

54th Annual Meeting
Eastern Snow Conference

May 4-8, 1997
Banff, Alberta Canada

Joint Meeting
with the 65th Annual
Western Snow Conference



PREFACE

The 1997 Snow Conference Proceedings represent a combined effort between the Eastern and Western Conferences held in conjunction with the 23rd Annual Meeting of the Canadian Geophysical Union. The papers published in this Proceedings represent contributions from the special sessions on hydrology and snow, organized by the CGU-Hydrology Section and the Eastern and Western Snow Conferences.



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WESTERN SNOW CONFERENCE

The origin of the WSC stems from the pioneering work in snow hydrology and runoff forecasting of Dr. James E. Church and has developed into a joint U.S./Canadian organization. Over the last 65 years, the WSC has provided an international forum "for individuals and organizations to share scientific, management, and socio-political information on snow and runoff from any viewpoint and to advance the Snow and Hydrologic Sciences."

Annual Meetings

Are normally held in the third week of April, with the meeting site rotating among states and provinces within an Area and through the four Areas of the Western Snow Conference. The four areas include: North Continental, North Pacific, South Continental, and South Pacific. They extend from Alaska to California and from the Pacific Islands eastward to the plains states and the Prairie Provinces. The annual meeting consists of two days of technical sessions with oral and poster paper presentations and a one-day field trip. An executive meeting is held before the technical sessions begin and a general business meeting during the meeting. An awards banquet and one or two social evenings are included. A spouse-program is held for part of the time during the technical sessions. Spouses are welcome to attend the field trip and social activities.

Awards

Best Papers: awarded annually to the best oral and the best poster papers presented at the Conference. These will be selected by the WSC Awards Committee and presented at the annual meeting.

Dr. J. E. Church Award: presented to an outstanding high school science student within the WSC North Continental area.

WESTERN SNOW CONFERENCE EXECUTIVES

Phyllis Snow, General Chair
Don Snow, Secretary
Jack Pardee, Treasurer
Gerrald Beard, Area Chair, North Continental Region
Charles Troendle, Area Chair, South Continental Region
Lisa von der Heydt, Area Chair, North Pacific Region
Frank Gehrke, Area Chair, South Pacific Region

Web Page:

<http://snobear.colorado.edu/WSC/WSC.html>

THE EASTERN SNOW CONFERENCE

The Eastern Snow Conference (ESC) is a joint Canadian/U.S. organization founded in the 1940s, originally with members primarily from eastern North America. Our current members are scientists, snow surveyors, engineers, technicians, professors, students, and operational and maintenance professionals from North America, as well as the United Kingdom, Japan, and Germany. There is a western counterpart to the ESC, the Western Snow Conference (WSC), also a joint Canadian/U.S. organization. Every fifth year the ESC and the WSC hold joint meetings.

The Eastern Snow Conference is a forum that brings the research and operations communities together to discuss recent work on scientific, applied, and operational issues related to snow and ice. The location of the conference alternates yearly between the United States and Canada, and attendees present their work by either giving a talk or presenting a poster. All resulting papers are reviewed, edited and published in our yearly *Proceedings of the Eastern Snow Conference*. In recent years, the ESC Meetings have included sessions on snow physics, winter survival of animals, snow and ice loads on structures, river ice, remote sensing of snow and ice, and glacier processes. Volumes of the *Proceedings* can be found in libraries throughout North America and Europe, and the papers are also available through the National Technical Information Service (NTIS) in the United States and CISTI in Canada.

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Le Colloque sur la neige-région est (ESC) est une organisation américano-canadienne fondée dans les années '40 et dont les membres provenaient à l'origine surtout de l'est de l'Amérique-du-Nord. Actuellement, les membres, qu'ils soient chercheurs, techniciens en enneigement, ingénieurs, techniciens, professeurs, étudiants, ou spécialistes des services d'exploitation et d'entretien, viennent non seulement d'Amérique du nord, mais aussi du Royaume Uni, du Japon, et d'Allemagne. Le Colloque sur la neige-région ouest (WSC), aussi une organisation américano-canadienne, est l'homologue de l'ESC pour l'ouest nord-américain. Tous les cinq ans, l'ESC et la WSC organisent des réunions en commun.

Le Colloque sur la neige-région est un forum qui rassemble chercheurs et responsables des services d'exploitation pour discuter des travaux récents sur les problèmes scientifiques, opérationnels ou autres dus à la neige et à la glace. Le site de cette réunion annuelle alterne entre les Etats Unis et le Canada. Les participants y présentent les résultats de leurs travaux par des communications orales ou au moyen d'affiches. Ces communications, une fois revues et éditées, sont publiées dans les Annales de l'ESC. Dans les années récentes, les réunions de l'ESC ont inclus des sessions sur la physique de la neige, la survie hivernale de la faune, les forces exercées par la neige et la glace sur les structures et les bâtiments, la glace de riviPre, la télédétection de la neige et de la glace, et les processus glaciaires. Les annales de l'ESC sont accessibles dans la plupart des bibliothèques scientifiques d'Amérique-du-Nord et d'Europe. Des copies d'articles peuvent être obtenues du National Technical Information Service (NTIS) aux Etats Unis et son équivalent au Canada, le CISTI.

54TH EASTERN SNOW CONFERENCE EXECUTIVE OFFICERS

Past President	Michael Ferrick	CRREL
President	Michael Demuth	NHRI
Vice-President	Robert Davis	CRREL
Secretariat, USA	Austin Hogan	Retired
Secretariat, Canada	Miles Ecclestone	Trent University
Editors	Mary Albert	CRREL
	Susan Taylor	CRREL
Chair, Steering Committee	Jim Buttle	Trent U.
Chair, Research Committee	Jean Stein	INRS-Eau (U de Quebec)
Chair, Technical Committee	Max Perchanok	Ontario MOT
Chair, Local Arrangements	Michael Demuth	NHRI

54TH EASTERN SNOW CONFERENCE

Business Meeting

97.05.06 1700H @Max Bell Auditorium, Banff Centre

Welcome

1. Reports from Officers:

- Programme Chair (R. Davis)
- Chair, Steering Committee (C. Taylor for J. Buttle)
- Chair, Research Committee (J. Stein)
- Chair, Technical Committee (M. Ecclestone for M. Perchanok)
- Secretariat (M. Ecclestone)
- Editors (M. Albert)

2. Nomination Committee/membership voting
3. 55th Eastern Snow Conference, Mount Washington, U.S.A. (R. Chisholm)
4. Post-conference Executive Meeting "Round-table on the Future of the ESC"
5. Snow BBQ Activities
6. Other Business

Adjourn

PRESIDENT'S PAGE - 54TH EASTERN SNOW CONFERENCE, BANFF, CANADA

The 54th Eastern Snow Conference in Banff, Alberta was held jointly with the Western Snow Conference and the Hydrology Section of the Canadian Geophysical Union. The success of this joint meeting was not only guaranteed by the spectacular Rocky Mountain venue, but also by the enthusiasm and spirit of the three participating snow and ice societies. This meeting had the great privilege of hosting snow and ice workers from all across North America, including several participants from overseas. Exposure to scientific and operational topics occurred at varied scales- from the imaging of snow structure at the grain scale (or is it crystal?!) to the computer-aided visualization of the influence of planetary orbital parameters on the earth's climate. Such varied exposure assures the consideration of regular joint meetings in the future. As we return to our individual society meetings next year, I hope we all take the opportunity to reflect on the immense scale of geophysical and environmental study and affirm our own individual roles as scientists, technicians, engineers, snow surveyors, and educators.

The role and importance of student participation was again evident at this year's meeting with outstanding presentations and written contributions to the annual ESC Student Paper Competition. On behalf of the ESC, I congratulate Newell Hedstrom, University of Saskatchewan, on winning the ESC Student Award with his paper entitled "Measurements of Intercepted Snow in the Boreal Forest: Measurements and Modelling." The Research Committee did another fine job of managing the competition process and constructively reviewing the submissions, and they are thanked. My only regret is that Don Weisnet could not attend to formally present the Weisnet Medal. It is with hope and gratitude that we look forward to Don's presence next year.

Organizing any conference is a challenging and requires the dedication of numerous individuals. A joint meeting requires particular care and attention to detail; all ably provided by the Joint Local Organizing Committee, including Philip Marsh, (CGU-HS), Gerrald Beard and Peter Palmer (WSC). Phyllis Snow (WSC General Chair), Terry Prowse (CGU-HS President) and myself assisted where we were able. Brenda Doell (CGU-HS) and Heather Popov (NHRI) ensured a smooth running conference foyer, site logistics and author and local arrangement correspondence with CGU and The Banff Centre. The support of Environment Canada-National Hydrology Research Institute and the U.S. Army Cold Regions Research and Engineering Laboratory is also gratefully acknowledged.

The collective efforts of Bert Davis (ESC), Geoff Kite (WSC) and Scott Munro (CGU-HS) produced a varied and highly stimulating technical program, while the smooth progression of the poster and oral sessions was enabled by the courteous and professional manners of the session convenors. As you delve into the 1997 Proceeding contents that follow, I would like to express my gratitude to Chuck Troendle (WSC) and Mary Albert and Susan Taylor (ESC) and for putting together another fine Proceedings volume. The printing of the Proceedings was, in-part, enabled by the financial support of the Canadian Geophysical Union, and they are thanked.

The Banff rendezvous was round out with a festive Snow Barbecue in the company of vibrant Scottish Gaelic melodies by Seanachie and the black peaks and clear night ski of the Rocky Mountains. By all accounts, almost enjoyable field excursion to the Columbia Icefields, was ably guided by Mindy Brugman (Columbia Mountain Institute for Applied Ecology). I also understand that numerous individuals took advantage of excellent late season snow conditions- both on and off-piste (although I cannot speak from my own personal experience, of course!!)

The most distant Eastern Snow Conference allowed some earnest reflection and discussion on the future of the ESC during a Round Table Discussion hosted by the President. A number of issues related to attendance, community structure and ensuring relevance into the next millennium were discussed by members, new and old alike. Born out of these discussions was a reaffirmation of the need for strong

science-operational ties and the informal and friendly traditions of the Eastern Snow Conference. Several initiatives were proposed and we can all look forward to seeing and participating in their evolution in the coming years.

I would like to personally thank Past-presidents, Mike Ferrick, Colan Taylor, Derrill Cowing, Terry Prowse, and Gerry Jones and the entire 1997 ESC Executive for their support, hard work, and dedication to the conference and its future. I welcome the 1998 ESC Executive to what I hope will be a rewarding task and wish them the best of success in organizing next years meeting in Mt. Washington Valley, New Hampshire. We sincerely hope you will make plans to join us.

Michael N. Demuth
President
54th Eastern Snow Conference



Eastern Snow Conference



AN INTERNATIONAL ORGANIZATION
IN
EASTERN CANADA AND THE NORTHEASTERN UNITED STATES

CONCERNED WITH THE
ORIGIN, PRECIPITATION, ACCUMULATION, CHARACTER, MELT, AND RUNOFF OF SNOW

1996 December 30

On behalf of the friends and members of the Eastern Snow Conference, the ESC Executive hereby honors

Austin W. Hogan

for his substantive contributions to the field of snow science, and his steadfast and thoughtful dedication to the Eastern Snow Conference.

Austin's first association with the ESC was in 1966 at Hartford, CT. At that time Austin was with the Atmospheric Sciences Branch, State University of New York at Albany, working closely with Vince Schaefer. By 1971, Austin had become a regular face at annual ESC meetings. Austin was influenced at various stages in his life and career by numerous contemporaries and most certainly some of his closest friends, including Gordon Ayer, Livingston Lansing, Bob Sykes and Vin Schaefer; all sharing with Austin a fascination of winter and all its complexities. In 1971, at Fredericton, NB, Austin and Raymond Falconer presented a pivotal paper on a previously undiscussed snow-atmosphere phenomenon- The Capture of Aerosol Particles by Ice Crystals. Herewith, began a series of polar explorations that took Austin to Greenland, the Arctic and the Antarctic, in search of insight into the phenomenon of ice crystal precipitation and related optical displays.

By 1985 Austin had returned to the ESC fold at the Montreal meeting, and his annual presence since then has fortified numerous sessions concerned with snow and the atmosphere. Austin presented his first ESC paper as a member of CRREL in 1987. At the recent meeting in Dearborn, MI, Austin became ESC Secretary. He also joined the ranks of the ESC Research Committee, to which he has contributed invaluable experience and encouragement to many students of snow and ice vying for the annual ESC Student Award. As a member of the ESC Executive, Austin continues to bestow the all important corporate memory of the ESC to members young and old alike.

Austin's robust enthusiasm can perhaps best be summarized in his fervent and ever-present greeting "Hi, how-are-ya!", and it is with similar enthusiasm that we honor Austin- his kind and competent tutelage as a dedicated supporter of the ESC and his considerable presence in the field of snow research. We wish you a long and happy retirement Austin, and look forward to your long, continued association with the Eastern Snow Conference.

With thanks and gratitude,

Michael N. Demuth
President, 54th Eastern Snow Conference