Number 104 *1st Issue 1994*

ICE

NEWS BULLETIN OF THE INTERNATIONAL GLACIOLOGICAL SOCIETY

UK PHONE NUMBERS

All UK area codes and some telephone numbers are changing.

For full details see p. 15 of this issue of *ICE*

ISSN 0019–1043

ICE

NEWS BULLETIN OF THE INTERNATIONAL GLACIOLOGICAL SOCIETY

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CONTENTS

COVER PICTURE: Hoarfrost on a wire fence in the forest, Kohlfirst Forest by Schaffhausen, Switzerland (photograph by E. Wengi, Swiss Federal Institute for Snow and Avalanche Research).

JAPAN – HONSHU

Prediction of wet-snow storms and prevention of snow accretion on power lines

(Y. Sasyo, T. Mori, T. Saito and A. Nagaoka, SWTIC)
The liquid water content of melting snowflakes was analyzed using two variables: the amount of heat supplied to the snowflakes from the ambient air (A), and the total latent heat released by the phase transition of water vapor (E). The domains of dry snow, wet snow and rain can be determined on a plot of A against E′, the negative value of E as the ordinate. The average values of A and E′ for 13 cases of heavy snow accretion, sufficient to damage electrical transmission lines, are being evaluated to determine their domain in the diagram.

Effects of various factors on rime icing

(T. Uchida, KNCT; S. Kusumoto, KSU; S. Kaji, NU)
The present study is designed to study indoor artificial icing throughout a year to avoid the data scattering inherent in the natural environment. Experiments performed in the low-temperature laboratory use mist from an ultrasonic humidifier. The external appearance of icing, the catch ratio of mist particles and successive observation of icing growth are examined using two stick materials and five stick diameters. The water vapor content is one order lower than that of the first report (Uchida and others, 1991; Seppyo, **55**, 145–154).

The effect of stick diameter on icing length is small. Above about 4 mm the icing width does not grow over the stick diameter and the catch ratio of mist particles is hardly affected by the duration of the test. Below about 4 mm, the icing spreads out like an unfolded fan against the wind and the catch ratio grows larger as the stick diameter becomes smaller. The effect of different stick materials on the icing length and the catch ratio of mist particles is very little except during the early stage of the icing formation. Water vapor content is one of the important factors in the icing growth, in addition to temperature and wind velocity.

Formation of air gaps in snow melting on a bottom boundary

(Y. Nohguchi, NSIS, NIED)
Air gaps frequently form when a snow cover melts at its bottom boundary. In this study, air gap formation is analyzed theoretically for two different snow cover models: (1) a two-layered snow cover and (2) a one-layered snow cover with uniform load on its surface. Air gap formation in the short-wave approximation, in which the disturbance wave length of horizontal uniformity is much smaller than the snow cover depth, is independent of hardness of the upper layer. When the lower layer is very hard in comparison with the upper layer, the upper layer functions only as a load to the lower layer. In the long-wave approximation, when the upper layer is hard, such as an ice layer, the condition becomes favorable for air gap formation.

^{18}O of snow meltwater and snow cover

(K. Suzuki, TMU)
Chemical studies of the snow meltwater discharged from a snowpack were conducted at Tahima, Fukusima prefecture and the chemical characteristics of precipitation and snow layers studied. The snow meltwater discharged from a snowpack was collected in a large lysimeter (1647 m^2). Discharge of meltwater was measured by a 45 degree V-notch weir and a pressure gauge. Conductivity of meltwater was monitored automatically. Periodic samples of meltwater were collected by an automatic water sampler. Precipitation was collected using a bulk sampler. The pH value of precipitation was 3.89 to 4.36, indicating the acidity of snowfall at Tajima. Significant correlation was found between $\delta^{18}O$ of precipitation and mean air temperature. Conductivity of meltwater decreased, and $\delta^{18}O$ of meltwater increased gradually, as the snowmelt progressed. The $\delta^{18}O$ of meltwater shows diurnal variations during the active snowmelting period. The daily peak value of $\delta^{18}O$ is observed in the afternoon.

Reciprocating snow compressing machine

(M. Kobiyama, T. Matsuno and T. Toyokawa, MIT; T. Koyama and K. Washiya, NKC; T. Tanifuji and K. Tanifuji, TKC; Y. Kimura, ACC)
The characteristics and performance of a piston-cylinder type reciprocating snow compressing machine, used to reduce the volume of snow, has been investigated. This study investigated the fundamental performance of a snow compressing machine driven by the 2 type oil pumps of constant velocity, i.e. 2 stage oil pump, by measuring changes in compression pressure and compressing work during the compressing process of compacted snow at –10°C. The effects on the performance of the machine of the density of the snow were discussed.

Hydraulic conveying of snow and ice

(T. Kitahara, NCT; M. Shirakashi, NUT)
A new method to measure the fraction of snow or ice in snow-water or ice-water mixture has been developed. The basic principle employed is the conductometric method or electrical conductance measurement. Some techniques are an improvement of the electrical circuit for resistance measurement, the use of "auxiliary electrodes", the introduction of the aspect ratio of the particles and so on. The method was tested using a prototype snow-fraction meter in a testing apparatus. The experimental results show that the meter is sufficiently practical. The method is expected to be useful for hydraulic conveying of snow or ice.

Snow transport in an open channel on mild slope configuration

(Y. Fukushima and N. Hayakawa, NUT; M. Murakami, CTLC)
A theory has been developed to treat water flow transporting snow chunks in an open channel as a solid–liquid two-phase flow. The equation of continuity and the equation of momentum in the flow direction are introduced to obtain the velocity for each phase. Based on the above relations, a theory is derived on the snow

transport rate and the rate of depth increase. The theory was compared with previously published formulae for snow transport and its validity tested with experimental results.

Snow-removing channel system driven by water jets

(T. Kobayashi and M. Kumagai, NISIS, NIED)

A snow-removing channel system is effective in removing snow from narrow streets and narrow areas around houses. But the system cannot be used where no water is available or the ground is level. Therefore, a snow-removing channel system driven by water jets was designed and a preliminary study of the system carried out. About 46 $t\,h^{-1}$ of snow was conveyed using a water-jet velocity of 19.6 $m\,s^{-1}$ to produce a flow velocity of about 1.2 $m\,s^{-1}$. It was concluded that the system is sufficiently effective in such an area.

Long-term trend of human body snow damage and its social background

(N. Numano, SBSIS, NIED)

After the rapid economic growth in the past three decades in Japan, the nature of snow damage has changed remarkably. The main cause of this change is due to social factors. The study examines the year-to-year change of snow damage from 1955 to 1989, and analyzes its social background. Data on snow damage cases accompanied by any injury to the human body, called human body snow damage (HBSD), were collected and classified from local newspapers. The two neighboring prefectures of Yamagata and Niigata, located in the central part of the snowy area of Japan, were selected as case-study areas. The analysis showed some types of HBSD to be obviously increasing during this period, while decreasing HBSD types were also found. Snow damage which may be a crucial issue in some fields in future are predicted.

Evaluating the cost of snow removal

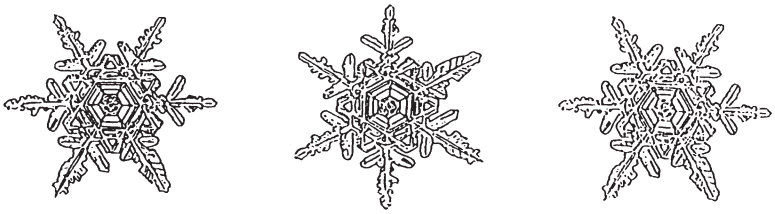
(T. Sakai, MC, HRCB; H. Kuriyama, HCA)

The relationship between winter road functioning and winter social activity was studied to assess the effects of snow removal quantitatively. A numerical model, to calculate a snow-removal cost-benefit index, is proposed as a tool for quantitative assessment for the first time. The average snow-removal cost-benefit index of the Niigata prefecture, calculated with this expression, was 5.9 for the last 19 years, meaning that the benefit is 5.9 times as large as the cost. This shows the high value of snow removal.

Abbreviations

ACC	: Asahi Consul Co. Ltd
CTLC	: Construction Technical Laboratory Co. Ltd
HCA	: Hokuriku Construction Association
HRCB	: Hokuriku Regional Construction Bureau
KNCT	: Kitakyushu National College of Technology
KSU	: Kyushu Sangyo University
MC	: Ministry of Construction
MIT	: Muroran Institute of Technology
NCT	: Nagaoka College of Technology
NIED	: National Research Institute for Earth Science and Disaster Prevention
NISIS	: Nagaoka Institute of Snow and Ice Studies
NKC	: Nikkou Kouei Co. Ltd
NU	: Nagasaki University
NUT	: Nagaoka University of Technology
SBSIS	: Shinjo Branch of Snow and Ice Studies
SWTIC	: Suga Weathering Test Instrument Co. Ltd
TKC	: Tanifuji Kohgyou Co. Ltd
TMU	: Tokyo Metropolitan University

Submitted by S. Kobayashi



International Glaciological Society

JOURNAL OF GLACIOLOGY

The following papers have been accepted for publication in the *Journal of Glaciology:*

R MAIR AND M KUHN
Temperature and movement measurements at a bergschrund

D G LONG AND M R DRINKWATER
Greenland ice sheet surface properties observed by the Seasat-A scatterometer at enhanced resolution

G A KUEHN AND E M SCHULSON
Ductile saline ice

H J ZWALLY AND S FIEGLES
Extent and duration of Antarctic surface melting

J-L TISON
A diamond-wire saw cutting technique for investigating the textures and fabrics of debris-laden ice and brittle ice

D B BAHR, W T PFEFFER AND M F MEIER
Theoretical limitations to englacial velocity calculations

D GRATTON, P J HOWARTH AND D J MARCEAU
An investigation of terrain irradiance in a mountain glacier basin

E W BLAKE, U H FISCHER AND G K C CLARKE
Direct measurement of sliding at the glacier bed

J S WALDER AND C L DREIDGER
Frequent outburst floods from South Tahoma Glacier, Mount Rainier, U.S.A. — relation to debris flows, meteorological origin, and implications for subglacial hydrology

R HODGKINS AND J A DOWDESWELL
Tectonic processes in Svalbard tidewater glacier surges: evidence from structural glaciology

J M N T GRAY, L W MORLAND AND E M MORRIS
A phase changing dry snow pack model

T L MOTE AND M R ANDERSON
Variations in snowpack melt on the Greenland ice sheet based on passive microwave measurements

J FIRESTONE
Resolving the Younger Dryas event through borehole thermometry: a thesis condensation

C J PATTERSON AND R LeB HOOKE
Physical environment of drumlin formation

N F HUMPHREY AND C F RAYMOND
Hydrology, erosion, and sediment production in a surging glacier; the Variegated Glacier surge, 1982–83

B FRANCOU, P RIBSTEIN, R SARAVIA AND E TIRIAU
Monthly balance and water discharge of an intertropical glacier: the Zong Glacier, Cordillera Real, Bolivia, 16°S

ANNALS OF GLACIOLOGY

The following papers will be published in Volume 19, *Proceedings of the Symposium on Applied Ice and Snow Research*, held at Rovaniemi, Finland, 18–23 April 1993.

TH ACHAMMER AND A DENOTH
Snow dielectric properties: from DC to microwave X-band

A DENOTH
An electronic device for long-term snow wetness recording

HE YUANQING AND WILFRED H THEAKSTONE
Climatic influence on the composition of snow cover at Austre Okstindbreen, Norway, 1989 and 1990

PETER RABEN AND WILFRED H THEAKSTONE
Isotopic and ionic changes in a snow cover at different altitudes: observations at Austre Okstindbreen in 1991

STEPHEN J JONES, H KITAGAWA, K IZUMIYAMA AND H SHIMODA
Friction of melting ice

LORNE W GOLD
The elastic modulus of columnar-grain fresh-water ice

JEROME B JOHNSON, DANIEL J SOLIE AND STEPHEN A BARRETT
The response of a seasonal snow cover to explosive loading

J MEYSSONNIER AND A GOUBERT
Transient creep of polycrystalline ice under uniaxial compression: an assessment of internal state variable models

MATTHEW STURM AND JONATHAN HOLMGREN
Effects of microtopography on texture, temperature and heat flow in arctic and sub-arctic snow

V A GOLOVKO, M LEPPÄRANTA, S KALLIOSAARI, Yu S SEDUNOV AND A M VOLKOV
Ice charting based on multispectral satellite data in the Baltic Sea

M A RIST, S J JONES AND T D SLADE
Microcracking and shear fracture in ice

KRZYSZTOF SZILDER AND EDWARD P LOZOWSKI
An analytical model of icicle growth

R L BROWN AND M Q EDENS
Metamorphism of fine-grained snow due to surface curvature differences

LASSE MAKKONEN
Application of a new friction theory to ice and snow

PENTTI KUJALA
Modelling of the ice-edge failure process with curved failure surfaces

EZIO LEPORATO AND LUCA MERCALLI
Snowfall series of Turin, 1784–1992: climatological analysis and action on structures

D M McCLUNG, SIMON WALKER AND W GOLLEY
Characteristics of snow gliding on rock

S C COLBECK
An error analysis of the techniques used in the measurement of high-speed friction on snow

TUOMA KÄRNÄ
Finite ice failure depth in penetration of a vertical indentor into an ice edge

J E LEWIS, P BUDKEWITSCH, G NEWTON, M SAYED AND R M W FREDERKING
Two-dimensional analysis of ice ridging in the Beaufort Sea using aerial photography

SHOICHIRO FUKUSAKO, MASAHIKO YAMADA AND CHIKARA WATANABE
Melting characteristics of ice blocks immersed in quiescent saline water

TAKESHI OHTA
A distributed snowmelt prediction model in mountain areas based on an energy balance method

N MAENO, L MAKKONEN AND T TAKAHASHI
Bent icicles and spikes

T H JACKA
Investigations of discrepancies between laboratory studies of the flow of ice: density, sample shape and size, and grain-size

E T GRATZ AND E M SCHULSON
Preliminary observations of brittle compressive failure of columnar saline ice under triaxial loading

GARY A KUEHN AND ERLAND M SCHULSON
The mechanical properties of saline ice under uniaxial compression

JOURNAL AND ANNALS STYLE CHANGES

We have made several changes to the layout of *Journal* and *Annals* papers in order to improve readability and clarity, and to reduce the overall printed length of papers. These changes will take effect from the first issue of 1994 (*J. Glaciol.*, **40**(134)) for the *Journal*, and the VISAG proceedings volume (*Ann. Glaciol.*, **20**).

The most obvious change is to the reference lists. These are now set in 8pt type, which considerably reduces the space occupied by the lists, yet makes them easier to scan. The spacing in tables has also been reduced, consistent with clarity. Authors will note, on receiving proofs for checking, that we are being more rigorous in reducing illustrations. Providing detail is not lost, figures are reduced to a width of 85 mm or less.

SUBMISSION OF PAPERS

Authors are reminded that papers for submission should be single column, double spaced with a minimum 5 cm (2 in) margin on either side. Other formats make the tasks of editing and typesetting unnecessarily difficult.

BRANCH NEWS

WESTERN ALPINE BRANCH

The 1993 annual general meeting was held in Grenoble on 22 October. A report was presented on the 1993 expedition of 32 participants to Spitsbergen which included a visit to Longyearbyen, Ny Ålesund and the neighbouring glaciers and coal mines. The executive for 1994 is:
President – Jean-Pierre Feuvrier
Vice President – Michel Sommier
Secretary – Gérard Bocquet
Treasurer – François Valla
The 1994 expedition will be to the glaciers on the right bank of the Rhône (Wildstrubel) from 1–4 September.

POLISH BRANCH

In September 1993, the Council of the International Glaciological Society approved the creation of a Polish Branch. Its inaugural meeting will take place in Warsaw at the occasion of joint sessions of the 21st Polar Symposium and the Polish Polar Club, from 23-24 September 1994. For further information contact: Dr Jacek Jania, Katedra Geomorfologii, Wydzial Nauk o Ziemi, Uniwersytet Slaski, ul. Bedziska 60, Sosnowiec, 41-200 Poland (Tel: (+48)32 662025; Fax: (+48)32 664351).

NORDIC BRANCH

12 and 13 November 1993 saw the revival of the IGS Nordic Branch Meeting. After some years in hibernation, what is hoped to be an annual event was proposed and organized by Jon Ove Hagen, Mike Kennett and Jack Kohler, all at NVE (Norwegian Water Resources and Energy Commission), Oslo. The informal meeting was intended for all who are working on questions regarding ice and snow with some relation to the Nordic countries. Judging from the attendance and the remarks made after the meeting, this has been a long-awaited event. Participants were present from all the Nordic countries, as well as Finland, France, Germany, Switzerland, UK and the US. During the meeting, 40 presentations were made on a wide variety of topics ranging from avalanches, Storglaciären, Svalbard, Antarctica, GRIP, mass balance, snow and ice physics, glacial geology, remote sensing, to zoning for glaciological risk assessment.

Friday evening was spent in Gunnar Østrem's cosy snow-dusted cabin north of Oslo, which provided the proper setting for establishing contacts between the participants of the different countries. Overall the meeting was judged to be a success both from a scientific and a social point of view. A second meeting of the revived IGS Nordic Branch is planned for November 1994, and will be hosted by the glaciology group at the Department of Physical Geography, Stockholm University.

Peter Jansson

RICHARDSON MEDAL FUND

Members not able to be in Cambridge last September would have first heard of the striking and awarding of the Richardson Medal in *ICE* 102/103. This award was made possible through the generous support of numerous long-standing members of the Society to whom we owe our gratitude. Those who did not request anonymity are named below.

Unfortunately, the need to maintain secrecy meant that some members who might have wished to contribute to the fund were not asked. Anyone wishing to do so can still send a donation payable to the International Glaciological Society specifying that it be allocated to the Richardson Medal Fund. Subsequent contributors will be recognized in *ICE*. If you wish to remain anonymous please let us know.

W. Peter Adams
Ray J. Adie
Eizi Akitaya
Walter Ambach
John T. Andrews
Terence E. Armstrong
Roger G. Barry
Charles R. and Marybelle Bentley
Weston Blake, Jr
Roger J. Braithwaite
Parker E. Calkin
William J. Campbell
Trevor J.H. Chinn
Garry K.C. Clarke
Sam C. Colbeck
Marcel R. de Quervain
Julian A. Dowdeswell
Jeff Dozier
David J. Drewry
Heidi Escher-Vetter
A. Flotron
Sir Vivian E. Fuchs
Richard P. Goldthwait
B. Lyle Hansen
Stefan L. Hastenrath
Geoff Hattersley-Smith
John A. Heap
Akira Higashi
Roger LeB. Hooke
Terry and Bev Hughes
Jack D. Ives
Claude F. Jaccard
Stephen J. Jones
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Kou Kusunoki
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Charlie F. Raymond
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Ronald L. Shreve
Konrad Steffen
Charles M.W. Swithinbank
T. Torii
Gorow Wakahama
M.E.R. Walford
Peter K. Wall
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Albert L. Washburn
Okitsugu Watanabe
Wilford F. Weeks
Johannes Weertman
Richie S. Williams, Jr
Bjørn Wold
Peter O. Wolf
Yosio Yoshida
Gordon J. Young

European Science Foundation
European Ice Sheet Modelling Initiative (EISMINT)

INTERNATIONAL SYMPOSIUM ON ICE SHEET MODELLING

Strasbourg, France, 18–22 September 1995

Co-sponsored by the International Glaciological Society

FIRST CIRCULAR

The International Glaciological Society (IGS) will co-sponsor, with the European Science Foundation (ESF), an International Symposium on Ice Sheet Modelling to be held in Strasbourg, France, on 18–22 September 1995.

TOPICS: The suggested topics will include: Model intercomparison; Mathematical and numerical methods; Ice–atmosphere interactions; Ice–ocean interactions; Basal processes; Mechanical properties of ice; Ice–lithosphere interactions; Former ice sheets; Standardised databases for modelling.

SESSIONS: These will be held over four full days and one half day. There will be ample opportunity for poster displays.

PUBLICATIONS: The proceedings of the Symposium will be published by the International Glaciological Society (IGS) in the *Annals of Glaciology*. Papers will be refereed and edited according to usual IGS standards. The Chief Editor will be Professor K. Hutter.

ACCOMMODATION: Details will be provided in the second circular.

FURTHER INFORMATION: You are invited to attend this Symposium. Please return the attached form as soon as possible. We anticipate that several speakers will be invited to present summaries or reviews of key areas. Their expenses will be met by the European Science Foundation (ESF). Additional funds may be available to contribute towards the expenses of younger scientists. The second circular regarding this Symposium will be issued in October 1994 and will provide full details about registration fees, accommodation, submission of abstracts, general programme and publication deadlines. Members of IGS and those on the ESF EISMINT mailing list will automatically receive a copy.

SYMPOSIUM ORGANISATION: This Symposium is being organised by the European Ice Sheet Modelling Initiative (EISMINT) scientific programme (Chairman, C. Doake) in conjunction with IGS (Secretary General, S. Ommanney).

LOCAL ARRANGEMENTS will be coordinated by the ESF.

EISMINT INTERNATIONAL SYMPOSIUM ON ICE SHEET MODELLING

Family name: . . . . . Telephone: . . . . .

First name: . . . . . Telefax: . . . . .

Address: . . . . . E-mail: . . . . .

. . . . . .

. . . . . .

I hope to participate in the EISMINT Symposium in September 1995 [ ]
I expect to submit a summary of a proposed paper [ ]

Tentative title/topic: . . . . . .

. . . . . .

PLEASE RETURN AS SOON AS POSSIBLE TO: Philippa Pirra, EISMINT, European Science Foundation, 1 quai Lezay Marnésia, F-67080 Strasbourg Cedex, France

ICE SURVEY

The results of the *ICE* questionnaire mailed last year are shown below as a percentage of the 93 replies received. There was unamimous support for the current format. Overall it seems that the news bulletin is providing an acceptable balance between the various interests of our members. Several respondents asked for the reintroduction of personal and institutional profiles, abandoned many years ago due to difficulties in obtaining a steady supply of material. We will see what we can do to respond to these and other good suggestions in future issues.

	Never read it	*Sometimes useful*	*Very useful*
Recent work	1	28	71
Journal papers accepted	13	57	30
Contents of next Annals volume	9	58	33
AGM Minutes	27	45	28
IGS Symposium circulars	2	33	65
Meetings of other organizations	3	51	46
Glaciological Diary	4	34	62
News	0	43	57

Recent meetings (of other organizations)

NORTHWEST GLACIOLOGISTS

The 1993 Northwest Glaciologists (NWG) gathering, hosted by Charlie Raymond, was held at the University of Washington, Seattle, 3–4 December. Most of the approximately 60 participants were from the western United States and Canada, but about 25% were from elsewhere in North America or Europe. The NWG meeting is a favorite stop-over for people on their way to the American Geophysical Union (AGU) meeting in San Francisco. There were about 45 oral presentations on topics including Antarctic glaciology, remote sensing of snow and ice, basal processes, subglacial hydrology, ice-dammed lakes, mass balance and climate, tidewater glaciers, surging glaciers, snow physics, and computational ice-flow modeling. As usual, several graduate students attended and made presentations. In keeping with the informal tradition of this meeting — now beginning its third decade — no abstracts or papers were submitted and no proceedings will be published.

Many presentations on glaciological topics were made at the 1993 Fall Meeting of the AGU in San Francisco. The meeting included general sessions on glaciers and ice sheets, plus sessions on snow hydrology, sea-ice and high-latitude ocean processes, microwave remote sensing of sea ice, climate studies based on the central Greenland ice cores, the role of the Laurentide ice sheet in the climate system, and glacial geomorphology. About a third of the presentations were posters; the remainder were oral. Abstracts were published in *EOS*, 74(43), 1993.

Joseph Walder

Future meetings (of other organizations)

INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS XXI GENERAL ASSEMBLY, BOULDER, COLORADO

2–14 July 1995, Boulder, Colorado, USA

The following sessions may be of interest to glaciologists:

H3.
Biochemistry of Seasonally Snow-covered Catchments (IAHS)
Topics include: snowpack and atmospheric transformations; snow hydrology and hydrochemistry; snowmelt runoff and biogeochemical processes; and hydrologic flowpaths in snow and glacial systems.
Convenors: K. Tonnessen, US National Park Service, Air Quality Division, P.O. Box 25287, Denver, CO 80225-0287, USA (Tel: 303-969-2738; Fax: 303-969-2822; E-mail: kat@aqd.nps.gov) and M. Williams (INSTAAR, USA)

PS7.
Air–Sea–Ice Interactions and High-Latitude Ocean Processes (IAPSO)
Convenors: M. Leppäranta, Department of Geophysics, P.O. Box 4 (Fabianinkatu 24 A), FIN-00014, University of Helsinki, Finland (Tel:358-0-191-2028; Fax: 358-0-191-3385; OMNET: M. LEPPÄRANTA), E. Augstein (Germany) and S. F. Ackley (CRREL, USA)

SNOWSYMP '94, INTERNATIONAL SYMPOSIUM ON SNOW AND RELATED MANIFESTATIONS

26–28 September 1994, Manali (HP), India

In India, research on snow and related manifestations commenced in the mid-sixties. Activities increased markedly following the creation of the Snow and Avalanche Study Establishment (SASE), under the aegis of the Defence Research and Development Organisation, in October 1969. As a highlight of the Silver Jubilee Year of SASE, an international symposium is being organised.

The symposium is aimed at bringing together scientists, engineers and users to assess the growth of snow science, delineate the direction in which the research is heading, and detail its future course.

The symposium will cover the following themes:

Physics of snow	Avalanche dynamics
Mechanics of snow	Avalanche forecasting
Snow drift	Artificial triggering of avalanches
Snow removal	Avalanche control measures
Instrumentation	

The programme will include both plenary and poster sessions. Various local tours and treks into the Himalaya are planned. Registration will be US$200. Hotel accommodation varies from US$60–70.

For further information contact:
Lt. Col. S. G. Nair
HQ Snow and Avalanche Study Establishment
Manali, Distt Kullu (HP), India
Tel: 01901-8223 Fax: 01901-2406
Telex: 03904-210 SASE IN

Glaciological Diary

** IGS Symposia
* Co-sponsored by IGS

1994

6-17 June
An Advanced Study Institute Summer School on Physics of Ice-covered Seas, Savonlinna, Finland (Matti Leppäranta, Department of Geophysics, P.O. Box 4 (Favianinkatu 24 A), SF-00014 University of Helsinki, Finland)

13-16 June
International Symposium on Cold Region Development, Espoo, Finland (ISCORD '94 Secretariat, Association of Finnish Civil Engineers RIL, Meritullinkatu 16 A 5, SF-00170 Helsinki, Finland)

3-8 July
Bi-Polar Information Initiatives: the Needs of Polar Research. 15th Polar Libraries Colloquy, Cambridge, U.K. (W. Mills, Scott Polar Research Institute, Cambridge CB2 1ER, UK)

10-15 July
International Symposium on Spectral Sensing Research '94 (ISSR '94) San Diego, California, U.S.A. (Science and Technology Coporation Meetings Division, Attn. ISSSR '94, 101 Research Drive, Hampton, VA 23666-1340, USA

7-12 August
** International Symposium on the Role of the Cryosphere in Global Change, Columbus, Ohio, USA (Secretary General, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, UK)

28 August-3 September
10th International Northern Research Basins Symposium and Workshop, Svalbard, Norway (K. Sand, SINTEF, Norwegian Hydrotechnical Laboratory, N-7034 Trondheim, Norway)

2-7 September
Arctic Ocean Grand Challenge: Scientific Rational-Strategy-Science Plan, Helsinki, Finland (J. Hendekovic, European Science Foundation, 1 quai Lezay-Marnésia, F-67080 Strasbourg Cedex, France)

5-9 September
International Conference on Arctic Margins, Magadan, Russia (International Conference on Arctic Margins, Geophysical Institute, University of Alaska–Fairbanks, Fairbanks AK 99775-0800, USA)

12-16 September
European Conference on Grand Challenges in Ocean and Polar Science, Bremen, Germany (ECOPS Conference, Alfred-Wegener-Institute, P.O. Box 120 161, D-27515 Bremerhaven, Germany)

14-16 September
100th Anniversary Symposium of the Commission Internationale des Glaciers: Glacier Mass Balances: Measurements and Reconstructions, Innsbruck, Austria (M. Kuhn, Institute of Meteorology and Geophysics, University of Innsbruck, Innrain 52, A-6020 Innsbruck, Austria)

26-28 September
Snowsymp '94, International Symposium on Snow and Related Manifestations, Manali, India (Lt.Col. S.G. Nair, HQ Snow and Avalanche Study Establishment, Manali, Distt Kullu (HP), India)

30 October-3 November
International Snow Science Workshop, Snowbird, Utah, USA (L. Fitzgerald, ISSW '94, P.O. Box 49, Snowbird, Utah 84092, USA)

1-6 November
3rd International Symposium on Glacier Caves and Cryokarst in Polar and High Mountain Regions, Chamonix, France (M. Griselin, GDR Recherches Arctiques, 70150 Bonboillon, France)

1995

11-16 June
5th International Offshore and Polar Engineering Conference, The Hague, The Netherlands (ISOPE, P.O. Box 1107, Golden, CO 80402-1107, USA)

3-14 July
Symposium on Biochemistry of Seasonally Snow-Covered Catchments (ICSI/ICWQ/ICT) (K. Tonnessen, US National Park Service, Air Quality Division, P.O. Box 25287, Denver, CO 80225-0287, USA)

20-25 August
** IGS International Symposium on Glacial Erosion and Sedimentation, Reykjavík, Iceland (Secretary General, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, UK)

18–22 September
* EISMINT International Symposium on Ice-sheet Modelling, Strasbourg, France (P. Pirra, EISMINT, European Science Foundation, 1 quai Lezay Marnésia, F-67080 Strasbourg Cedex, France)

1996

24-28 June
Interpraevent 1996: Protection of Habitat against Floods, Debris Flows and Avalanches, Garmisch-Partenkirchen, Germany (Interpraevent 1996, c/o Bayerisches Landesamt für Wasserwirtschaft, Lazarettstr. 67, D-80636 Munich, Germany)

27-31 August
IX International Symposium on the Physics and Chemistry of Ice, Dartmouth College, Hanover NH, USA (Victor Petrenko, 8000 Cummings Hall, Dartmouth College, Hanover, NH 03755-8000 USA)

IGS members of the British Antarctic Survey presented the outgoing Secretary General, **Hilda Richardson**, with a framed photograph of Richardson Peak, in the Antarctic, on the occasion of her retirement.

AWARD

In September 1993, **Dr Branko Ladanyi** received the Roger J.E. Brown Memorial Award in recognition of his "outstanding contributions to permafrost science and engineering".

WORLD GLACIER MONITORING SERVICE (WGMS)

Work continued within the framework of the service's five main tasks, using funding mainly provided by GEMS/UNEP, FAGS/ICSU, UNESCO/IHP and ETH Zürich.

1. Fluctuations of Glaciers
Volume VI, the *Fluctuations of Glaciers 1985–1990*, was printed and distributed. It contains information on 711 glaciers from 28 countries (including Antarctica). Data on "Variations in the positions of glacier fronts" (1985–90) were received for 615 glaciers in 23 countries with "Addenda from earlier years" for 78 glaciers in 112 countries. "Mass balance study results — summary data" (1985–90) were submitted for 94 glaciers in 14 countries with "Addenda from earlier years" for nine glaciers in four countries. Detailed information concerning "Mass balance versus altitude" was made available for 38 glaciers in 8 countries and data relating to "Changes in area, volume and thickness" are presented for 28 glaciers in seven countries. Finally, index measurements and special events were reported from 41 glaciers in 125 countries. Interesting observations became available for Chile, Pakistan and India, and a mass balance programme was recently initiated in Bolivia. No data were obtained from Mexico, Ecuador, Turkey, Iran, Afghanistan and Bhutan. With Vernagtferner 1889 and and its orthophoto map of 1990, more than a century of precision mapping is documented in the new volume.

The use of a data bank management system to produce Volume VI of the *Fluctuations of Glaciers 1985–1990* was successful. Therefore, all older data will be moved into the new data base. The data archive was improved and reorganized to

- make the data available in machine-readable form
- provide more flexibility in data access
- enable comfortable user handling
- centralize the data in one physical system
- improve data checking.

The glacier fluctuation data were reorganized first. Next, the "World Glacier Inventory" data bank was similarly improved. Loading of glacier inventory data into the new data bank has started.

2. Glacier inventory
Due to problems with computer compatability and access in Russia, the data from the former USSR can definitely not be transferred to WGMS. A rescue programme is now being developed in cooperation with WDC-A for Glaciology at Boulder/Colorado to re-enter the data into a modern system. Deficiencies in the numbering system of the World Glacier Inventory are now being handled in connection with the loading into the new data bank and a quality check of inventory data.

3. Glacier mass balances
Glacier Mass Balance Bulletin No. 2 was printed and distributed. In 1990 and 1991, the mean mass balance reported was negative by roughly half a meter of water equivalent per year, a value which is about one third higher than the decadal average 1980–90 for the same set of 27 glaciers in the Northern Hemisphere. The finding of a human body, buried some 5300 years ago in a topographic depression at the perennially frozen glacier bed on top of a small mountain glacier in the Oetztal Alps (Austria), seems to confirm that glacier shrinkage in the Alps could now be passing at a high and possibly accelerating rate beyond the range of pre-industrial variability.

4. Satellite observations of remote glaciers
Projects are being developed to determine secular glacier mass changes from glacier length change and inventory data along two meridional transects (Mt Kenya to Svalbard, Mexico to Alaska) with the help of existing maps, aerial photograph and satellite imagery. The main goals are (1) to assess the representativity of ongoing mass-balance programmes, (2) to investigate latitude and continentality effects, and (3) to prepare a basis for future remote-sensing programmes.

5. Assessments
A popular brochure *Glaciers and the environment* in the UNEP/GEMS Environment Library (No. 9) was printed and distributed. Other statements and summaries included "Cryosphere requirements for GCOS climate studies" (Global Climate Observing System), "International collection of mass balance data", "Workshop on cryospheric data rescue and access" and "Secular glacier melt rates".

1994 is a special year for the service, because international coordination of worldwide glacier monitoring started exactly 100 years ago, making glacier monitoring one of the oldest such services in the world. Already in 1893 the Swiss Glacier Commission had been established in order to co-ordinate long-term observations of glacier fluctuations at a national level. One year later, in 1894, the Sixth International Geological Congress at Zürich followed the example of the Swiss Glacier

Commission with the purpose of coordinating long-term glacier observations at the international level. The goals of this worldwide glacier monitoring programme are defined by F.-A. Forel from Geneva, the first president of the then established International Glacier Commission, in a remarkable article entitled "Les variations périodiques des glaciers. Discours préliminaire" (*Archives des Sciences Physiques et Naturelles*, Geneva, **34**, 209–229). In connection with this historical benchmark, it is now planned to prepare a document which would redesign the original strategy of the programme in view of future problems, especially regarding potential greenhouse warming and global water resources.

Wilfried Haeberli
Director WGMS

INTERNATIONAL COMMISSION ON GLACIER CAVES AND KARST IN POLAR REGIONS

Following reports presented at the XIth International Congress of Speleology in August 1993, the International Working Group "Glacier Caves and Karst in Polar Regions" was accorded International Commission status by the Union internationale de spéléologie. Their third symposium, which will take place in Chamonix, 1-6 November 1994, deals with glacier caves and cryokarst in polar regions and exploration in the depths of glaciers. In addition to formal papers, an excursion to Mont Blanc and evenings devoted to videos and films, the working group will address specific questions. These include continuation of the glaciokarst terminology multilingual dictionary, common projects, international expeditions, and problems of security in this high-risk scientific discipline.

ICE GENEVA

A new organisation named "ICE Geneva", International Committee in Geneva for Cryosphere Ecosystems, has been formed by a group of legal, scientific and environmental experts based in Geneva for the protection of the cryosphere: the cryosphere being defined as 'regions of ice, sea ice, permafrost or long duration snow cover'. The Committee will devote itself to the Antarctic, Arctic and high-mountain regions.

It is an international scientific committee under Swiss law, and will seek consultative status with tne United Nations and other intergovernmental bodies. It has already applied for accreditation to the UN Commission on Sustainable Development.

ICE Geneva's purpose is to track political, scientific and environmental developments in the cryospheric regions and seek to: preserve the natural ecosystems; appreciate the rights and concerns of the indigenous peoples; identify elements likely to affect global climate change; and propose policies to assist in preserving the environment, of which the cryosphere is an essential element.

For further information contact: Dennis Thompson, ICE Geneva, 8 rue des Belles Filles, 1299 Crans, Switzerland (Fax: 022-776-7303).

THE HIMALAYAN EXPERIMENT

The Himalaya is the world's mightiest mountain system having 14 peaks over 8000 m and hundreds over 7000 m. It is known as the store-house of snow and ice. Himalayan snow and ice fields rival those in the polar regions, and the cryosphere is highly related to the atmosphere through heat and moisture exchanges. The monsoon is a gift of the high Himalayas. The mountain system attracts moisture from the Atlantic, Indian and Pacific Oceans. It provides intense freeze–thaw cycles with diurnal changes up to 25°C, resulting in strong erosion. The mountain has micro-climates ranging from tropical (300–900 m) to perpetually frozen (above 4800 m) and is rich in flora and fauna. It is one of the mega bio-diversity zones of our planet.

As the natural resources from here support much economic activity, there is a need to understand atmospheric processes and circulation in order to manage the fragile environment for sustained development. With this in mind, a Himalayan Experiment (HIMEX), along the lines of ALPEX, has been proposed with the following scientific objectives:

- To improve the understanding of mountain waves and mountain roughness representation in large-scale atmospheric models.
- To appreciate spatial variability in meteorological parameterisation at sub-grid scales for GCMs.
- To develop meso-scale and regional numerical models with detailed parameterization of land-surface processes for local specific operational weather forecasts.
- To study the air flow, mass and moisture fields over and around the mountain ranges under various synoptic conditions.
- To study precipitation patterns and orographic contributions at different altitude ranges during summer and winter seasons.
- To determine the role of diabatic heating associated with lee cyclogenesis over the Bay of Bengal for cyclone forecasting.
- To understand dynamic and physical processes associated with storm activity (thunder storms, Nor'westers) better.
- To study the modifying effect of radiative cooling on weather systems over the cold north-west region.
- To study the modifying effect of diabatic heating on weather systems over a warm southeast region.
- To help establish a data base for the cold Himalayan region for collecting, storing and disseminating information on seasonal/perennial snow and ice processes, interaction with the physical environment and effect on climate and its change.

The project will need a high-level of national, regional and international coordination for its implementation.

For further information contact the Director, Department of Science and Technology, New Delhi 110 016, India (Tel: 654781; Fax: 655145).

Jagdish Bahadur

OBITUARY

Robert Legget (1904-1994)

Robert Ferguson Legget, distinguished engineer, geologist, author and historian, died on 17 April 1994 in Ottawa, Ontario, of a stroke. He is survived by his son David; his wife, Mary, died in 1984.

Legget was born in Liverpool, England. As a child he wanted to be a railroad engineer. He studied engineering at Liverpool University to pursue this career, but could find no suitable related employment when he graduated in 1925. He maintained a lifelong interest in railways and always preferred to travel by train. His first job was on a major hydroelectric project, the Lochaber power scheme in northern Scotland. On moving to Canada in 1929 he joined the Power Corporation of Montréal to work on a hydro project in northern Ontario. Prior to his appointment as lecturer in engineering at Queen's University in 1935, he was with the Canadian Sheet Piling Company. From Queen's he moved to the University of Toronto as assistant professor in 1938. There he remained throughout the war under an edict that kept engineering or science faculty at their posts because of the need to train more engineers and scientists.

In 1947, the National Research Council of Canada decided to take a more active role in support of the building industry. For its President, Dr C. J. Mackenzie, the logical choice to head the new Division of Building Research (DBR) was Robert Legget. Under Legget's guidance DBR developed renown for research on building materials, building services, structures, acoustics, vibrations, soils, housing and construction in cold climates. He was also given responsibility for the preparation of a model building code which, under his direction, developed into the National Building Code of Canada. By the time he retired in 1969, the division had a skilled staff of 250 and extensive facilities for testing and research in response to the needs of the construction industry, and the Building Code had been adopted throughout Canada.

Dr Legget realized that some of the basic problems to be studied were necessarily related to snow and ice. During a visit to Europe in 1945, he established contact with Swiss authorities, whom he felt had the experience he was seeking, and was offered the services of Marcel de Quervain for one year. Dr de Quervain was then Chief Scientist for the Swiss Snow Research Institute, and his stay at DBR during 1948–49 marked the beginning of snow and ice research there. Many members know of the contributions on the mechanical and physical properties of snow and ice arising from this research which, from 1950 to 1974 was under the direction of Lorne Gold, a Past President of the Society.

Although Legget's interest in soils and geology set the stage for the first research on permafrost in Canada, it was during a study of the transportation system on the Mackenzie River that he became intrigued by permafrost and developed a lifelong interest in the North. One of the major contributions of the permafrost research at DBR was the compilation of the first permafrost map of Canada, due largely to the work of the late Roger Brown. The map has been described as a great achievement for Dr Brown and a tribute to Legget's leadership.

In 1945, Legget was asked by the President of the National Research Council to chair a committee that was to direct research on tracked vehicles. This committee became the Associate Committee on Soil and Snow Mechanics. During his tenure as its Chairman to 1967, it played a major role in encouraging research on soils, ice, snow, peat, and permafrost through publications, the sponsoring of conferences, workshops and other technical meetings, and participation in programs such as the International Geophysical Year and the International Hydrological Decade.

Dr Legget knew Gerald Seligman well and visited him whenever he could. He was one of those instrumental in the British Glaciological Society becoming the Glaciological Society, in recognition of the broader role it was beginning to play after the war. He has had an indirect involvement with the Society in recent years, as it was through his intervention in early 1950 that the records of the Canadian work on the World War II project, Habbakuk, were placed in the care of Lorne Gold, with the understanding that the project be written up as soon as the material was declassified. Dr Gold was finally able to carry out this commitment after his retirement in 1986, and the Society was given the privilege of publishing it in 1993.

He numbered among his friends many of the leading glaciologists and polar experts of his time. Marcel de Quervain, Past President of the IGS, recalls one trip in the U.S. where his contacts included J. C. Church, W. O. Field, H. Landsberg, U. Nakaya, V. J. Schafer, P. Siple, V. Stefansson, A. Thompson and Sir Charles Wright. He describes Legget as an extraordinary, generous and charming person who believed in the positive qualities of his fellow being: one who could bring people together to common purpose, identify a problem, make decisions and get things done. He was a self-effacing man, generous in applauding the work of others, and an excellent speaker and teacher.

In recognition of his role in encouraging research on ice and snow in Canada, and his continuing friendship for the International Glaciological Society and support of its goals, he was made an Honorary Member in 1970.

One of his principal, non-glaciological, fascinations was the Rideau Canal, which he considered among the most remarkable engineering triumphs in North America. It was the subject of his most popular book.

He was recognised by many professional and learned societies, receiving 15 special awards and 12 honorary degrees. He was an Honorary Fellow of the British Institution of Civil Engineers, only one of two Canadians so honoured, and founding President of the Canadian Academy of Engineering. In 1989 he was elevated to Companion of the Order of Canada.

Last summer, knowing he would be unable to join members at the meeting in September, despite a busy schedule, he took time to visit the IGS in Cambridge. In the words of Lorne Gold, "it is the end of an era". He would have been 90 in September and was still going strong.

Simon Ommanney

Reviews

Ferguson, S. A. 1992. *Glaciers of North America.* Golden, CO, Fulcrum Publishing. 176pp. $14.95 in paperback

This is a charming little book that was fun to read, is nicely illustrated, and should be a great guide for glacier trekkers everywhere. No doubt scientists will argue about some of the technical details, but I enjoyed reading the book because it took me back to the glaciers I no longer get to visit. Filled with Sue's wit and humor, it starts with a Foreword by Ed LaChapelle, who describes his early years on glaciers and the growth of glaciology. The book is designed to educate, inspire, caution and inform. It provides a lot of information about glaciers at a semi-technical level while communicating the thrill of experiencing them. After inspiring one to visit a glacier, it gives a short course in the techniques for glacier travel and lots of warnings about how one can get into trouble on them. At the end it provides information about specific glaciers in North America as well as other useful information. One-half of the book describes various features of glaciers, starting with the very definition and then passing on to surface features like snow metamorphism, ogives and ice worms. Various types of glaciers, the concept of a glacier's health, and the modes of flow are described. Crevasses, ice falls, and ice avalanches are noted for their special interest to the glacier traveller. The water cycle is described, from melting to discharge streams, and provides a good reason to talk about surging. Moraines provide opportunities or obstacles for glacier travel and, like the other glacier features described, deserve more consideration, but how much detail can one get for $15?

The chapter on equipment, techniques and hazards gets your attention with its title: "Glacier poison: one drop and you're dead." It includes some reports of personal brushes with death, which is appropriate, since the author clearly feels some responsibility for the people she will inspire to go glacier trekking. The descriptions and references are adequate to get a person started, although the best conclusion to be drawn by the inexperienced is that they should begin by taking a course on mountaineering and/or hire a guide. The appendix on North American glaciers gives useful information about their locations, approaches to them, some highlights of each and sources of further information. The glossary is fairly complete and should be very helpful to the layman trying to understand glacial features. The selected bibliography will enable one to pursue further reading on the subject.

In conclusion, I would say that this book should be enjoyable for the experienced glacier traveller, useful for the less experienced, and essential for anyone thinking about getting started. As Sue got started on adventures with her father, many people might want to share this book and the subsequent experiences with their children.

Samuel C. Colbeck

BOOKS RECEIVED

Bull, C. and P. F. Wright, *eds.* 1993. *Silas: the Antarctic diaries and memoirs of Charles S. Wright.* Columbus, OH, Ohio State University Press, 418 pp. ISBN 0-8142-0548-8.

Dawson, A. G. 1992. *Ice age earth: Late Quaternary geology and climate.* London and New York, Routledge, 293 pp. (Routledge Physical Environment Series.) Hardback ISBN 0-415-01566-9 £50, paperback ISBN 0-415-01567-7 £17.99.

French, H. M. and O. Slaymaker, *eds.* 1993. *Canada's cold environments.* Montréal and Kingston, McGill-Queen's University Press, 340 pp. (Canadian Association of Geographers Series in Canadian Geography.) ISBN 0-7735-0925-9, Cdn$42.75.

Hambrey, N. and J. Alean. 1992. *Glaciers.* New York, Cambridge University Press, 208 pp. ISBN 0-521-41915-8.

Hayakawa, N., ed. 1993. Proceedings, Nagaoka International Symposium on Avalanche Control: 1992 Nagaoka, Hokushin'etsu Branch. Nagaoka, Japanese Society of Snow and Ice.

Jordan, E. 1991. *Die Gletscher der bolivianischen Anden: eine photogrammetrisch-kartographische Bestandsaufnahme der Gletscher Boliviens als Grundlage für klimatische Deutungen und Potential für die wirtschaftliche Nutzung [The glaciers of the Bolivian Andes: a photogrammetric–cartographic inventory of the glaciers of Bolivia based on climatic interpretations and potential economic use].* Stuttgart, Franz Steiner Verlag, 401 pp + maps. (Erdwissenschaftliche Forschung 23.) ISBN 3-515-04917-7, DM 192.

Kalvoda, J. 1992. *Geomorphological record of the Quaternary orogeny in the Himalaya and the Karakorum.* Amsterdam, etc., Elsevier, 315 pp + maps. (Developments in Earth Surface Processes 3.) ISBN 0-444-98676-6, Dfl. 360, US$ 205.50.

Lliboutry, L. 1992. *Sciences géométriques et télédétection.* Paris, Masson, 289 pp.

Maeno, N. and T. Hondoh, *eds.* 1992. *Physics and chemistry of ice. Proceedings of the International Symposium on the Physics and Chemistry of Ice, held in Sapporo, Japan, 1–6 September 1991.* Sapporo, Hokkaido University Press, 516 pp. ISBN 4-8329-0261-X.

SchweizerLexikon und Gletscherkommission der Schweizerischen Akademie der Naturwissenschaften, *eds.* 1993. Gletscher, Schnee und Eis: das lexikon zu Glaziologie, Schnee- und Lawinenforschung in der Schweiz. Luzern, Mengi und Ziehr, 102 pp. (Verlag Schweizer Lexikon.) ISBN 3-9520144-2-7, Fr. 19.50.

Sharp. R. P. 1991. *Living ice: understanding glaciers and glaciation.* Cambridge, etc., Cambridge University Press, 225 pp. Paperback ISBN 0-521-40740-0, £10.95, US$15.95.

Shroder, J. F., Jr, *ed.* 1993. *Himalaya to the sea: geology, geomorphology and the Quaternary.* London and New York, Routledge, 429 pp. ISBN 0-41506648-4, £85.

Simpson-Housley, P. 1992. *Antarctica: exploration, perception and metaphor.* London and New York, Routledge, 131 pp. ISBN 0-425-08225-0, £40.

UK PHONE NUMBERS

ALL UK area codes and some telephone numbers are changing. The new area codes below can be used from 1 August 1994. The old codes will continue to work until Easter 1995 (i.e. 16 April 1995), after which only the new codes will be accepted.

The changes are:

1. Area codes and the six digit telephone numbers for the following cities will become:

City	Old code and number		New code and number			
			National		International	
Bristol	0272	xx xxxx	0117	9xx xxxx	117	9xx xxxx
Leeds	0532	xx xxxx	0113	2xx xxxx	113	2xx xxxx
Leicester	0533	xx xxxx	0116	2xx xxxx	116	2xx xxxx
Nottingham	0602	xx xxxx	0115	9xx xxxx	115	9xx xxxx
Sheffield	0742	xx xxxx	0114	2xx xxxx	114	2xx xxxx

2. All other area codes will have the number 1 added but the telephone numbers will remain the same. Using I.G.S. telephone and fax numbers as an example:

	Old code and number		New code and number			
			National		International	
IGS telephone	0223	35 5974	01223	35 5974	1223	35 3974
IGS fax	0223	33 6543	01223	33 6543	1223	33 6543

3. For UK users only: the exit code for dialling international calls will change on 16 April 1995 from 010 (present exit code) to 00 (new exit code).

For example, to phone Columbus, Ohio, USA:

Old exit codes				New exit codes			
010	1	614	xxx xxxx	00	1	614	xxx xxxx

THESE CHANGES TAKE EFFECT ON 15 APRIL 1995

New members

Vladimir B. Aizen, Sierra Nevada Aquatic Research Laboratory, Star Route 1, Box 198, Mammoth Lakes, CA 93546, USA

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Mario B. Giovinetto, Department of Geography, University of Calgary, Calgary, Alberta T2N 1N4, Canada

John F. Hiemstra, 2^{E} van der Helstaat 5^{I}, 1073 AE Amsterdam, The Netherlands

Clare Johnson, Corpus Christi College, University of Oxford, Oxford, UK

Friedrich Jung-Rothenhäusler, Alfred-Wegener-Institut für Polar- und Meeresforschung, Columbusstrasse, Postfach 12 01 61, D-27515 Bremerhaven, Germany

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Hironori Yabuki, Institute for Hydrospheric–Atmospheric Sciences, Nagoya University, 464-01 Nagoya, Japan

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We would especially like to have examples of the following:

Permafrost features
Ice or snow formations
River and lake ice
Pingos

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1993 H. Richardson

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INTERNATIONAL GLACIOLOGICAL SOCIETY

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