CEOLOG Number / Numéro 3 Autumn / Automne 2018

Volume 47



Events and Happenings

Coming soon to a lecture theatre near you...

Two distinguished Canadian geoscientists are embarking on Canada-wide lecture tours this fall: Dr. Gordon (Oz) Osinski (Department of Earth Sciences, Western University) and Dr. Derek Thorkelson (Department of Earth Sciences, Simon Fraser University). Please check departmental websites for details of the dates and times of their presentations.

Dr. Gordon (Oz) Osinski is the Hutchison Lecturer for 2018-2019. This tour is undertaken by the recipient of the W. W. Hutchison Medal and is funded through the Canadian Geological Foundation (CGF). The award is given to an outstanding young geoscientist for exceptional advances in Canadian earth science. Dr. Osinski has prepared two lectures for his tour: The Role of Meteorite Impacts in the Origin and Evolution of Life and Igneous Rocks Formed by Meteorite Impact. Abstracts for these talks are given below. Dr. Osinski will be travelling to western Canada in late October, with other venues to be added later.

The Role of Meteorite Impacts in the Origin and **Evolution of Life**

Impact cratering is one of the most ubiquitous geological processes in the Solar System. Over the past decade, it has become clear that impact events have profoundly affected the origin and evolution of Earth and producing benefits in the form of economic mineral and hydrocarbon deposits. The



destructive geological, environmental, and biological effects of meteorite impact events are well known. This is largely due to the discovery of the ~180 km diameter Chicxulub impact structure, Mexico, and its link to the mass extinction event that marks the end of the Cretaceous Period 66 Myr. ago. In recent years, it has also become apparent that, once formed, impact events also have certain beneficial effects, particularly for microbial life. The effects range from generating conditions conducive for the origin of life (e.g., clays, which form catalysts for organic reactions, and hot spring environments) to varied habitats for life that persist long after an impact event, including hydrothermal systems, endolithic habitats in shocked rocks and impact glasses, and impact crater lakes. This may have important implications for our understanding of the origin and evolution of early life on Earth and possibly other planets such as Mars.

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 bienêtre de la nation.

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Prix Section and / et Division Awards

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Certificat d'excellente de l'AQUEST Canadian Geomorphology Research Group— J. Ross Mackay Award, 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— Duncan R. Derry Medal, William Harvey Gross Award, Julian Boldy Certificate Awards Paleontology Division— Elkanah Billings Medal, Pikaia Award Precambrian Division / Mineral Deposits Division — Howard Street Robinson Medal Canadian Tectonics Group— Jack Henderson Prize for Best Thesis, Ph.D. and M.Sc. Volcanology and Igneous Petrology Division— Career Achievement Award, Léopold Gélinas Medal

GEOLOG

Vol. 47, No. 3, Fall / Automne 2018

Publisher / Publié par GEOLOGICAL ASSOCIATION OF CANADA c/o Dept. of Earth Sciences, Memorial University of Newfoundland

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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 members 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 ouvernementaux 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.

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PUBLICITÉ: Nous acceptons la publicité rémunérée. Une copie prête pour la reproduction est préférable. Veuillez communiquer avec le Rédacteur en chef pour des renseignements additionnels à ce sujet.

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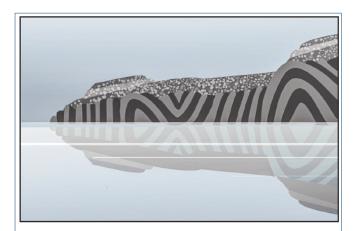
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Acknowledgements and Thanks

This *GEOLOG* benefits from the contributions and assistance of / Nous voulons souligner la contribution et l'assistance de Karen Dawe, Melissa Grey, Andy Kerr, and Jane Wynne. Apologies to any contributors that have been missed. This *GEOLOG* was produced with support from the Royal Alberta Museum. Your contributions for future editions are welcome / Désolé pour ceux qui auraient été involontairement oubliés. Cette copie de *GEOLOG* a été produite grâce à l'assistance du Royal Alberta Museum. Nous sollicitons vos contributions pour les publications à venir.

Contributions for next issue

Please send items for the next issue of *GEOLOG* by e-mail to Alwynne.Beaudoin@gov.ab.ca on or before **December 1 2018**.



Classic Rock Tours 1. Hutton's Unconformity at Siccar Point, Scotland: A Guide for Visiting the Shrine on the Abyss of Time

Andrew Kerr

Memorial University Department of Earth Sciences St. John's, Newfoundland and Labrador, A1B 3X5, Canada E-mail: akerr@mun.ca

SUMMARY

The angular unconformity at Siccar Point in Scotland is one of the most famous localities in the history of geology. At this spot, steeply dipping, folded turbiditic sandstone of early Sil-

Looking for an interesting read in geological history? Geoscience Canada's your go-to publication. See p. g. Cont'd from p. 1

Igneous Rocks Formed by Meteorite Impact

Igneous rocks are the primary building blocks of planetary crusts. Most igneous rocks originate via decompression melting and/or wet melting of protolith lithologies within planetary interiors and their classification and characteristics are well-studied. Over the past few decades it has become clear that impact cratering is one of the most ubiquitous geological processes in the Solar System. It is now recognized that the production of igneous rocks is a fundamental outcome of hypervelocity impact that, in the case of Sudbury, Ontario, are host to world-class magmatic ore deposits. Despite this, our understanding of impact melt rocks, as they are termed, is still evolving. While the process of formation may differ, it is apparent that the products of meteorite impact can share close similarities – both in the field and on the microscopic scale – with volcanic and shallow intrusive igneous rocks of endogenic origin. Historically, these similarities led to the misidentification of some igneous rocks now known to be impact melt rocks as being of endogenic origin. This raises the question as to how to distinguish between an impact versus an endogenic origin for igneous-like rocks on other planetary bodies where fieldwork and sample analysis may not be possible and all that may be available is remote sensing data.

Dr. Derek Thorkelson is the Howard Street Robinson Lecturer for 2018-2019 as selected by the Precambrian Division of GAC®. Dr. Thorkelson is recognized "for his outstanding contributions to understanding the Precambrian geology of western Canada and western Laurentia". His tour is funded through the Howard Street Robinson Fund and is intended "for furtherance of scientific study of Precambrian Geology and Metal Mining". Dr. Thorkelson has prepared a lecture called *The Precambian Secrets of the Yukon*. See below for the lecture abstract. Dr. Thorkelson will be travelling to eastern and central Canada in November. Other venues will be added soon.

The Precambrian Secrets of the Yukon

Most geologists in Canada regard the Canadian Cordillera as a Phanerozoic orogen consisting of fold belts and accreted terranes rich in precious and base metal deposits, and flanked by the modern Cascadia subduction zone. To the surprise of many, the orogen



also preserves a rich Precambrian history that spans over a quarter of Earth history. The most extensive Precambrian exposures are preserved in structural culminations in Yukon Territory. These inliers extend from Alaska to the Northwest Territories and host sedimentary, igneous, metamorphic and hydrothermal rocks of Paleoproterozoic to Neoproterozoic age. The inliers lie within the Wernecke and Ogilvie Mountains, and the only road to cross them is the Dempster Highway as it passes north from Dawson City to Inuvik.

Few academic researchers have worked in these vast and mysterious mountains, and it has taken decades to unlock their geological secrets. My contributions began in 1992 as the leader of a two-person, four-year mapping program for the Yukon Government. With the help of several colleagues - mainly geochronologists -we began to address outstanding geological issues and chart a research plan that would ultimately span 26 years. After moving to Simon Fraser University in 1995, the research benefitted from the hard work and insight of graduate and undergraduate students. Although each step was important, our most revealing strides have come in the past few years. We have developed a new, deeper understanding of how northwestern Canada evolved during the Proterozoic and participated in the construction and break-up of the supercontinents Nuna and Rodinia. This talk will provide a backdrop of information followed by recent research highlights including our new model of Proterozoic terrane accretion, and a glance toward future research.

Medals and Awards

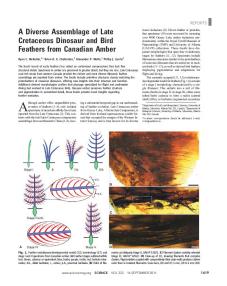
Pikaia Award Nomination - 2018 Dr. Ryan McKellar

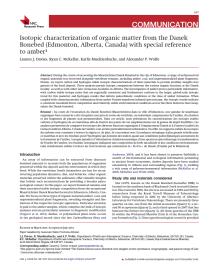
As an early career research scientist, Dr. Ryan McKellar is one of Canadian palaeontology's fasting rising stars. Dr. McKellar is currently the Curator of Invertebrate Palaeontology at the Royal Saskatchewan Museum (RSM), and is considered one of the country's leading authorities on amber and amber inclusions. He is the author of 41 peer-reviewed papers and two book chapters on palaeoentomology, amber, and Devonian trilobites. Although his specialty is fossil insects, with particular emphasis on parasitoid wasp families, Dr. McKellar is perhaps best known for his 2012 article in Science on feathers in Canadian amber, and for his 2016 co-authored Current Biology paper on a feathered dinosaur tail trapped in Myanmar amber. He is the recipient of multiple awards and grants, including an NSERC Discovery Grant for his current work at the RSM. Dr. McKellar completed a B.Sc. (2003), M.Sc. (2006) and Ph.D. (2011) at the University of Alberta, with thesis projects under the supervision of Dr. Michael Caldwell, Dr. Brian Chatterton and Dr. Alexander Wolfe. His doctoral thesis on Canadian Cretaceous amber, for which he was granted a NSERC graduate scholarship, received the Doctoral Dissertation Award for best dissertation in the Faculty of Science. Prior to starting at the RSM in 2014, Dr. McKellar held postdoctoral fellowships at the University of Alberta (2011-2012) and

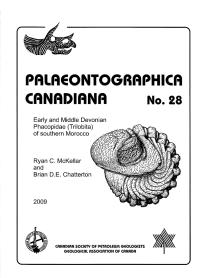


Dr. Emily Bamforth presents the *Pikaia* award to Dr. Ryar McKellar at the Canadian Paleontology Conference in Saskatoon, September 24,2018 *Image: Dr. Melissa Grey, via Twitter*

the University of Kansas (2012-2014). Dr. McKellar is now also an adjunct professor in the Department of Biology at the University of Regina (Saskatchewan), and a research affiliate with the Department of Ecology and Evolutionary Biology at Lawrence (United States). Dr. McKellar exemplifies excellence in Canadian paleontology, and has made extraordinary contributions to the understanding of Canadian and international paleoentomology and the study of amber. He is very deserving of this award.







Milestones, Memories, and Tributes

Owen L. White 1926-2018

We announce with sadness the death of Owen J. White on June 23,2018, at the age of 92. Owen White was a long-time member of GAC®, maintaining his membership in the association for 57 years.

S. George Pemberton 1949-2018

It is with sadness that we announce the death of S. George Pemberton on August 4, 2018, in Edmonton, Alberta, at the age of 69. In 2017, Dr. Pemberton was the recipient of the Elkanah Billings Medal from the Paleontology Division of GAC®.

Raymond J. T. Butler 1938-2018

We regret to announce the death in Osborne Park, Western Australia, of Raymond J. T. Butler on June 1, 2018, at the age of 79. At that time, he had been a member of GAC® since 1977. A mining geologist, his work led to the development of the Robe River iron ore deposits in the Pilbara region of Western Australia. He also worked on the development team that led to the opening of Australia's first vanadium project at Coates Siding near Perth, Western Australia.

[Editor's note: Short announcements are for information and do not preclude longer tribute articles at a later date.]

Announcements

GAC® award nominations are open

Consider nominating a deserving colleague for one of GAC®'s prestigious awards. Nomination deadline for National Awards is December 15, 2018.

National Awards

- Logan Medal
- W. W. Hutchison Medal
- E. R. Ward Neale Medal
- J. Willis Ambrose Medal
- Eric Mountjoy Exchange Award

Student Awards

Mary-Claire Ward Geoscience Award

Division / Section Awards

- Canadian Sedimentology Research Group— Middleton Medal
- Marine Geosciences Division—Michael J. Keen Medal
- Mineral Deposits Division—Duncan R. Derry Medal, William Harvey Gross Award, Howard Street Robinson Medal
- Paleontology Division—Elkanah Billings Medal, Pikaia Award
- Canadian Tectonics Group—Jack Henderson Prize for Best Thesis, Ph.D. and M.Sc.
- Volcanology and Igneous Petrology Division—
 Career Achievement Award, Leopold Gelinas Medal

For more information and nomination forms, please go to http://www.gac.ca/

Canadian Geological Foundation 2018 Grants

	2018 Grants	
#	Project Title (Applicant)	Award amount
18-1	Procurement of Leopold Gelinas Medal by VIP Division GAC (John Greenough)	\$2,038.00
18-2	Women in Rocks (Joanna Hodge, Fleming College)	\$5,000.00
18-3	Dynamic Earth Sciences Programs (Science North)	\$5,000.00
18-4	Restructuring the GAC (Dene Tarkyth)	\$37,850.00
18-6	Trilobite Learning Centre - Touch Screen Exhibits (Stephen Johnston)	\$25,000.00
18-7	The Geological History of the Saguenay-Lac -Saint-Jean Region (Musee du Fjord)	\$2,800.00
18-8	Satellite Interpretation Centre, Stonehammer (Gail Bremner)	\$40,000.00
18-9	Promoting Earth Science within the community (Gerri McEwen, VIU)	\$10,000.00
18-10	Saskatchewan Geological Society Annual School Lecture (Kate MacLachlan)	\$1,900.00
18-11	Canadian Minerals Exhibit at GAC-MAC-IAH 2019 (Stephanie Larmagnat)	\$7,400.00
18-12	NL Collection of Minerals Kit and Identification Guide (Amanda McCallum)	\$8,600.00
18-13	Online Capacity Building Tool for Canadian Geoparks (Godfrey Nowlan)	\$14,000.00
18-14	Educational Outreach programming for RFG 2018 conference (Lesley Hymers)	\$11,500.00
18-15	Discovering Earth Sciences Inquiry-based Field Experience for Teachers (Beth Halfkenny, Carleton University)	\$7,520.00
18-18	Geosciences and Society: a teaching workshop (Anne Marie Ryan)	\$1,000.00
18-19	Tumbler Ridge UNESCO Global Geopark Geology Field guide (TRGGS)	\$20,000.00
	Total	\$199,608.00



GAC-MAC-IAH

QUÉBEC 2019

www.gacmac-quebec2019.ca







L'Association géologique du Canada (AGC), l'Association minéralogique du Canada (AMC) et la section nationale Canadienne de l'Association internationale des hydrogéologues (AIH/SNC) vous invitent cordialement à vous joindre à eux pendant la conférence AGC-AMC-AIH/SNC, qui se tiendra du 12 au 15 mai 2019 dans la ville historique de Québec, site du patrimoine mondial de l'UNESCO. Les participants auront l'opportunité de visiter et vivre le charme et l'hospitalité de cette merveilleuse ville ainsi que d'explorer ses nombreux sites naturels avoisinants.

Sous la bannière "Où les géosciences convergent". le comité organisateur tient à promouvoir la collaboration et les échanges stimulants entre géologues, minéralogistes, pétrologues, hydrogéologues, géophysiciens et géochimistes. La conférence mettra l'emphase sur les thèmes suivants:

- Géosystèmes et hydrogéosystèmes;
- Ressources minérales, énergie et environnement:
- Science des données en géoscience;
- Géosciences et société

Sessions générales incluant:

- Minéralogie et cristallographie;
- Pétrologie ignée et métamorphique;
- Sédimentologie, stratigraphie et paléontologie;
- Géophysique:
- Géologie structurale et tectonique;
- Hydrogéologie générale;
- Géologie glaciaire et géomorphologie au Canada.

The Geological Association of Canada (GAC®), the Mineralogical Association of Canada (MAC) and the Canadian National Chapter of the **International Association of Hydrogeologists** (IAH/CNC) invite you to join them at the joint GAC-MAC-IAH/CNC meeting from May 12th to 15th 2019 in historic Québec City, a UNESCO World Heritage site. Participants will have the opportunity to visit and discover the warmth and charm of this beautiful city and to explore its many attractive nearby natural sites.

Under the theme "Where Geosciences Converge", the organizing committee wishes to promote collaboration and stimulating discussions among geologists, mineralogists, petrologists, hydrogeologists, geophysicists and geochemists. The conference will highlight the following themes:

- Geosystems and hydro-geosystems;
- Resources, energy and environment;
- Data science for geosciences;
- Geosciences and society

General Sessions including:

- Mineralogy and crystallography;
- Igneous and metamorphic petrology;
- Sedimentology, stratigraphy and paleontology;
- Geophysics;
- Structural geology and tectonics;
- General hydrogeology;
- Glacial geology and geomorphology in Canada.

SÉANCES PLÉNIÈRES/PLENARY SESSIONS

Dr. Barbara Sherwood Lollar

"Subsurface Habitability in the Earth's Deep Hydrosphere: Implications for Planetary Science and Astrobiology"

Mr. Darrell Beaulieu

"A Dene perspective on resource development in Canada for, by and among First Nations"

Dr. Guv Desharnais

"How BIG Data is changing Mining"



I WANT TO ATTEND!

Registration opens: March 1 st, 2019



gacmac-quebec2019.ca

JE VEUX PARTICIPER!

Ouverture des inscriptions : 1^{er} mars 2019

Au plaisir de vous voir! Looking forward to seeing you







Collisional wreckage in the broken core of the eastern Churchill Province

Hutton's Great Unconformity: Hiking to a holy place on a hallowed headland

The Iron Man of Labrador - Tracing one thin line through a wide and savage land

Resources for Generations - Diverse and exciting field excursions

Across the Great Divide and Back - A new guidebook for the Rocky Mountaineer

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Inside the Experimental Lab: Where fire and pressure force fearful rocks

Tantalum and Niobium: Science, statistics and supply considerations

Cultivating an Eon Rose: A new hybrid variety seeks multidisciplinary input to flourish and flower

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Geoscience Canada JOURNAL OF THE GEOLOGICAL ASSOCIATION OF CANADA JOURNAL DE L'ASSOCIATION GÉOLOGIQUE DU CANADA

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Report

EON-ROSE* and the Canadian Cordillera Array – Building Bridges to Span Earth
System Science in Canada

*Earth-System Observing Network - Réseau d'Observation du Système terrest/E

*ELE Boggs R.C. Aster, P. Audet, G. Brunet, R.M. Clowes, C.D. de Groch-Hedlin,
E. Donovan, D.W. Eaton, J. Elicit, J.T. Freymueller, M.A.H. Hedlin, R.D. Hyndman,
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F.L. Vernon, and N. West

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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

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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

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