

President's Preamble

Sitting down to write this message while thinking of how much the world has changed since the last one of these went out is a bit daunting. We're living in a pandemic, our work and social lives are completely rearranged, field work and travel is a distant memory, and our entire industry looks different. Some of us have lost loved ones, some have lost livelihoods, some are struggling with illness, caregiving responsibilities, being separated from friends and family, or financial insecurity. I want to extend my most sincere sympathy and support for anyone in our GAC® community who has struggled with hardship and loss this year.

It seems frivolous to write about all the things we miss from "before"... Things like field work, travel, conferences, classes, parties? So I will not write much about that. But I think it is important to acknowledge that we are all missing a great deal of what we would consider our "normal" lives in so many ways. But, geologists know that sometimes you just have to deal with what you have in front of you. As with those days in the field where your Brunton breaks, you fall into a bog, the bears eat the camp food, and the helicopter can't pick you up so you are stuck on a cold mountain overnight, we really just have to make the best of what we have. So, here's a short tour of what the Geological Association of Canada has been up to in this memorable year!

GAC® has had a very busy year. GAC® members and volunteers contributed greatly to the rescheduled GeoConvention 2020 meeting held in September. The originally scheduled meeting in May was postponed to September and turned into a fully virtual meeting. Our congratulations and thanks to the GeoConventions team (including our GAC® and MAC volunteers) who managed this gargantuan task



with great success. We even managed to have our traditional Jerome K. Remick III poster competition and we had a record number of student posters in the competition. Congratulations to all the winners, and thank you to the large collection of judges who made it possible!

In a similar vein our Local Organizing Committee for the London 2021 GAC-MAC at Western University is working incredibly hard to bring to life a hybrid meeting with a virtual component as well as an in-person one. They are eagerly awaiting abstracts so I encourage everyone to get those submitted! This LOC is undoubtedly dealing the most difficult circumstances GAC-MAC in our history and I want to thank them for the incredible work they are doing amidst extreme uncertainty. As we've learned many times this year, we can plan and plan well, and we may still have to deal with rapid and unexpected changes. We know very well that having options outside of our traditional in-person work is not a replacement for our in-person meetings and activities, but an addition to it. If the virtual part of a conference can broaden participation that is a positive; if we can open up our science to people who may not be able to travel we still gain from having more people involved; if we can attend seminars anywhere in the world that is something we should celebrate.

Cont'd on p. 4

GEOLOGICAL ASSOCIATION OF CANADA

The MISSION of the Geological Association of Canada is to facilitate the scientific well-being and professional development of its members, the learned discussion of geoscience in Canada, and the advancement, dissemination and wise use of geoscience in public, professional and academic life. The VISION of the GAC® is to be a multidisciplinary scientific society supportive of the entire scope of the geosciences in Canada. The GAC® aims to be a geoscience community that is knowledgeable, professionally competent and respected, whose input and advice is relevant, widely sought and utilized, and whose vital contribution to the economic prosperity and social well-being of the nation is widely acknowledged.

La MISSION de l'Association géologique du Canada est d'aider au développement scientifique et professionnel de ses membres, de favoriser les échanges géoscientifiques au Canada ainsi que de promouvoir et de diffuser l'utilisation éclairée des géosciences dans un contexte public, professionnel et académique. La VISION de l'AGC® est de faire connaître une communauté géoscientifique de grand savoir, dont les compétences professionnelles sont respectées, dont les suggestions et les avis sont pertinents, recherchés et utiles, et dont la contribution largement reconnue est considérée comme vitale pour la prospérité économique et le bien-être de la nation.

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Olav Slaymaker Awards

Geophysics Division—

Geophysics Division Student Award

Canadian Sedimentology Research Group—

Middleton Medal

Marine Geosciences Division—

Michael J. Keen Medal

Mineral Deposits Division—

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Howard Street Robinson Medal

Canadian Tectonics Group—

Jack Henderson Prize for Best Thesis, Ph.D. and M.Sc.

Dave Elliott Best Paper Prize

Volcanology and Igneous Petrology Division—

Career Achievement Award

Léopold Gélinas Medal, Ph.D., M.Sc. and B.Sc.

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GEOLOG (ISSN 0227-3713; 1712-3747) is the quarterly news-magazine of the Geological Association of Canada, St. John's, Newfoundland and Labrador. *GEOLOG* is published for the benefit of GAC® members and its content reflects the diversity of the organization. News items and short articles on topics of potential interest to the membership including public geoscience awareness are encouraged. Also encouraged are communications promoting interaction among academic, industry and government sectors. *GEOLOG* accepts and publishes contributions in both of Canada's official languages. Opinions expressed herein are those of the writers and do not necessarily represent the official positions of the GAC®. *GEOLOG* is one of several forums provided by the GAC® for scientists worldwide.

SUBSCRIPTIONS: *GEOLOG* is one of the privileges of GAC® membership. To become a member, application forms are available by mail or fax from the Geological Association of Canada, or can be printed from the website.

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GEOLOG (ISSN 0227-3713; 1712-3747) est le bulletin trimestriel de l'Association Géologique du Canada, à St. Jean, Terre-Neuve-et-Labrador. *GEOLOG* s'adresse aux membres de l'AGC® et son contenu reflète le caractère polyvalent de cette organisation. Nous invitons la soumission de nouvelles et articles courts pouvant intéresser les membres, incluant les thèmes de sensibilisation du public aux sciences de la Terre. Les articles suscitant des échanges d'opinions et d'informations entre les secteurs académique, industriel et gouvernementaux sont également la bienvenue. *GEOLOG* accepte et publie les articles dans les deux langues officielles du Canada. Les idées sont celles des auteurs et ne représentent pas nécessairement la position officielle de l'AGC®. *GEOLOG* n'est qu'un des nombreux forums offerts par l'AGC® aux scientifiques à travers le monde.

ABONNEMENT: L'abonnement à *GEOLOG* est un des privilèges dont bénéficient les membres de l'AGC®. On peut se procurer un formulaire d'adhésion par courrier ou par fax en communiquant avec l'Association Géologique du Canada.

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Contributions for next issue

Please send items for the next issue of *GEOLOG* by e-mail to Alwynne.Beaudoin@gov.ab.ca by **March 1 2021**.



Not your usual fieldtrip?
 Students visit Botswana, though probably not this specific spot, on a virtual fieldtrip, see p. 15
 Hippo in Chobe National Park, Botswana
 Public domain. https://en.wikipedia.org/wiki/Wildlife_of_Botswana#/media/File:Chobe_National_Park_Riverfront_Portrait.jpg

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A major highlight of this year has been the multitude of online speaker series organized by our community. This started with the Atlantic Geoscience Society and now the AGS is doing a regular series with GAC's Newfoundland Section. The Canadian Tectonics Group and the Volcanology and Igneous Petrology Division are both hosting regular speakers. These seminars and a plethora of others both local and international have been a wonderful lifeline for our community, and I want to thank all the organizers for making those happen. That's one thing I hope continues after the pandemic is over.

We've developed and introduced a new and much improved Code of Ethics for members, and combined that with a Code of Conduct for conferences and other events. Both of these codes are supported by a newly developed Statement of Principle on the topic of equity, diversity, and inclusion for us as an association. These policies will guide our implementation of new initiatives over the next few years that will be aimed at making GAC® the diverse and vibrant association we want to be, an association that reflects the diversity of Canadian society, an association that is welcoming to all geoscientists.

Our new relationship with the Pathfinder Group has been a great success. They have modernized our accounting practices and payment methods, and financial transactions are now mostly electronic. Another success has been GAC®'s assistance with access to publications. In March GAC® Council voted to make all of our electronically available publications Open Access for the year to help specifically with the need for quality online material for university classes after the switch to emergency virtual learning. Since then university faculty and students everywhere have all worked extremely hard to switch their courses to mainly virtual delivery with some places adding many hybrid options as well.

GAC® is in many ways my geological home. I gave my very first student presentations at GAC-MAC meetings, every single interesting project I've even been involved at started from talking to people at GAC-MAC meetings, I've made life-long friends and visited unforgettable places on field trips... It has been an honour to lead this association and do something to contribute towards its work. This organization cannot function without the small group of extremely dedicated volunteers, or without the support of our

wonderful staff members at HQ, Eleanor and Karen. Thank you to everyone who is involved in our sections and divisions, our conferences, our publications, and our council. It has been a pleasure working with everyone this year, and I am extremely grateful to have such a great group of people involved in our organization.

It has been said that "we're all in this together" or "we're all in the same boat"... That's partly true, we're all in the same storm for sure. But we are most certainly not all "in the same boat"... Some of us are on ocean-going yachts with staff and supplies and great wifi... Some of us are in old lobster boats, sturdy, great for bad weather, but not particularly comfortable and definitely without the fancy extras... Some of us are just floating in the beaten-up rowboats. So what do we do with that? Look around your community and go check for people in rowboats. Find the ones who are struggling, find the ones who do not have the resources you have. Give someone a tow to the harbour, pass over some supplies, if you have an extra motor hook them up, if they are just holding on reach out a helping hand. Being grateful for what we have and using that to help someone in need is not just the right thing to do, it is the only thing to do. Perhaps we can come out of this pandemic a little kinder, a little less judgemental, and a little more aware of the difficulties that people around us face every day.

My New Year's wish is for us to use the last few days of 2020 to reflect on what we're grateful for, and think of ways we can improve our own small corners of the world in the coming year.

Best wishes for a healthy and happy 2021!

Deanne van Rooyen
GAC® President
Sydney, Nova Scotia



https://commons.wikimedia.org/wiki/File:Fishing_Dory.jpg
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GAC[®] Codes and EID Statements

Geological Association of Canada Code of Ethics

Preamble

The Geological Association of Canada (GAC[®]) is a member-led, national multi-disciplinary geoscience organization in Canada with representatives in all Canadian Territories and Provinces as well as the United States, Europe, and other parts of the world. The GAC[®] is dedicated to excellence, inclusivity, openness, and integrity in geoscience research, as well as the promotion and development of the geological sciences in Canada through publications, awards, conferences, meetings and exhibitions.

Representing a diverse scientific community, the GAC[®] provides a means to share, publish, promote and collaborate on the latest geoscience research within Canada. The GAC[®] annual general meeting is a major forum for sharing geoscience knowledge and building collaboration opportunities and community for geoscientists.

This document outlines the Code of Ethics (the Code) adopted by the GAC[®]. The aim of this Code is to promote ethical integrity and an inclusive, constructive, and positive approach to geoscience within the scope of GAC[®] activities. Scientific integrity and ethics are fundamental to the geosciences and depend upon the respectful and equitable treatment of all those engaged in the scientific community. The principles, standards and guidelines in this document are intended to guide GAC[®] members and participants on expectations for professional behaviour. The Code also outlines the process for reporting and addressing violations. The word “member” as used throughout this Code includes all classes of membership. This code supplements and works in concert with other professional codes of ethics members may be subject to, such as those associated with Professional Geoscientist (P.GeO) registration or public service, or requirements in other workplaces like academic or government institutions.

All members must comply with this Code as a condition of GAC[®] membership. This document stands as an umbrella Code of Ethics for GAC[®] activities, and is supported by our general statement on Equity, Diversity and Inclusion, and our Events Code of Conduct.

Code of conduct – general principles

The GAC[®] is committed to providing an ethically sound, equitable, safe, open, and respectful environment for scientific activities. The GAC[®] encourages all geoscientists to pursue integrity, honesty, respect, responsibility, rigour and equity in their professions.

Specifically:

- Each member shall be guided by the highest standards of ethics, personal honour, scientific integrity, and professional conduct, and prioritize honesty, integrity, fairness, and impartiality;
- The GAC[®] values diversity, equality, and inclusion within its membership. Discrimination, harassment, bullying, coercion, intimidation, and exclusion are considered unethical behaviours.
- Members shall exemplify high standards in science, teaching, management, and interactions with others, particularly when in a position of power or privilege. In particular, members shall treat students and subordinates respectfully, without exploitation, and provide a safe, supportive environment to encourage learning and professional development.
- Members shall endeavour to cooperate with others in science and will encourage the ethical dissemination of geological knowledge.
- Members are expected to conduct their research and draw their conclusions based on critical analysis of the evidence. Findings and interpretations are expected to be reported fully, accurately and objectively, along with the related uncertainties.
- Members shall give credit for work done by others to whom the credit is due, refrain from plagiarism in oral and written communications, and not knowingly accept credit rightfully due to another.

- Members shall communicate with each other, with professional colleagues, and with individuals from other workplaces and cultures in a respectful and collegial manner, avoiding disparaging remarks, stereotyping, negative language, and ad hominem attacks. Standards of respectful communication apply in any forum or medium, including print, online and social media, conference presentations, and media interviews.
- Members shall proactively disclose any real or perceived conflict of interest in situations related to any discharge of professional or volunteer obligations.

Policy and procedure for handling potential ethical violations

GAC® members who experience or witness any form of unacceptable behaviour or have any questions about what is unacceptable behaviour are encouraged to contact the GAC® Vice President who is the official Safety Officer for the association. The GAC® annual general meeting, and GAC® field trips and similar events shall have a designated Safety Officer to whom ethical violations can be reported in person, by email or by telephone. Complaints submitted to the GAC® Safety Officer or event-specific Safety Officer will be handled confidentially to the extent possible and will be investigated and resolved promptly according to the process detailed below.

Reports of unacceptable behaviour will be presented by the Vice President and reviewed by the GAC® Executive. The Executive will review all submitted evidence and if warranted will ask for additional statements from the parties involved. The Executive may bring in external assistance, or form ad-hoc committees to address any reports where potential conflict of interest is involved. The Executive or ad-hoc committee will make decisions based on submitted evidence. If the Executive feels that legal help is needed they may consult a lawyer before making a decision.

If the Executive or committee determines that sanctions are warranted based on the Code of Ethics they will notify all parties of the result and enact any sanctions (e.g. revocation of GAC® membership, ban on future conference attendance). It should be clearly understood that anything that could be a criminal issue will be referred to legal authorities immediately. Reports of ethical violations in the course of someone's

employment will be referred to their employer or other professional regulatory organization.

The GAC® Code of Ethics strictly prohibits retaliation against anyone for reporting or inquiring in good faith about what that person believes to be unacceptable behaviour or for participating in any related investigation. GAC® will not tolerate retaliatory behaviour from its members, especially from those in senior positions.

Adapted from:
GSA Code of Ethics and Professional Conduct
EGU Code of Conduct

Geological Association of Canada Code of Conduct for GAC® meetings and events

The Geological Association of Canada (GAC®) aims to provide all participants of GAC®-related events with a positive, safe, and harassment-free environment in which diverse participants may learn, discuss, and network in an atmosphere of mutual respect, regardless of race, ethnicity, gender or gender identity, gender expression, sexual orientation, country of origin, age, disability, physical appearance, body size, religion, or culture. We recognize the responsibility to create and maintain that diverse environment for the benefit of all and to be active in promoting meaningful participation of individuals from all underrepresented groups and minorities.

Applicability

GAC® members and all non-member participants (such as visitors, venue staff, or exhibitors) must adhere to the GAC® Code of Ethics and GAC® Code of Conduct in all GAC®-related events. This applies to all GAC® events and events run by the Sections and Divisions of the GAC® including (but not limited to) meetings, field trips, short courses, mentorships, and other supported programs and all virtual events. The GAC® Code of Ethics and GAC® Code of Conduct also apply to events by organizations other than GAC® but held in conjunction with GAC® in public or private facilities. Finally, GAC® members are expected to abide by the standards set in the GAC® Code of Ethics and GAC® Code of Conduct in non-GAC® related events.

Examples of expected behaviour

- Treat everyone with respect and consideration.
- Communicate respectfully and openly with others, critiquing ideas rather than individuals.
- Be considerate of views and opinions that are different from your own.
- Alert a GAC® councilor, an LOC volunteer, or onsite security personnel if you witness unacceptable behaviour or someone in distress.
- Honour instructions if photographs or recordings of presentations are not allowed
- If you choose to drink alcohol or to consume other legal intoxicants in accordance with Federal and Provincial laws, do it so responsibly and safely. Be mindful of your responsibility to act professionally and to the standards set in the GAC® Code of Ethics and GAC® Code of Conduct.
- Respect the rules and policies of the conference centre and all associated venues, including but not limited to field trip accommodations and pre- and post-conference events (e.g. workshops).
- Standards for respectful behavior and communication apply in any forum or medium, including in-person or virtual conferences and events, any online interactions, any social media, conference presentations, and media interviews.

Examples of unacceptable behaviour

- Harassment and intimidation in any form, including gender-based harassment, and any verbal, written, or physical conduct designed to threaten, intimidate, or coerce.
- Discrimination in any form based on race, gender or gender identity, sexual orientation, national origin, age, disability, physical appearance, body size, religion, or culture.
- Use of nudity or sexual images in public spaces or presentations.
- Jokes or remarks that reflect stereotyping and denigrate others.
- Stalking in any form, including on-line trolling.
- Sexual harassment in any form, including inappropriate, unwanted or unwelcome physical contact such as touching, patting or pinching;

insulting comments, gestures, or practical jokes of a sexual nature that cause discomfort or embarrassment; and inappropriate enquiries or comments.

- Disrespectful disruption of presentations in all GAC®-related events.
- Disparaging remarks, stereotyping, negative language, and ad hominem attacks.
- Use of online tools such as chat rooms, any social media, or other forms of digital communication to engage in any form of harassment, stalking, discrimination, or any of the behaviours listed above.

Consequences

Anyone requested to stop any form of unacceptable behaviour must comply immediately. If necessary, the Safety Officer or on-site security may take further action, including:

- Verbal warning
- Immediate removal from the event without warning and without a refund
- Submission of a formal misconduct report to the GAC® Council.

Where complaints submitted to the GAC® Council are found to have merit, disciplinary action will be taken against the offender — up to and including prohibiting attendance at any future meeting and revocation of GAC® membership or referral of complaints to the offender's employer or legal authorities if criminal actions are involved.

Local Organizing Committee Responsibilities

Each Local Organizing Committee (LOC) shall have a Safety Officer who will ensure that the Code of Conduct is included in all meeting materials, prominently displayed during the conference, and ensure that all volunteers know the procedures for reporting incidents. An LOC may choose to work with an external group for incident reporting, such as a Campus Security office, a university ombudsman, or a local legal group. If someone on the LOC has had previous training in dealing with reports of this kind they can be the designated first point of contact but it is recognized that an LOC may prefer to have an external entity be the reporting contact. Contact information for any designated personnel should be available from the

event registration desk, meeting website, and conference materials. In other settings such as field trips the safety officer will be identified at the start of the event and in the program.

At the GAC® annual meeting, reports of unacceptable conduct can be made to any LOC volunteer, a GAC® councilor, or on-site security personnel member. These individuals should readily be identifiable on-site using an identification badge or volunteer shirt. All LOC volunteers will be aware of who to contact in case a report is made.

Reporting Unacceptable Behavior

If you experience or witness any form of unacceptable behaviour or have any questions about what is unacceptable behaviour, please contact an LOC volunteer, a GAC® councilor, or on-site security personnel member immediately. If reports are made verbally and dealt with by on-site security personnel the LOC Chair should be informed by the person receiving the report after the incident. The incident may also be reported to GAC® Council if further action is needed.

Complaints regarding any type of unacceptable behaviour can be made in person on-site or *via* email to the designated authority for each event, ensuring that the email subject line reflects the urgency of the situation. Complaints submitted to the GAC® Council will be handled confidentially to the maximum extent possible and will be investigated and resolved promptly following the procedure outlined in the GAC® Code of Ethics.

The GAC® Code of Ethics strictly prohibits retaliation against anyone for reporting or inquiring in good faith about what that person believes to be unacceptable behaviour or for participating in any related investigation. GAC® will not tolerate retaliatory behaviour from its members, especially from those in senior positions.

If you experience or witness behaviour or actions that are an immediate or serious threat to you, others, or public safety (for example, physical and sexual assault), first consider your safety and then contact emergency services (911) or on-site security immediately.

Adapted from:
AGU Meetings conduct
GSA Events Code of Conduct

EGU Code of Conduct
Favaro *et al.*, 2016. Your science conference should have a code of conduct.
Frontiers in Marine Science.3:103.
DOI: 10.3389/fmars.2016.00103

Foxx *et al.*, 2019. Evaluating the prevalence and quality of conference codes of conduct.
Proceedings of the National Academy of Sciences Jul 2019, 116 (30) 14931-14936
DOI: 10.1073/pnas.1819409116 .

Geological Association of Canada Position statement on Equity, Diversity, and Inclusion

Science, including Earth Science in all its forms, exists as part of society. As such, science is not an endeavour unaffected by systemic biases and inequities that exist in the wider society. As an association, it is our responsibility to work towards a just and equitable version of our profession and our world. The Geological Association of Canada values diversity of ideas and diversity of contributors towards our science and our organization.

We strive to be an association in which all members are and feel welcomed, valued, supported, and encouraged in a space that is free of discrimination based on race, gender and gender identity, gender expression, sexual orientation, socioeconomic status, caste, age, disability, physical ability and appearance, body size, country of origin, ethnicity, religion, culture, or language. Racism and discrimination has no place in the Geological Association of Canada and we will work towards making our conferences and activities more inclusive and supportive of the full and meaningful participation of Black, Indigenous, and participants of Colour.

We will use this position statement as guidance when selecting our representatives, engaging in our business as a society, when designing our conferences, when putting together scientific programmes and events, and when engaging in community consultations, science outreach, education, and the ethical practice of our profession. As the Geological Association of Canada we strive to celebrate and reflect the diversity of our country to better serve all our members and our wider communities.

Events and Happenings

2020 Canadian Tectonics Group Fall Workshop

The Canadian Tectonics Group (CTG) held another successful Fall Workshop on November 20 and 21, 2020. This year's meeting, organized by Renaud Soucy La Roche, Eric Thiessen, and Sean Kelly, marked the 40th annual CTG Fall Workshop.

Due to the COVID-19 pandemic, the CTG was unfortunately unable to host an in-person workshop, or a field trip this year. However, despite these challenges, this year's on-line Fall Workshop was very successful, with 25 speakers and 65 participants. In fact, the on-line format and free attendance offered a unique opportunity for people who would otherwise be unable to travel to an in-person meeting to attend the workshop this year. Encouragingly, the workshop had participants from across Canada, as well as the US, UK, and Europe, and included students, early career researchers, and senior researchers, representing both academia and government.

The presentations were organized as either 15-minute long-form presentations or shorter 5-minute presentations, which accommodated more preliminary research results. This flexibility allowed for a variety of presentation styles, including giving students who are earlier in their research an opportunity to present their work and receive constructive feedback.

The presentations spanned a wide range of research topics, including geomorphology, regional tectonics, and methodological studies related to structural geology. Furthermore, the presentations spanned field areas across Canada, including Western Cordillera, Grenville Province, Trans-Hudson Orogen, Archean

terranes in Northern Ontario and Western Quebec, but also global regions such as the Himalaya, Southwest Pacific and Andes.

The workshop, hosted via the Zoom platform, was launched by Dr. Cees van Staal (Geological Survey of Canada, University of Waterloo) and Dr. Fried Schwerdtner (University of Toronto), who attempted to share their experiences of attending the first CTG Fall Workshop in 1981, albeit with some connection issues. The first day of the workshop had 10 presentations on topics ranging from the geomorphology of the Andes to Archean tectonics. The second day started with keynote speaker Dr. Catherine Mottram (University of Portsmouth, UK), who delivered an excellent talk titled "Syncing fault rock clocks: Direct comparison of U-Pb carbonate and K-Ar illite fault dating methods". Following the keynote presentation there were 14 presentations on topics ranging from thermochronology to mantle-scale geophysics.

An additional advantage to the on-line format is that the workshop presentations could easily be recorded. Recorded presentations (from consenting presenters) have been uploaded to the newly created CTG YouTube channel (<https://www.youtube.com/channel/UCuCh-8Mx7dwH8cuxiWcieKQ>), which also hosts seminars from CTG's new monthly lecture series. The abstract volume for the presentations is posted on the CTG website (<http://www.canadiantectonicsgroup.ca/workshops.html>). Overall, the 40th CTG workshop was a success with many exciting presentations and discussions, and a much-needed opportunity for the tectonics community to connect during these challenging times.

Sean Kelly
CTG Fall Workshop organizer

GeoFact: December 13 1795: A meteorite fell to earth at Wold Newton, Yorkshire, England, stimulating much debate about the object's origin.

GeoFact: December 27 1831: HMS Beagle leaves Plymouth and sets sail for a round-the-world voyage. On board is Charles Darwin as ship's naturalist.



Screen mosaic of attendees at the 2020 Canadian Tectonics Group Fall Workshop

Announcements

Canadian Geological Foundation Invitation for 2021 Grant Applications

The Canadian Geological Foundation invites all interested parties to submit proposals for the 2021 CGF grant competition. The secretary must receive your application by March 31, 2021.

The Foundation is a non-profit, charitable organization dedicated to assisting the development of geological sciences in Canada and to promoting public interest in the value of the geological sciences to society. Grants are generally made in support of activities of national interest and broad significance, with emphasis on those of long-term importance. Grants are made on the basis of written applications giving a summary and detailed budget for the proposed project. The Foundation disburses more than \$175,000 annually. Note that grants are paid upon completion of the project.

The CGF uses a three-tiered grant system related to the size of the grants being requested: small grants (<\$10,000),

medium grants (\$10,001 to \$30,000) and large grants (up to \$45,000). In addition, the Foundation will consider the possibility of multi-year grants (i.e., specific amounts to be paid in each of up to 4 years).

Application forms, a new cover form and detailed instructions are available on the CGF website at http://www.canadiangeologicalfoundation.org/?page_id=393

Please submit the cover form and application form together as one pdf file to the CGF Secretary. Applicants should read the instructions carefully to ensure that their application meets the CGF grant criteria and that it is complete.

Incomplete applications will not be returned for correction and any material in the application in excess of the five pages limit will not be circulated for review.

Queries about the Canadian Geological Foundation grants and grant program should be addressed to the Secretary: Eileen van der Flier-Keller at evanderf@sfu.ca

Essay

Remote Undergraduate Geoscience Education: Lectures

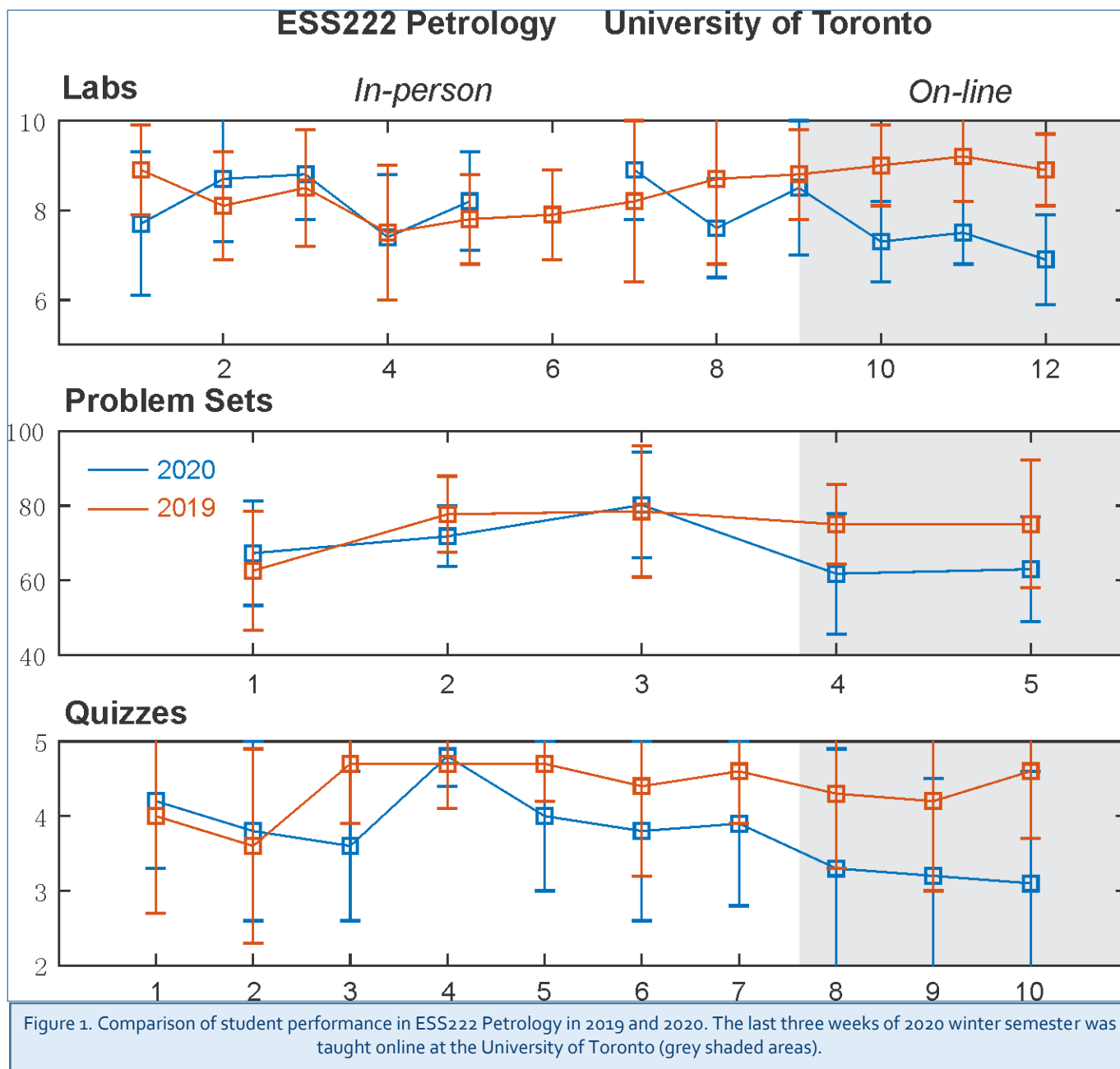
This year geoscience educators have largely shifted to remote teaching approaches, bringing with it new challenges for teaching in this traditionally lab- and field-intensive program. Seemingly overnight, we have adapted our curriculums, had crash-courses in new online tools, and have come up with creative solutions to ensure student learning and success in a stress-filled world. Our students have had to face the challenge of transitioning to an unknown environment, which can impact their grades and further increase their stress (e.g., Fig. 1). Here, we reflect on our remote semester as members of the hard-rock faculty at the University of Toronto and share some of the specific challenges that both students and instructors face, and the methods that we have adopted to deal with these challenges. In this contribution, we focus on challenges specific to remote lectures. We recognize that there is no one-size-fits-all approach to education, and do not claim to have the best solutions to these challenges. Our goal is simply to spark a national discussion about geoscience pedagogy, and we encourage you to contribute to this discussion by sharing your own experiences in publications like *GEOLOG* and other forums, or by emailing us with your experiences.

Some of the challenges that our students face are extrinsic, including unreliable internet connections, not having a quiet at-home working environment, and additional stresses that affect student's mental health and well-being. While we cannot directly alter these circumstances, we can plan our lectures and labs with these things in mind. Like in-person teaching, leading with kindness and compassion is key to student success. Beyond this, there are intrinsic challenges related to the format of online learning, including maintaining engagement, additional struggles of time management, and how we approach student assessments when exams cannot be invigilated in person. Here, we describe some of the approaches that we have taken in several of our Earth Science courses (Earth Systems Processes, Petrology, and Economic Geology).

Challenge 1: Establishing trust and community

It is more difficult to establish trust with students when you are not interacting face to face, and yet now more than ever it is important to be accessible and approachable for students. To establish a connection with students, we make use of the chat function on our video conference software of choice, generally starting a few minutes before class with a casual chat asking about their weekends or other world events. This interaction helps me to get to know students and sets the tone for continued participation as the lecture begins. The goal is for students to see their instructors as a human rather than just a face on a screen. We reciprocate this effort through acknowledgements of the challenges they face and explicit and repeated statements that we care about their well-being and success. Rather than falling behind, this may encourage students to reach out when they are struggling.

The transition to an online environment can be daunting for instructors and it can be easy to focus only on the strictly academic parts of the course. A major draw-back of remote learning is that our students are missing out on the "university experience" that involves making friends and finding community on campus. This has a particularly large impact on first- and second-year students who have not yet built personal connections in their departments. In the classroom, building a sense of community further develops trust, allowing students to become more comfortable taking academic risks and thinking outside of their comfort zone to grow and learn. Our students report that something as simple as the chat function before/during/after the class is helpful, even when they just read other people's messages rather than participating. This is because students will often chat about how they are doing and problems that they face related to COVID, so this helps all students to feel like they are not alone. In larger introductory courses (>40 students), students prefer to keep their webcams turned off (possibly due to internet connection problems), while in smaller upper-year courses, ~50–70% of our students keep their webcams on, which may be a result of the comfort level of these students as they are already familiar with one another from previous courses. Despite not using webcams, the



students tend to be familiar with text-based communication (including emojis) and prefer that over talking with mics.

Beyond this, there are opportunities to combine socialization with education in the remote classroom. In the Economic Geology course, this was done by organizing a **movie night** to watch the movie “Gold,” which is based on the true story of the BreX scandal, a cautionary tale for all economic geologists. This movie is widely available on Netflix and other streaming services and can be watched synchronously using tools like the **Netflix Party** browser extension. Before the movie, a short PowerPoint presentation (15 min) about

the facts and details of the BreX scandal prepared the students to understand the context of this event. During the movie, discussion was encouraged using the unobtrusive **chat function**. This event was popular and was a welcomed break from traditional lecturing.

In the remote classroom, it is easier now than ever to invite **guest speakers** into the classroom from anywhere in the world to add diversity to online platforms. Outside of the course, there are a huge variety of virtual talks offered by our department, other departments, and many other societies. We encourage our students to attend these talks for bonus marks (or as an alternative to a lecture) to expand their geologic

horizons. These opportunities allow us to further enrich our remote classrooms beyond traditional course materials.

As with in-person learning, we find opportunities to encourage our students to work together collaboratively throughout the semester. In the remote environment, this includes joining online forums where stronger students can help those who are struggling. These forums can include **Canvas discussion board**, **Discord servers**, **Facebook groups**, or **WeChat**, among many others. Based on our experiences from this semester, having one dedicated **Discord server** that is set up in advance is preferable to having many scattered groups. During the lectures and labs, group-work is encouraged through **breakout rooms** where students are placed in small groups to work on an activity collaboratively with mics turned on for more efficient communication. Students have mixed reviews about breakout rooms, some feeling that these rooms are awkward and contributing to the discussion makes them anxious, others reporting that these rooms are fun, active, and helpful. The student experience will vary with personality and with the composition of the groups. Use of breakout rooms during one of the first lectures for students to either debate a topic or work collaboratively towards a goal can help students become familiar with this tool and give them an early opportunity to get to know one another. To ensure effectiveness of breakout rooms, it's important that the groups are not too large (3–4 students works well), and that the activity requires participation and interaction with the group to be completed. For some activities, it can be helpful to require the breakout groups to nominate a *group moderator*, who keeps the students on task and encourages contributions from everyone (and discourages conversation-dominators), and a *group representative*, who will present the results from the group to the rest of the class. Students find it less intimidating to know in advance if they will be required to present to the larger classroom.

Small group projects are a traditional way to facilitate collaboration, but it can be challenging for students to select groups, particularly in introductory courses where students do not know one another. To make group selection easier, one useful tool is the **Groups** function on Canvas, which allows the instructor to create a list of groups by topic and then the students can enroll themselves in the topic that they are interested in (rather than picking partners). Another

drawback is the fact that many of our students are currently in different time zones, and students report that communication and scheduling of group meetings has been challenging. Assigning projects far in advance of deadlines may help with this and having dedicated places for students to establish communication is also important (e.g., **Discord server**).

Finally, to encourage the development of a conducive learning environment, we assign a significant participation mark in each of our courses (at least 3% of the final grade), with many opportunities for students to participate. This includes both online **discussion boards** and contributing to **chats/discussions** in weekly meetings (lecture/labs). Many times, initiating a discussion in a classroom setting is difficult, this is even more the case in an online format where students can be easily distracted during the discussion. With the incentive of a participation being significant proportion of the final mark, this can help start the discussion early on and once it has started it becomes a natural part of the course. In the courses where this has been implemented, it notably facilitated robust discussion and interaction between the professor and students.

In general, the remote experience does not compare to the interactions of in-person teaching, but that does preclude us from doing our best to promote a sense of connectedness with our students using traditional approaches combined with modern tools. It's more fun for us too.

Challenge 2: Internet connectivity and course accessibility

In addition to challenges with personal connections, poor internet connections have been a major problem across the board for both students and instructors. Students who want to participate in classes are not able, and video lag time reduces the overall quality of our lectures. To overcome this, we believe that **recording** of synchronous (live) lectures is critical, and it is equally important that these recordings are available immediately after a lecture. This provides students with added flexibility (particularly those who are in different time zones), less stress when they lose internet connectivity, and our students report that they use these recordings to revisit parts of the lectures that they didn't understand the first time. This actually improves the accessibility of remote lectures over in-person lectures as students can go through the material at their own pace. Recording of lectures is simple and

straight-forward with all the major video conferencing platforms, and those that integrate with the online course platforms (e.g., BB Collaborate in Canvas) will automatically upload the videos after the lecture (with options to make this publicly available or not). The BB Collaborate feature that makes the chat messages anonymous for the recording to further encourage students to make use of the chat. To further improve accessibility, there is the option of adding **closed captioning** to the videos. In BB Collaborate and Zoom, there is the option for live closed captioning, which requires a moderator (a TA) to type the captions as you lecture, which are also included in the recording. In BB Collaborate, these captions can be added later to the recordings. or these captions can be added later to the recordings.

Alternatively, one course utilized **pre-recorded lectures** which could be watched asynchronously with normal lecture times being used to review the lecture and discuss the topics in more detail (i.e., the “flipped classroom” approach). This allowed for the same benefits of recording synchronous lectures (ability to re-watch and review, add sub-titles, less stress with lack of internet connectivity, etc.) while increasing the amount of discussion time. The response to this method were mixed, some students really enjoyed the flexibility of the lectures and the ability to have the course material reinforced during the review session. However, others thought that it would be better to allow for questions during the lecture and the gap in time between the lecture and meeting inhibited a spontaneous discussion. These students also suggested that the review during the meeting time would be better spent discussing case studies rather than directly repeating parts of the lecture.

Another simple way to improve the accessibility of any course is to select a **textbook** that has a **digital version (e-book)** available for students who use screen readers to read text. Accessibility of any remote or in-person course can be enhanced by **providing lecture notes and handouts ahead of time**. This allows students to review the material in advance and is particularly helpful for ESL students. Rather than providing complete lecture notes, we prefer to provide skeletal notes with some intentional blanks for students to annotate during the lecture, which they can either do by printing and annotating by hand, or digitally using any one of several apps. This encourages students to watch the lectures (synchronously or asynchronously)

rather than simply relying on lecture notes and textbooks. By removing barriers related to internet connectivity and overall course accessibility, we can support our students learning and improve the inclusivity of the remote learning environment.

Challenge 3: Engagement

Attending classes online make it easier for students to be distracted either by their surroundings or by ever-present distractions on the internet. In a classroom, we can judge whether students are paying attention and directly interact with them face-to face. Although there are additional challenges online, the fundamentals of classroom engagement are largely the same as in-person teaching. This includes instructor enthusiasm, use of real-world examples, using videos/models/animations, and frequent discussions/questions. The use of videos in the classroom (or even tools like Google Earth) can be challenging due to internet bandwidth restrictions, so it is important that these are available to students after the lecture to review on their own if they are unable to watch them during the lecture. With online learning, the integrated tools in the video conference platforms are helpful, including the **chat**, **polls** (yes/no or multiple choice), or **breakout rooms** (described above). Besides this, the structure and pace of the lecture itself can help students to remain engaged. Note-taking may be less common in online formats if the entire slide presentations are available to the students. On the other hand, if no notes are provided, the students attention may be *too* focused on notetaking rather than listening (limited working memory capacity). We prefer a balanced approach where we provide notes that students must **annotate** to enhance information retention. However, this approach may not work in every classroom setting (e.g., math-intensive courses). To deal with theoretical components of a course, like explaining the phase rule, there is a simple way to implement a **pencil-and-paper mode of lecture** delivery. Simply log into the video chat on a smart phone and place it in a holder over a piece of paper. Although students no longer see the instructors face, we have found that handwritten course contents can more actively engage students than slides. This can develop a valuable sense of in-person delivery by a real human. Like chalk talks, the pace must be slow because it takes time to write out on a paper and for students to copy these notes. More importantly, this mode of delivery has allowed and encouraged real-time feedback and discussion.

Finally, field trips are a great way to engage students by showing them different aspects of the course material in the real world. Mine tours also allow students to learn about the geology of an area from experts who spend a large amount of time trying to understand the geology of a specific deposit. In the Economic Geology course, a **virtual field trip** to eight ore deposits of South Africa and Botswana was developed to give students a flavor of the value of field experiences. This virtual field trip was developed using videos and photos in **Google Earth**, allowing student to move from site to site to view the photos and videos. Two wildlife viewing stops were included to highlight the added experiential benefits of field experiences. This optional assignment was well received by the students and can inspire students to continue in the field of Geosciences so they can have the opportunity to have these types of real-world experiences. As we are now required further develop our remote field experiences, and the lessons we learn may enhance the accessibility of our discipline when we return to in-person teaching.

Challenge 4: Remote assessments

The classic mode of assessment in a course is to have one or more term tests and a final exam, often timed and written under the watchful eyes of invigilators. Since it is not straightforward to monitor students remotely to ensure academic integrity, many instructors have moved to **open-book exams** and essays (using plagiarism detection tools such as **Turnitin**), while others have completely eliminated major exams all together in favor of **smaller assignments and online quizzes** distributed throughout the course. This form of assessment allows us to assess a student's deeper understanding of the material, likely better than classic timed exams. When students can use resources besides what they can memorize, and spend more time problem-solving (e.g., apply what you've learned to a problem), they can better demonstrate what they have learned. Another benefit of this is that it reduces test anxiety for the students. In our Earth Systems Processes course, smaller assignments and online quizzes were at the end of each topic throughout the year, requiring students to review/annotate the lectures and keep pace with the class. Additionally, this allows for revision/repetition of key points that were missed in a timely fashion rather than after the final exam when it is too late. The downside of this is that many other instructors are taking a similar approach, so the students are facing much higher weekly workloads than ever before, and time management becomes more

important. Having clear deadlines on a syllabus and frequent reminders may help with this, along with generous and consistent deadlines. As this past semester progressed, the late submission policy in this course was revised from a rigid "no late submissions will be marked" to a more flexible "late submissions will have a penalty of -10% per day" to accommodate students who were struggling to manage deadlines. This resulted in fewer missing submissions, and also fewer emails from students requesting extensions. By having smaller assignments worth a smaller percentage of their grade, there is also less stress associated with any given assignment.

One major concern with open-book assignments and exams is the potential for increased incidents of academic dishonesty *via* plagiarism. This tends to happen with questions that are more open-ended, leading to student confusion and a reliance on copying information from internet searches. Outlining clear codes of academic integrity on the syllabus does not appear to prevent plagiarism. In order to reduce the number of incidences, instructors need to clearly convey the expectations, provide examples of proper citation, and present the questions in a straightforward and easily understandable manner. The scope of this problem is difficult to navigate and is an ongoing issue for all instructors.

Take-home message

As the current state of the world is incredibly stressful, we strongly feel that we should do anything we can do to reduce course-related stress for our students, while promoting accessibility, a sense of community, and overall course engagement to support our students through these difficult times. This demands more of our time and energy and requires support from our departments and universities. Remote teaching is new to many of us, but it is providing opportunities for us to re-evaluate our courses and teaching methods and may give us new insights that we can take with us as we return to the classroom.

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Howard Street Robinson Fund

The Robinson Fund was established in 1977 by the Geological Association of Canada, using a bequest from the estate of Howard Street Robinson. The fund is dedicated to the furtherance of scientific study of Precambrian Geology and Metal Mining by:

- sponsoring an annual Distinguished Lecturer Tour whose focus alternates between Precambrian research and economic geology (lecturer alternately chosen by the GAC®'s Precambrian and Mineral Deposits divisions)
- supporting Special Projects including publications, symposia and conferences.

Proposals for special projects on Precambrian Geology or Metal Mining should be submitted to the Robinson Fund Committee. Projects should be sponsored or organized through the GAC® or one of its Divisions or Sections. Proposals that have a wide appeal or degree of accessibility to the GAC® membership are preferred.

For further information and proposal submissions, please contact: Dr. Stephen Piercey, Chair, Robinson Fund, c/o Department of Earth Sciences, Memorial University of Newfoundland, St. John's, NL A1B 3X5 Canada, E-mail: spiercey@mun.ca



Astotin Lake, Elk Island National Park, Alberta, winter 2008

Information for Contributors

Contributions should be submitted by e-mail to Alwynne.Beaudoin@gov.ab.ca, with GEOLOG in the subject line. Contributions are welcome in either of Canada's two official languages. MS Word (.doc or .docx) is the preferred format for contribution but generic word processing (.rtf or .txt) files are also fine. Please do not submit PDF files. Up to four hi-res images may be submitted per contribution: preferred format is .jpg, RGB colour, with a minimum 300 dpi resolution at 5" x 3" size. Please ensure that images are cropped and colour-corrected, and provide a caption for each image, and an image credit line if needed. Contributors are responsible for securing permission to publish for any third-party images or images of living recognizable people. Diagrams (vector graphics) may also be submitted. Preferred format for graphics is Adobe Illustrator (.ai); make sure that the file is saved with "save text as lines" option enabled to ensure no font substitutions. Additional information on other file formats can be obtained from the Editor. Please do not embed images or graphics in your text document; images or graphics should be submitted as separate files. In your text, use a call-out in parentheses to indicate the approximate placement of each image and graphic. If files are larger than 10 mb, please contact the Editor for alternate delivery arrangements. Your contribution will be copy-edited to ensure consistent spelling and orthography and to correct any obvious typos or errors. Contributions may also be edited for clarity and length. If the Editor has questions about specific information in the text, she will contact contributors for clarification. Contribution deadlines are March 1, June 1, September 1 and December 1.

Consignes aux auteurs

Les contributions d'auteur doivent être soumises par courriel à Alwynne.Beaudoin@gov.ab.ca, en indiquant GEOLOG à la rubrique Objet. Les articles seront acceptés dans l'une des deux langues officielles du Canada. Les fichiers de format MS Word (.doc ou .docx) sont préférables, mais les formats génériques (.rtf ou .txt) sont aussi acceptables. Veuillez ne pas soumettre de fichiers au format PDF. Par article, jusqu'à quatre images haute résolution peuvent être soumises; format préféré est .jpg, couleurs RVB, avec un minimum de 300 PPP en taille 5 po x 3 po. Veuillez vous assurer que les images sont recadrées et leurs couleurs corrigées, qu'elles sont accompagnées d'une légende ainsi que des informations de référence le cas échéant. Il est de la responsabilité des auteurs d'obtenir la permission de publier toute image de tiers ou de personne reconnaissable. Des diagrammes (graphiques vectoriels) peuvent également être soumis. Le format préféré pour les diagrammes est celui d'Adobe Illustrator (.ai); assurez-vous que le fichier est sauvegardé avec l'option « Sauvegarder le texte comme ligne » activée pour éviter toute substitution de police de caractère. On peut obtenir des informations sur d'autres formats de fichiers en communiquant avec l'éditrice. S'il vous plaît ne pas incorporer d'images ou de graphiques dans votre texte; ces images ou graphiques doivent être soumis sous forme de fichiers distincts. Dans votre texte, veuillez utiliser des notes numérotées entre parenthèses pour indiquer l'emplacement approximatif de chaque image et graphique. Dans le cas de fichiers dépassant 10 Mo, veuillez contacter l'éditrice pour convenir des modalités de téléchargement. Vos articles seront révisés afin d'en assurer la cohérence orthographique et corriger les fautes de frappe ou erreurs évidentes. Les articles pourront aussi être corrigés pour plus de clarté et éviter des longueurs. Dans les cas où l'éditrice aurait besoin d'informations particulières concernant le texte, elle communiquera avec les auteurs. Les dates limites pour soumettre des articles sont le 1 mars, le 1 juin, le 1 septembre et le 1 décembre.