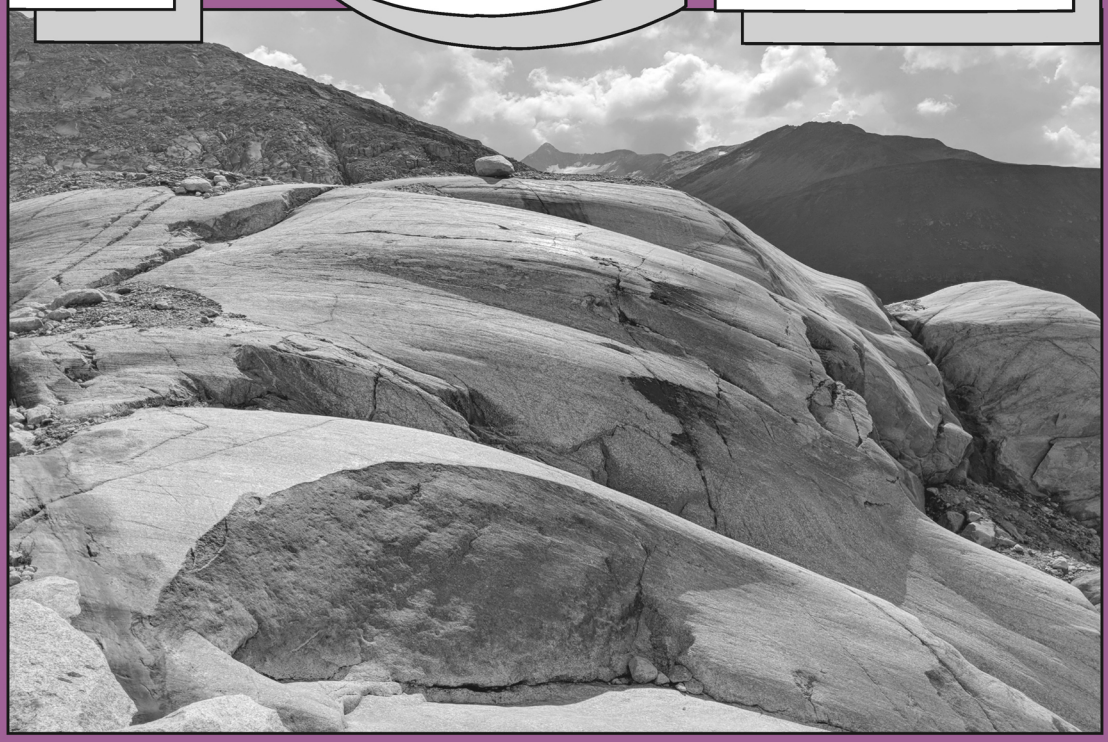
Number 180 *2nd Issue 2019*

ICE



NEWS BULLETIN OF THE INTERNATIONAL GLACIOLOGICAL SOCIETY

ISSN 0019–1043

Ice

News Bulletin of the International Glaciological Society

Number 180 2nd issue 2019

Contents

Cover picture: Recently exposed granitic roche moutonnée from forefield of Rhone Glacier, Switzerland. Ice was flowing from left to right. Photo by Lucas Zoet.

From the Editor

Dear IGS member

Welcome to the second issue of *ICE* for 2019.

This has been one of the busiest summers we have had for a long time. The final symposium of the year was the Sea Ice one which took place in Winnipeg, Canada. We had an attendance of more than 360 delegates, which I believe is a record for an IGS symposium. We have had a number of symposia with 300+ delegates but we have never been this close to the 400-delegate mark. The symposium was very successful but like all good things it had its negative aspects. Having had more than 400 abstracts submitted we had to have three parallel session, which meant participants had the difficulty of choosing between so many excellent talks and of juggling to make it to the next presentation on their list. Luckily the local organizers had chosen a venue where there were three halls very close to each other, so the frantic running was kept to a minimum.

The IGS is reaching a milestone in its existence with the establishment of the IGS Early Career branch. This will be an autonomous part of the IGS but the IGS will be supporting them as much as we possibly can. This brings me to the main topic of this editorial, support for Early Career researchers. You will have heard me talking about the drop in membership numbers and also the drop in manuscripts submitted to our journals. Luckily these trends have started to reverse but we still need more members and manuscripts. The only income the IGS has comes from membership and from author processing charges for articles in the journals. We would like to increase the support we give to Early Career researchers and to do so our income needs to be larger. Keep in mind the IGS's support of the Early Career Branch next time you consider renewing your membership or think about where to submit your new paper.

In the survey we conducted at the beginning of this year it was noticeable how many of you wanted us to do better on that front. We have supported the Alaska Summer School from the beginning and for the last couple of years we have also supported the Argentinian Summer School. We have also helped individuals to attend the Karthaus Summer School. We have supported various activities of Early Career and gender equality groups and we would like to continue to do so.

So, the question I have for you is this: Would you like to support and encourage activity like this? If you do, we need you to continue to be a member of the IGS and to encourage your peers to join. Not only that, but we need you to submit your manuscript to the *Journal* and the *Annals* and likewise to encourage your peers to do the same.

With more members and thicker publications, we can support you better. Don't get me wrong, our journals are excellent publications in themselves and highly respected, with healthy impact factors. And we have a solid membership base and we sponsor excellent symposia. I can honestly say that at every IGS symposium I have attended people come up to me to thank me, and they invariably say how much they enjoy our events and how much they benefit from attending. So we want more students and Early Career folks to be able to attend and experience the intimate feeling at an IGS symposium. The only way we can do that is with support from you. So please renew your membership (you can now get a 2- or 3-year membership, which saves you from trying to remember to renew every year).

I started this editorial talking about our symposia so I will finish on the same note. I have just finished reviewing our upcoming meetings and I must say we have an exciting program for the years ahead. Please go to our symposia website https://www.igsoc.org/symposia/ and start planning the years ahead.

I would especially like to draw your attention to our next symposium, to take place in the historical setting of Durham University. Planning is progressing nicely but I would like to spotlight a special event taking place during the week. As you know, the IGS recently awarded the Seligman Crystal to Richard Hindmarsh and Doug MacAyeal and the Richardson Medal to Hans Oerlemans. It so happens that all three will be at Durham and will be receiving their awards during the week of the Durham symposium.

See you all there!

Magnús Már Magnússon
Secretary General

Early-Career Scientists within the IGS, WELCOME to the Early Career Glaciology Group

The Early Career Glaciology Group (EGG) was formed in early 2019 within the IGS. Our aim is to connect early career scientists (ECSs) active in the various fields of glaciology and to foster networking during an early stage within the academic career. We would like to build an professional as well as socially warm environment for ECSs. At upcoming conferences and meetings you will find short courses and Q&A sessions organized by us. In addition, we are trying to arrange financial support for ECSs visiting IGS meetings.

More information about our activities (such as at IGS Branch meetings, EGU, IGS symposia) can be found on our webpage: http://igsegg.org/ or just follow us on twitter @egg_igs.

Please let us know how we could improve our work – any comments or suggestions are more than welcome!

Rebecca Schlegel

International Glaciological Society

JOURNAL OF GLACIOLOGY

Papers accepted for publication between 1 May and 30 September 2019. The papers are listed in alphabetical order by first author. Some of these papers have already been published.

Douglas Benn, Andrew Fowler, Ian Hewitt, Heidi Sevestre
A general theory of glacier surges

Douglas Benn, Robert Jones, Adrian Luckman, Johannes Fürst, Ian Hewitt, Christian Sommer
Mass and enthalpy budget evolution during the surge of a polythermal glacier: a test of theory

David Bonan, John Erich Christian, Knut Christiansen
Influence of North Atlantic climate variability on glacier mass balance in Norway, Sweden and Svalbard

Francisca Bown, Andrés Rivera, Michal Petlicki, Claudio Bravo, Jonathan Oberreuter, Carlos Moffat
Recent ice dynamics and mass balance of Jorge Montt glacier, Southern Patagonia Icefield

Sandra Brugger, Erika Gobet, Federica Schanz, Oliver Heiri, Christoph Schwoerer, Michael Sigl, Margit Schwikowski, Willy Tinner
Why loss matters: Reply to the comments of Festi and others (2019) on Brugger and others (2018)

Pinlu Cao, Qi Zhao, Zhuo Chen, Hongyu Cao, Baoyi Chen
Orthogonal experimental research on the structural parameters of a novel drill bit used for ice core drilling with air reverse circulation

Davide Castelletti, Dustin Schroeder, Elisa Mantelli, Andrew Hilger
Layer optimized SAR processing and slope estimation in radar sounder data

Marzieh Foroutan, Shawn Marshall, Brian Menounos
Automatic mapping and geomorphometry extraction technique for crevasses in geodetic mass balance calculations at Haig Glacier, Canadian Rockies

Roberto Francese, Aldino Bondesan, Massimo Giorgi, Stefano Picotti, José Carcione, Maria Cristina Salvatore, Franco Nicolis, Carlo Baroni
Geophysical signature of a World War I tunnel-like anomaly in the Forni Glacier (Punta Linke, Italian Alps)

Cyril Grima, Inka Koch, Jamin Greenbaum, Krista Soderlund, Dustin Schroeder, Duncan Young, Donald Blankenship, Sean Fitzsimons
Surface and basal boundary conditions at the southern McMurdo and Ross ice shelves, Antarctica

Ji-Young Ham, Soondo Hur, Won Sang Lee, Yeongcheol Han, Hyejung Jung, Jeonghoon Lee
Isotopic variations of meltwater from ice by isotopic exchange between liquid water and ice

Henna-Reetta Hannula, Jouni Pulliainen
Spectral reflectance behaviour of different boreal snow types

Nathan Hopkins, Edward Evenson, Dario Bilardello, Richard Alley, Claudio Berti, Kenneth Kodama
Magnetic anisotropy and debris-dependent rheological heterogeneity within stratified basal ice

Guillaume Jouvet, Matthias Huss
Future retreat of Great Aletsch Glacier

Lynn Kaluzienski, Peter Koons, Ellyn Enderlin, Gordon Hamilton, Zoe Courville, Steven Arcone
Crevasse initiation and history within the McMurdo shear zone, Antarctica

Hannes Konrad, Anna Hogg, Robert Mulvaney, Robert Arthern, Rebecca Tuckwell, Brooke Medley, Andrew Shepherd
Observations of surface mass balance on Pine Island Glacier, West Antarctica, and the effect of strain history in fast-flowing sections

Joshua Leigh, Chris Stokes, Rachel Carr, Ian Evans, Liss Marie Andreassen, David Evans
Identifying and mapping very small (<0.5 km^2) mountain glaciers on coarse to high-resolution imagery

Yang Li, Shichang Kang, Fangping Yan, JiZu Chen, Kun Wang, Rukumesh Paudyal, Jingshi Liu, Qin Xiang, Mika Sillanpää
Cryoconite on a glacier in the north-eastern Tibetan Plateau: light-absorbing impurities, albedos and enhanced melting

Katie Miles, Evan Miles, Bryn Hubbard, Duncan Quincey, Ann Rowan, Mark Pallett
Instruments and methods: hot-water borehole drilling at a high-elevation debris-covered glacier

Stephanie Mills, Anne Le Brocq, Kate Winter, Michael Smith, John Hillier, Katia Ardakova, Clare Boston, David Sugden, John Woodward
Testing and application of a model for snow redistribution (Snow_Blow) in the Ellsworth Mountains, Antarctica

Longjiang Mu, Xi Liang, Qinghua Yang, Jiping Liu, Fei Zheng
Arctic ice ocean prediction system: evaluating sea ice forecasts during *Xuelong*'s first trans-Arctic passage in summer 2017

Lu Niu, Gerrit Lohmann, Sebastian Hinck, Evan Gowan, Uta Krebs-Kanzow
The sensitivity of Northern Hemisphere ice sheets to atmospheric forcing during the last glacial cycle using PMIP3 models

Shad O'Neel, Christopher McNeil, Louis Sass, Caitlyn Florentine, Emily Baker, Erich Peitzsch, Daniel McGrath, Andrew Fountain, Daniel Fagre
Reanalysis of the US Geological Survey benchmark glaciers: long-term insight into climate forcing of glacier mass balance

Eric Petersen, Joseph Levy, John Holt, Cassie Stuurman
New insights into ice accumulation at Galena Creek rock glacier from radar imaging of its internal structure

Sarah St Germain, Brian Moorman
Long-term observations of supraglacial streams on an Arctic glacier

Pablo Sánchez Gámez, Francisco José Navarro, Toby Benham, Andrey Glazovsky, Robin Bassford, Julian Dowdeswell
Intra- and inter-annual variability in dynamic discharge from the Academy of Sciences Ice Cap and its role in modulating mass balance

Louise Schmidt, Christine Hvidberg, Jung Rack Kim, Nanna Karlsson
Non-linear flow modelling of a Martian lobate debris apron

Olga Sergienko, Duncan Wingham
Grounding line stability in a regime of low driving and basal stresses

Sunil Shah, Argha Banerjee, Harish Nainwal, R. Shankar
Estimation of the total sub-debris ablation from point-scale ablation data on a debris-covered glacier

Jakob Steiner, Pascal Buri, Evan Miles, Silvan Ragettli, Francesca Pellicciotti
Supraglacial ice cliffs and ponds on debris-covered glaciers: spatio-temporal distribution and characteristics

Aaron Stubblefield, Timothy Creyts, Jonathan Kingslake, Marc Spiegelman
Modelling oscillations in connected glacial lakes

Shin Sugiyama, Francisco José Navarro, Takanobu Sawagaki, Masahiro Minowa, Takahiro Segawa, Yukihiko Onuma, Jaime Otero, Evgeny Vasilenko
Subglacial water pressure and ice speed variations at Johnson's Glacier, Livingston Island, Antarctic Peninsula

Sojiro Sunako, Koji Fujita, Sakai Akiko, Rijan Kayastha
Mass balance of Trambau Glacier, Rolwaling region, Nepal Himalaya: in situ observations, long-term reconstruction, and mass-balance sensitivity

Peter Washam, Keith Nicholls, Andreas Muenchow, Laurence Padman
Summer surface melt thins Petermann Gletscher ice shelf by enhancing channelized basal melt

Xinyue Zhong, Shichang Kang, Wei Zhang, Junhua Yang, Xiaofei Li, Yulan Zhang, Yajun Liu, Pengfei Chen
Light absorbing impurities in snow cover across northern Xinjiang, China

ANNALS OF GLACIOLOGY 60(79)

The following papers have been selected for publication in Annals of Glaciology *60(79) (thematic issue on Progress in Cryoseismology), edited by Fabien Walter*

Samuel Taylor-Offord, Huw Horgan, John Townend, Paul Winberry
Seismic observations of crevasse growth following rain-induced glacier acceleration, Haupapa/Tasman Glacier, New Zealand

Joshua Carmichael
Narrowband signals recorded near a moulin that are not moulin tremor: a cautionary short note

Brad Lipovsky, Colin Meyer, Lucas Zoet, Christine McCarthy, Dougal Hansen, Alan Rempel, Florent Gimbert
Glacier sliding, seismicity, and sediment entrainment

Denis Lombardi, Irina Gorodetskaya, Guilhem Barruol, Thierry Camelbeeck
Thermally induced icequakes detected on blue ice areas of the East Antarctic Ice Sheet

Gregory Church, Andreas Bauder, Melchior Grab, Lasse Rabenstein, Satyan Singh, Hansruedi Maurer
Detecting and characterizing an englacial conduit network within a temperate Swiss glacier using active seismic, ground penetrating radar and borehole analysis

Michael Baker, Richard Aster, Robert Anthony, Julien Chaput, Douglas Wiens, Andrew Nyblade, Peter Bromirski, Peter Gerstoft, Ralph Stephen
Seasonal and spatial variations in the ocean-coupled ambient wavefield of the Ross Ice Shelf

Masahiro Minowa, Evgeny Podolskiy, Shin Sugiyama
Tide-modulated ice motion and seismicity of a floating glacier tongue in East Antarctica

Annals 60(79) is now complete

ANNALS OF GLACIOLOGY 60(80)

The following papers have been selected for publication in Annals of Glaciology *60(80) (thematic issue on Glacial Erosion and Sedimentation), edited by Neal Iverson and Lucas Zoet*

Devin Harrison, Neil Ross, Andrew Russell, Stuart Dunning
Post-jökulhlaup geomorphic evolution of the Gígjökull Basin, Iceland

Jasper Knight
Coeval brittle and ductile deformation beneath the late Wisconsinan Puget Lobe, Washington State, USA

Douglas MacAyeal
Revisiting Weertman's Tombstone Bed

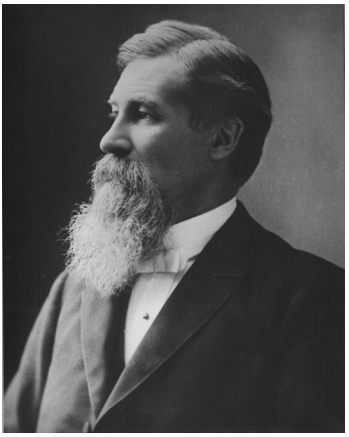
Atsuhiro Muto, Richard Alley, Byron Parizek, Sridhar Anandakrishnan
Bed-type variability and till (dis)continuity beneath Thwaites Glacier, West Antarctica

More papers for *Annals* 60(80) will be listed in the next issue

Glacial Erosion and Sedimentation

IGS Symposium, Madison, Wisconsin, USA, 12–17 May 2019

The IGS convened its symposium on glacial erosion and sedimentation in one of the USA's most 'livable' university towns, Madison, Wisconsin, on a landscape where some of the first scientific study of the topic was undertaken in the late part of the 19th century. (T.C. Chamberlin, president of the University of Wisconsin at Madison from 1887–92, was an important American glacial geologist whose ideas were stimulated by the diverse landscape surrounding Madison.) The most recent IGS symposium on the topic was held in Reykjavik in 1995, so the talks and poster presentations covered the full spectrum of topics ranging from the stubbornly enduring questions to the latest frontiers.



Thomas Chrowder Chamberlin, President of the University of Wisconsin from 1887–92, was a brilliant Earth scientist known for making important observations and proposing comprehensive theories on glacial erosion, sedimentation and climate change.

The symposium got off to a flying start with an Icebreaker held on the roofrop terrace of the venue, the Pyle Center in downtown Madison.

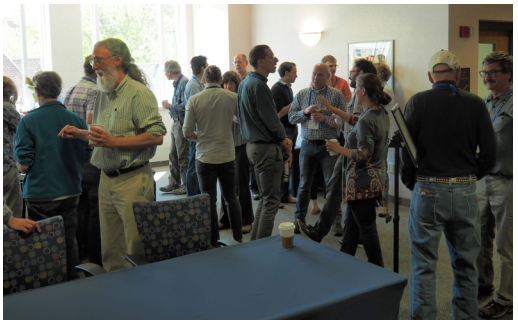
There was an impressive choice of local beers.

Participants in the symposium represented the range of glacial geological research on landforms and erosion/deposition processes as well as observations and observational techniques; but a key scientific dynamic of the meeting was the fact that ice dynamics, subglacial hydrology and ice physics were strongly represented. The first day's

The Icebreaker is always an excellent place to begin the week, reconnecting with old friends, meeting new ones and enjoying the ambience and the refreshments.

The symposium was opened by the Chief Scientific Editors, Neal Iverson and Lucas Zoet. Luke was also Chair of the Local Organizing Committee.

Presentations were soon under way in the spacious and well equipped meeting room.



There were plenty of opportunities for networking during coffee breaks...

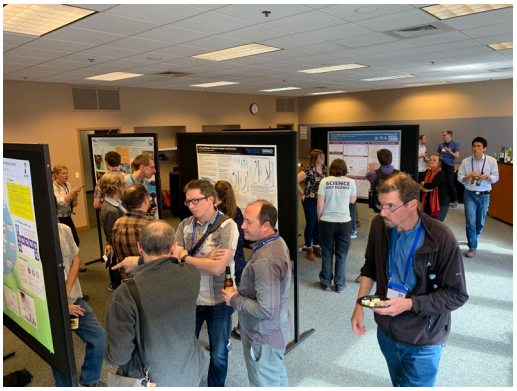
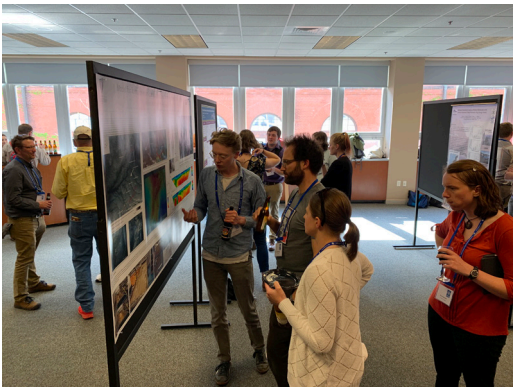
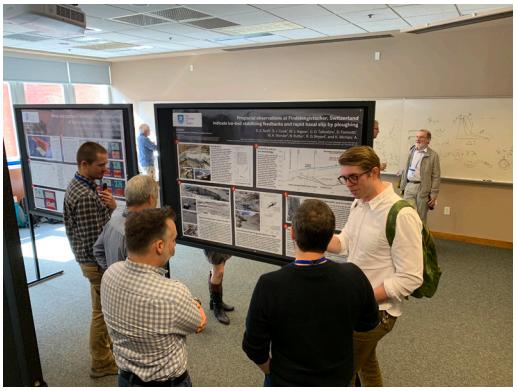
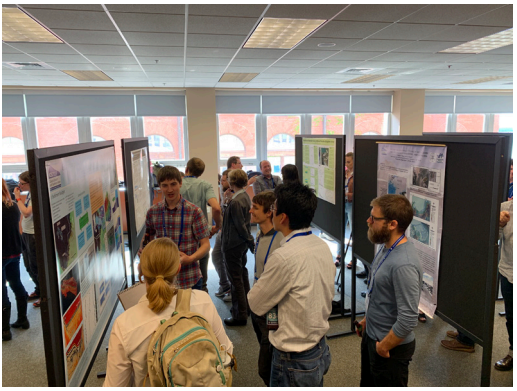
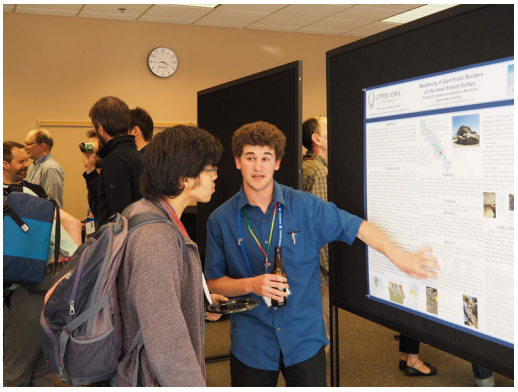
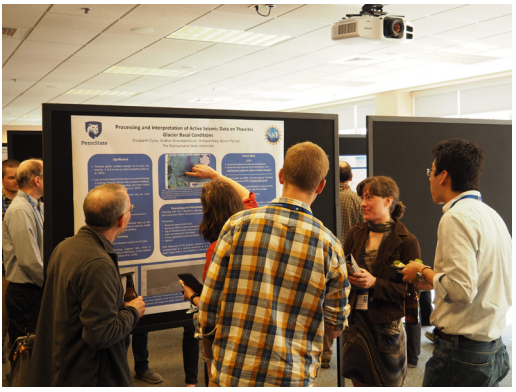
... and at lunchtime.

As usual, Magnús Már Magnússon, the Secretary General, was manning the registration desk.

keynote speaker, for example, was Professor Jenny Suckale from Stanford University, who spoke on the dynamics of ice/till interfaces in large-scale ice-sheet environments. Her talk was followed by a number of presentations covering subglacial fluvial processes as investigated by radar, seismic observations and numerical modeling. The first day continued with talks on basal sliding mechanisms and consequences and concluded with a public lecture by Professor Andrew Fowler, an applied mathematician, on the history of glacier sliding and glacier sliding research by three of the subject's pioneering scientists: Almut Iken, Hans Weertman and John Nye (all of whom had passed away in the year leading up to the symposium).

Day 2 of the symposium focussed on talks covering erosion and sediment transport, and featured talks by both 'established' old timers such as Bernard Hallet and Richard Alley, as well as students and early career scientists. Days 4 and 5 of the symposium were likewise focussed

Proceedings on Monday finished with a public lecture by Andrew Fowler on the work of Almut Iken, Hans Weertman and John Nye in the field of glacier sliding.

Networking and refreshments also featured during the poster session on Tuesday.

intensively on glacial landforms, tidewater glaciers and the Laurentide ice sheet. There were at least 10 students who contributed to the total of 54 oral presentations, and six students contributing to the total of 16 poster presentations. In all cases, oral presentations and posters evoked lively questions from the very vocal audience of symposium participants.

Day 3 of the symposium was devoted entirely to the mid-week excursion through the depositional and erosive glacial terrain of the region. The trip started in the vicinity of Madison and progressed northeast into the Kettle Moraine region. Owing to the excellent weather and preparation by the excursion's leaders, Dave Mickelson, Lucas Zoet, Elmo Rawling, John Attig and Kent Syverson, the excursion was a great success. Many classic glacial features of the region were visited such as drumlins, an interlobate area, hummocky topography, eskers, kames and

In preparation for the walk to the location of our lunchbreak, Dave Mickelson gave us a synopsis of the marshlands we were about to cross.

We had a delightful packed lunch at the visitor centre at the Horicon Marsh Department of Natural Resources station.

A number of glacial erosion and sedimentation experts examine a gravel pit excavated into the side of one of the drumlins from the Campbellsport drumlin field. These drumlins are the tallest found in Wisconsin and some of the tallest in the world. This is one of the few exposures of these drumlins and it contains a thick sequence of glacial outwash capped by a layer of till.

After lunch we again enjoyed an informative presentation by Dave Mickelson, this time in the auditorium at the visitor centre.

Following some healthy nourishment for both body and soul, as is evident from the smiling faces, we were on our merry way again.

As is compulsory for any University of Wisconsin field trip, we were treated to some cheese curds. As those of you can confirm who know the consistency of cheese curds, it can be difficult to engage in a discussion with a mouthfulof them, as Gwenn Flowers and Tim Creyts discovered.

The local experts always had a captive audience at the various point-of-interest stops.

The explanations were always accompanied by the relevant teaching aids ...

Andrew Fowler paid particular attention as he will be hosting the next symposium where drumlins will be on the agenda.

….in most cases a beautiful map printed on real paper.

Group photo with a local inhabitant.

The excursion finally made it to its last port of call, the Union Terrace beer garden, although too late for the intended accompanying brewery tour.

proglacial lake beds. At several of the various stops along the excursion route, debates about the glacial features evident in the area lasted so long that the excursion barely made it to its final stop, a trip to the Union Terrace beer garden (one element of the excursion that was not debatable).

Social events during the symposium included a picturesque icebreaker reception on the rooftop of the University of Wisconsin's Pyle Center overlooking Lake Mendota, and the traditional symposium banquet, also held in the Pyle Center. Due to the intensity of debate about the various landforms, including drumlins, on the mid-week excursion, Timothy Creyts, with assistance from Richard Alley, brought the famous sextet 'The Pleistocene Singers' together (including famed vocalists Kathy Licht, Carrie Jennings and Christine Kassab, with backup by Doug MacAyeal) to sing, a cappella style, the moving song: 'Mr Drumlin', based loosely on the 1954 ballad 'Mr Sandman' by Pat Ballard (most recently recorded by Emmylou Harris).

Mr Drumlin
(To the tune of 'Mr Sandman', words by Tim Creyts)

(Intro ba ba ba ba ba, etc.)

Mr Drumlin, tell me a story
Were you deposited in fast moving glory?
Are your two ends pointed or round?
Did you emerge as till was ground down?

Scenes from the Banquet on Thursday evening.

The Pleistocene Singers in full flow. Click on the image for the video! (If you are reading a paper copy it's at https://www.igsoc.org/symposia/2019/madison/IMG_0832.MOV)

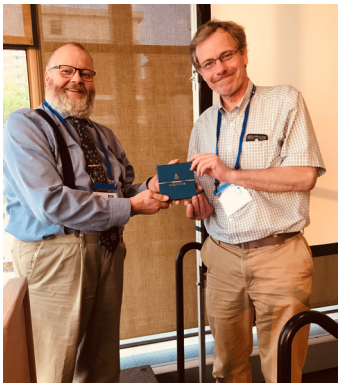
Mr Drumlin, you're not alone,
You've got some friends there, that much is known
Please tell us what happened before I get weary,
What is the physics underlying your theory?

(Middle ba ba ba, etc.)
Mr Drumlin, tell me the theme
Give me the insight to that fast ice stream
Give us the idea of your very smooth hill
Tell us, please, was it deformational till?
Mr Drumlin, what was the ice speed?
And how much water did you really need?
Did it dilate between every clast?
And were you sculpted at first or at last?

Overall, the symposium was intimate and fully delivered on the notion that a lot has been happening in glacial erosion and sedimentation research since 1995 when the last IGS symposium on the topic had taken place. The symposium was concluded after five full days of interaction among 86 participants from nine countries. The IGS expresses its deep gratitude to the Local Organizing Committee: Lucas Zoet (Chair), Dave Mickelson, Elmo Rawling, Shaun Marcott, Carrie Jennings and Urs Fischer, as well as to the Scientific Steering and Editorial Committee: Neal Iverson and Lucas Zoet (co-chief editors), with scientific editors David Egholm, Gwenn Flowers, Mark Johnson, Shaun Marcott and Chris Stokes.

Doug MacAyeal

The award for best student poster went to Brandon Graham. Here he is receiving his award from Secretary General Magnús Már Magnússon. The award for the best student oral presentation went to Emma MacKie. Unfortunately she had to leave us early and was unable to receive her award in person.



At the Banquet, the Secretary General also presented IGS dishes to Neal Iverson and Luke Zoet in recognition of their hard work in putting the symposium together and ensuring that it all ran smoothly.

British Branch Meeting 2019

Geography and Environmental Sciences, Northumbria University, Newcastle-upon-Tyne, UK, 4–5 September 2019

The 44th Annual Meeting of the International Glaciological Society British Branch was hosted by Northumbria University, on 4 and 5 September 2019. We were welcomed to the north-east by Nick Rutter and the organizing committee, and started off the conference with a welcome address from John Woodward. The conference had excellent attendance, with 92 people submitting an abstract. Altogether, we had 47 talks, with 10 student presentations, and a lively poster session with 45 posters. To keep things environmentally friendly, all conference materials were provided digitally, which worked extremely well and saved a lot of paper!

The first day started with a session on glacier dynamics and mass balance, which travelled all the way from the Russian Arctic, presented by Paco Navarro, to the Last Glacial Maximum moraines of New Zealand, presented by Jenna Sutherland. We had three excellent talks on High Mountain Asia. First, Tobias Bolch discussed mass budgets since the 1960s. Next, Ethan Lee went further back in time and looked at changes in the Himalaya since the Little Ice Age using moraine mapping. Finally, Owen King talked to us about the impacts of lake expansion on Himalayan glacier loss.

The second morning session focused on ice-sheet dynamics and mass balance, and started with Tavi Murray presenting her findings from borehole measurements from the Rutford Ice Stream. Next, we moved to Greenland and had excellent talks on plume modelling and patterns of margin change around Greenland, determined from Google Earth Engine. Next, we moved back to the southern hemisphere, for Frazer Christie's presentation on changes in the grounding lines and velocities of West Antarctic glaciers. We finished up the session with a talk on the use of high-resolution time-lapse data to understand Greenlandic glacier calving and plumes, and Andrew Sole's findings on late winter speed-ups on Nordenskiold Glacier.

After lunch, we had an entirely snow-focused session, for possibly the first time at an IGS British Branch. We started off with Hamish Pritchard outlining a new approach to measuring across wide areas, using lake levels. Next, we moved into the forests, to understand the impact of canopies on snowmelt and albedo, with Markus Todt and Johanna Malle. The following three talks focused on snow modelling, including assimilating geophysical data, microstructure and tundra. Unfortunately, Richard Hindmarsh was unable to attend and deliver his Seligman Crystal talk, and so the Branch AGM was then held. The treasurer's report was presented and it was agreed that the branch meeting would take place in Edinburgh in 2020.

After talks concluded at mid-afternoon, we transitioned to the Wylam Brewery. Contrary to unsubstantiated rumours, the organizing committee were indeed able to organize a poster session in a brewery, and it was an excellent one at that. The atmosphere was vibrant and discussions were helped along by the selection of excellent Wylam ale. It was excellent to see a large number of student presenters, who really engaged with the

Ethan Lee telling us about Little Ice Age glacier shrinkage in the Himalaya.

Richard Essery taking the talks in a different direction.

Enjoying the conference dinner in a picturesque setting.

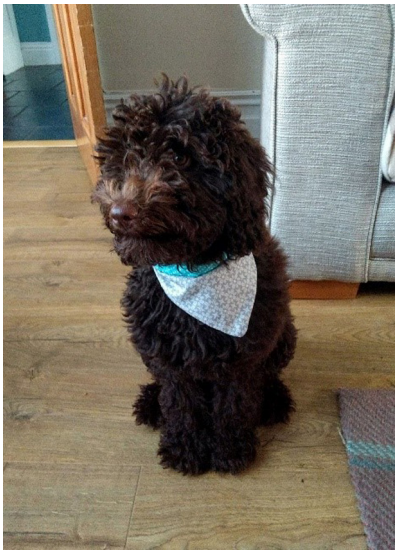
discussions and presented their work brilliantly. The conference dinner swiftly followed, which brought excellent food, further beverages and ongoing discussions of all things glacial.

Day 2 kicked off with a session on Ice Shelves and Ice–Ocean Interactions. This started with two talks on modelling ocean-driven retreat and then moved on to Emily Hill's presentation on the response of Peterman Glacier to loss of its ice tongue. After that, we looked at fracture mechanics and the impact of ice-shelf geometry on the calving cycle of the Brunt Ice Shelf, presented by Jan de Rydt. Following this, we heard how the atmosphere can double the impact of ocean warming in Greenland (Donald Slater) and learnt about the evolution of supraglacial lakes on the Larsen B, prior to collapse, presented by Amber Leeson. The session wrapped up with Joe Mallalieu talking to us about his time-lapse analysis of calving processes at the west Greenland margin.

The penultimate session focused on ice sheet and glacier hydrology. The first talk took us to Antarctica, where Bernd Kulessa told us about using airborne and ground-based geophysics to understand the evolution of the hydrological system. Neil Ross followed, also speaking about geophysics and showing us how much difference a small amount of additional data can make to ice-sheet-scale bed topography products. Next, we looked at subglacial lakes in the Ellsworth Mountains, followed by two presentations on glacial lakes at the margins of the Greenland Ice Sheet.

The final session focussed on glacier geophysics and biogeochemistry. We started off with a very interesting, if rather concerning, talk by Caroline Clason about contamination of glaciers. We were very happy to see Caroline back at British Branch this year and to have Isla the dog join us in her very fetching IGS scarf. Following Caroline, we asked why are ice-sheet beds always smooth and what can subglacial hydrochemistry reveal about upstream glaciological conditions? Kate Winter then talked to us about englacial layers, detected from radar and Stewart Jamieson discussed long-term reconstructions of past Antarctic topography. Michael Cooper and David Ashmore continued the paleo theme, discussing the forgotten record of glacier and ice-sheet change and age-depth constraints in the Weddell Sea. This marked the end of the presentations.

The meeting concluded with the annual award of the John Glen prizes for student presentations,



Isla, our youngest and fluffiest attendee, sporting her very fetching IGS dog scarf.

which were judged by Anne Le Brocq, Jim Jordan and Pete Nienow. The winners were Johanna Malle for the best talk, entitled 'Effects of canopy structure and snow cover fraction on wintertime land surface albedo of forested environments' and Will Smith for his poster on 'Automatic identification of supraglacial debris expansion using Google Earth Engine: a new tool for glacier monitoring'. Congratulations are extended to both our winners and to all the students who attended the conference.

We heartily thank the local organizing committee for all their hard work and for organizing another excellent British Branch meeting. We look forward to seeing everyone at the next meeting in Edinburgh University in September 2020.

Rachel Carr

Presentations of the John Glen prizes to Will Smith (best poster) and Johanna Malle (best talk).

News

Annual General Meeting 2019

9 July 2018, Mackenzie Room, Stanford Engineering Quad, Stanford University, California, USA

The President, Francisco J. Navarro, was in the Chair.

33 persons, from 13 countries, attended of whom 32 were members.

1. The previous AGM's minutes
The Minutes of the last Annual General Meeting, published in the 3rd issue of *ICE,* 2018, No. 178 and on the IGS website were approved on a motion by H. Miller seconded by R. Bingham and signed by the President.

2. The President's report
The President gave the following report for 2018/19:

Ladies and gentlemen, members of the IGS and dear colleagues

1. Actions undertaken during the last 10 months
Part of the work since the last AGM has been the continuation of some actions initiated or completed during the previous period. Therefore, when discussing these pieces of work, I will briefly recap the status of these subjects at the end of the previous reporting period.

a) The IGS Council, in its meeting of 20 June 2018, approved the composition of a new ad-hoc committee, on Governance Changes, promoted by the President and aimed at proposing changes to our current Constitution (the last version of which is dated 21 July 1985) necessary to adapt the governance of the IGS to the new times and to the demands of the membership. The composition of this ad-hoc committee was: Regine Hock (Chair), Hilmar Gudmundsson, Christina Hulbe, Doug MacAyeal, Magnús M. Magnússon, Francisco Navarro and Laura Stevens/Doug Brinkerhoff (Early Career), although Hilmar Gudmundsson resigned as a Committee member a few months later. The first step of this Committee was to design a survey, mostly addressed to the IGS membership, to know about their feelings and ideas regarding the envisaged governance changes. The survey preparation finished by mid-December 2018 and was announced by various means (including the Cryolist) on 17 December 2018, with deadline 15 Jan 2019. The latter was extended to February 2019 to allow people participating in Antarctic fieldwork to complete the survey. The number of valid answers to the survey was 358, of which 86 were only partially completed. Unfortunately, the analysis of the survey results has not been undertaken yet, mostly due to heavy involvement of the Committee chair in the IPCC Report writing.

b) The Awards Committee completed in April 2018 the compilation of a new document on Awards definition and criteria, together with an accompanying document on Committee Procedures. Unfortunately, soon after its completion the Committee Chair, Lora Koenig, stepped down from her position because of a change in job, and Regine Hock (who had been most active, together with Lora, in the development of the new Awards criteria) also stepped down, after several years in the Committee. Several other Committee members also ended their terms. The appointment of new members for this important committee, and in particular its chairperson, required a substantial effort (and amount of time), but was finally completed by the end of January 2019. The new composition of the Committee is: Ian Allison (Chair), Dirk Notz (repeating), Elisabeth Isaksson (repeating), Carleen Tijm-Reijmer, Andrew Mackintosh, Sergey Sokratov and Shin Sugiyama, plus the IGS President and Secretary General as ex-officio members. The Committee soon discussed and decided the timing of the call for awards, and the deadlines for submission of nominations, their evaluation by the committee and for final decision on the awards. This process has been completed a few days ago, and the 2019 awards have been approved by the Council in its meeting of this morning. The awards recipients will soon be announced. This is an important step, since, for various reasons (including the lack of clear definitions and procedures, and this is why the previous Committee decided to focus its efforts on this aspect prior to giving out any new awards) no Seligman Crystal Awards have been awarded since 2013, and no Richardson Medals since 2018. I hereby extend my thanks and my acknowledgement to the Awards Committee, with special recognition to its Chair, Ian Allison, for their efforts and efficient work.

c) During the first half of 2018, the embryonic Early Career Scientist committee (basically there were only two active persons, Laura Stevens and Doug Brinkerhoff) wrote their Terms of Reference (ToR), which were approved at the Council meeting of 20 June 2018. This group took the name of IGS Early-career Glaciologists' Group (EGG). Significant efforts were needed during the second half of 2018 to bring together a sufficient number of early-career glaciologists interested in joining the EGG Committee and moving forward this initiative. Following several e-mail comments and discussions, the EGG Committee held an initial teleconference in early April of 2019. The main ideas discussed during this meeting, which have also been briefly discussed by the IGS Council in its meeting of today, include:

- The organization of early-career mini-symposia in conjunction with IGS meetings, in which ECGs will share their research with their peers, and will solicit invited talks from later-career glaciologists on topics related to professional development in glaciology.
- The pursuit of funding from IGS and external organizations to finance intensive collaborative research opportunities for ECGs (inspired by the general consensus on the usefulness, at the early-career stage, of experiences usch as the Karthaus and McCarthy summer schools). The EGG acknowledges the logistical efforts and expenses associated with such activities.
- The establishment of an early-career award for best presentation at an IGS symposium. The EGG acknowledges that more consideration is needed to determine how this interfaces with existing IGS efforts (in particular, see below the Graham Cogley Award).
- The establishment of an EGG website as the central mechanism for advertising EGG activities. Doug Brinkerhoff has volunteered to undertake this effort, and to host the website at the University of Montana.
- In order to support the above activities (in particular the first one), EGG intends to request some small funding from IGS.

Further discussion on the above items is needed in order to analyse their feasibility and possible implementation.

d) Related to both of the above bullets 2 and 3, a new award has been established by the IGS, jointly with the International Association of Cryospheric Sciences (IACS), to honour the memory of our former Chief Editor Graham Cogley. This award, sponsored by Graham's widow, Kathie, who (together with Regine Hock) was the 'alma mater' of the award), is addressed to early-career students. The award will be given once a year alternately by IGS and IACS.
IGS will give the award to a student who has published a paper of exceptional quality in the *Journal of Glaciology* or *Annals of Glaciology*. The selection process will be based on the IGS Chief Editor and Associated Chief Editors' decision.
IACS will give one award each for the best student oral and best student poster presentation at bi-annual IACS General Assemblies as judged by an evaluation committee to be established by IACS. The establishment of this award has already been approved by the Council, pending of the final details on the process, to be discussed by the Awards Committee. But the main lines (as sketched above) have been approved, because the first award will be given at the IUGG/IACS conference in Montreal in July 2019. This new award fulfils one of the wishes expressed by the EGG.

e) The Nominations Committee has undergone a full renovation since the last AGM. Doug MacAyeal, as last IGS President, became its new Chair, and completed the renovation of the Committee membership in February 2019. The renovated membership is:
Chair: Doug MacAyeal
Members:
Jennifer Hutchings, Liss Andreassen, Mikhail Ivanov, Allen Pope and Kumiko Goto-Azuma, plus the IGS President and Secretary General as ex-officio members.
The Committee's main task has been the configuration of the slate for replacing Jennifer Hutchings, Liss Andreassen, Mikhail Ivanov, Allen Pope and Dirk Notz for the next election of IGS officers and Council members (involving one Vice-President and five Council members), which will be voted under a later agenda item of this AGM.

f) By the time of the last AGM, the Publications Committee had been renovated with a new Chair (Gwenn Flowers) and two new members (Valentina Radić and Ian Allison). The remainder of the committee's members were C.J. van der Veen and W.T. Colgan, and the IGS President, Secretary General and Chief Editor as ex-officio members (for the position of the IGS Chief Editor, Hester Jiskoot replaced

Graham Cogley upon the death of Graham). C.J. van der Veen and W.T. Colgan were ending their terms by the end of 2018, but were kept on duty to avoid a complete change of the Committee in a brief period. Since the last AGM, the Publications Committee has been involved in various tasks, including the consideration of the new Editorial Board, the definition of the new type/format of papers (articles, letters, correspondence, where the letter is the new entity and the correspondence has partly changed its aims), the change in the layout of the *Journal* and *Annals* papers (more conformative to the online layout of papers, and which will help speed up the Cambridge University Press typesetting) and other publication-related matters.

g) The Editorial Board of the IGS, under the leadership of Hester Jiskoot upon the passing of Graham Cogley (initially as Acting Chief Editor, and as Chief Editor since 4 May 2019) and with the strong involvement of Frank Pattyn as Associate Chief Editor (ACE), and the two new ACEs Nicolas Eckert and Ralf Greve, as well as support from the new expanded set of scientific editors, have all together succeeded in returning to normal the delay in reviewing papers resulting from Graham's illness and subsequent death. Special thanks are owed to the superb performance of Hester Jiskoot, followed by that of Frank Pattyn.
Regarding the evolution of the *Journal* and the *Annals* during 2018/19, despite the very slight increase of the *Journal* impact factor (from 3.200 in 2017 to 3.261 in 2018) and a substantial increase of that of the *Annals* (from 2.761 to 3.131), the number of submissions, and of printed pages, is still low for both. For the *Journal* the number of submissions in 2018 was 13% lower than that of 2017 (perhaps as a result of the delay in processing and reviewing of papers associated to Graham Cogley's illness and death), and the number of printed pages in 2018 was slightly lower than in 2017, which in turn was slightly lower than in 2016; the trend seems to continue in 2019. For the *Annals*, although the number of printed pages was 15% higher in 2018 than in 2017, it was still well below the number for 2016 (although 2016 had three symposia, versus two in 2017 and two in 2018; also the number of pages per symposia has been lower for 2017 and 2018 than for 2016). Again, the trend seems to continue in 2019. All efforts should be made to encourage submissions to both the *Journal* and the *Annals*. Note that this has serious budgetary implications, as a substantial part of the IGS income arises from the CUP royalties per number of papers published.

h) The drop in membership continues to be a matter of concern. The number of paid memberships (i.e. excluding complimentary memberships offered to non-IGS members registering to IGS symposia) has continued in 2018 its marked decreasing trend initiated in 2015, reaching in 2018 the absolute minimum in the last decade, but has improved in 2019 and we are close to the level of membership we saw in 2017. Again, all efforts should be made to encourage membership.

2. Plan of action for next year

a) The main task immediately ahead is the implementation of the IGS governance changes, which requires, as a first step, the analysis and discussion by the ad-hoc committee of the results of the survey to the IGS membership discussed above. From this should result a set of proposed changes to the IGS Constitution, to be further discussed and agreed by the IGS Council before mandatory (as of the current Constitution) final approval by the IGS membership. The needed changes could include, for example, the possibility to have online Council meetings, to modify/adapt the Council membership and conditions for quorum (which were designed for in-person meetings), and any other possible changes in the structure of the IGS addressed to make its governance more efficient.

b) The sustained drop in membership since 2015 discussed above continues to be a matter of concern. Of particular relevance is the increase in membership of early-career students/researchers. Let us hope that the recent and foreseen progress of the EGG will help on this. Regarding the general membership, it is my opinion that the national correspondents could play a role in tracking and reinforcing membership in their respective countries. This, of course, is more feasible in countries with a well integrated glaciological community. And for this we also need well motivated national correspondents. The role of the national correspondent should be revisited, and assigned clear responsibilities, among them, the mentioned tracking and reinforcing of the IGS membership in the respective countries. But, beyond a possible action by the national correspondents, this is a matter that every IGS member should take seriously, promoting IGS membership among their peers and students.

c) It is also the aim of the President, in collaboration with the Editorial Board and the

Publications Committee, to search for ways to make the *Journal of Glaciology* and *Annals of Glaciology* more attractive to potential authors, with particular attention to early-career researchers. Again, let us hope that the Graham Cogley award will be a further motivation for publishing for the early career researchers.

d) Finally, tight control is required of the IGS finances, as some of the issues discussed in this report (in particular, the drop in number of submissions and published pages in the IGS journals, and the drop in membership) imply a substantial reduction of income.

Let me finish this report by acknowledging the IGS Secretary General, Magnús Magnússon, and the members of the Council, the Editorial Board and the various committees of the IGS, for their hard and generous work to make the IGS progress and improve. My thanks are also extended to the Membership and Accounts Manager, Louise Buckingham.

Francisco Navarro
President

The Secretary General invited attendees to ask questions or to comment on the President's report.

O. Eisen asked what was the absolute number of papers submitted to the *Journal* and what is the acceptance rate for those papers.

The President responded and reported that for 2018 the *Journal* had 152 submissions and the average rate of acceptance was about 50%. In 2017, 175 papers were submitted, in 2016 there were 172 and before that there were typically between 180 and 195. The acceptance rate has been fairly constant, at about 55% on average, for the past 8 years.

M. Siegert said that he had attended several meetings and that there had been discussions that those who register as non-IGS-members would get a year's membership to the IGS. He asked whether this had been implemented.

The SG responded and said Council had approved this back in 2010 and it was implemented in 2011.

There were no further questions

E King proposed and D Blankenship seconded, that the President's report be accepted. This was carried unanimously.

3. The Treasurer's report
The Secretary General presented the Treasurer's report with the audited Financial Statements for the year ended 31 December 2018 on behalf of the IGS Treasurer, Amber Leeson.

Fellow members, ladies and gentlemen

The Society's accounts underwent an independent examination rather than a full audit this year. Throughout my report, I will refer to the Society's unaudited accounts for 2018, referring to the relevant page numbers.

As this is my first report as the IGS Treasurer, I have essentially based it on the reports of my predecessor, Ian Willis.

The Society's finances are summarized by considering the changes from 1 January 2018 to 31 December 2018, as shown on page 12 of the accounts. In the table, the Restricted Funds refer to money associated specifically with the Seligman Crystal and the Richardson Medal. The Unrestricted Funds is everything else.

Restricted Funds: increased by £78 from £5344 to £5422 as a result of the interest on investments. No Crystals were awarded in 2018. One Richardson Medal was awarded in 2017 but not given out until 2018. As several blank medals are made on a regular basis (the last time was in 2016) the IGS office has medals 'in stock' so the only cost incurred was £15.95 for engraving.

Unrestricted Funds: decreased by £46 649 from £468 225 to £421 576. This is due to 1) expenditure exceeding income by £28 788 and 2) net losses on investments of £17 783.

Total: The Society had its net resources before revaluation drop by £28 788 and on top of that a loss on investments of £17 783 resulting in a negative movement in the Society's funds of £46 571 in 2018, compared to a gain of £337 in 2017. In previous years we have had a loss of £59 209 in 2016, profits of £35 697 in 2015, £97 204 in 2014, £8477 in 2013, £28 092 in 2012, and losses between 2008 and 2011.

We have no control over the investment gains/losses but the deficit of £28 788 associated with income and expenditure is primarily caused by:

- The royalties from CUP were ~£6000 less than the previous year (i.e. fewer papers published).
- *Drop in membership income.* Starting in 2018 the IGS reduced the membership fee from £72 to £52 for an ordinary member. That is an effective reduction of 27.8%.

  The IGS gives a person who registers as a non-member to its symposia a membership for the current year. For accounting purposes this has to be entered as membership income. To counter that (non-existent) income the symposia income has to be debited by the same amount. And as the IGS had two well attended symposia in 2017 the 'free' membership

was added as in income under membership amounting to £4380. The same amount was debited from the respective symposia income.

In 2018 we had two much smaller symposia, so the corresponding income added to 'Membership' amounted to £2514. Correspondingly the same amount was debited from the 'Symposia' account.

- *Decline in membership*. In 2017 we had 697 paid members and in 2018 we had 582 paid members. That is a reduction in membership of 16.5%. As a result, the income from membership dropped from £47 350 in 2017 to £32 823 in 2018.
- The symposia in 2018 (180 delegates altogether) were quite small compared to 2017 (385 delegates altogether). For most parts the work involved for symposia is similar irrespective of the number of delegates. So, when that is spread between 180 delegates vs 385, the net income is substantially less. Attendance numbers depend on the venue for the symposium and since the society prefers to rotate venues for symposia small numbers are occasionally unavoidable.
- Income tends to fluctuate less between years than expenditure. For example in 2017 income was £324 676 and in 2018 it dropped to £188 206 (£136 000 less). Expenditure in 2017 was about £333 000 whereas it was £217 000 in 2018 (£116 000 less). So the difference in the respective 'drops' is about £20 000. In other words, the income and expenditure do not correlate exactly.
- If we then look at the difference between 'Cash at bank and in hand' (page 13 of the accounts), we can see that it has dropped by about £16 000. This is in part because last year we paid Portland University the residue left over from 2012 when we were in charge of the registration for the Portland SCAR Open Science Meeting. The reason for the delay in transferring these funds is on their part; it was only requested by them last year.

Although this large deficit is somewhat disappointing, it is reassuring that it can be explained. The Society's expenditure is now of the order of ~£217 000 and its total assets are ~£427 000. In this respect, the Society is not in a bad place, but we continue to aim to at least break even in future years, and preferably close the cumulative deficit that has accrued since 2007.

More detail is given below, income is itemzed in notes 2–5 of the accounts, and expenditure is listed in notes 6–8 and in the unnumbered Support costs on pages 19–20 of the accounts.

Income:

Note 2. Donations were £20 in 2018 compared to £2013 in 2017. No grants were received in 2018..

Note 3. Income from interest on investments was slightly less in 2018 compared to 2017: down by £2306 from £10 679 to £8373. Income from this source had been rising for the last few years, but 2018 was known to be a bad year for markets generally so this fall is not surprising. The Society continues to invest part of its capital in 'higher interest' but still 'low risk' investment accounts, and this is reviewed each year.

Note 4. Incomes associated with the *Journal* and *Annals* were slightly up in 2018 compared to 2017. In 2018 the Society received an income of £9960 from the *Journal*, *ICE* & Books, up from £5255 in 2017, but still below £12 407 we received in 2016. Similarly, for *Annals*, in 2018 we received £310 compared to £843 in 2017.

Income from Meetings/Symposia was down by £127 487 from £179 621 in 2017 to £63 395 in 2018. This reflects the fact that, although we had two symposia in both years there were considerably more delegates attending in 2017 (385) than in 2018 (180).

Income from membership was down by £14 527 from £47 350 to £32 823. It fell by £4287 from £51 637 between 2016 and 2017. This fall in membership since the Society moved to Open Access publishing is worrying, although it is good to see that the membership has risen in 2019 to levels similar to 2017. Membership income is determined by the 'Membership rate', 'The number of delegates attending IGS symposia' and of course the number of members.

For a breakdown of the drop of the membership income see item 2 'Drop in membership income' on page 1 of this report.

The CUP royalty was down £6021 from £78 470 to £72 449. This has not been split by *Journal/Annals* but the drop represents the fewer articles published in the *Journal* in 2018 compared to 2017, but mostly the far fewer articles published in the *Annals* (two issues were published in both 2017 and 2018).

Note 5. The sales of *Journal* and *Annals* direct to members and the sale of *ICE* to libraries and members are managed directly by the Society. In this respect the income from the *Journal* is slightly up in 2018, £3412 versus £3287 in 2017. In addition to this the IGS received an income of £4488 as a result of a member paying in advance for publication (otherwise they would have lost the funds due to the expiry of a grant) and the IGS then waived the APCs once the articles were accepted. This brings the total income from the *Journal* to £7900. Similarly for *ICE*, the income

is also slightly up, £2060 compared to £1968 in 2017. The total income from the *Journal*, *ICE* & Books was thus £9960. For the *Annals* the income is down, £310 in 2018 versus £843 in 2017.

Expenditure:
Note 6. A summary of all expenditure shows that outgoings associated with running Meetings & Symposia were down by £114 660 from £209 454 in 2017 to £94 794 in 2018. This is due to much smaller symposia being run in 2018 compareds to 2017. Expenditure on other charitable activities (everything else the IGS does besides run the Meetings/Symposia) was slightly down by £1916 from £121 083 in 2017 to £122 999 in 2017.

Note 7. In 2018, grants totalling £5450 were made to support the Alaskan and the Argentinian Glaciological Summer Schools and to support student attendance at various events and glaciological summer schools other than Alaska and Argentina, e.g. Karthaus (whereas in 2017 there were only grants given to individuals to support attendance at various events and summer schools totalling £1321).

Note 8. Direct costs are down substantially in 2018 compared to 2017, from £211 988 to £106 905 or by close to 50% (£105 038). The biggest reductions were in cost relating to symposia ~£100k which is primarily because of the size of the symposia. Wages and salaries were down by £4k. Other direct costs showed relative small gains or falls.

Support costs
General support costs are down by £16 705 from £79 894 in 2017 to £63 189 in 2018. In general, overall support costs have fallen. Similarly, computing and web hosting costs are down due to reduced number of staff in the IGS office and no major IT purchases. Wages and salaries and associated National Insurance and pension costs are down by £14 311.

Governance costs are stable and comparable to last year.

Overall, the total support costs are down by £15 667 from £119 144 in 2017 to £103 477 in 2018.

Summary
The Society's finances are in reasonable shape in spite of the loss incurred. The deficit in 2018 amounts to ~11% compared to our total funds in 2018, similar to 2016. We essentially broke even in 2017 compared to the deficit in 2016 (~11% of funds) and the surpluses in 2015 (~7% of funds), 2014 (~20% of funds), 2013 (~2% of funds) and 2012 (~7% of funds), and various deficits between 2008 and 2011 (ranging from ~1% to ~27% of funds).

The Society must continue to monitor its income largely from CUP, membership fees, and symposia registration, and its outgoings associated with running symposia and running the IGS office.

As my predecessor, Ian Willis, mentioned in his report from last year, it is increasingly important for the IGS to hold on to and attract new authors and have them submit articles to the *Journal* and to *Annals*. The more papers published, the greater the contribution the IGS receives from CUP. This is the main single revenue stream to the Society. The decline in papers published in the *Journal* over the last two years is regrettable and we should work harder with CUP to reverse this trend. It is also increasingly important for the Society to hold on to and attract new members, as membership fees are also a valuable source of income to the Society. Again, it will need to think of innovative ways of making the Society more attractive, especially now that a major reason for joining (copies of the *Journal*) is no longer an incentive because of Open Access. It is difficult to see how individual symposium registration fees can be increased as these are already relatively high compared to, for example, EGU and AGU. But obtaining external grants to sponsor certain aspects of IGS symposia, which therefore benefit the Society, would be advantageous. It is also advantageous to have bigger symposia and investigate how we can collaborate with other societies and organizations as we did in 2017 in Wellington, New Zealand, where we joined up with IACS, SCAR, CliC, etc.

On the output side, the Society must monitor its expenditure associated with running symposia and with generally running the IGS. Making greater use of online virtual meeting platforms for Council meetings and holding Council meetings at IGS Symposia (rather than at. for example, AGU or EGU) would save the Society some expenditure. This will be addressed by the Governance Review Committee as it will require a constitutional change.

There are economies of scale to be made when the Society runs more than one symposium per year and it is significantly advantageous if the Society can run at least two per year. Salary costs (including NI and pension contributions) are, as in many organizations of course, the most expensive item of expenditure, totalling £95 757 in 2018 or 44% of all expenditure (note, however that expenditure was down by 35% and salary costs were down by 15%). In 2017 salary costs were 34% of all expenditure.

I am indebted to Magnús Magnússon and Louise Buckingham for all they've done for the IGS over the past year, and for their help in checking some of the facts and figures in a draft of my report.

Amber Leeson, Treasurer
6 July 2019

The Secretary General invited members to discuss the Treasurer's report.

No questions or comments were put forward.

O. Eisen proposed, and H. Miller seconded, that the Treasurer's report be accepted. This was carried unanimously.

4. Election of auditors for 2019 accounts
The Secretary General proposed that the IGS remain with our current auditors, Messrs Peters Elworthy and Moore; as they have been doing our accounts for several decades, they knew the innards of the IGS very well.

On a motion from the Secretary General, R. Jacobel proposed, and N. Karlsson seconded, that Messrs Peters Elworthy and Moore of Cambridge be elected 'Independent Inspectors or Auditors', whichever is appropriate for the 2019 accounts. This was carried unanimously.

5. Elections to Council
After circulation to members of the Society of the Council's suggested list of nominees for 2019–22, no further nominations were received, and the following members were therefore elected unanimously.

The following nominations were suggested to the Council by the Nominating Committee for service for the terms indicated:

Vice-President:	Christina Hulbe (New Zealand)	(2019–22)
Elective Members:	Małgorzata Błaszczyk (Poland)	(2019–22)
	Indrani Das (USA)	(2019–22)
	Margareta Hansson (Sweden)	(2019–22)
	Matthias Huss (Switzerland)	(2019–22)
	Dustin Schroeder (USA)	(2019–22)

These appointments were unanimously approved by the AGM on a motion from T. Scambos and seconded by H. Miller.

6. Other business
No other items were raised.

The SG asked people, should they have any ideas/suggestions, to contact the officers and Council members in order to bring those ideas forward.

The President asked for a motion to adjourn the AGM.

The AGM was adjourned on a motion from N. Karlsson seconded by O. Eisen at 17:37 PST.

International Summer School in Glaciology

organized by the University of Alaska, Fairbanks (UAF) to be held in McCarthy, Alaska, USA, 6–16 June 2020

The sixth Alaska International Summer School in Glaciology will be organized by the University of Alaska, Fairbanks (UAF) from 6–16 June 2020. The course will provide a comprehensive overview of the physics of glaciers and current research frontiers in glaciology with focus on quantitative glaciology, modeling and remote sensing. The course will be open to 28 graduate students from around the world targeting primarily early-stage PhD students who perform glacier-related research. It will be taught by faculty of UAF's glaciology group and several invited guest lecturers from outside Alaska.

Course content

Key topics to be covered include: remote sensing in glaciology; glacier mass balance and meteorology; response of glaciers to climate change; glacier dynamics and hydrology, surging and tidewater glaciers; ice streams; ice–ocean

Excursion on Kennicott glacier with ice-marginal lake which had not drained yet.

interactions; and ice-sheet modeling. The course will consist of lectures, exercises, computer projects and field excursions.

Course location
The course will be held in McCarthy, a small village in south central Alaska in the immediate vicinity of 5000 km^2 of glaciers originating in the Wrangell Mountains (up to 5000 m a.s.l.). Transport by van from and to Fairbanks will be offered.

Costs
Students will be expected to cover their travel to and from Fairbanks but student assistance may be available. In addition, students need to pay a course fee of approximately US $100–300 which includes accommodation and full board in McCarthy, transport from Fairbanks to and from McCarthy and course material.

Applications
Applications must be sent to Regine Hock (rehock@alaska.edu) by 25 January 2020. For more details see http://glaciers.gi.alaska.edu/courses/summerschool.

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Photos by R. Hock

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Seligman Crystal for Richard C.A. Hindmarsh

Richard has advanced the field of glaciology on a huge number of different fronts, and to enormous effect, through his insights in the technical and mathematical field of ice sheet modelling. The distinctive common feature of these advances is Richard's imaginative deployment of methods and techniques from the wider realms of physics, numerical methods and mathematics, leading to great advances in our understanding of glaciers and ice sheets.

Of such ice bodies, he has studied their flow, their dynamical instability, their thermomechanical behaviour, and the roles they play in the global system of planet Earth. All of these endeavours have become increasingly relevant to society during Richard's illustrious career, and he has remained at the forefront of the rapidly growing field of ice-sheet modelling for all of that time. Few scientists, in any geophysical field, will have pioneered so many wide-ranging numerical and mathematical techniques to address so many important problems. Put simply, Richard is recognized internationally as an ice-sheet modeller of the highest calibre. Over the years, he has delivered a panoply of thought-provoking and inspirational talks, often introducing methods, models and concepts completely new to glaciology. He has also contributed as Chief Scientific Editor and Scientific Editor for IGS journals, and as convenor of an Ice Sheet Modelling session at EGU.

More than anything, Richard has pushed the idea that glaciological models benefit enormously from direct confrontation with observational data (and that modellers and observational scientists similarly benefit from close communication with each other. By operating to such a high standard at this interface between modelling and observations, Richard has published many of the breakthrough papers that have led the entire field of glaciology forwards into the modern era of realistic ice-sheet models that productively exploit data from satellites and broad-scale field campaigns.

Amongst his many huge contributions, Richard identified the importance of membrane stresses in regulating the patterning of ice streams, recognized the need for improvements in numerical treatment of grounding line migration, proposed theories of drumlin formation as an instability, improved thermal models of ice sheets, invented new ways to date and interpret ice cores, and developed an entirely new class of asymptotically motivated ice-sheet model. The publication list provides additional detail of these, and many other, advances. Models based on Richard's equations now underpin sea-level predictions made by numerous ice-sheet modelling groups across the world.

In his crucial research into grounding lines, Richard has been instrumental in identifying, and overcoming, a major hurdle that hindered ice-sheet modelling for decades. Richard has not always been right about grounding lines, perhaps most conspicuously in early assertions that removing ice shelves ought to have little impact on grounded ice flow; but then, it was Richard who recognized the need for a more advanced theoretical development, and who was instrumental in leading glaciology towards a revolution in the understanding of grounding-line dynamics. Richard, with others, led model intercomparison exercises that blazed a trail to the accurate physical models of grounding-line migration we have today.

Richard's approach to science has always been collaborative, and his attitude to colleagues and students has always been helpful, supportive and encouraging. Just a few of the topics and collaborations that Richard has contributed to are listed below:

- stability of marine ice-sheets (with Gaël Durand, Olivier Gagliardini, Manu Le Meur, Frank Pattyn and Thomas Zwinger)
- ice-sheet and shelf mechanics (with Christian Schoof, Olga Sergienko, Martin Wearing, Grae Worster and with Frank Pattyn and the MISMIP team)
- ice-sheet model numerics and thermo-mechanical coupling in ice-sheets (with Gisela Hiess)
- sediment deformation and glacial erosion (with Chris Clark, Paul Dunlop, Andrew Fowler, Ed King, Ed Kite, Felix Ng, Olga Sergienko, Matteo Spagnolo and Chris Stokes)
- the BRITICE project (with Chris Clark, Sarah Bradley, Richard Chiverell, Jenny Doole, Jeremy Ely, Derek Fabel, Niall Gandy, Ed Gasson, Lauren Gregoire, Colm Ó Cofaigh, James Scourse and the other BRITICE project members)
- initialization of ice-sheet models (with Rob Arthern, Rosie Williams and Nick Barrand),
- radar sounding (with Rob Bingham, Howard Conway, Hugh Corr, Fabien Gillet-Chaulet, Hamish Pritchard, Ed King and Robert Mulvaney)
- analysis and modelling of radar records (with Tolly Aðalgeirsdóttir, Rob Bingham, Howard Conway, Hugh Corr, Fabien Gillet-Chaulet, Gisela Hiess, Jack Holt, Nanna Karlsson, Ed King, Jonny Kingslake, Gwendolyn Leysinger Vieli, Martin Lüthi, Kenny Matsuoka, Carlos Martín, Fred Parrenin, Martin Siegert and Louise Sime)
- ice-divide modelling and motion (with Fabien Gillet-Chaulet, Carlos Martín, Paco Navarro, Nadine Nereson and Charlie Raymond)
- ice-coring projects (with Nerilie Abrams, Nancy Bertler and the RICE team, Howard Conway and Robert Mulvaney)
- the history of Antarctica (with Brian Anderson, Mike Bentley, Nancy Bertler and the RICE team, Sarah Bradley, Howard Conway, Alan Hayward, Dan Hill, Matt King, Sjoerd Kluiving, Wendy Lawson, Paul Valdes, Anja Verbers, Andreas Vieli, Dick van der Wateren and Pippa Whitehouse)

In view of his success at tackling these difficult problems in glaciology, his collaborative leadership of the field, both through his excellent work and his supervision of students and postdoctoral researchers, and mindful of the high esteem in which he is held by glaciologists worldwide, the Council of the International Glaciological Society has decided to award the Seligman Crystal to Richard Hindmarsh.

The Awards Committee of the International Glaciological Society

Seligman Crystal for Douglas R. MacAyeal

Doug's career has spanned an epic transformation of the science of glaciology, and his research path, in particular his contributions to computational glaciology, has paced its evolution. His interest in ice sheets – and flair for the dramatic – started early. As a physics undergraduate at Brown University in the USA, Doug developed an ice-sheet-driven catastrophe model of paleoclimate. That work was impressive enough to get him hired on the spot by the equally pioneering Robert (Bob) Thomas at the University of Maine, and was eventually published in the *Journal of Glaciology*. Doug moved to Maine and joined a major field campaign in the Antarctic, the Ross Ice Glaciology and Geophysics Survey (RIGGS). Bob later reported that Doug was an enthusiastic member of the field team who paid attention to both the big picture and the small details that ensured data quality. It was a massive, important array of field data sets, and Doug introduced new ideas about how it could be used. In his MS thesis with Bob and Professor Terry Hughes, Doug used in situ temperature profile measurements to construct a history of melting and freezing beneath the ice shelf.

Recognizing the importance of the RIGGS data set to supporting and testing new theories, Doug continued to use them after he moved on to pursue a PhD at Princeton. Working with Professor Kirk Bryan, he used the finite element ice-shelf model he had developed at Maine to make rapid advances in the area of ice–ocean interaction – far ahead of the present focus on that topic. Completed in 1983, his PhD research centered on a numerical model of tidal circulation beneath the floating ice, connecting this with the patterns of melting he had studied as an MSc student and with patterns of ice thickness. This topic remains a central focus in ice-sheet studies today. Even as his work turned toward the computational, Doug never lost his love of field work. He pioneered the adaptation of mathematical models of ice-sheet physics to high-performance computing at a time when doing so meant the scientist had to travel to the computer. In addition to honing his modelling skills, Doug was developing an intellectual fearlessness that continues characterize his approach to science.

Mathematical models allowed Doug to make connections between the rapidly expanding knowledge of ice-sheet physics and his undergraduate interest in Earth's past. Following

completion of his PhD, Doug was appointed as an assistant professor at the University of Chicago, perched on the sedimentary remnants of the southern lobes of the Laurentide Ice Sheet. This connection to the glaciological past must have been a great inspiration. He worked with students there to adapt models developed to keep pace with modern observations on a number of questions in paleoclimatology: from methane trapped in frozen peat to the production of North Atlantic Heinrich Layers (via growth and decay cycles of Hudson Bay's region of the Laurentide Ice Sheet), to changes in atmospheric circulation in the aftermath of ice-sheet collapse. These views of the past all built on his modelling studies of West Antarctic ice streams and they inspired others to renew their interest in the potential for rapid change in marine ice sheets, a topic that had been pioneered by Doug and his thesis advisers back at the University of Maine.

Doug's work during the 1990s helped to establish the unique nature of extremely large, low-driving-stress ice streams. He worked with colleagues and students at Chicago to improve the mathematical theory and computational treatment of ice streams and helped lead the small but growing global ice-sheet modelling community as it developed the first model inter-comparison projects. He tailored geophysical inverse methods ('control methods') to ingest the large data sets that were becoming available thanks to new Earth observing satellites and created spatially comprehensive views of the mechanical connection between ice streams and the underlying bedrock or till.

Doug kept pace with the rapidly developing field of satellite remote sensing through the late 1990s. His research increasingly incorporated this data, but not always in the most obvious ways. When the Larsen B ice shelf collapsed and the community was busy thinking about past climate forcing and future implications, Doug focused on the 'now'. He saw physics in the high-resolution satellite view of the icebergs and built a mathematical model that considered the role of mechanical interactions among icebergs as an added energy source for rapid disintegration. As the use of radar interferometry grew, Doug created his own synthetic interferograms from models and used these to ask what the models were missing when it came to rift evolution near the fronts of the large ice shelves.

During the 2000s, icebergs and theories of ice-shelf collapse led Doug back to the field. He tried new tools to track ice motion and kick-started what is now a growing interest in iceberg and ice-shelf seismology. Professor Hughes wrote about this work:

> *From my perspective, his greatest contribution to glaciology has been analyzing calving dynamics from ice shelves, including broad swells of Pacific Ocean water produced by earthquakes, tsunamis and storm systems that travel toward the Southern Ocean and, in attenuated form, pass under the Ross Ice Shelf, enabling resonant frequencies to develop on the ice shelf with the potential of disrupting the ice shelf into fragments in a short period of time. Again, this invokes Doug's fascination with catastrophism theory that got him into glaciology in the first place.*

Continuing with this theme, only Doug would have looked at melt ponds from space and concluded that, in addition to mathematical theory, analog experiments were an obvious way forward. He proposed making artificial lakes in order to study their mechanical effects up close and in person – as it happened, a natural lake was available and was used instead. And this unique perspective led a game-changing series of studies with Alison Banwell on the mechanical interactions of meltwater lakes on floating ice shelves.

Doug was an early leader scientifically, again and again finding new treasures where few had looked before: on extreme geometry changes to the Laurentide Ice Sheet, on the tidally driven details of iceberg drift, on transoceanic sound propagation of iceberg scuffing, on snow drift within ice shelf rifts, on tsunami-induced calving and auto-calving due to iceberg toppling.

Doug's leadership has also embraced service to the community. He was Chief Editor of the *Journal of Glaciology* from 1991–98 and has served in an editorial capacity on six issues of the *Annals of Glaciology*. He led the IGS as President of the Society from 2011–17, during the transition to a new publishing model and a partnership with Cambridge University Press. Doug committed to attending nearly all IGS symposia and all side events during his Presidency and as many local branch meetings as he could manage.

Doug's storytelling skills are legendary. His ability to explain, with wit and gentle charm, the complexities of ice-shelf disintegration, or ice-sheet collapse, or simply how glaciers work, make him a highly sought-after speaker, exemplified by his selection for the Nye Lecture in 2013. He is additionally a great commentator for the public. He has appeared on PBS, BBC *Horizon*, in Werner Herzog's *Encounters at the End of the World*, and most recently on Anthony Bourdain *Parts Unknown*, each time presenting our science as engaging, important and advanced.

Perhaps Doug's greatest contribution has been his mentorship of early- and mid-career scientists. Doug has spent most of his professional career at the University of Chicago, where he teaches at all levels of the curriculum and has won awards for his creativity and focus on student success. His lab is both welcoming and exciting. He is a generous thinker who always has an idea to share (indeed, once you work with Doug the e-mails full of interesting observations, new code and new ideas never stop coming) and he is always interested in the ideas of others.

Alison Banwell, who worked at Chicago as a postdoctoral scholar in 2012 and 2013, wrote about Doug's particular approach to mentoring:

> *One of Doug's most important mentoring skills is to encourage early-career scientists to follow their own ideas, rather than his. And now, almost 5 years on, although I am no longer physically based in Chicago, I consider Doug to be an extremely valuable colleague who is just as encouraging as ever through his responsive e-mails full of interesting thoughts and ideas.*

Ralf Greve wrote about the decision to visit Chicago as an exchange student, and reminded us that Doug was an early adopter of the open access model:

> *What mainly attracted me was Doug's ground-breaking work on 'binge–purge' ice-sheet oscillations as a cause of the North Atlantic Heinrich Events, and we set up the dynamic/thermodynamic ice sheet model SICOPOLIS for a flowline through Hudson Bay and Hudson Strait to study this problem. The time at Doug's lab was very inspiring for me as he*

is an enthusiastic mentor, and the work led to a joint publication in the Annals of Glaciology. We continued to work together on ice-sheet modelling issues within the first EISMINT model inter-comparison exercise. In 1997, Doug published his famous 'Lessons in Ice-Sheet Modeling', a mighty and freely available 428-page manuscript that was influential for a whole generation of scientists interested in the matter.

Doug is a geophysicist and mathematical modeler who approaches every new question like an expedition into the wild. Developing code can be a lonely journey, full of many more failures than successes. Doug does not, in our experience, view this as an engineer would, a sequence of steps that lead inevitably to a destination. In Doug's worldview, new code or any new idea is more like an expedition into uncharted territory. Even if the maths are deterministic, the process isn't. It's in the attention paid to both the whole and the part, it's in the focus on what didn't go as expected, that the insight and the learning come. He cares about the journey and about who he's travelling with along the way. He cares who his students and collaborators are as thinking individuals, supporting them to follow their own ideas, not his.

Way back in 1988, Bob Thomas said of Doug: 'Doug MacAyeal is at the forefront of the small band of polar scientists who are transforming the study of ice-sheet glaciology from a series of hairy expeditions to picturesque places… into a strategic attack on a set of problems that are highly relevant to the study of global change.' It's as true today as it was back then.

In view of each of these bases, but above all his groundbreaking and inspirational science, the Council of the International Glaciological Society has decided to award the Seligman Crystal to Douglas MacAyeal.

The Awards Committee of the International Glaciological Society

Richardson Medal for Johannes (Hans) Oerlemans

The IGS has awarded the Society's Richardson Medal to Johannes (Hans) Oerlemans, a longstanding member of the International Glaciological Society.

The scientific contribution of Hans (as he is known) to the field of glaciology has been widely recognized. His work on the interactions between the cryosphere, climate and sea level is characterized by a fertile combination of modelling studies and fieldwork, and has significantly furthered the understanding of these important processes. This awards is primarily in recognition of an equally important contribution that Hans has made to the glaciological community: the Karthaus summer school on 'Ice Sheets and Glaciers in the Climate System'. It is through Hans's dedication and hard work that early-career glaciologists have for decades have been able to attend this unique training experience. Undoubtedly, the existence of the Karthaus summer school has been and will continue to be of great benefit to the glaciological community.

The legendary summer school has its roots in the formation of EISMINT (the European Ice Sheet Modelling Initiative) and was first held in 1995 in Grindelwald. Two years later, the course moved to Karthaus in Südtirol and here it has remained. Since 2007, the course has been held annually and this year will be its 19th iteration at Karthaus. At the heart of the summer school is its informal atmosphere, which is in complete accordance with Hans's own personality. The unique environment inspires participants to interact and discuss science, life and, of course, music. Hans has shown generations of glaciologists that succeeding in science can go hand in hand with musical prowess. Certainly, demonstrating and encouraging this diversity of skills has strengthened the scientific culture of the glaciological community. Contributing to the Karthaus 'feel' is of course the awe-inspiring landscape. It is a stroke of genius to ensure that, during the famous excursion to Hochjochferner, the modellers get to see glaciological processes in action. For many Karthaus participants this is their first time on a glacier.

The format of Karthaus has proved very popular and effective. It is said that imitation is the highest form of flattery, and other glaciological summer schools have since sprung into existence if not in imitation of Karthaus, then definitely inspired by it. It is also a testimony to the wide recognition of the Karthaus course that many institutions across Europe have supported it through the years. This support has not just been monetary. Since its formation, more than 50 teachers have taught at the course and institutions across the world have sent over 500 students to Karthaus. Many of the now-teachers attended as students themselves, and it is where they started their own career and glaciological network. Thus, the name of this charming village is now synonymous for many glaciologists with an intense learning experience, unbelievable amounts of delicious food and, most importantly, the formation of long-lasting bonds of scientific collaboration, joint projects and, of course, friendship. Indeed, the course has undoubtedly influenced the careers of many members of the glaciological community.

It is in recognition of Oerlemans's remarkable mentorship, which has contributed to the continued growth of the glaciological community and the influx of many enthused early-career scientists, that the Council of the International Glaciological Society has decided to award the Richardson Medal to Johannes (Hans) Oerlemans.

The Awards Committee of the International Glaciological Society

Glaciological diary

** IGS sponsored * IGS co-sponsored

2019

30 September–3 October 2019
8th International Ice Drill Symposium
Copenhagen, Denmark
Contacts: D. Dahl-Jensen or S.B. Hansen on <(icedrillsymposium@nbi.ku.dk>
Website: www.icedrillsymposium.dk

16–18 October 2019
2019 West Antarctic Ice Sheet Workshop
Camp Cedar Glen, Julian, California, USA
Website: http://waisworkshop.org/

17–18 October 2019
Symposium – Women in Antarctica: Celebrating 50 years of Exploration
Byrd Center, Columbus, Ohio, USA
Website: https://byrd.osu.edu/celebrate-womenwaisworkshop.org

30 October –1 November 2019
International Glaciological Society Nordic Branch Meeting
Reykholt, Iceland
Contact: Hrafnhildur Hannesdóttir <hh@vedur.is>
Website: http://earthice.hi.is/IGSNB2019/main_page

19–21 November 2019
47th Yellowknife Geoscience Forum
Yellowknife, Northwest Territories, Canada
Website: https://www.nwtgeoscience.ca/gsforum/

2–5 December 2019
ArcticNet Annual Scientific Meeting ASM2019)
Halifax, Nova Scotia, Canada
Website: http://www.arcticnetmeetings.ca/asm2019/

4–14 December 2019
First Southern Hemisphere Conference on Permafrost (SouthCOP)
Queenstown, New Zealand
Website: https://southcop19.com/

9–13 December 2019
AGU Fall Meeting
San Francisco, California, USA
Website: https://www.agu.org/fall-meeting

9–13 December 2019
Arctic Week 2019
Paris, France
Call for proposals: https://www.igsoc.org/symposia/arcticweek2019callforproposals.pdf

2020

8–10 January 2020
Quaternary Research Association Annual Discussion Meeting: Quaternary Earth System processes and feedbacks: challenges for society
Leeds, UK
Website: https://qraleeds2020.com/

13–17 January 2020
7th International Conference on Mars Polar Science and Exploration
Ushuaia, Tierra del Fuego, Argentina
Website: https://www.hou.usra.edu/meetings/marspolar2020/

28–30 January 2020
IASC Workshop on the Dynamics and Mass Budget of Arctic Glaciers
Obergurgl, Austria
Website: https://nag.iasc.info/workshopsnowhydro.eurac.edu/

28–31 January 2020
SnowHydro Conference: Challenges in Mountain Areas
Bolzano/Bozen, Italy
Website: https://snowhydro.eurac.edu/

3–5 February 2020
***New Zealand Snow and Ice Research Group (SIRG: the New Zealand branch of IGS) Annual Workshop**
Matiu/Somes Island, Wellington, New Zealand
Website: https://sirg.org.nz/about/2020-annual-meeting/

3–5 February 2020
9th Workshop on Remote Sensing of Land Ice and Snow (European Association of Remote Sensing Laboratories (EARSeL)): Remote Sensing of the Cryosphere – Monitor what is vanishing
Bern, Switzerland
Website: http://www.earsel.org/SIG/Snow-Ice/workshop/call.php.

12–15 February 2020
4th Polar Ecology Conference: Interactions between Ocean and Terrestrial Ecosystems
České Budějovice, Czech Republic
Website: https://www.agu.org/ocean-sciences-meeting/

16–21 February 2020
Ocean Sciences Meeting 2020
San Diego, California, USA
Website: https://www.agu.org/ocean-sciences-meeting/

18–21 February 2020
3rd Canadian Polar Data Workshop
Banff, Alberta, Canada
Contact Ravi Darwin Sankar <ravi.sankar@ucalgary.ca>
Website: https://www.arcus.org/sites/all/modules/civicrm/extern/url.php?u=17542&qid=3013318

27–28 February 2020
2020 Alpine Glaciology Meeting
Milan, Italy
Contact Davide Fugazza <davide.fugazza@unimi.it>

2–6 March 2020
Sixth International Symposium on Arctic Research
Tokyo, Japan
Website: http://www.jcar.org/isar-6/

2–8 March 2020
36th International Geological Congress
New Delhi, India
Theme 8: The Polar World – Past Present and Future
Theme 9: Glacier Mass Balance
Theme 12: Quaternary Environments: Sedimentation and Landform Evolution – Symposium 12.4: Glaciers Past and Present
Website: https://www.36igc.org/

10–12 March 2020
2020 Polar Technology Conference
Boulder, Colorado, USA
Website: https://www.arcus.org/logistics/2020-polar-technology

27 March–2 April 2020
Arctic Science Summit Week (ASSW2020)
Akureyri, Iceland
Website: https://www.assw2020.is/

3–8 May 2020
European Geosciences Union Annual Meeting
Vienna, Austria
Website: https://www.egu2020.eu/

14–19 June 2020
18th International Conference on Ground Penetrating Radar
Golden, Colorado, USA
Website: https://gpr2020.csmspace.com/

19–24 July 2020
****International Symposium on Ice Stream Dynamics**
Durham, UK
Contacts: Secretary General, IGS
Chris Stokes <c.r.stokes@durham.ac.uk>

21–24 September 2020
***Cryosphere 2020: International Symposium on Ice, Snow and Water in a Warming World**
Reykjavík, Iceland
Contacts: Secretary General, IGS
Þorsteinn Þorsteinsson <thor@vedur.is>

24–26 September 2020
3rd International Conference on Polar Climate and Environmental Change in the Last Millennium
Toruń, Poland
Contact Przemysław Wyszyński <polarclimate2020@umk.pl>
Website: https://www.arcus.org/sites/all/modules/civicrm/extern/url.php?u=18159&qid=3116042

2021

27 June–2 July 2021
****International Symposium on Interactions of Ice Sheets and Glaciers with the Ocean**
La Jolla, California, USA
Contacts: Secretary General, IGS
Helen Amanda Fricker <hafricker@ucsd.edu>

18–23 July 2021
BACO-21: IAMAS-IACS-IAPSO Joint Assembly
Busan, Republic of Korea
Contact: Richard Essery <Richard.Essery@ed.ac.uk>, Regine Hock <rehock@alaska.edu>
Website: http://baco-21.org/2021/english/main/index_en.asp

5–10 September 2021
****International Symposium on Science and Mitigation of Glacier and Snow Hazards**
Davos, Switzerland
Contacts: Secretary General, International Glaciological Society (IGS)

4–8 October 2021
****International Symposium on Glaciology and Society**
Bilbao, Basque Country, Spain
Contacts: Secretary General, International Glaciological Society (IGS), Sergio Henrique Faria <sh.faria@bc3research.org>h.faria@bc3research.org>

2022

June 2022
****International Symposium on Maritime Glaciers**
Juneau, Alaska, USA
Contacts: Secretary General, IGS, Jason Amundson <jmamundson@alaska.edu>

September 2022
****International Symposium on Southern Hemisphere Glaciers under Pressure: subglacial lakes, subaquatic environments, calving glaciers and climate**
Valdivia, Chile
Contacts: Secretary General, IGS
Andrés Rivera <arivera@cecs.cl>

2023

July 2023
IUGG General Assembly
Berlin, Germany

New members

Miss Clara Burgard
The Ocean in the Earth System, Max Planck Institut für Meteorologie
Bundesstrasse 53, D-20146 Hamburg, Germany
E-mail: clara.burgard@mpimet.mpg.de

Ms Jessica Cartwright
National Oceanography Centre
European Way, Southampton SO14 3ZH, UK
E-mail: jc1n15@noc.soton.ac.uk

Mr Evan Clark
Artificial Intelligence Group, Jet Propulsion Laboratory, California Institute of Technology
M/S 301-260, 4800 Oak Grove Drive, Pasadena, CA 91109-8099, USA
E-mail: evan.clark@jpl.nasa.gov

Dr Eric Collins
College of Fisheries and Ocean Sciences, University of Alaska Fairbanks
2150 Koyukuk Drive, 245 O'Neill Building, PO Box 757220, Fairbanks, AK 99775-7220, USA
E-mail: recollins@alaska.edu

Dr Renato R. Colucci
Department of Earth System Sciences and Environmental Technology, Italian National Research Council
Consiglio Nazionale delle Ricerche, Piazzale Aldo Moro 7, I-00187, Rome, Italy
E-mail: r.colucci@ts.ismar.cnr.it

Miss Patricia DeRepentigny
Department of Atmospheric and Oceanic Sciences, University of Colorado Boulder
311 UCB, Boulder, CO 80309-0311 USA
E-mail: patricia.derepentigny@colorado.edu

Mr Björn Erlingsson
Polar Ocean Laboratory, University Center of the Westfjords
Háskólasetur Vestfjarða, Suðurgata 12, IS-400 Ísafjörður, Iceland
E-mail: bjorn@uw.is

Dr Polona Itkin
Department of Physics and Technology, The Arctic University of Norway
Hansine Hansens veg 18, N-9019 Tromsø, Norway
E-mail: polona.itkin@uit.no

Miss Lynn Kaluzienski
School of Earth and Climate Sciences, University of Maine
5790 Bryand Global Sciences Center Orono, ME 04469-5790, USA
E-mail: lynn.kaluzienski@maine.edu

Dr Chaincy Kuo
Climate & Ecosystem Sciences Division, Lawrence Berkeley National Laboratory
1 Cyclotron Road, Berkeley, CA 94720, USA
E-mail: ckuo@lbl.gov

Mr Hoi Ming Lam
Department of Geography, University of Calgary
2500 University Drive N.W., Calgary, AB T2N 1N4, Canada
E-mail: hoiming.lam@ucalgary.ca

Ms Megan O'Sadnick
Northern Research Institute (Norut) Narvik
Rombaksveien 47, N-8517 Narvik, Norway
E-mail: megan@tek.norut.no

Dr Michael Prior-Jones
School of Earth and Ocean Sciences, Cardiff University
Main Building, Park Place, Cardiff, CF10 3AT, UK
E-mail: prior-jonesm@cardiff.ac.uk

Mr Nolan Snyder
Centre for Earth Observation Science, University of Manitoba
587 Wallace Building, University of Manitoba, Winnipeg, MB R3T 2N2, Canada
E-mail: ntsnyder@outlook.com

Dr Sharon Stammerjohn
Institute of Arctic and Alpine Research, University of Colorado Boulder
Campus Box 450, Boulder, CO 80309-0450 USA
E-mail: sharon.stammerjohn@colorado.edu

Dr Fabrizio Troilo
Safe Mountain Foundation
Piazzale Monte Bianco, 10, I-11013 Courmayeur, Valle d'Aosta, Italy
E-mail: ftroilo@fondms.org

International Glaciological Society

Secretary General M.M. Magnússon

	Council Members		Concurrent service on Council, from
President	F. Navarro	2017–2020	2017
Vice-Presidents	G. Flowers	2018–2021	2014
	C. Hulbe	2019–2022	2018
	*J. Stroeve	2017–2020	2017
Immediate Past President	D.R. MacAyeal	2017–2020	2010
Treasurer	*A.A. Leeson	2018–2021	2018
Elected Members	*M. Błaszczuk	2019–2022	2019
	*K. Fujita	2017–2020	2017
	*A. Glazovskiy	2018–2021	2018
	*M.E. Hansson	2019–2022	2019
	R. Hock	2018–2021	2018
	*M. Huss	2019–2022	2019
	*I. Das	2019–2022	2019
	Kang Schichang	2018–2021	2015
	*N.B. Karlsson	2017–2020	2017
	*S. MacDonell	2018–2021	2018
	*D.M. Schroeder	2019–2022	2019
	*A. Treverrow	2017–2020	2017
Coopted Members	R. Bingham		
	G. Leysinger Vieli		

*First term of service on the Council

IGS Committees

Awards	I. Allison (Chairman)
Nominations	D.R. MacAyeal (Chairman)
Publications	G. Flowers (Chairman)

Correspondents

Australia	P. Heil	Japan	S. Sugiyama, K. Nishimura
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Austria	E. Schlosser	New Zealand	H. Purdie
Belgium	J.-L. Tison	Norway	J.C. Kohler
Brazil	J. Simões	Poland	W. Dobinski
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France	C. Ritz	USA (Eastern)	T. Neumann
Germany	O. Eisen	USA (Western)	H.B. Conway and E.D. Waddington
Iceland	Þ. Þorsteinsson		
Italy	C. Smiraglia	USA (Alaska)	M.A. Nolan

Seligman Crystal

1963	G. Seligman	1989	H. Oeschger	2001	G.K.C. Clarke
1967	H. Bader	1989	W.F. Weeks	2003	K. Hutter
1969	J.F. Nye	1990	C.R. Bentley	2005	R.B. Alley
1972	J.W. Glen	1990	A. Higashi	2007	L.G. Thompson
1972	B.L. Hansen	1992	H. Röthlisberger	2009	P.A. Mayewski
1974	S. Evans	1993	L. Lliboutry	2011	A. Iken
1976	W. Dansgaard	1995	A.J. Gow	2012	D.E. Sugden
1977	W.B. Kamb	1996	W.F. Budd	2013	P. Duval
1982	M. de Quervain	1997	S.J. Johnsen	2019	R. Hindmarsh
1983	W.O. Field	1998	C. Lorius	2019	D.R. MacAyeal
1983	J. Weertman	1999	C.F. Raymond		
1985	M.F. Meier	2000	S.C. Colbeck		
1986	G. de Q. Robin	2001	G.S. Boulton		

Honorary Members

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V.M. Kotlyakov	G. Østrem
G. Wakahama	Yang Zhenniang

Richardson Medal

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1997	D.R. MacAyeal	2013	A. Weidick
1998	G.K.C. Clarke	2016	T. Chinn
1999	J.A. Heap	2016	E.M. Morris
2003	C.S.L. Ommanney	2017	J.M. Palais
2010	T.H. Jacka	2019	J. Oerlemans
2012	W.S.B. Paterson		

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All enquiries about the International Glaciological Society should be addressed to:
Secretary General, International Glaciological Society, High Cross,
Madingley Road, Cambridge CB3 0ET, UK
Tel: +44 (1223) 355974 Fax: +44 (1223) 358334
E-mail: igsoc@igsoc.org
www.igsoc.org