, Lands and Parks: Ministry of Forests. 423 pp.

Environment Canada. 2015. Recovery strategy for the Scarlet Ammannia (Ammannia robusta) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada. Ottawa. 22 pp.

Graham SA. 1979. The origin of Ammannia x coccinea Rottboell. Taxon 28: 169-178.

Graham SA. 1985. A revision of Ammannia (Lythraceae) in the western hemisphere. J. Arnold Arbor. 66: 395-420.

NatureServe. 2020. NatureServe explorer: an online encyclopedia of life. Version 7.2. Virginia. [retrieved 2020 Aug 12]. Available from: http://explorer.natureserve.org/servlet/NatureServe?-searchName=Ammannia+robusta

Ontario Ministry of Natural Resources and Forestry. 2017. Recovery Strategy for the Scarlet Ammannia (Ammannia robusta) in Ontario. Ontario Recovery Strategy Series. 21 pp.

Stevens K, Costea M, Salive K. 2017. Assessing the status of Ammannia robusta in Essex County wetlands. Ontario Species at Risk Stewardship Fund Grant Report. pp. 63.

Plants, peanut butter, and ptarmigans: Biodiversity research in the western Canadian subarctic

Kirsten Reid
PhD Candidate, Memorial University of Newfoundland
2019 Recipient of The Laurie Consaul Northern Research Scholarship

I am honoured to have been awarded The Laurie Consaul Northern Research Scholarship in 2019 and am grateful to the Canadian Botanical Association and to Dr. Consaul's family for the financial support provided by this award. It feels particularly meaningful to hold this award at Memorial University, where Dr. Consaul was due to begin a faculty position.



Grizzly bear at a research site at the Yukon/Northwest Territories border.

My research takes place in Yukon and Northwest Territories, in the traditional territories of the Vuntut Gwitchin, Tr'ondek Hwech'in, and Inuvialuit. This is one of the most rapidly warming regions in the world and the responses of entire biotic communities to these changes remain unknown. The probability of novel communities (community and climate combinations which have no historical analogue) in this region is high. It is therefore important that we have a detailed understanding of the current biotic interactions before we can begin to predict future interactions and community composition.

At my 14 study sites, I am classifying biodiversity (richness and diversity) for the following five trophic levels:

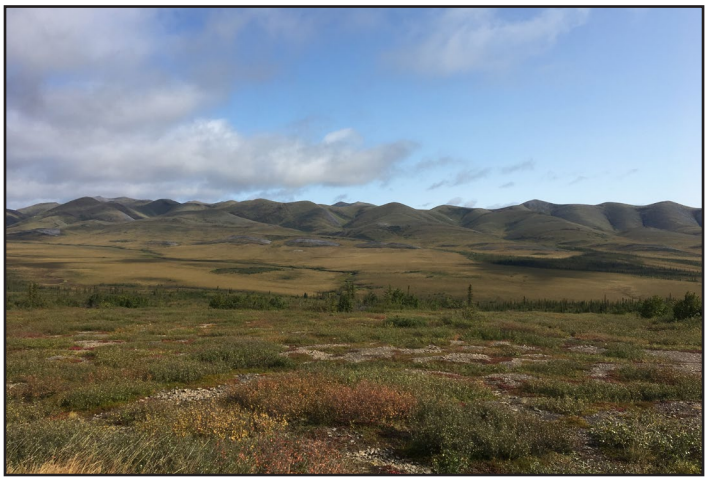
1. Understory vegetation: In 10 x 1m^2 quadrats at each site, I am identifying the percent cover of vascular and non-vascular species. The sites are a mix of tundra and boreal forest vegetation so the diversity across the entire region is relatively high. I have committed to providing all of my species data, but especially the vegetation information to the Yukon Conservation Data Centre to assist with evaluating the conservation status of species and to assess which species are expanding their currently documented ranges.



Fireweed at the foothills of the Richardson Mountains (Photo Credit: Kirsten Reid)

2. Large mammals: Using motion activated trail cameras, I am identifying the richness and diversity of large mammals that use each site. So far, I have recorded a wide range of animals from moose to wolves, grizzly and black bear, ptarmigans, porcupines, hares, and many, many ground squirrels.

3. Small mammals: Using another set of trail cameras, this time baited with peanut butter (the universal attractant!), I am identifying the richness and diver-



Richardson Mountains at the Arctic Circle (Photo Credit: Kirsten Reid)



Small mammal feasting on peanut butter at a site in the Tombstone Mountains

sity of small mammals. Diversity is relatively low as there are few species that live in this region. Nonetheless, this method of cameras pointed at the ground is quite novel, so I am happy that the data are being successfully collected in that manner.

4. Invertebrates: Using five pitfall traps at each site, I am gathering data on the invertebrate communities throughout the region. For the purposes of time, I will only be identifying spiders and ground beetles (*Carabidae*) since a lot of previous work in the arctic has focused on these groups.

5. Soil microbes: Using high throughput sequencing, I will be identifying bacterial and fungal DNA.

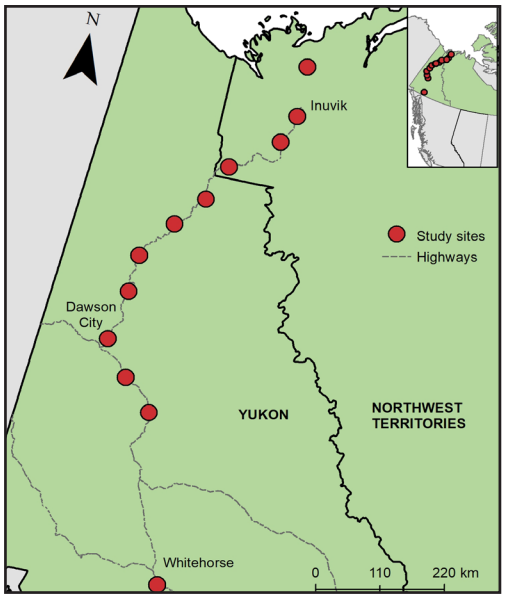
With these data, the goal is two-fold:

1. What are the drivers of species diversity and abundance for different taxa? In addition to the above diversity measurements, I am also measuring many covariates (including soil depth and moisture, air temperature, snow depth and duration, decomposition rate). Through correlation analyses, I am asking questions such as whether the same drivers are important across all taxa and if the directions of the relationships are the same between community measurements (i.e., richness and diversity)?

2. With an understanding of the drivers controlling each trophic level, I then want to know how drivers interact to structure community composition. Using multivariate statistics and pathway analysis, I will be incorporating the univariate data from Objective 1 to determine the site-level drivers of community composition and the magnitude of effect that each biotic variable has on the community.

From a global change perspective, the goal is to use all of these data to predict how community composition and landscape biodiversity will respond to increasing pressure from disturbances (e.g., wildfire). There are two naturally occurring, partially overlapping wildfires in the study region which have set the stage to understand how the ecosystem will recover from increasingly frequent disturbances as a result of climate change. These wildfires burned in 1991 and 2005 and were initially studied between 2007-2009 (Brown and Johnstone 2011, 2012, 2015). Comparison of understory community and stand density between 2009 and 2019 will indicate how the vegetation is recovering from these novel disturbances.

Monitoring of post-fire vegetation recovery is typical after disturbance, while other taxa are less well understood. To address this knowledge gap, starting in June 2019, diversity of all taxa outlined above are being measured at two of these burned sites to indicate how multi-taxa diversity recovers from disturbances.



Map of study sites in Yukon and Northwest Territories

Results and data from my research will contribute to a dynamic understanding of biodiversity within the western Canadian subarctic. These data will be unique in their spatial coverage and taxonomic diversity measured across this latitudinal gradient. Multi-taxa models are rare yet are extremely important for correctly predicting the response of individual taxa to environmental stressors. As environmental change continues to happen at increased pace and severity, these baseline data can provide important insights regarding vulnerable landscapes or populations. At the conclusion of this project, data may be able to point towards locations where sensitive or threatened species are abundant, thereby informing future management strategies. When combined with future predictors for Yukon's biomes (e.g., Rowland et al. 2016), landscape-scale base-

line data will assist in decisions regarding landscape connections and conservation corridors. With changes to biomes and species ranges, knowing where to create and maintain links between habitats will be crucial for conserving species and habitats.

I am very grateful to the Canadian Botanical Association, Dr. Consaul's family, and all of my other funders for supporting me with this research. Through my PhD fieldwork, I have had the opportunity to explore an amazing corner of the world and I have had many experiences that I will never forget.



Kirsten Reid in the Tombstone Mountains
(Photo Credit: Lucas Brehaut)

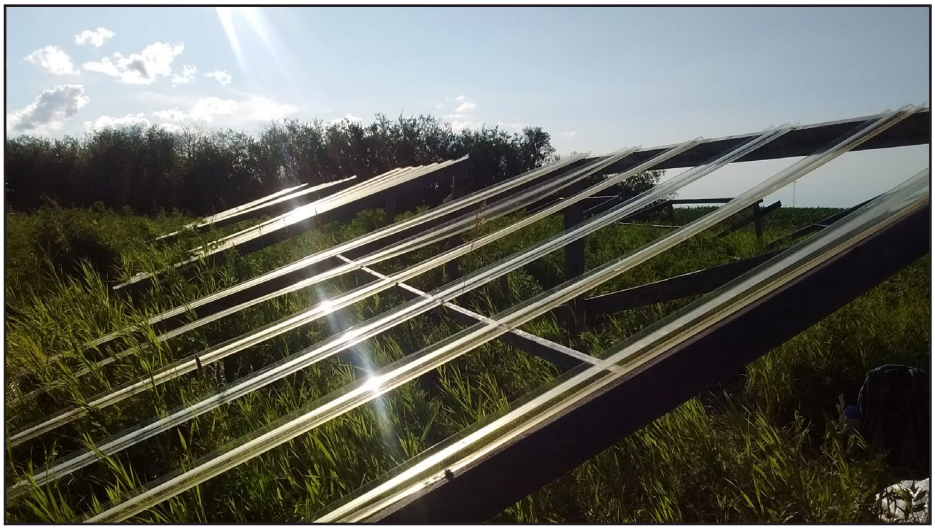
Views From the Field



CBA member Rafael Otfinowski writes:

Here are some photos from our collaboration with the International Drought Experiment (https://drought-net.colostate.edu/international-drought-experiment).





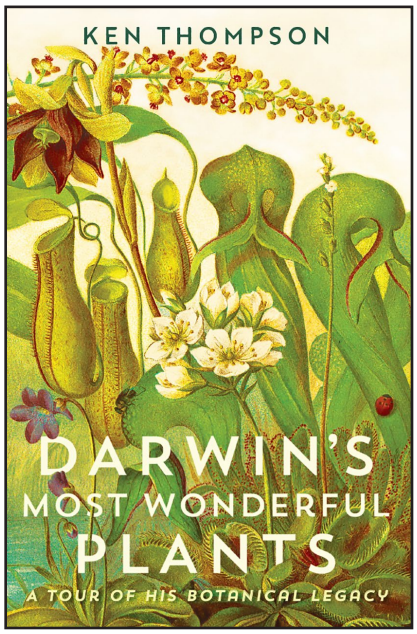
Experiment testing the sensitivity of terrestrial ecosystems to extreme drought. Each frame passively reduces precipitation to simulate naturally-occurring, extreme dry years. Our station is in Brookdale, MB and is one of 146 stations participating in this experiment world-wide. The project is coordinated by the International Drought Experiment and is in partnership with the Manitoba Beef and Forage Initiatives Inc.

Book Review: Darwin's Most Wonderful Plants

DARWIN'S MOST WONDERFUL PLANTS – A TOUR OF HIS BOTANICAL LEGACY

Ken Thompson

The University of Chicago Press 2018 (255 pages)



Ken Thompson, independent senior research fellow at the Department of Animal and Plant Sciences at the University of Sheffield, England, organizes this book around the seven scientific articles Darwin wrote on plants between 1862 and 1880. Three main topics, plant movement, carnivorous plants, and plant fertilization, are reviewed in five chapters of approximately equal lengths. Drawing from these articles, Thompson formulates questions that Darwin had left unanswered and through a thorough search of the literature, he often comes up with answers. These questions were left open not because of Darwin himself, but rather because of the state of technology at the time or because the organisms that would have permitted Darwin to test his hypotheses were unknown to him, or were yet to be discovered. This book is for the general public, as it is rich in examples, each one more interesting than the last.

To illustrate that Darwin would have needed new technology to solve some of his queries, Thompson mentions the aquatic bladderworts. Darwin, although very observant and patient, was never able to see the bladders trap the plant's prey; it is only with modern high-speed cameras that scientists captured the bladder's action. Indeed, Vincent *et al*. (2011) demonstrated that the suction phase of the *Utricularia* trapping mechanism lasts less than one millisecond. One would have to be very lucky to catch it acting without any aid!

To exemplify a species known at the time of Darwin, but unknown to him, one can cite the Cook pine, *Araucaria columnaris*, which was discovered by James Cook in New Caledonia during the second Pacific voyage of H.M.S. *Endeavour*. It is the only tree known today to display a hemisphere-dependent behavior (Johns et al., 2017). Amazingly, the further the tree is located from the equator, the further it is leaning! Darwin recognized that it was difficult to study plant responses to gravity, and Thompson leaves us wondering what Darwin would have done with that tree and its propensity to lean.

The last example here will be of a species not yet discovered at the time of Darwin and it will be one from the insect world, that of the moth *Xanthopan morganii*. With that example, Thompson demonstrates that Darwin was thinking far ahead of his time. In his greenhouse at Down, Darwin had been able to care for the orchid *Angraecum sesquipedale* with its "astonishing" nectary of "disproportionate" length. However, why the orchid would have such an appendage was puzzling. Darwin proposed that it must be used by "some huge moth, with a wonderfully long proboscis". This moth was indeed found in the forests of Madagascar a few decades after Darwin predicted its existence, and it is only in 1997 that it was seen pollinating the orchid!

Thompson offers us a rich list of relatively recent articles on each topic he chose to discuss; these references are not always found in the text and this confused me at first. Quickly, I found the references at the back of the book, organized by chapters and topics. This was surprising but their location outside the text likely makes the book more palatable to a lay person. Like Darwin, Thompson may have been worried about boring his readers; however, he does not! This book should be appealing to those teaching Introductory Botany and wanting to spark the students' interest, to aficionados of carnivorous plants, and to gardeners among many others. Those looking for an erudite discussion on subjects related to Darwin's "abominable mystery", i.e., the origin of flowering plants, such as the evolution of endosperm or double fertilization, may be disappointed as those topics are not touched upon. Thompson, however, has an entire chapter on cross- and self-fertilisation. He mentions recent work by the group of Spencer Barrett in Toronto on the heterostyly of *Narcissus* (Barrett and Harder, 2005), a genus wherein both distyly and tristyly exist. Apparently, in the heterostylous species,

cross-fertilization does not rely on pollen incompatibility, but uniquely on heterostyly. According to the author, this work would have likely pleased Darwin!

The afterword summarizes well what the book is all about. I have the impression that Thompson wanted to render to Darwin what belongs to Darwin and to reinforce that Darwin was in his own right a plant biologist, although many of us do not think of him as such. He was interested in many aspects of plant life and he was led in his research by his dogma on how adaptation and evolution were tightly linked. Throughout this book, Thompson highlights Darwin's efficient yet simple talents. His observational skills were extraordinary; he was also curious and inquisitive. Other qualities were his tenacity and perseverance as exemplified by his work on *Linaria,* which lasted 11 years. When he had taken hold of a subject, he studied it at length and in depth, until he could not get anything more out of it. And of course, Darwin had a fertile imagination which allowed him to formulate his hypotheses on evolution.

Frédérique Guinel,
Retired Professor (fguinel@wlu.ca)

Acknowledgment – I would like to thank Tim Dickinson for his feedback on early drafts.

References:

Barrett, S.C.H., and Harder, L.D. (2005). The evolution of polymorphic sexual systems in daffodils (Narcissus). New Phytologist, 165:45-53.

Johns, J.W., Yost, J.M., Nicolle, D., Igic, B., and Ritter, M.K. (2017). Worldwide hemisphere-dependent lean in Cook pines. Ecology, 98: 2482-2484.

Vincent, O., Weisskopf, C., Poppinga, S., Masselter, T., Speck, T., Joyeux, M., Quilliet, C., and Marmottant, P. (2011). Ultra-fast underwater suction traps. Proceedings of the Royal Society B: Biological Sciences, 278: 2909-2914.

From the Bulletin Archives

MIGRATORY HABITS OF THE SCIENTIFIC GOOSE.

The rapidly expanding population of the once rare bird, the scientific goose, has increased the importance of attempts to study and interpret the rather exceptional geographic movement patterns of this species. Although permanent nesting areas are found in all habitable regions of the earth, they tend to be concentrated in the vicinity of the major cities. At intervals, which correlate only approximately with seasonal variations, individual birds from widely separated nesting sites simultaneously take flight. They travel, often vast distances, to flocking points where they engage in the "ritual ceremony" or "symposium" which lasts an average of 5 to 7 days, then return to their points of origin. The cycle is repeated again and again, with the only discernible difference being the location of the flocking point.

The assumption that this migratory behavior is related primarily to breeding may be rejected on the grounds that the males greatly outnumber the females; moreover, the frequency of participation appears to accelerate with age, so that the oldest birds (easily distinguishable by their bedraggled feathers and drooping tails) are in almost constant flight. Any alternative hypothesis to explaining this mysterious evolutionary adaption must account for the events of the "ritual ceremony." During this activity the individuals, one by one, take a position facing the others and cackle loudly in turn. Analysis of these sounds has demonstrated characteristic cackling patterns for each individual, the only variation being the addition of a few novel sounds at the end and the omission of a like number at the beginning of each presentation. Also to be explained are the recent experiments which have shown that the prime characteristic of the migrating individuals is their high position in the pecking order of their home flocks. Moreover, their departure signals a marked relaxation of flock activities as well as an exceptional degree of disorganized and chaotic behavior in the remaining members. In certain respects this overall behavior pattern suggests a form of racial suicide consequent upon the recent extremely rapid rise in the population.

In order to discuss these problems, a Congress on the Migratory Habits of the Scientific Goose has been organized and will be held either on the French Riviera or the island of Tahiti in the fall of 1969.

Section Reports

Mycology Section



Allison Walker

Greetings! I am Dr. Allison Walker, a graduate of the former University of Toronto Botany Department, and I am honoured to be the new CBA Mycology Section Chair. Here at Acadia University in Wolfville, Nova Scotia, my students and I study marine and coastal fungi and are active with the N.S. Mycological Society in promoting mycology in our region through forays and events, and our new newsletter, "The Nova Sclerotium." I teach 3rd year mycology each fall with weekly labs and serve as Director of the E.C. Smith Herbarium. Additionally, I'm an Associate Editor for the journal Mycologia, and Councilor for Ecology and Evolution for the Mycological Society of America. I look forward to serving the CBA in my new role and representing Canada's mycological community and their interests. Recently, I have been involved with the launch of a new research coordination network for Canadian mycology, CanFunNet, which held its first conference virtually July 28-30 with over 300 registrants from academia, government, industry and elsewhere across Canada. More details can be found at the following address; we welcome CBA member involvement in this new initiative aiming to connect Canadian fungal researchers and provide training opportunities for students and early career mycologists: https://www.fungalresearch.ca/

At this time, I want to thank profusely the former co-Chairs of the CBA Mycology Section, Dr. Hugues Massicotte and Dr. Shannon Berch, who have both recently retired, for their many years of outstanding service to the CBA and the Canadian mycological community. Additionally, we thank the Weresub Paper Award adjudication panel for their hard work this year, before the wonderful virtual CBA annual meeting.

Section members may also be interested in the following information regarding upcoming free virtual events hosted by Foray Newfoundland: "Hello Members and Friends of Foray NL, I am delighted to tell you that in lieu of our 2020 Foray, the board of Foray NL, will host an online Series of Mushroom Learning Events. An impressive number of prestigious people have agreed to share their knowledge and enthusiasm with us so that we have a wonderful variety of presentations for you. They will begin on the evening of Thursday August 20 and continue each Thursday evening until a grand finale Party on October 8. As a bonus there will also be two Saturday morning workshops. The attached poster tells you the schedule of who is presenting and a short version of their talk titles. To join the Series of Mushroom Learning Events there is a one-time registration. Once you've registered then a weekly email will be sent to you with more information on the presenters and their talk and a ZOOM link for that event. Might I suggest that you register here: https://docs.google.com/forms/d/e/1FAIpQLSdQxi7bK4Vb-zjhW1u7H3Hho1VGj3etf1Z1xJ8oN4xsgdwv7Q/viewform because you won't want to miss any of it. With very best wishes for a happy mushroom season. Helen Spencer (President Foray NL)".

Respectfully submitted,

Allison Walker

Associate Professor, Department of Biology, Acadia University

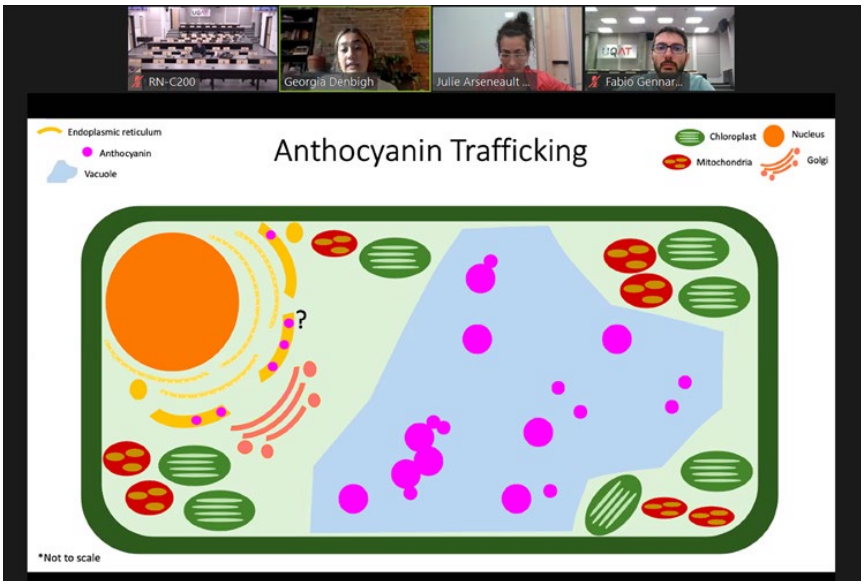
Section Reports

Plant Development Section

This year, there were two submissions for the Taylor Steeves Award for the best student paper published in plant development, structure, or morphology. I would like to thank section members and fellow judges David Garbary and Art Davis for helping to evaluate the applications.

This year's winner is Nathan M. Rowarth, who is completing his PhD under supervision of Arunika Gunawardena at Dalhousie University in Halifax. This award is open to all students who have graduated from or are enrolled in a Canadian university or Canadian students who have studied abroad, so I encourage society members to bring this award to the attention of all eligible students.

The proposed 2020 symposium on tree developmental biology was deferred, due to the difficulty in identifying suitable tree developmental biologists, and the uncertainty over the format and delivery of our 2020 conference. I would like to thank section member Patrick von Aderkas for his continued interest and encouragement.



Georgia Denbigh's presentation of her MSc research

Although there was no section symposium at this year's online version of the annual meeting, there were a number of interesting presentations on plant development, such as Georgia Denbigh's presentation of her MSc research "Examining anthocyanin localization in relation to the endoplasmic reticulum during programmed cell death in lace plant (*Aponogeton madagascariensis*) leaves" (with co-authors Christian Lacroix and Arunika Gunawardena).

Our online section meeting was held on June1st with ten in attendance. Since CBA/ABC is to meet with the International Bryological Association and the American Bryological and Lichenological Association in Québec City in 2021, a symposium on the developmental biology of wetland and aquatic plants was suggested. Members are asked to suggest potential speakers. The following individuals volunteered to act a judges for the Cinq-Mars competition in 2021: Shelley Hepworth (Carleton University) and Christian Lacroix (University of Prince Edward Island). Dr. Shelley Hepworth (Carleton University) graciously volunteered to act as co-Chair for the upcoming year, in particular to assist with symposium organization. It was proposed that the chair touch base with the leadership of CSPB (Daphne Goring, president and/or Robin Cameron, vice-president) to encourage dialogue between organizations with regard to working together on common interests.

To build the section, members are asked to identify non-CBA researchers working in the area of plant development, especially in Québec and Ontario. Section members discussed the revival of plant development workshops. It was proposed that previous participants could be contacted about participating in a 'virtual' plant development workshop, although this would require staff with expertise in IT and teleconferencing.

~Moira Galway, St. Francis Xavier University

Section Reports

Ecology Section


Richard Caners

At the virtual meeting in June, the CBA Ecology Section welcomed a new chair, Dr. Richard Caners. Richard is a bryologist and Curator of Botany at the Royal Alberta Museum in Edmonton, and has been a CBA member for more than 20 years. He has been on the Board of Directors (Western Canada) since 2017 and is excited to be involved in this new role.

This year, the Ecology Section was pleased to receive several excellent applications for the J. Stan Rowe Award, for the best student paper in Ecology. We were pleased to present this year's award to Dr. Mélanie Jean, who is presently a postdoctoral fellow at the Université du Québec en Abitibi-Témiscamingue, for her outstanding article on "Broadleaf litter controls feather moss growth in black spruce and birch forests of interior Alaska", by Mélanie Jean, April Melvin, Michelle Mack, and Jill Johnstone, published in Ecosystems (2020, 23: 18–33). An Honourable Mention was made to Dr. Jacqueline Dennett, Department of Renewable Resources, University of Alberta, for her article on "Detectability of species of Carex varies with abundance, morphology, and site complexity", by Jacqueline Dennett and Scott Nielsen, published in the Journal of Vegetation Science (2019, 30: 352–361). Thank you to all applicants, whose work has made important advancements in the field of plant ecology.

When Ecology Section members met during the virtual meeting, we discussed the possibility of holding remote seminars during the year to stay engaged. We also discussed ways to promote the J. Stan Rowe Award more widely to encourage even greater numbers of applicants. Following the launch of the vibrant new CBA website last year, the Ecology Section aims to enhance its presence and showcase the work of its members, and connect with other ecologists and CBA members.

~Richard Caners

Section Reports

Systematics & Phytogeography Section



Julissa Roncal

We have section news on several fronts. First, we welcome our new section co-chair! Julissa Roncal, Memorial University of Newfoundland, is taking over from Deb Metsger of the Royal Ontario Museum.

The Porsild-Consaul Award for best paper in plant systematics or phytogeography was not awarded this year. At the section meeting held during CBA-ABC 2020, it was decided that in view of this year's unusual circumstances, two best paper awards will be offered in 2021. We encourage section members to spread information about the award as widely as possible among Canadian plant systematists and plant geographers. Applicants can be current/recent graduates from a Canadian university or Canadian students studying abroad (they do not have to be CBA-ABC members).

At next year's annual meeting in Quebec City, we hope to have at least one section-sponsored workshop and/or symposium. Anne Bruneau has proposed a workshop on data publication, a topic of great interest to herbaria and to all of us who use digitized herbarium data. A symposium is also under discussion.

We are also considering topics for reports in upcoming issues of the Bulletin.
One topic that has been proposed is the status and future of smaller herbaria across the country. We welcome further ideas, suggestions and participation from all section members.

Finally, we would like to do more to reach out to a broader botanical audience and connect with all those who share our botanical interests and enthusiasm. Your suggestions are welcome!

~Gerry Allen and Julissa Roncal
Co-chairs, Systematics and Phytogeography Section

Navigating research and teaching in a time of COVID-19: How might we genuinely add kindness?

Laura Super[1]*, Lindsay Billings[2], Nika Martinusson[3], Santokh Singh[4] and Patrick von Aderkas[5]*

*Co-chairs of CBA's Teaching Section

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[5] Centre for Forest Biology, Department of Biology, University of Victoria, pvonader@uvic.ca

Many people are vulnerable and anxious. The spread of COVID-19 around the world, the anger of injustice illustrated by the Black Lives Matter non-violent demonstrations, and online climate strikes have all highlighted uncertainty. In these difficult times, it is especially important that society and our institutions follow Dr. Bonnie Henry's (Provincial Health Officer for British Columbia) mantra "Be kind, be calm, be safe." Both professors and students alike are forced to reach out to one another to create an intellectual bubble in which all participants can flourish.

Has your research been delayed? Are you getting the support you need? How can we make things kinder for you? Part of having a kind research community involves learning and teaching not just our students, but becoming co-learners as many of the challenges that we face have no historical comparison. Faculty, staff, and students in universities and beyond are navigating new waters.

What about teaching? Teaching mostly online has its challenges. For subjects like botany, online teaching results in a loss of many content-related experiential components. For example, students cannot tissue culture a rose for an assignment or easily do a class field trip and project in a local park together. The loss of social complexity and with it, community-building in a class, suffers even more. How do you best add human value and meaningful interaction to your course when you cannot meet face-to-face? How do you make your course more inclusive? Furthermore, kindness makes students feel good about themselves. The resulting positivity improves concentration and willingness to learn while decreasing stress. Injecting kindness into any course will improve teaching settings.

While there is a lot of unrest in the world, there are many acts of kindness. What would you like to see at your institution for kindness? At the University of British Columbia (UBC), a Kindness Project (which is growing in momentum, originally started in 2019) aims to embed more kindness into academic culture, policies and structures. The Kindness Project working group is an interdisciplinary team (medicine, education, biology, etc.) and network of faculty, staff, and students (undergraduate and graduate) initially dedicated to making UBC a kinder place, especially with respect to (i) conflict resolution, (ii) plant-based programming (food and botany/nature walks), (iii) mental health, and (iv) equity, diversity, and inclusion. More recently, the Kindness Project is reaching out to other collaborators in kindness from other institutions (University of Victoria, University of Notre Dame, etc.). At UBC, the Kindness Project is in collaboration with Conflict Theatre to creatively and kindly explore conflict, as conflict is common in academia and life in general:

https://www.hr.ubc.ca/learning-engagement/workplace-learning-ecosystem/conflict-theatre/

Interested? Please contact us: the more, the merrier. This fall, we are working on a strategic plan to make this project permanent. Ideally, it will be the start of a trans-disciplinary, long-term endeavour that grows as the participants in kindness progress through their careers and lives. There will be a blog coming soon; currently it is more of a list-serv with regular working group meetings. We have received funding to explore microaggressions in a fall theatre play. We have also been involved in other activities this summer!

The following examples for research and teaching are just a few. Please let us know yours, so we can share them.

i) Research:

- Have online forums to support early, middle, and late career researchers. Link up with botanists from around the globe.

- Take up our offer to attend the online play that the Kindness Project-Conflict Theatre will be putting on this autumn. Contact us for more details.

- Create a forum in which to discuss microaggression and racism along more nuanced lines, i.e., subconscious bias, and how to prevent oneself from committing the small acts that diminish others' lives.

- Give feedback to the Tri-Council's (including NSERC) Dimensions on what you want to see for Equity, Diversity, and Inclusion (EDI): https://www.nserc-crsng.gc.ca/NSERC-CRSNG/EDI-EDI/Dimensions_Dimensions_eng.asp

- Create a YouTube channel to share botany-related research techniques

- Have a botanist photo contest to share our favourite plants.

- Think about who is being included and excluded. Start the conversation to make sure our colleagues know we care about one another. Reduce stigma about mental health and other needs during the pandemic by talking openly about the fact that it is normal to be stressed right now and that wellbeing is important.

ii) Teaching: None of these should be worth any marks. The exercises or activities should stand on their own. Getting TAs and graduate students involved will add energy to the exercise.

- Create a photo gallery that students can post a picture of a plant or botanical art that is special to them and have them explain its significance.

- Have a discussion in which a plant that has big symbolic value is discussed. This is a wonderful way to expand from plants that everyone 'gets,' to plants that students from other cultures may wish to explain to their classmates.

- Make an exercise in which everyone writes about a botanically interesting place that they are itching to visit after life returns to normal.

- Foster student awareness of local initiatives such as the burgeoning urban food forests movement. https://www.cbc.ca/news/technology/what-on-earth-food-forests-1.5660211

- Have the instructor and/or the students raise a plant from seed and follow its growth and development from week to week. We would recommend Arabidopsis thaliana, or another quickly growing plant, as anything that will readily germinate and grow quickly could be easily attempted.

- Develop an online sustainability exercise for students to measure a change in their carbon foot print from the pre-COVID to COVID period.

- Be more considerate to students' requests for accommodations during this difficult period.

- Create and post maps to interesting things to see. This is obviously best for students who are in town so that students who are living away from town can avail themselves of these walks when they return to campus in a future year. To give you an idea, a series of maps of guided walks around UVic were first posted for the CBA meeting in 2015. These were re-posted during March when COVID turned everything upside down. They were a roaring success. People want to get out and about! Making maps like these are easier than you think. In fact, given that there is usually a bunch of geography students in any botany course, you could make this a class activity. For example: http://web.uvic.ca/~pvonader/images/Binder1.pdf

- It has been a year of protest. Ask students to post pictures of flowers and plants that are used to memorialize events. There is a wide range of options, from Banksy's flower-chucking murals, to BLM street memorials, to a host of historical protests. Flowers are a medium of kindness during these times.

In conclusion, please contact us! Thank you for reading our article. We look forward to your feedback and ideas.

Botany Recent Issues

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May 2020

An RNA-Seq transcriptome analysis revealing novel insights into fluorine absorption and transportation in the tea plant
Xin Huang, Pu Wang, Siyi Liu, Yaru Du, Dejiang Ni, Xiaowei Song, Yuqiong Chen
Botany, 2020, 98:(5), 249 - 259, 10.1139/cjb-2019-0088

Screening of lupine germplasm for resistance against Phytophthora sojae
Gayathri U. Beligala, Helen J. Michaels, Vipaporn Phuntumart
Botany, 2020, 98:(5), 261 - 272, 10.1139/cjb-2019-0163

Inhibitory effect of aqueous extracts of Centaurea solstitialis subsp. schouwii on seed germination and growth of Sulla coronaria
Chadlia Hachani, Mohammed S. Lamhamedi, Mejda Abassi, Zoubeir Béjaoui
Botany, 2020, 98:(5), 273 - 281, 10.1139/cjb-2019-0108

Application of the hydrotime model to assess seed priming effects on the germination of rapeseed (Brassica napus L.) in response to water stress
Samaneh Tatari, Farshid Ghaderi-Far, Ahad Yamchi, Asieh Siahmarguee, Ali Shayanfar, Carol C. Baskin
Botany, 2020, 98:(5), 283 - 291, 10.1139/cjb-2019-0192

June 2020

Editorial: Botany revises its scope
Christian Lacroix, Liette Vasseur
Botany, 2020, 98:(6), iii - iii, 10.1139/cjb-2020-0085

New species in the Gymnopilus junonius group (Basidiomycota: Agaricales)
R. Greg Thorn, David W. Malloch, Irja Saar, Yves Lamoureux, Eiji Nagasawa, Scott A. Redhead, Simona Margarites-cu, Jean-Marc Moncalvo
Botany, 2020, 98:(6), 293 - 315, 10.1139/cjb-2020-0006

Fatty acid ω-hydroxylases of soybean: CYP86A gene expression and aliphatic suberin deposition
Trish L.A. Tully, Pooja Kaushik, Jessica O'Connor, Mark A. Bernards
Botany, 2020, 98:(6), 317 - 326, 10.1139/cjb-2019-0198

Seed dormancy in Campanulaceae: morphological and morphophysiological dormancy in six species of Hawaiian lobelioids
Carol C. Baskin, Jerry M. Baskin, Alvin Yoshinaga, Dustin Wolkis
Botany, 2020, 98:(6), 327 - 332, 10.1139/cjb-2020-0009

Pollination of cycads in an urban environment
Lilí Martínez-Domínguez, Fernando Nicolalde-Morejón, Francisco Vergara-Silva, Dennis Wm. Stevenson
Botany, 2020, 98:(6), 333 - 339, 10.1139/cjb-2019-0154

Correction: Breeding system and inbreeding depression in the rare orchid, Platanthera praeclara, in a fragmented grassland landscape
Steven E. Travers, Kirk Anderson, Pati Vitt, Marion O. Harris
Botany, 2020, 98:(6), 341 - 341, 10.1139/cjb-2018-0186

July 2020

In vitro rooting of hybrid hazelnuts (Corylus avellana × Corylus americana) in a temporary immersion system
James Nicholson, Mukund R. Shukla, Praveen K. Saxena
Botany, 2020, 98:(7), 343 - 352, 10.1139/cjb-2019-0206

Selfing and correlated paternity in relation to pollen management in western red cedar seed orchards
Kermit Ritland, Allyson Miscampbell, Annette Van Niejenhuis, Patti Brown, John Russell
Botany, 2020, 98:(7), 353 - 359, 10.1139/cjb-2019-0123

Distinguishing Impatiens capensis from Impatiens pallida (Balsaminaceae) using leaf traits
Heather L. Whitfield, Rachel H. Toczydlowski
Botany, 2020, 98:(7), 361 - 369, 10.1139/cjb-2020-0022

Heteromorphic seed germination and seedling emergence in the legume Teramnus labialis (L.f.) Spreng (Fabacaeae)
Yanier Acosta, Lianny Pérez, Doris Escalante, Aurora Pérez, Marcos Edel Martínez-Montero, Dayamí Fontes, Lina Qadir Ahmed, Sershen, José Carlos Lorenzo
Botany, 2020, 98:(7), 371 - 379, 10.1139/cjb-2020-0008

Species composition, richness, and diversity of weed communities of winter arable land in relation to geo-environmental factors: a gradient analysis in mainland Italy
Emanuele Fanfarillo, Sandrine Petit, Fabrice Dessaint, Leonardo Rosati, Giovanna Abbate
Botany, 2020, 98:(7), 381 - 392, 10.1139/cjb-2019-0178

A sexual hybrid and autopolyploids detected in seed from crosses between Neslia paniculata and Camelina sativa (Brassicaceae)
Sara L. Martin, Michelle L. LaFlamme, Tracey James, Connie A. Sauder
Botany, 2020, 98:(7), 393 - 399, 10.1139/cjb-2019-0202

August 2020

Developmental sequence of the syncarpous gynoecium of Sarracenia purpurea (Sarraceniaceae) with flattened and broadened carpels and an umbrella-shaped style
Jinyan Guo, Chad T. Halson
Botany, 2020, 98:(8), 401 - 423, 10.1139/cjb-2020-0011

Structure and function of secretory glochids and nectar composition in two Opuntioideae (Cactaceae) species
Stefany Cristina de Melo Silva, Silvia Rodrigues Machado, Massimo Nepi, Tatiane Maria Rodrigues
Botany, 2020, 98:(8), 425 - 437, 10.1139/cjb-2020-0004

Adaptation of restoration target with climate change: the case of a coastal peatland
Mélina Guêné-Nanchen, Noémie D'Amour, Line Rochefort
Botany, 2020, 98:(8), 439 - 448, 10.1139/cjb-2020-0050

Germination of Cenchrus ciliaris, Pennisetum divisum, and Panicum turgidum is seasonally dependent
Arvind Bhatt, Willian Batista-Silva, David J. Gallacher, Marcelo F. Pompelli
Botany, 2020, 98:(8), 449 - 458, 10.1139/cjb-2019-0194

Phenotypic evidence for an extensive mosaic hybrid zone between two species of columbine, Aquilegia flavescens and A. formosa
Jeffrey S. Groh, Quentin C.B. Cronk
Botany, 2020, 98:(8), 459 - 467, 10.1139/cjb-2020-0015

Causes and consequences of deer browsing on red trillium (Trillium erectum) along an elevational gradient
Diane Auberson-Lavoie, Mark Vellend
Botany, 2020, 98:(8), 469 - 478, 10.1139/cjb-2020-0053

Find these issues and more at:
https://www.nrcresearchpress.com/journal/cjb

Canadian Science Publishing

Botany Special Issue ~ Édition spéciale de la revue *Botany*



There will be a special issue of the journal *Botany* associated with the ABC-CBA 2020 conference! All participants are welcome to submit a paper. The deadline for submission of articles is December 31st, 2020, with the intention of publishing the special issue on May 1st, 2021.

Il y a aura une édition spéciale du journal *Botany* associée à la rencontre ABC-CBA 2020! Tous les participants sont invités à soumettre un article. La date limite pour la soumission des articles est le 31 décembre 2020, la mise en ligne de l'édition spéciale est prévue pour le 1er mai 2021.

Click to submit:

https://mc06.manuscriptcentral.com/botany-pubs

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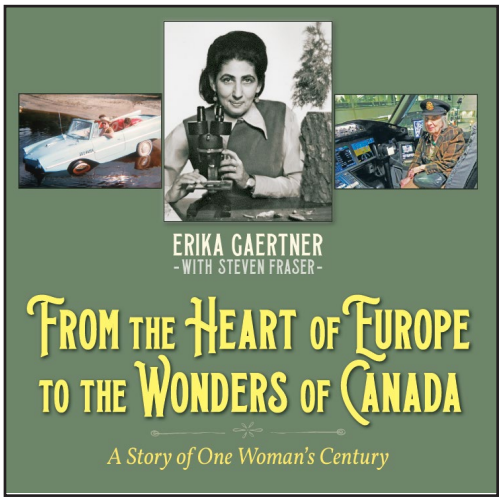
Special issue timeline/ Échéancier pour cette édition spéciale

Submissions open	Ouverture des soumissions	August/août 1, 2020
Submission deadline	Date limite des soumissions	December/décembre 31, 2020
Deadline to finish peer review*	Date limite pour l'évaluation par les pairs*	February/février 1, 2021
Deadline to export papers to CSP	Date limite pour transmettre à CSP	March/mars 1, 2021
Proposed issue date	Date proposée de publication	May/mai 1, 2021

* Note that some peer reviews under COVID-19 are taking a little longer than expected. Please be flexible.
* Notez que des délais peuvent survenir lors de l'évaluation par les pairs en raison des différentes contraintes liées à la COVID-19. Merci de votre flexibilité.

From the Heart of Europe to the Wonders of Canada

Erika Gaertner writes: "As a long-time CBA member (since the 1960s!) and economic botanist (OAC'44, Cornell PhD'49), I thought that my fellow botanists might be interested in my just-published memoir, describing my education, research, and worldwide adventures in search of plants."



From the Heart of Europe to the Wonders of Canada relates the life journey of Dr. Erika E. Gaertner from her childhood days (1920s) in what is now the Czech Republic and the Heart of Europe to her botanical pursuits of the 21st century in retirement! Along, the way, she relates stories from her education in botany at the Ontario Agricultural College (Guelph's OAC) and Cornell University, her family life in the Forests of Petawawa, and her big city botanizing experiences in Montréal and beyond.

Erika's recollections will fascinate those interested in memoirs, history, botany, and international travel. Her previous books, *Harvest without Planting* (1967) and *Reap without Sowing* (1995) documented how a walk in the woods can be more than just a pleasant outing – it can also be an adventure in dining! Produced in collaboration with her son, Steven Fraser, this is Erika's third and most ambitious book. Erika's personal recollections are complemented by more than 300 photos and maps drawn from her personal archives. Now almost 100 years young, Erika continues to be a member of the CBA; some may remember her from the July 2017 CBA banquet at the Royal Botanical Gardens in Hamilton.

About Erika: https://burnstownpublishing.com/gaertner-erika-e/
Buy the book: https://burnstownpublishing.com/product/from-the-heart-of-europe-to-the-wonders-of-canada-a-story-of-one-womans-century/

Dr. Erika Gaertner is probably one of the longest supporters of CBA, as she became a member of the association soon after its founding in 1965. Her passion as a botanist was unrelenting across nearly eight decades. She graduated from the Ontario Agricultural College at Guelph in 1944 and defended her PhD at Cornell University in 1949. Now, Erika has weaved her memories and while a full review of her memoirs will be provided in a future Bulletin issue by another member of CBA, I just wanted to highlight her pioneer contribution to the study of the parasitic plant *Cuscuta* (dodders). Done in the late '40s and early '50s, this research provided the first insights into the germination and dormancy of dodder seeds. In 1950, Erika managed to distinguish among several species of *Cuscuta* by using seed coat anatomy, and her results have been fully corroborated now, in 2020. She also studied the host range of *Cuscuta* species in the greenhouse using an experimental approach that has rarely been attempted subsequently because of the incredible amount of work involved. She discovered that certain "specialist" dodders, like *C. epilinum* (epi - on, Linum - flax, "on flax"), are restricted to that particular host only during the attachment of the seedlings. Once the "specialist" parasite seedling has attached to its specialized host, the new shoots it produces become "generalist," capable of attacking numerous other hosts. This unusual aspect of primary and secondary host range has not been reinvestigated afterwards, but it likely has important ecological and functional implications. Stay tuned for the review of her memoirs!

~Mihai Costea

Gaertner, E.E. 1949. Cuscuta pentagona vs. Cuscuta campestris. Association of Official Seed Annalists (AOSA) Newsletter 23: 14.
Gaertner, E.E. 1950. Studies of seed germination, seed identification, and host relationships in dodders, Cuscuta spp. Memoirs of Cornell Agricultural Experiment Station 294: 294: 1–56.
Gaertner, E.E. 1952. Observations on the host range of Cuscuta europaea among the Compositae. Canadian Journal of Botany 30: 682–684.
Gaertner, E.E. 1956. Dormancy in the seeds of Cuscuta europaea. Ecology 37: 389.

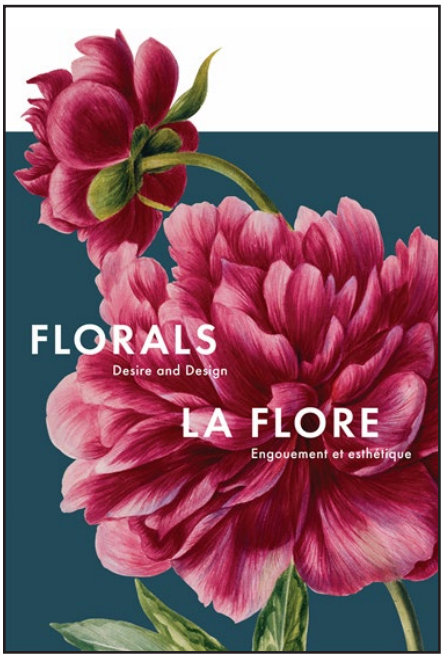
Two Special Exhibitions of Interest at the Royal Ontario Musuem, Toronto til 2021



For the first time in 50 years, the Royal Ontario Museum (ROM)'s world-renowned collection of Indian chintz will be presented to the public in a new original exhibition opening September 12, 2020. **The Cloth that Changed the World: India's Painted and Printed Cottons** celebrates the technical mastery, creativity, and far-reaching influence of India's vividly painted and printed textiles, from the origins of dyeing and weaving millennia ago, to the artisans working today. On display through to Fall 2021, this extraordinary exhibition presents 20 recognized masterworks alongside 10 new acquisitions and rare loans from prestigious international collections.

"The world would be a drab place without India," says Dr. Sarah Fee, the exhibition's lead curator and the ROM's Senior Curator, Global Fashion & Textiles. "Our blue jeans and printed T-shirts trace much of their lineage back to the ingenuity of India's cotton printers and dyers. This exhibition celebrates how India 'clothed the world' in exuberantly coloured cottons for thousands of years."

On view in the Patricia Harris Gallery of Textiles & Costume, *The Cloth that Changed the World: India's Painted and Printed Cottons* presents the splendour of Indian chintz from the 13th century to today. It also explores the consequences of global consumer desire for the textile, from its role in intensifying Europe's Industrial Revolution and the trans-Atlantic slave trade that accompanied it, to present-day environmental concerns.



The companion installation **Florals: Desire and Design**, open through September 2021 in the European Special Exhibitions Gallery, examines the connection between Europe's decorative arts and new scientific study of plants in the 18th century. Seminal botanical publications, including *Hortus Cliffortianus*, by Carolus Linnaeus (1737), and *Exotic Botany Vol. I*, by James Edward Smith and James Sowerby (1804), are on display along with textiles based on Robert Furber's *Twelve Months of Flowers* (1730), *Flora Danica* and Hans Sloane ceramics, and exquisite Indian chintzes. Both exhibitions are included with Museum admission.

The exhibition companion book *Cloth that Changed the World: The Art and Fashion of Indian Chintz* further delves into the fascinating tales behind this influential textile. This collection of essays by world-renowned experts is edited by Dr. Fee and published by ROM and Yale University Press, with the generous support of the Louise Hawley Stone Charitable Trust.



For more information, see the ROM website, https://www.rom.on.ca

Herbarium Digitisation in Canada

Anne Bruneau, Carole Sinou, and Sean Tudor,
Institut de recherche en biologie végétale, Université de Montréal and Canadian Museum of Nature

Digitisation of herbarium specimens for scientific research, conservation and education

The increase in mobilisation of digitised natural history collections online has led to a surge of studies that use data associated with specimens and which previously had been locked away in our museums and had been more difficult to access (Soltis 2017). Herbarium data in particular has been used for studying the effects of environmental change on plant species distributions (e.g., Graham et al. 2004; Lavoie 2013), flowering phenology (Willis et al. 2017) and herbivory (Meineke & Davies 2019), for example, and for examining changes in habitat over time and space (reviewed by Lang et al. 2018; James et al. 2018), as well as for conservation-related decisions (Nualart et al. 2017; Nic Lughadha et al. 2018). The specimens themselves, and the images taken from them, can be used for taxonomic and morphological analyses (Bebber et al. 2010), for studying character evolution (Borges et al. 2020), and material associated with specimens has been used for genetic and phylogenetic analyses (Hart et al. 2016). Recent developments have turned to herbarium specimens as a source of functional trait data, including near-infrared leaf measurements, which, when linked to high resolution spectral images (i.e., captured by airborne crafts), may improve the efficiency of biodiversity assessments. Although for many purposes observation data are adequate for providing a portrait of biodiversity for a region, specimens housed in natural history collections are critically important both as a scientifically verifiable source of information and because they can reveal the presence of a species not just now or in the near past, but also historically.

Recent estimates indicate more than 390 million specimens in about 3300 herbaria worldwide (Thiers 2020), of which only a fraction have been digitised and are available in public databases. In Canada, it is thought that over 9.3 million specimens are housed in 88 herbaria (including fungal collections, Thiers 2020), which include national collections (Agriculture and Agri-Food Canada & Canadian Museum of Nature), university herbaria, and collections held in provincial and regional museums, provincial ministries and various organisations (Table 1). The Global Biodiversity Information Facility (GBIF), an international initiative that aggregates and publishes occurrence data from collections (and other sources) worldwide, currently displays occurrence data for 2M herbarium specimens from Canada, of which 1.8M are housed in Canadian collections. Although a decline in field collection has been documented worldwide (Tewksbury et al. 2014), including in Canada (but see recent Arctic-focused research involving field work and massive collection by the Canadian Museum of Nature (CMN); Saarela et al. 2020), the more important bottleneck in getting data into public databases is not the lack of specimens, but the time consuming process of digitisation itself that requires additional human resources to do the work (and thus additional funding).

The history of herbarium digitisation in Canada

In the 1980s, several university herbaria across the country began digitisation of their specimens using the more efficient computer infrastructures that were being put in place. In 2001, Canada, with the lead of Guy Baillargeon and the late Larry Spears from Agriculture Canada, developed a data publication infrastructure in collaboration with GBIF. The Canadian Biodiversity Information Facility (CBIF) deployed Species Access and was one of the first national data publication portals to be developed. This led to a first wave in publication of biodiversity data from Canada. However, whereas digitisation and data publication was increasing worldwide in the late 1990s with the advent of new online tools that were well-adapted to improve the efficiency of taxonomy and help overcome the taxonomic impediment, Canada itself stagnated with little new collection data being made available online. It was only with the funding by the Canadian Foundation for Innovation of major projects, such as the Beatty Museum at the University of British Columbia, the Barcode of Life initiative at University of Guelph, and Canadensys led by the Université de Montréal, that new approaches and informatics tools were implemented and

funds directed specifically to digitisation of specimens. This resulted in more data from Canadian collections and about Canadian biodiversity becoming publically available online. Canadensys was specifically developed as an infrastructure to facilitate digitisation and publish specimen information from Canadian university collections. When it was launched in 2008, Canadensys involved 10 universities and about 30 collections. The Integrated Publication Toolkit (IPT), developed by GBIF and implemented by Canadensys, allowed collections across the country to share their data in a standardised format (Darwin Core fields) and for these data to be published in a sharable form on GBIF. Canadensys now publishes to GBIF 2.5M occurrences from 31 institutions across the country, of which nearly 1.7M are herbarium records. Since then, several other institutions across the country have set up their own IPTs, including those from Barcode of Life Database (BOLD), CMN, Royal Ontario Museum, and University of Alberta, all of which serve their data directly to GBIF (Table 1; Fig. 1). Despite having this publication infrastructure in place, the primary challenge remains that of getting the data from herbarium labels into a digital format and imaging the specimens in a cost-effective and efficient manner.

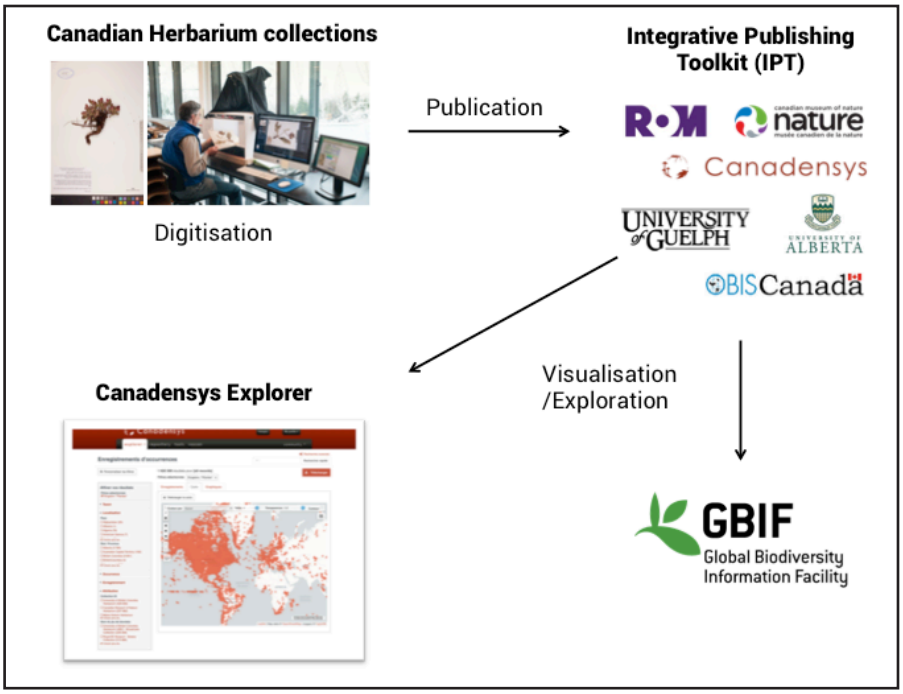


Figure 1

Approaches for facilitating digitisation of herbarium specimens

Our data suggest that, although patchy, at least 33% of herbarium specimens in Canadian collections for which data are available are now digitised (with images and/or text; Table 1). Collections differ in the amount of data that are digitised and available online (ranging from minimal specimen label data to including a high resolution image of the specimen) and differ in their approaches to digitisation. The Université de Montréal herbarium (MT), for example, uses a system developed by the New York Botanical Garden that has a fixed camera attached to a light box linked directly to a computer for imaging specimens. The herbarium relies heavily on volunteer workers to take the photos, but also to enter data in the herbarium database (Fig. 1). Using this system, MT can process approximately 200 specimens per week, translating into approximately 100,000 specimens having been digitised in the past 10 years (32,336 images). Similar approaches are in place at several herbaria in the country (Herbier Louis-Marie at Université Laval, UBC Herbarium, CMN) and in other collections outside Canada (Haston et. al., 2012). Some collections (Agriculture and Agri-food Canada (Biomod initiative); Muséum d'Histoire Naturelle, France; Naturalis, Netherlands; Digitarium, Finland; Meise Botanic Garden, Belgium) have taken a different, highly automated approach that uses a conveyor belt for direct and rapid imaging of specimens (Sweeney et al. 2018; Nieva de la Hidalga et. al. 2020), followed by data entry by citizen science participation. Such automated work flows may be the answer to future more rapid and efficient digitisation of legacy herbarium specimens, particularly if we can take full advantage of developing artificial intelligence approaches, but data quality must remain central regardless of the approach.

What's in the future for the digitisation of herbaria in Canada?

Canada is a vast country with relatively few collections. These parameters make it both a challenge and an opportunity to fully digitise the specimens in our herbaria, and potentially in other types of collections. A collaborative thrust that federates ongoing parallel initiatives from our Federal institutions with those happening in universities

across the country is feasible and could allow us to develop a national biodiversity infrastructure akin to that developed in Australia with the highly successful and innovative data-rich Atlas of Living Australia biodiversity portal. Many herbarium collections in Canada are small, lack resources and struggle to set aside the time required for the process of digitisation. To increase the rate of digitisation, we can imagine developing a portable automated imaging infrastructure that would be used for set periods of time and shared across multiple institutions in the country. Concomitantly, an effective citizen science or data entry system would need to be adopted to improve the rate of data entry in our herbaria, while at the same time ensuring data quality and links with other data types. What if Canada were to become one of the first countries in the world to have all its plant specimens fully accessible online? This challenge is within our reach.

If you are interested in pursuing these reflections on the development of a unified natural history collections and biodiversity portal for Canada, please contact us (canadensys.network@gmail.com).

References

Bebber DP, Carine MA, Wood JRI, Wortley AH, Harris DJ,Prance GT, Davidse G, Paige J, Pennington TD, Robson NKB, Scotland RW. 2010. Herbaria are a major frontier for species discovery. PNAS 51: 22169–22171. doi: 10.1073/pnas.1011841108

Borges LM, Reis VC, Izbicki R. 2020. Schrödinger's phenotypes: herbarium specimens show two-dimensional images are both good and (not so) bad sources of morphological data. doi: 10.1111/2041-210X.13450

Graham CH, Ferrier S, Huettman F, Moritz C, Peterson AT. 2004. New developments in museum-based informatics and applications in biodiversity analysis. Trends Ecology and Evolution 19 (9): 497-503.

Hart ML, Forrest LL, Nicholls JA, Kidner CA. 2016. Retrieval of hundreds of nuclear loci from herbarium specimens. Taxon 65(5): 1081-1092

Haston E, Cubey R, Pullan M, Atkins H, Harris D (2012) Developing integrated workflows for the digitisation of herbarium specimens using a modular and scalable approach. ZooKeys 209: 93-102. https://doi.org/10.3897/zookeys.209.3121

James S, Soltis P, Belbin L, Chapman A, Nelson G, Paul D, Collins M. 2018. Herbarium data: Global biodiversity and societal botanical needs for novel research. Applications in Plant Sciences 6: e01024.

Lang PLM, Willems FM, Scheepens JF, Burbano HA, Bossdorf O. 2018. Using herbaria to study global environmental change. PeerJ Preprints 6: e26886v26881.

Lavoie C. 2013. Biological collections in an ever changing world: Herbaria as tools for biogeographical and environmental studies. Perspectives in Plant Ecology, Evolution and Systematics 15 (1): 68-76.

Meineke EK, Davies TJ 2019. Museum specimens provide novel insights into changing plant–herbivore interactions. Philosophical Transactions of the Royal Society B 374 (1763): doi: 10.1098/rstb.2017.0393

Nic Lughadha E, Walker BE, Canteiro C, Chadburn H, Davis AP, Hargreaves S, Lucas EJ, Schuiteman A, Williams E, Bachman SP, et al. 2018. The use and misuse of herbarium specimens in evaluating plant extinction risks. Philosophical Transactions Royal Soc Lond B Biol Sci 374 (1763): 20170402.

Nieva de la Hidalga A, Rosin PL, Sun X, Bogaerts A, De Meeter N, De Smedt S, Strack van Schijndel M, Van Wambeke P, Groom Q (2020) Designing an Herbarium Digitisation Workflow with Built-In Image Quality Management. Biodiversity Data Journal 8: e47051. https://doi.org/10.3897/BDJ.8.e4705

Nualart N, NI, Soriano I, López-Pujol J. 2017. Assessing the relevance of herbarium collections as tools for conservation biology. Bot. Rev. 83: 303-325.

Saarela, J.M., Anderson, R. & Tudor, S. 2020. Canadian Museum of Nature Science Review 2019. Canadian Museum of Nature, Ottawa

Soltis, PS. 2017. Digitization of herbaria enables novel research. American Journal of Botany 104 (9): 1281 – 1284.

Tewksbury, J. J., Anderson, J. G. T., Bakker, J. D., Billo, T. J., Dunwiddie, P. W., Groom, M. J., Hampton, S. E., Herman, S. G., Levey, D. J., Machnicki, N. J., del Rio, C. M., Power, M. E., Rowell, K., Salomon, A. K., Stacey, L., Trombulak, S. C., & Wheeler, T. A. (2014). Natural History's Place in Science and Society. BioScience, 64(4), 300–310. https://doi.org/10.1093/biosci/biu032

Thiers, B. 2020. Index Herbariorum.In Garden NYB. New York.

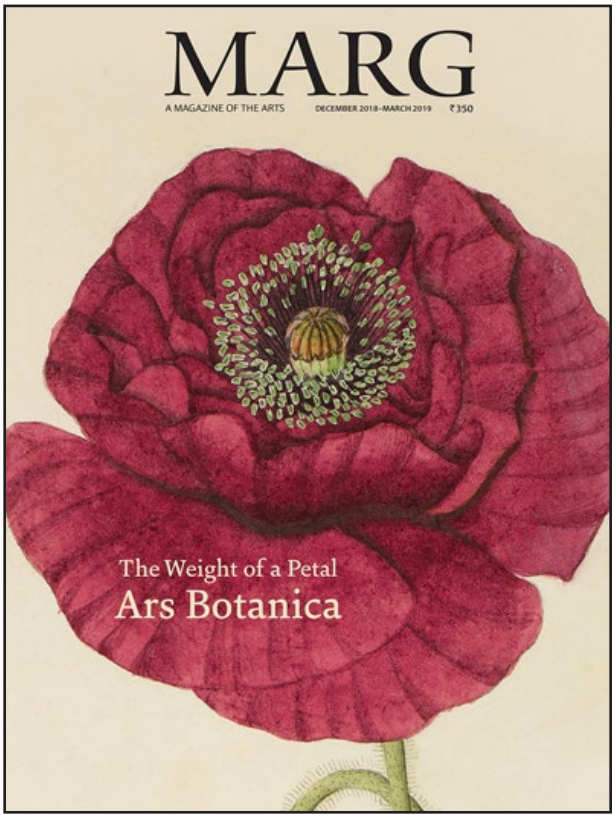
Willis C, Ellwood E, Primack R, Davis C, Pearson K, Gallinat A, Yost J, Nelson G, Mazer S, Love N, et al. 2017. Old Plants, New Tricks: Phenological Research Using Herbarium Specimens. Trends in Ecology & Evolution 32.

Book Review: The Weight of a Petal: *Ars Botanica*

"THE WEIGHT OF A PETAL: *ARS BOTANICA*,"

Edited by Sita Reddy. Special issue, MARG, 70, no. 2 (December 2018 - March 2019).

Reviewed by Deborah Metsger, Toronto, Ontario.



The Canadian Botanical Association Bulletin may seem an unlikely place to review a prestigious Indian Art Magazine, however it is equally unusual to find an Art Magazine that is entirely devoted to Botanical Art and Illustration, historical and contemporary. I stumbled upon this volume while conducting research on the floral motifs depicted on Indian painted cottons - "Indian chintz" – from the 18th century held in the Royal Ontario Museum's (ROM's) Textile and Fashion Collection. This was my contribution to the current ROM exhibitions "Florals: Desire and Design" and "The Cloth that Changed the World: India's Painted and Printed Cottons," and its companion publication, "*The Cloth that Changed the World: The Art and Fashion of Indian Chintz*" (Fee 2020). I began my research into the identity of, or inspiration for, the motifs by searching for accounts of the Indian flora in the 18th century, and floral decoration in historical Indian art and architecture. An online citation for "Architecture and Art of the Mughals" (Koch, *In* Reddy 2018) led me to this publication fifteen minutes before the library closed for the Easter long-weekend. I spent the next four days eagerly reading it from cover to cover. I could not have imagined such a rich single source, one that not only provided a synopsis of botanical art and exploration in India, but also brought new perspectives on the artistic genre, its hybrid origins, and its many players – famous and unknown – from India and around the world from the 16th century to the present day.

The Weight of a Petal: *Ars Botanica*, is a special issue of the Indian Art Magazine MARG, which regularly publishes original research on Indian art and culture. This issue is edited by Sita Reddy, an independent scholar and curator based in Hyderabad, India, who specializes in visual history and the decolonization of museum collections. For this issue, Reddy has assembled 22 contributors, including plant taxonomists, art historians, science historians, museum curators, biographers, and contemporary artists to tell the stories of India's diverse botanical art. Reddy's Introduction "Ars Botanica: refiguring the Indian botanical art archive" provides both an historical context and a summary of the papers and artworks that follow. She begins with a dictionary definition for the term that forms part of her title.

Ars/Botanica / n. Latin derived for:

1. the arts of botanical science
2. the science of botanical illustration
3. the craft or process of botanical art production
4. the documentation of all of the above, a visual genealogy of botanical art traditions at the interface between art and science.

Reddy suggests that, as an art form that services two masters, "it [botanical art] reconciles two differing views of the natural world – one that aestheticizes nature, relying on the *idea* of the plant, as motif or pattern, the other seeking to understand and document it, warts and all, relying on empirical observation in its natural habitat." Indian botanical art, with its long history of cross-cultural exchange with Europe -- she suggests

-- manifests as "the visual tension between naturalistic depiction of individual plant specimens (such as those in contemporary European botanical illustrations), and the lingering intimacy, stylization and flat depiction of composite floral "types" (drawn from Indian miniature and narrative painting genres)."

Reddy explains that Indian botanical art of the 18th and 19th centuries, anchored in Colonialism, has been conventionally treated as a subgenre of Company School paintings, Kampani Kalam – a term applied to "a variety of hybrid, Indo-European 18th- and 19th-century painting traditions that developed in India by Indian artists under the patronage of the East India Companies." Botanical art by Indian artists was usually commissioned by the Company Surgeon-Botanists who worked in botanical gardens, or in agricultural or forest reserves, as a means of documenting the plants of a region, or plants that were of economic or medicinal value. Numerous Indian artists produced the paintings but the body of work was attributed to the European botanist, e.g. William Roxburgh's "Flora of the Coromandel Coast", not to the artists who created each one. The works or Icones themselves were dispersed by the Companies to scientific institutions abroad and so the Indian botanical art archive was disjunct and incomplete, and the artists who created them remained largely unknown.

"The Weight of a Petal: *Ars Botanica*" strives to reunite and decolonize the Indian botanical art archive, addressing gaps and expanding it beyond the scope of the Kampani Kalam and the 18th and 19th century. The suite of essays achieves this by highlighting seminal works and important players from both continents in chronological order and considering works from different regions of India. Where possible, the artists, indigenous and not, are identified by name, community or heritage.

The essays are divided into three sections.

The first (untitled) – includes three essays that bring to light the cross-cultural influences on important iconographies: floral motifs in the Mughal art and architecture of the Taj Mahal as borrowed from 16th century European florilegia; the contribution of Indian artists trained in traditional Indian artforms to 19th century botany –both acknowledged individuals (e.g. Govindoo and Rungiah) and anonymous members of communities or castes (e.g. moochies and gudigars); and finally, the commission and production of European-style botanical art by the ruler of the Tanjore Court, Raja Serfojii II and his moochies, especially the celebrated "Tanjore moochy", Coopan Sithar, in the late 18th and early 19th centuries.

The second section: "Notes on Manuscripts" highlights three of the earliest accounts of the Indian Flora in the 17th Century by the three major colonial players: French (*Jardin de Lorixa*), English (*the Gunnery Herbal*) and Dutch (*Hortus Indicus Malabaricus*). These early floras were of tremendous importance to the expansion of botany world-wide. We are told that Linnaeus used Hortus Indicus Malabaricus as the source for his Asian tropical flora in the 1758 edition of Species Plantarum (Reddy *In* Reddy). The floras' species coverage also provides a testament to the globalization of plants that was taking place at the time.

The third section: "Archival Spotlight" explores ten different historical botanical archives housed in collections in India, Europe and the United States. They include not only scientific illustrations on paper, but also botanical specimens (Botanical Gallery of the Indian Museum), botanical models (Harvard's Blaschka Glass Flowers), and documentary botanical art (Marianne North's Sacred Hindu Plants at Kew Gardens). Together they highlight the diverse ways of documenting plants and creating plant portraits. They also remind us that the lasting impact of museum objects (as things of beauty) is often quite different than their original utilitarian intent.

The last two sections of this publication move from the past to the present. Sita Reddy skillfully brings the botanical art archive to life with the inclusion of eight contemporary art pieces all of which she describes as "drawing on the idea of botany." In at least three, there is a direct connection between the contemporary art and the historical works described in "Archival Spotlight" −Sunoj D. studied *Hortus Malabaricus*, Meena Subramaniam's paintings are inspired by Marianne North, and Mahaveer Swami's draw on Mughal plant portraits. Other artists link their works to native plants or to Indian artistic traditions, and to contemporary science. Together, they demonstrate the progression and continuance of artistic styles and traditions related to plants.

The final section explores three art exhibitions based on contemporary (1) and historical (2) botanical artworks.

Each one highlights the important archival function of botanical art. They also demonstrate the tremendous utility of botanical art in telling stories, often stories that are diametrically opposed: natural beauty and diversity / species loss; botanical discovery and documentation / resource appropriation; recognition of indigenous knowledge / exploitation and appropriation of indigenous knowledge.

Simryn Gill's closing photo essay "Run", on Pulau Run, one of the Banda Islands, meditates on the global movement of plants (nutmeg seeds, in this case) and peoples, ownership and identity, and the nature of plant portraits.

Indeed, these are the themes that unite this issue of MARG. The first half of the title "the weight of a petal" is drawn from an essay by Loren Eiseley "How Plants Changed the World" (1957):

"Without the gift of flowers and the infinite diversity of their fruits, man and bird, if they had continued to exist at all, would be today unrecognizable…. The weight of a petal has changed the face of the world and made it ours"

Sita Reddy ends her Introductory Essay by expanding on her use of the phrase: "we hope that the weight of a *drawn petal*, botanical *image* or *plant portrait* makes an indelible mark on the arc of Indian art history and Kampani kalam."

I would hazard to say that the research presented in this publication also makes an indelible mark on botanical history, bringing to light the many invisible hands who crafted the illustrations that are critical to the taxonomic accounts of the Indian Flora. The accounts of each body of work provide fascinating insights into the history of botanical gardens, botanical explorations, and the interactions and communications between India and Europe, which were no-doubt paralleled in colonial interactions around the world.

The Weight of a Petal: *Ars Botanica* certainly makes great strides toward its objective to decolonize Indian botanical art and to present it as an important, comprehensive body of work that extends back to the 16th and 17th centuries and continues to the present day. It is a timely publication in an era when the world is seeking to undo the injustices of colonization and to celebrate the contributions of indigenous people in the present and in the past.

This issue of MARG should also bring pause to contemporary botanists as we conduct our field studies and our work. Plant taxonomists rightly revere historical specimens and botanical art as vital vouchers. But what have we learned from the traditions of the past? Has our mindset changed? Are we focussed only on collecting to achieve our research goals and fulfill the requirements of collecting permits, or are we cognizant of the cultures, traditional knowledge and environments in which we collect? Our race is not just to discover new plants and their properties (as in earlier centuries), but to preserve plants and habitats and unravel evolutionary histories. Documentation of plants has shifted from traditional botanical art to photography. What archive will we leave behind?

I highly recommend this magazine issue to anyone who enjoys plants, botanical art, botanical history or the rich heritage of Indian art.

References

Eisley, Loren. 1957 'How Flowers Changed the World" In "The Immense Journey: An Imaginative Naturalist Explores the Mysteries of Man and Nature. New York, Random House USA

Fee, Sarah.2020. "Cloth That Changed the World, the art and fashion of Indian Chintz." Toronto, Royal Ontario Museum, CanadaToronto. 294 p.

Koch, E. 2018. "Architecture and Art of the Mughals" P. 24-33 in The Weight of a Petal:Ars Botanica . Special issue, MARG, 70, no. 2 (December 2018-March 2019).

Reddy, Sitta. 2020 "Ars Botanica: Refiguring the Botanical Art Archive."P. 14-23 In "The Weight of a Petal:Ars Botanica . Special issue, MARG, 70, no. 2 (December 2018-March 2019).

TOP CANADIAN ORNAMENTAL PLANTS. 26. Hibiscus

ERNEST SMALL[1, 2]

Ornamental plants are grown for their beauty – in most cases for the appearance of their flowers – so plants that produce long-lasting, colourful displays are favoured. A simple principle employed by horticulturists is to exhibit them, whether planted in the ground or in pots, in groups (so-called "mass planting") so as to maximize the impact of a large, continuous presentation of colour. Roses have achieved the status of "Queen of the flowers" because individual plants are capable of generating large displays of colour that attract the eye. But roses have a competitor – hibiscus – which significantly is sometimes termed "Chinese rose" and "Queen of tropical flowers." Hibiscus ornamentals include cultivars that bloom copiously for months, with eye-popping flowers of all colours as large as 30 cm across. Visitors to tropical countries are invariably impressed with the stunning giant hibiscus shrubs and trees, which are unable to survive Canadian winters. However, for the past century, breeders have been creating gorgeous "hardy hibiscus" cultivars, which are well suited to Canada.



Figure 1: Little girls and big hibiscus flowers. Left: *Hibiscus moscheutos*. © SB Johnny (CC BY SA 3.0). Centre: *Hibiscus rosa-sinensis.* © Christina Mossaad (CC BY SA 2.0). Right: Hibiscus 'Bordeau'. © Famille Wielosz-Caron (CC BY SA 2.0).



Figure 2: Hibiscus flower worn on the right indicates availability for marriage, on the left indicates attached status. Left: From DLPNG public domain image database. Right: "Tahitian women on the beach" wearing hibiscus flowers, by Paul Gaugin (1848–1903). Public domain image.

Names

Scientific name: The genus *Hibiscus* is said to be based on the Greek *hibiscus* or *ibiscum*, an allusion to associating with storks (ibis) in marshes. Alternatively, the Greek word is claimed to simply designate marsh-dwelling plants of the genus.
English name: Hibiscus.
French name: Hibiscus.

Symbolism

Hibiscus rosa-sinensis is the national flower of Malaysia, the Solomon Islands and Niue, and the national symbol of Haiti. The state flower of Hawaii is *H. brackenridgei*, which is native there. *Hibiscus syriacus* is the national flower of South Korea. In Tahiti and Hawaii, hibiscus flowers are worn by women as an indication of their marriage eligibility. Wearing the flower behind the right ear signals availability, behind the left ear indicates the woman is not available.

Wild Hibiscus species

There are perhaps as many as 400 species of *Hibiscus,* including annual or perennial herbs, vines, subshrubs, shrubs, and trees. Molecular study of the genetic relationships of which species should be placed in *Hibiscus* has led to debates about the wisdom of including traditionally separated but phylogenetically related small genera. *Hibiscus* is indigenous to all continents except Antarctica, and also occurs on islands of the Indian and Pacific Oceans. The plants are found mostly

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

in warm-temperate, subtropical, and tropical regions. Three species (*H. laevis, H. moscheutos*, and *H. trionum*) are indigenous to Canada. Hibiscus flowers are characterized by a very prominent staminal column which surrounds the pistil. The flowers are very attractive to pollinators, including hummingbirds and butterflies. *Hibiscus* flowers generally last only 1 day (often senescing by dusk), occasionally up to 3 days, but the plants compensate by flowering profusely and continuously producing new blooms.



Figure 3: Staminal column of Hibiscus. Left: © Dinuraj K (CC BY 2.0). Right: Distal end showing five stigma lobes. © Mondberg25 (CC BY SA 3.0).

Several other cultivated species in the Malvaceae family are similar in appearance to hibiscus. These include hollyhocks (*Alcea*), mallows (*Malva* and *Kosteletzkya*) and okra (*Abelmoschus esculentus*).

Domesticated Hibiscus species

As with other major ornamental plants, most cultivars grown today are hybrids, often with parentage tracing to several wild species. Malinowski et al. (2019) provide an extensive account of the probable ancestors of modern cultivars.

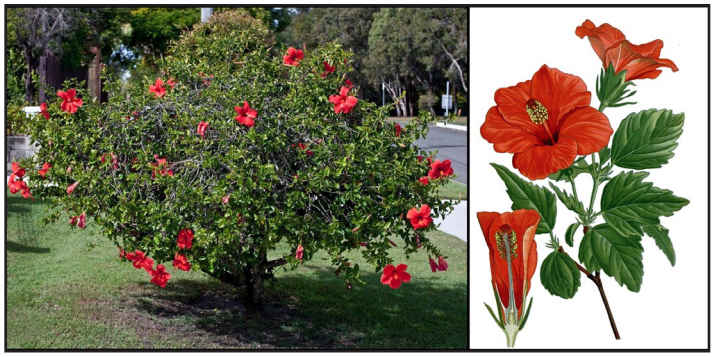


Figure 4: *Hibiscus rosa-sinensis*. Left: Shrub. © John (CC BY SA 2.0). Right: Painting (public domain) from Favourite flowers of garden and greenhouse, 1896/1897, Frederick Warne, London.



Figure 5: Examples of colourful flowers of *Hibiscus rosa-sinensis*. a: © Xemoth1 (CC BY SA 2.0). b & c: © John (CC BY SA 2.0). d: © Franz Winter (CC BY SA 3.0).

Hibiscus rosa-sinensis (tropical hibiscus, Chinese hibiscus) is a shrubs or tree, 1–3(–5) m in height. It appears to be a cultigen – i.e. it seems to have originated in cultivation, and does not have a natural indigenous range. The plant has been extensively cultivated and hybridized for centuries, Its ancestors may trace to China, Africa, and/or the New World tropics, and different cultivars likely arose as hybrids from different parents. Most plants are sterile, and do not set seed, so they are propagated by cuttings. Nevertheless, in the Tropics and subtropics where it is principally cultivated, the plant has become somewhat naturalized. There are thousands of cultivars, a very wide range of flower sizes, and huge variation of colours and colour combinations. Modern cultivars are mainly hybrids of about eight tropical species, ranging from Hawaii (perhaps the most important centre of selection), Madagascar, Mauritius, China, and Fiji. These probably include the African *H. schizopetalus* and the Hawaiian species *H. arnottianus, H. kokio,* and *H. waimeae*. Australia has also become an important breeding centre. *Hibiscus rosa-sinensis*, the most important ornamental species in the genus, is distantly related to *H. syriacus*, the second most important species, and breeders have been unable to cross them. *Hibiscus rosa-sinensis* is grown as a perennial shrub or tree in warmer areas than found in most of Canada, often as a hedge plant. It is extremely popular outdoors in tropical and subtropical areas. In hot climates, the foliage is evergreen. The plant freezes and dies at about -3°C, so it is unsuitable as an outdoor garden perennial in most of Canada. However, it makes an excellent potted specimen that can be moved to the patio or deck in the summer, and sheltered indoors in the winter.



Figure 6: *Hibiscus rosa-sinensis* hedges in Hawaii. © Forest and Kim Starr (left: CC BY 2.0, right: CC BY 3.0).



Figure 7: Rose of Sharon (*Hibiscus syriacus*). Left: Shrub. Photo (public domain) by I. Sáček. Right: Chromolithograph (1868; public domain) of old cultivars by A.J. Wendel ((1826–1915).

Hibiscus syriacus (common hibiscus, garden hibiscus, rose of Sharon, shrub althaea, shrub althea) is the most widely grown ornamental hibiscus in temperate regions. The species is not the biblical "rose of Sharon," which has been interpreted as a species of lily, tulip, or any of several other species. Nor is it *Hypericum calycinum*, another ornamental plant which is also well known as rose of Sharon. *Hibiscus syriacus* is a native of China and India, but is not indigenous to Syria, despite its name. It is naturalized in many areas of the world (reports from southern Canada require verification). This winter-hardy deciduous shrub is 1–4 m in height, and is sometimes trained to look like a small tree. The flowers are typically pink (cultivars with many other colours are available) and usually last for just one day, but the plant blooms profusely from mid-summer and into fall. Some cultivars produce semi-doubled or doubled flowers.



Figure 8: Rose mallow (*Hibiscus moscheutos*). Left: Painting (public domain) by Mary Vaux Walcott (1860–1940), Smithsonian American Art Museum. Right: A modern cultivar. © André Alliot (CC BY SA 3.0).

So-called "hardy hibiscus" species are cold-tolerant, but not necessarily able to survive in most of Canada. These include *H. syriacus* discussed above, and some members of *Hibiscus* section *Muenchhusia*, a small North American indigenous group of five or six herbaceous perennial plants which die back to the ground in which they overwinter. These are known as "rose mallows" (rosemallows). They include *H. coccineus* (scarlet rose mallow), *H. dasycalyx* (Neches River rose mallow), *H. grandiflorus* (swamp rose mallow), *H. lasiocarpos* (hairy or wooly rose mallow, often considered part of *H. moscheutos*), *H. laevis* (halberd-leaf rose mallow), and *H. moscheutos* (common rose-mallow, crimson-eyed rosemallow). Only the latter two are cold-hardy enough to survive in most of Canada. *Hibiscus moscheutos* is the most important of these. It is a native to Canada, and has become naturalized elsewhere, including Eurasia. Offerings labelled *H. moscheutos* in nurseries are likely to be hybrids with related species. The species grows as tall as 2.5 m. The dwarf cultivar 'Luna Red' has become popular in recent years. It grows to about 1 m in height, has huge flowers, and is easy to cultivate.

Plants purchased from nurseries in Canada may not be identified to species, but are most likely one of the three species described above. The leaves of *H. rosa-sinensis* are glossy and deep green, while the foliage of the hardy species is a dull medium green.



Figure 9: *Hibiscus acetosella* 'Mahogany Splendor', grown as an annual near Detroit. © F. D. Richards (CC BY SA 2.0).

Red-leaf hibiscus (*H. acetosella*) is a tropical shrub, often grown as an annual in temperate regions. Popular cultivars develop maple-like leaves that are burgundy red.

In warmer areas than Canada, a wide variety of Hibiscus are cultivated, including some that grow into extremely attractive large shrubs and small trees. Most economically significant species of *Hibiscus* are grown as ornamentals, but *H. cannabinus* is a significant stem fibre crop and *H. sabdariffa* is a source of fleshy calyces employed to flavour beverages. Both of the latter species are adapted to warmer climates than found in Canada, but are occasionally grown experimentally or as curiosities. These species as well as those grown for

ornamentals have been extensively employed in herbal medicine to treat a variety of illnesses, and are currently being researched for possible modern medicinal applications.



Figure 10: *Hibiscus schizopetalus* in a city square, Ecuador. © David J. Stang (CC BY SA 4.0).

Care of plants

Detailed information is available in the section "Key websites," below.

PROPAGATION

The herbaceous perennials such as *H. moscheutos*, are propagated by seeds or division. *Hibiscus rosa-sinensis* often does not produce seeds, and in any event named cultivars of the shrubby perennial species grown in Canada are usually hybrids which will not grow true from seeds, so they are reproduced vegetatively (by cuttings, grafting, or layering; marcottage or marcotting is air layering, i.e. the rooting medium is bound to the plant rather than enclosed in a pot).

PURCHASING

Hibiscus rosa-sinensis will normally be acquired in Canada as a potted plant, and is best maintained in containers, allowing it to be overwintered indoors. The hardy hibiscus species can also be acquired in pots, or in some cases grown from seed started indoors. Larger nurseries and specialty mail-order businesses are preferable to big box chain stores.

SOIL & MOISTURE CONDITIONS

The hardy hibiscus species are suited for outdoor cultivation in garden soil. *Hibiscus moscheutos* and many of its herbaceous hardy perennial relatives are native to swamps, so they need ample moisture. *Hibiscus rosa-sinensis*, which in Canada is best grown in containers, requires regular watering and good drainage. *Hibiscus* plants prefer soil that has appreciable organic matter. Ideal pH for the soil is 6.0 to 7.0. Moderate fertilization is recommended, with a slow-release balanced fertilizer, or one formulated for hibiscus plants.

LOCATION

Hibiscus species prefer sunny sites but tolerate light shade. Tall cultivars should be situated where they are not exposed to strong winds to avoid breaking of the long stems.

TEMPERATURE

The hardy hibiscus cultivars differ in overwintering cold tolerance. New cultivars are being generated, and local advice from horticulturalists is advantageous. *Hibiscus syriacus* and many cultivars of *H. moscheutos* will usually survive as far north as U.S. Department of Agriculture climate zone 5, but some can tolerate U.S.D.A. zone 4. (Examples of progressively winter-warm U.S.D.A. ratings: 3: Saskatoon; 4: Calgary, Edmonton, Winnipeg; 5: Ottawa; 6: Halifax, St. John's; 7: Toronto; 8: Vancouver.) Mulching the base of the shrubs in late fall will promote survival. *Hibiscus rosa-sinensis* does not tolerate frost, and in Canada the plant is usually grown as an annual or sheltered inside overwinter.

TIPS

To encourage blooming, spent flowers should be removed.



Figure 11: Indoor cultivation of *Hibiscus rosa-sinensis*. Public domain figures (left from Pipsels, right from Maxpixel).

Curiosities of science and technology

- The expression "Rose of Sharon" traces to the translation of a Hebrew passage in the Old Testament (Song of Solomon 2:1) by the editors of the King James version of the Bible (published in 1611). "Sharon" refers to a fertile valley plain in northern Palestine, but what the "Rose" was is doubtful. Although botanists today primarily employ the phrase for both *Hibiscus syriacus* and *Hypericum calycinum* (sometimes also for other species), biblical scholars strongly disagree on what material this originally designated (it apparently was a metaphor for the beauty of one of King Solomon's lovers/brides). The English phrase "Rose of Sharon" has been a popular designation for characters in literature, notably for a young woman in John Steinbeck's novel *Grapes of Wrath*, where after her baby was stillborn, she provided her milk to a starving stranger. "Rose of Sharon" has also become a favoured name for foundations, businesses, movements, and buildings.

- The red flowers of some forms of *H. rosa-sinensis* are so dark they appear to be black. Preparations of such flowers have been employed as shoe blacking in Asia, and this gave rise to the alternative names "shoe plant" and "shoe black plant."

- Of all of the world's navies, the British have named ships after plants more than any other nation. Two British Royal Navy vessels were named HMS *Hibiscus*: HMS *Hibiscus* (1917), a sloop used until 1923, and HMS *Hibiscus* (K24), a corvette launched in 1940 and retired in 1946. Several non-naval British ships have also been named "Rose of Sharon."

Key publications

Akpan, G.A. 2007. Hibiscus: *Hibiscus rosa-sinensis*. In: Flower breeding and genetics: Issues, challenges and opportunities for the 21st century, edited by N.O. Anderson. Springer, Dordrecht. pp. 479–490.

Allen, G., and Ford, B. 2004. COSEWIC assessment and update status report on the swamp rose-mallow (*Hibiscus moscheutos*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. https://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=1FA6E443-1&printfullpage=true&pedisable=true

Al-Snafi, A.E. 2018. Chemical constituents, pharmacological effects and therapeutic importance of *Hibiscus rosa-sinensis* – A review. IOSR Journal of Pharmacy 8: 101–119.

Bates, D.M. 1965. Notes on the cultivated Malvaceae, 1. *Hibiscus*. Baileya 13: 56–130.

Blanchard, O.J., Jr. 2015. *Hibiscus.* In: Flora of North America, vol. 6, edited by Flora of North American Editorial Committee. Oxford University Press, New York. pp. 252–267.

Kuligowska, K., Lutken, H., Christensen, B., and Muller R. 2016. Interspecific hybridization among cultivars of hardy *Hibiscus* species section Muenchhusia. Breed. Sci. 66: 300–308.

Kuligowska, K., Simonsen, M., Lutken, H., and Muller, R. 2013. Breeding of *Hibiscus rosa-sinensis* for garden use in Denmark. Acta Hortic. 990: 235–242.

Hinsley S.R. 2009. *Hibiscus* section *Muenchhusia*. http://www.malvaceae.info/Genera/Hibiscus/Muenchhusia.php

Khan, I.M., Rahman, R., Mushtaq, A., and Rezgui, M. 2017. *Hibiscus rosa-sinensis* L. (Malvaceae): Distribution, chemistry and uses. Internat. J. Chem. Biochem. Sci. 12: 147–151.

Lawton, B.P. 2004. *Hibiscus*: Hardy and tropical plants for the garden. Timber Press, Portland, OR. 184 pp.

Lim T.K. 2014. *Hibiscus rosa-sinensis*. In: Edible medicinal and non-medicinal plants, by T.K. Lim. Springer, Dordrecht. pp. 306–323.

Lim T.K. 2014. *Hibiscus syriacus.* In: Edible medicinal and non-medicinal plants, by T.K. Lim. Springer, Dordrecht. pp. 374–380.

Malinowski, D.P., Pinchak, W.E., Yanker-Hansen, K. 2019. Phenotypic similarities in flower characteristics between novel winter-hardy hibiscus hybrids and their tropical relatives. Front. Plant Sci. 10, 1528. https://doi.org/10.3389/fpls.2019.01528

Merritt, P.B. 2003. The tropical hibiscus handbook. American Hibiscus Society, Cocoa Beach, FL. 120 pp.

Pfeil, B.E., Brubaker, C.L., Craven, L.A., and Crisp, M.D. 2002. Phylogeny of *Hibiscus* and the tribe Hibisceae (Malvaceae) using chloroplast DNA sequences of ndhF and the rpl16 intron. Syst. Bot. 27: 333–350.

Small, R.L. 2004. Phylogeny of *Hibiscus* sect. *Muenchhusia* (Mal-

vaceae) based on chloroplast rpL16 and ndhF, and nuclear ITS and GBSSI sequences. Syst. Bot. 29: 385–392.

Sparnaaij, L.D. The introduction of new hibiscus cultivars. Acta Hortic. 31: 133–136.

Walker, J. 2001. *Hibiscus*. Firefly Books, Richmond Hill, ON. 96 pp.

Winters, H.F. 1970. Our hardy *Hibiscus* species as ornamentals. Econ. Bot. 24: 155–164.

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Key websites

American Hibiscus Society – http://www.americanhibiscus.org/ (limited online information, some interesting links, note the presentation "Growing tropical hibiscus up north").

Canadian Hibiscus Society – https://groups.yahoo.com/neo/groups/CanHibiscus/info (a small discussion group).

Gilman, E.F., and Watson, D.G. 2014. *Hibiscus syriacus:* Rose-of-Sharon. University of Florida Extension Bulletin ENH454. 3 pp. (a brief guide).

Hibiscusmania – http://www.hibiscusmania.com/ ("le premier groupe francophone consacré à cette plante magnifique").

How to grown hibiscus indoors – https://indoorgardenook.com/hibiscus-from-a-to-z/ (a good guide).

How to grow hibiscus outdoors – https://www.wikihow.com/Grow-Hibiscus-Outdoors (another good guide).

How to propagate hibiscus – https://www.wikihow.com/Propagate-Hibiscus (an illustrated guide).

How to winterize a perennial hibiscus – https://www.wikihow.com/Winterize-a-Perennial-Hibiscus (another illustrated guide).

Rhode, T. 2020 How to grow and care for hardy hibiscus. – https://gardenerspath.com/plants/flowers/grow-hardy-hibiscus/ (a basic guide to gardening with hibiscus in Canada).

International Hibiscus Society – http://internationalhibiscussociety.org/new/index.php/library/hibiscus-sources (mostly deals with *H. rosa-sinensis* and with cultivation in hot regions).

The World of Hibiscus – https://www.hibiscusworld.com/Mail-Lists.html (general information & links).

Nakasone, H.Y., and Rauch, F.D. 1980. Ornamental hibiscus propagation and culture. Hawaii Agricultural Experiment Station Research Bulletin 175. – https://scholarspace.manoa.hawaii.edu/bitstream/10125/15090/RB-175.pdf (deals with *H. rosa-sinensis*).