

## GLACIOLOGICAL LITERATURE

THIS is a selected list of glaciological literature on the scientific study of snow and ice and of their effects on the earth; for the literature on polar expeditions, and also on the "applied" aspects of glaciology, such as snow ploughs, readers should consult the bibliographies in each issue of the *Polar Record*. For Russian material the system of transliteration used is that agreed by the U.S. Board on Geographic Names and the Permanent Committee on Geographical Names for British Official Use in 1947. Readers can greatly assist by sending reprints of their publications to the Society, or by informing Dr J. W. Glen of publications of glaciological interest. It should be noted that the Society does not necessarily hold copies of the items in this list, and also that the Society does not possess facilities for microfilming or photocopying.

### GENERAL GLACIOLOGY

- BIRD, J. B. *The physiography of Arctic Canada, with special reference to the area south of Parry Channel*. Baltimore, Johns Hopkins Press, 1967. xix, 336 p., map [in end-pocket]. [Canada north of 60° N. (except Yukon Territory). [Includes sections on present-day distribution of glaciers, permafrost, periglacial mass movement and patterned ground, the role of snow and of sea, river and glacier ice, and on waning of Quaternary ice sheet.]
- DAVIES, J. L. *Landforms of cold climates*. Cambridge, Mass., and London, The M.I.T. Press, Massachusetts Institute of Technology, [c1969]. xvi, 200 p., illus. (An Introduction to Systematic Geomorphology, Vol. 3.)
- FUKUTA, N., and others. Ice nucleation in the Venus atmosphere, by N. Fukuta, T.-L. Wang and W. F. Libby. *Journal of the Atmospheric Sciences*, Vol. 26, No. 5, Pt. 2, 1969, p. 142-45. [Laboratory tests of ice nuclei with CO<sub>2</sub> present and deductions about ice in Venus atmosphere.]
- KICK, W. Alexander von Humboldts Wirken für die Hochgebirgsforschung in Asien, besonders über die Brüder Schlagintweit. *Petermanns Geographische Mitteilungen*, 113. Jahrg., 2. Quartalsht., 1969, p. 89-99. [History of Humboldt's interest in exploration and the consequent glaciological work of the Schlagintweit brothers. English summary.]
- KOBAYASHI, T., and KITAHARA, T. Sukēto-rinku no hyōshitsu-chōsa [Studies on the properties of ice in skating rinks]. *Teion-kagaku: Low Temperature Science*, Ser. A, [No.] 26, 1968, p. 297-314. [Measurements of surface temperature and indentation hardness. English summary, p. 313.]

### GLACIOLOGICAL INSTRUMENTS AND METHODS

- CROAZ, G. Fission products in Antarctic snow, an additional reference level in January 1965. *Earth and Planetary Science Letters*, Vol. 6, No. 1, 1969, p. 6-8. [Discusses occurrence of recent artificial radio-activity levels, used to date snow accumulation rates in Antarctica.]
- EVANS, S., and others. Glacier sounding in the polar regions: a symposium. *Geographical Journal*, Vol. 135, Pt. 4, 1969, p. 547-63, plates. [Contains the following papers: S. Evans, "The VHF radio echo technique", p. 547-48; P. Gudmandsen, "Airborne radio echo sounding of the Greenland ice sheet", p. 548-51; C. [W. M.] Swinbank, "Airborne radio echo sounding by the British Antarctic Survey", p. 551-53; G. Hattersley-Smith, "Results of radio echo sounding in northern Ellesmere Island, 1966", p. 553-57; G. de Q. Robin, "Long-range radio echo flights over the Antarctic ice sheet", p. 557-59; discussion, p. 559-63.]
- MUROZUMI, M., and others. Chemical concentrations of pollutant lead aerosols, terrestrial dusts, and sea salts in Greenland and Antarctic snow strata, [by] M. Murozumi, T. J. Chow and C. Patterson. *Geochimica et Cosmochimica Acta*, Vol. 33, No. 10, 1969, p. 1247-94. [Observations and possible archaeological significance.]

### PHYSICS OF ICE

- ALLEN, L. C., and KOLLMAN, P. A. A theory of anomalous water. *Science*, Vol. 167, No. 3924, 1970, p. 1443-54. [Theory of anomalous water as a structure related to ice Ic as graphite is to diamond.]
- ANDERSON, B. J., and others. Influence of methyl 2-cyanoacrylate monomer on the habit of ice crystals grown from the vapor, by B. J. Anderson, J. D. Sutkoff and J. Hallett. *Journal of the Atmospheric Sciences*, Vol. 26, No. 4, 1969, p. 673-74. [Ice crystals in presence of this substance grow from the vapour as thin fibres parallel to the c-axis.]
- ANGELL, C. A., and SARE, E. J. Vitreous water: identification and characterization. *Science*, Vol. 168, No. 3928, 1970, p. 280-81. [Review of experimental evidence for a glass transition in ice and discussion of its peculiarities.]
- BARAK, A., and DAGAN, G. An analytical investigation of the flow in the saturated zone of ice counterwashers. *American Institute of Chemical Engineers Journal*, Vol. 16, No. 1, 1970, p. 9-17. [Theoretical study of flow of brine through an ice bed.]
- BASCOM, W. D., and others. Ice adhesion to hydrophilic and hydrophobic surfaces, [by] W. D. Bascom, R. L. Cottingham and C. R. Singletary. *Journal of Adhesion*, Vol. 1, October 1969, p. 246-63. [Study of adhesional shear strength and of structure of ice near the surface.]
- BATES, J. B., and others. Dynamics of some lattice models of polywater, [by] J. B. Bates and E. R. Lippincott and Y. Mikawa and R. J. Jakobsen. *Journal of Chemical Physics*, Vol. 52, No. 7, 1970, p. 3731-39. [Calculations give excellent agreement with infra-red and Raman data. Model consists of two-dimensional network of water molecules.]

- BOTSARIS, G. D., and others. Crystallization. Part III. Data concerning particular system and product, by G. D. Botsaris and [7] others. *Industrial and Engineering Chemistry*, Vol. 61, No. 12, 1969, p. 65–79. [Review of papers published 1967–69. Has separate section on the crystallization aspects of ice.]
- BRIAN, P. L. T., and others. Transport of heat and mass between liquids and spherical particles in an agitated tank, [by] P. L. T. Brian, H. B. Hales and T. K. Sherwood. *American Institute of Chemical Engineers Journal*, Vol. 15, No. 5, 1969, p. 727–33. [Data for heat transfer from water to melting ice spheres.]
- CASTELLION, G. A., and others. Polywater: methods for identifying polywater columns and evidence for ordered growth, [by] G. A. Castellion, D. G. Grabar, J. Hession, H. Burkhard. *Science*, Vol. 167, No. 3919, 1970, p. 865–68. [Refractive index measurements give rapid indication of polywater formation and indicate it is initially ordered.]
- CORBATÓ, C. E. Thermal diffusivity and conductivity of glacier ice. *Eos (Transactions. American Geophysical Union)*, Vol. 50, No. 4, 1969, p. 142. [Abstract only. Measurements at Wilkes station, Antarctica, reinterpreted allowing for solar radiation.]
- DELSEMME, A. H., and WENGER, A. Super dense water ice. *Science*, Vol. 167, No. 3914, 1970, p. 44–45. [Below 100 K ice deposited from the vapour at low temperatures had a density of  $2.32 \pm 0.15 \text{ g cm}^{-3}$ .]
- DOMIAN, H. A., and BOLLING, G. F. Continuous solidification pores. *Metals and Materials*, Vol. 3, No. 10, 1969, p. 394–95. [Letter. Includes observation of effect of supersaturation of gas on growth of gas pores in ice frozen from water.]
- EDWARDS, G. R., and others. Two-dimensional phase changes in water absorbed on ice-nucleating substrates, [by] G. R. Edwards, L. F. Evans and A. F. Zipper. *Transactions of the Faraday Society*, Vol. 66, No. 5, Pt. 1, 1970, p. 220–34. [Study of ordered ice-like state on some substrates at low temperatures.]
- EISELE, I., and others. Temperature dependence of photocurrent in  $\gamma$ -irradiated alkaline ice. Location of energy levels of trapped electrons, [by] I. Eisele, R. Lapple, L. Kevan. *Journal of the American Chemical Society*, Vol. 91, No. 23, 1969, p. 6504–05. [Letter. Dependence from 4 to 77 K and above 77 K shows nature of transition and presence of shallow traps.]
- FLETCHER, N. H. Active sites and ice crystal nucleation. *Journal of the Atmospheric Sciences*, Vol. 26, No. 6, 1969, p. 1266–71. [Suggests active sites are re-entrant corners or jogs in growth steps. Theory for nucleation by spherical particle with conical pit.]
- FLETCHER, N. H. *The chemical physics of ice*. Cambridge, University Press, 1970. xi, 271 p. (Cambridge Monographs on Physics.) [Monograph describing recent developments in knowledge of structure and defects of ice and the resulting physical properties.]
- FUKUTA, N. Experimental studies on the growth of small ice crystals. *Journal of the Atmospheric Sciences*, Vol. 26, No. 3, 1969, p. 522–31. [Fall velocities and growth rates of freely falling ice crystals in a nucleated supercooled fog. Modification of theory required to explain results.]
- HARDASAN, T. M., and GOVINDARAJAN, J. Lattice dynamics of hexagonal ice. *Chemical Physics Letters*, Vol. 4, No. 1, 1969, p. 11–12. [Deduced on basis of elastic constants. Normal mode frequencies agree with experiment.]
- HARRIOTT, P. The growth of ice crystals in a stirred tank. *American Institute of Chemical Engineers Journal*, Vol. 13, No. 4, 1967, p. 755–59. [Rate of growth of crystals growing in water or sodium chloride solution compared with rate predicted from heat-transfer theory.]
- HASE, H., and KEVAN, L. EPR studies on trapped species produced by tritium  $\beta$  particles in alkaline and acid ices at 77° K. *Journal of Chemical Physics*, Vol. 52, No. 6, 1970, p. 3183–88. [Comparison with results for  $\gamma$ -irradiated ice.]
- HUFFMAN, P. J., and THURSBY, W. R., jr. Light scattering by crystals. *Journal of the Atmospheric Sciences*, Vol. 26, No. 5, Pt. 2, 1969, p. 1073–77. [Measurement for microscopic ice crystals in laboratory cold chamber.]
- HUNTER, L. M., and others. Low-energy electron reflection spectrometry for thin films of *n*-hexane, benzene, and ice at 77° K, [by] L. M. Hunter, D. Lewis and W. H. Hamill. *Journal of Chemical Physics*, Vol. 52, No. 4, 1970, p. 1733–39. [Measurement and interpretation.]
- JANCSO, G., and others. Vapour pressure of H<sub>2</sub><sup>18</sup>O ice (I) (–17° to 0°) and H<sub>2</sub><sup>18</sup>O water (0° to 16°), [by] G. Jancso, J. Pupezin, W. A. Van Hook. *Nature*, Vol. 225, No. 5234, 1970, p. 723. [Letter. Experiments which disagree with previous data.]
- KNACKE, R. F., and others. Infrared spectra of highly reddened stars: a search for interstellar ice grains, by R. F. Knacke, D. D. Cudaback and J. E. Gaustad. *Astrophysical Journal*, Vol. 158, No. 1, Pt. 1, 1969, p. 151–60. [Absence of absorption bands implies that interstellar grains contain very little ice.]
- KUBAREV, S. I., and SHEDRIN, M. I. A model calculation of protonic mobility in ice. *International Journal of Quantum Chemistry*, Vol. 3, No. 6, 1969, p. 893–901. [Theory based on strong coupling between protons and phonons gives results in qualitative agreement with experiment.]
- KURTIN, S. L., and others. "Polywater": a hydrosol? [By] S. L. Kurtin, C. A. Mead, W. A. Mueller, B. C. Kurtin, E. D. Wolf. *Science*, Vol. 167, No. 3926, 1970, p. 1720–22. [Suggestion that anomalous water owes its properties to dispersed particulate matter not to a polymeric form of water.]
- LAYTON, R. G., and FLETCHER, N. H. Comments on "Ice nucleation behavior of silver iodide smokes containing a soluble component". *Journal of the Atmospheric Sciences*, Vol. 26, No. 4, 1969, p. 774–75. [Comments by Layton on paper by Fletcher, *ibid.*, Vol. 25, No. 6, 1968, p. 1058–60, and reply by Fletcher.]
- LAYTON, R. G., and STEGER, J. Nucleation of ice on silver iodide. *Journal of the Atmospheric Sciences*, Vol. 26, No. 3, 1969, p. 518–21. [Study of supercoolings required for condensation and deposition.]
- LEIGHLY, H. P., jr. Penetrating punch. *Metals and Materials*, Vol. 4, No. 2, 1970, p. 49. [Letter. Observation that grape juice and "ginger ale" will separate ice crystals from each other.]
- LEVI, L. Different interpretations of the growth rates of ice dendrites in supercooled water. *Journal of Chemical Physics*, Vol. 52, No. 7, 1970, p. 3854–55. [Letter. Discussion of results found by Pruppacher and by Macklin and Ryan.]

- LINNETT, J. W. Structure of polywater. *Science*, Vol. 167, No. 3926, 1970, p. 1719–20. [Discusses possible structures for high density concentrate of anomalous water.]
- LIPPINCOTT, E. R., and others. Polywater, [by] E. R. Lippincott, R. R. Stromberg, W. H. Grant, G. L. Cessac. *Science*, Vol. 164, No. 3887, 1969, p. 1482–87. [Infra-red and Raman spectra suggest very strong OHO bond with H midway between two O. Possible structures for polywater discussed.]
- MAL'TSEV, V. A., and NEKRASOV, L. I. K voprosu o vysshey perekisi vodoroda i zamorozhennykh radikalakh. XIII. Elektronograficheskoye issledovaniye amorfnogo l'da, sistem  $H_2O_2-H_2O$  i perekisno-radikal'nykh kondensatov [Higher  $H_2O_2$  and frozen free radicals. XIII. Electron diffraction study of amorphous ice, the  $H_2O_2-H_2O$  system and peroxy free radical condensates]. *Zhurnal Fizicheskoy Khimii*, Tom 43, Vyp. 5, 1969, p. 1153–58. [Temperature of crystallization of amorphous ice with no cubic ice found to be  $-115^\circ C$ . English translation in *Russian Journal of Physical Chemistry*, Vol. 43, No. 5, 1969, p. 641–45.]
- MIKSCH, E. S. Solidification of ice dendrites in flowing supercooled water. *Transactions of the Metallurgical Society of AIME*, Vol. 245, No. 9, 1969, p. 2069–72. [Effect of convection on morphology and growth rate of ice dendrites.]
- MUGURUMA, J. Effects of surface condition on the mechanical properties of ice crystals. *British Journal of Applied Physics (Journal of Physics, D)*, Ser. 2, Vol. 2, No. 11, 1969, p. 1517–25. [Large difference in properties of chemically and mechanically polished ice single crystals.]
- ODENCRANTZ, F. K. An apparent confirmation of the transient nature of whiskers on ice crystals. *Journal of the Atmospheric Sciences*, Vol. 27, No. 1, 1970, p. 167–68. [Formvar replicas show whisker remnants.]
- OWE-BERG, T. G., and GAUKLER, T. A. Electrification experiments with AgI in the system: water vapor, liquid water and ice. *Journal of the Atmospheric Sciences*, Vol. 26, No. 4, 1969, p. 675–83. [Measurement of charge on AgI particles in air currents as sorption, freezing and melting take place.]
- PLUMB, R. C. Chemical principles exemplified. The snowmaking machines. *Journal of Chemical Education*, Vol. 47, No. 3, 1970, p. 176. [Draws attention to thermodynamics involved in snowmaking machines using compressed air and water.]
- RENKER, B. Phonon dispersion in  $D_2O$ -ice. *Physics Letters A*, Vol. 30, No. 9, 1969, p. 493–94. [Neutron inelastic scattering study. Dispersion curves along  $[11\bar{2}0]$  and  $[10\bar{1}0]$  compared with Forslind's theory.]
- ROUSSEAU, D. L., and PORTO, S. P. S. Polywater: polymer or artifact? *Science*, Vol. 167, No. 3926, 1970, p. 1715–19. [Analysis of samples prepared in same way as other "polywater" samples shows high concentration of impurities.]
- SAKABE, Y., and others. Dielectric dispersion of NaOH-doped ice at low temperatures, [by] Y. Sakabe, M. Ida and S. Kawada. *Journal of the Physical Society of Japan*, Vol. 28, No. 1, 1970, p. 265. [By using purer water than before, dielectric constant found which is consistent with phase transition at  $\sim 60 K$ .]
- TAKAHASHI, T. Electric potential of liquid water on an ice surface. *Journal of the Atmospheric Sciences*, Vol. 26, No. 6, 1969, p. 1253–58. [Theoretical and experimental study. Discussion of implications for hailstone electrification and charging of melting snow.]
- TAKAHASHI, T. Electric potential of a rubbed ice surface. *Journal of the Atmospheric Sciences*, Vol. 26, No. 6, 1969, p. 1259–65. [Theoretical and experimental study of electric potential of ice surface rubbed by single crystal piece of ice.]
- TILLER, W. A. Migration of a liquid zone through a solid. *Journal of Crystal Growth*, Vol. 6, No. 1, 1969, p. 77–85. [Analysis of data on migration of a droplet of aqueous solution through ice in a temperature gradient.]
- TSENG, P. K., and RUBY, S. L. Some further results on the concentration dependence of tin (IV) isomer shifts in ice. *Chinese Journal of Physics (Taipei)*, Vol. 7, No. 1, 1969, p. 50–52. [Study of effect of adding KF, or HCl in addition to HF, or of changing the ratio of KCl to HCl. Isomer shifts depend on type and concentration of anions, but not on different cations.]
- VANIER, C. R., and TIEN, C. Free convection melting of ice spheres. *American Institute of Chemical Engineers Journal*, Vol. 16, No. 1, 1970, p. 76–82. [Experimental study of melting of ice spheres in water.]
- WEISWEILER, W. Messung der Wachstumsgeschwindigkeit lamellarer Eiskristalle gezüchtet am Tauspiegel. *Zeitschrift für Meteorologie*, Bd. 20, Ht. 11–12, 1968, p. 327–36. [Study of nucleation and growth of lamellar ice crystals growing on a dew-point mirror. English summary.]
- WEISWEILER, W. Wachstum lamellarer Eiskristalle unter instationären Züchtungsbedingungen auf einem Tauspiegel. *Zeitschrift für Meteorologie*, Bd. 20, Ht. 11–12, 1968, p. 337–43. [Study of growth and evaporation of lamellar ice crystals of a dew-point mirror under controlled supersaturation and air flow velocity. English summary.]
- WHALLEY, E., and LABBÉ, H. J. Optical spectra of orientationally disordered crystals. III. Infrared spectra of the sound waves. *Journal of Chemical Physics*, Vol. 51, No. 7, 1969, p. 3120–27. [Theory of light absorption by translational vibrations in such crystals compared with measurements on ice.]
- WILLIAMS, P. J. Melting point behaviour of glacier ice. *Nature*, Vol. 220, No. 5168, 1968, p. 689. [Comment on letter having same title by F. J. Radd and D. H. Oertle, *ibid.*, Vol. 218, No. 5148, 1968, p. 1242.]
- YEN, YIN-CHAO. On the effect of density inversion on natural convection in a melted water layer. *Chemical Engineering Progress Symposium Series*, Vol. 65, No. 92, 1969, p. 245–53. [Study of convective heat transfer in water above and below melting ice cylinder.]
- ZWEERINK, G. R., and ROACH, D. V. Thermal accommodation coefficients of helium, neon and argon on an ice surface. *Surface Science*, Vol. 19, No. 1, 1970, p. 249–54. [Determination at 77 K and 216 K.]

## LAND ICE. GLACIERS. ICE SHELVES

- AMBACH, W., and others. Deuterium-Gehalt des Wassers im Gletscherabfluss, [von] W. Ambach und H. Eisner, H. Moser und W. Stüchler. *Naturwissenschaften*, Bd. 57, Ht. 2, 1970, p. 86. [Diurnal and long-period variations in deuterium content of stream below Kesselwandferner, Austria.]

- AMBACH, W., and others. Untersuchung von charakteristischen Pollenspektren in Akkumulationsgebiet eines Alpengletschers (Kesselwandferner, Eitztaler Alpen, Österreich, von W. Ambach, S. Bortenschlager, H. Eisner. *Pollen et Spores*, Vol. 11, No. 1, 1969, p. 65–72. [High content of *Picea* pollen in those summers which have maximum flowering of *Picea*. English and French summaries.]
- ANDERSEN, E. Report of the geodetic, geophysic, and photogrammetric work at the west coast region of Greenland executed by the Danish Geodetic Institute in connection with the ice-cap work of E.G.I.G. *Meddelelser om Grønland*, Bd. 173, Nr. 4, 1969, 14 p. [Gives connection between northern terminal of E.G.I.G. network on ice sheet and Danish first order triangulation on west coast. Includes topographic map on scale 1 : 50 000 of glacier Kangerdlugssúp sermerssua.]
- ANDREWS, J. T., and WEBBER, P. J. Lichenometry to evaluate changes in glacial mass budgets: as illustrated from north-central Baffin Island, N.W.T. *Arctic and Alpine Research*, Vol. 1, No. 3, 1969, p. 181–94. [Lichen studies used to define ice margins from A.D. 1650 and hence glacier changes.]
- BAKER, P. E., and others. Volcanic activity at Deception Island in 1967 and 1969, by P. E. Baker, T. G. Davies and M. J. Roobol. *Nature*, Vol. 224, No. 5219, 1969, p. 553–60. [Eruptions, apparently associated with the caldera fault zone, have created a new island and a new 5 km fissure. Rift in overlying glacier released flood of water.]
- COLBECK, S. C., and EVANS, R. J. Experimental studies related to the mechanics of glacier flow. *Trends in Engineering*, Vol. 21, No. 2, 1969, p. 8–14. [Field experiments on Blue Glacier, Washington, U.S.A., including study of strain-rates in crevasse fields and creep tests on glacier ice at 0° C.]
- FEDOROV, B. A. Radiolokatsionnyye issledovaniya lednikovogo pokrova Antarktity [Radar studies of the Antarctic ice sheet]. *Trudy Sovetskoy Antarkticheskoy Ekspeditsii*, Tom 49, 1969, p. 213–38. [Survey of Soviet and other work.]
- GERKE, K. Barometrische Höhenbestimmungen auf dem grönländischen Inlandeis bei der Internationalen Glaziologischen Grönlandexpedition (EGIG) 1959. *Meddelelser om Grønland*, Bd. 173, Nr. 8, 1969, 77 p. [Barometric levellings on Greenland ice sheet, 1959. English and French summaries.]
- LIESTØL, O. Bremlånger i 1967. *Norsk Polarinstitutt. Årbok*, 1967 [pub. 1969], p. 183–90. [Mass balance measurements on four glaciers and front variations of thirteen glaciers in Norway. English abstract.]
- MIKHALIOV, V. I. The character of ice formation on Spitsbergen glaciers. *Norsk Polarinstitutt. Årbok*, 1967 [pub. 1969], p. 129–38. [General description of glacier facies as determined by Sovetskoy Shpitsbergenskoy Ekspeditsiya 1965 and 1966.]
- NEAVE, K. G., and SAVAGE, J. C. Icequakes on the Athabasca Glacier. *Journal of Geophysical Research*, Vol. 75, No. 8, 1970, p. 1351–62. [All seismic events appear to originate from extensional faulting near glacier surface.]
- NEAVE, K. G., and SAVAGE, J. C. Seismic activity in the Athabasca Glacier. *Eos (Transactions. American Geophysical Union)*, Vol. 50, No. 4, 1969, p. 236. [Abstract only. Seismic method of locating newly formed crevasses.]
- QUERVAIN, M. DE. Schneekundliche Arbeiten der Internationalen Glaziologischen Grönlandexpedition (Nivologie). *Meddelelser om Grønland*, Bd. 177, Nr. 4, 1969, 283 p. [Accumulation, temperature and metamorphosis studies on the snow and firn of Greenland. Appendices by F. Brandenberger, O. Reinwarth, A. Renaud and R. Schneider. English abstract.]
- SCHNEIDER, H. J. Minapin—Gletscher und Menschen im NW-Karakorum. *Die Erde*, 100. Jahrg., Ht. 2–4, 1969, p. 266–86, map. [Description of 1 : 50 000 map prepared by terrestrial photogrammetry. Advance and retreat of Minapin Glacier since 1889. Velocity measurements in 1959. English summary.]
- VIVIAN, R., and ALPHONSE, P.-H. Fiches des glaciers français. Les glaciers de Chasseforêt. *Revue de Géographie Alpine*, Tom. 58, Fasc. 1, 1970, p. 237–40. [Summary of knowledge of these glaciers.]
- VIVIAN, R., and CHINAL, M. Fiches des glaciers français. Le glacier du Chardon. *Revue de Géographie Alpine*, Tom. 58, Fasc. 1, 1970, p. 233–35. [Summary of knowledge of this glacier.]
- VORNDRAN, G. Untersuchungen zur Aktivität der Gletscher, dargestellt an Beispielen aus der Silvrettagruppe. *Schriften des Geographischen Instituts der Universität Kiel*, Bd. 29, Ht. 1, 1968, 129 p. [Study of changes in ice thickness and area of glaciers in this region of Switzerland and Austria and their dependence on glacier type. French and English summaries.]
- WEISS, R. F., and others. Compositional variations in gases in temperate glaciers, by R. F. Weiss, P. Bucher, H. Oeschger, H. Craig. *Eos (Transactions. American Geophysical Union)*, Vol. 50, No. 4, 1969, p. 142. [Abstract only. Analysis of entrapped air from Jungfraujoeh, Switzerland.]

## ICEBERGS. SEA, RIVER AND LAKE ICE

- ADDISON, J. R. Electrical relaxation in saline ice. *Journal of Applied Physics*, Vol. 41, No. 1, 1970, p. 54–63. [Frequency dispersion of dielectric coefficient used to determine spectrum of relaxation times which is interpreted in terms of properties of ice and brine.]
- BUZUYEV, A. YA., and SHESTERIKOV, N. P. Zavisimost' sredney tolshchiny pripaynogo l'da ot torosistosti [Relation between mean thickness of fast ice and hummockiness]. *Problemy Arktiki i Antarktiki*, Vyp. 32, 1969, p. 30–36.
- DEAN, C. H. Wave recording in a field of pack ice: a comparison of three independent methods. (In *Symposium on Antarctic oceanography, Santiago, Chile, 13–16 September 1966*. Cambridge, Scott Polar Research Institute for Scientific Committee on Antarctic Research, 1968, p. 222–23.) [Three categories of independent systems for measuring ocean waves defined.]
- GORBUNOV, YU. A., and TIMOKHOV, L. A. K issledovaniyu dinamiki l'dov [Investigation of ice dynamics]. *Izvestiya Akademii Nauk SSSR. Fizika Atmosfery i Okeana*, Tom 4, No. 10, 1968, p. 1086–91. [Numerical values of various indices of ice dynamics and relationships between them. English translation in *Izvestiya. Academy of Sciences, U.S.S.R. Atmospheric and Oceanic Physics*, Vol. 4, No. 10, 1968 [pub. 1969], p. 623–26.]
- GUSHCHENKOV, YE. M. K metodike prognoza srokov dostizheniya l'dom tolshchiny 20–25 cm [Method of forecasting time taken for ice to grow to a thickness of 20–25 cm]. *Problemy Arktiki i Antarktiki*, Vyp. 32, 1969, p. 45–51. [Floating ice.]

- INGRAM, R. G., and others. Pilot study of ice drift in the Gulf of St. Lawrence, [by] R. G. Ingram, O. M. Johannessen and E. R. Pounder. *Journal of Geophysical Research*, Vol. 74, No. 23, 1969, p. 5453-59. [Observations and comparison with theoretical calculations.]
- KARLSSON, P. Hugleiddingar um hafis. *Tímarit Verkfræðingafélags Íslands*, Árg. 53, Ht. 2-3, 1968, p. 17-25. [Distribution and movement of floating ice in Arctic Ocean.]
- KUTSCHALE, H. Arctic hydroacoustics. *Arctic*, Vol. 22, No. 3, 1969, p. 246-64. [Includes effect of sea ice on background noise and on propagation of underwater sound.]
- LAKE, R. A., and others. Brine drainage during sea ice growth and vertical circulation in the underlying water, [by] R. A. Lake, E. L. Lewis and E. R. Walker. *Eos (Transactions. American Geophysical Union)*, Vol. 50, No. 2, 1969, p. 63. [Abstract only.]
- LOCK, G. S. H., and others. A study of one-dimensional ice formation with particular reference to periodic growth and decay, by G. S. H. Lock, J. R. Gunderson, D. Quon and J. K. Donnelly. *International Journal of Heat and Mass Transfer*, Vol. 12, No. 11, 1969, p. 1343-52. [Experiments compared with theoretical predictions.]
- PAIGE, R. A. Stalactite growth beneath sea ice. *Science*, Vol. 167, No. 3915, 1970, p. 171-72. [Hollow tapering inverted cones found extending beneath sea ice in McMurdo Sound, Antarctica.]
- PITTS, J. Black icebergs, 2. *Antarktise Bulletin*, No. 26, 1968, p. 40. [Further comments on this phenomenon, quoting Sir Alister Hardy on R.R.S. *Discovery* in Antarctic waters, 1925-27. For "Black icebergs, [1]", see below, Van der Merwe, A.]
- UNTERSTEINER, N. Sea ice and heat budget. *Arctic*, Vol. 22, No. 3, 1969, p. 195-99. [Survey of progress in understanding properties of sea ice and conditions for its development.]
- VAN DER MERWE, A. Black icebergs. *Antarktise Bulletin*, No. 25, 1968, p. 30-31. [Comments by author and Sir Vivian Fuchs and Dr C. W. M. Swithinbank (in letter to author) on this phenomenon, reported in Antarctic waters, 1967. For continuation, see above, Pitts, J.]
- VINJE, T. E. Sea ice conditions in Svalbard in 1967. *Norsk Polarinstittut. Årbok*, 1967 [pub. 1969], p. 194-96. [Area charts for each month and discussion.]

## GLACIAL GEOLOGY

- BLACK, R. F. Geology, especially geomorphology, of northern Alaska. *Arctic*, Vol. 22, No. 3, 1969, p. 283-99. [Survey of present knowledge particularly that due to Naval Arctic Research Laboratory work.]
- BRAY, J. R. Glaciation and solar activity since the fifth century B.C. and the solar cycle. *Nature*, Vol. 220, No. 5168, 1968, p. 672-74. [Evidence for a 2 600 year solar cycle.]
- CLARK, R. A contribution to glacial studies of the Malham Tarn area. *Field Studies*, Vol. 2, No. 4, 1967, p. 479-91. [Late-glacial and post-glacial landforms.]
- DANSGAARD, W., and TAUBER, H. Glacier oxygen-18 content and Pleistocene ocean temperatures. *Science*, Vol. 166, No. 3904, 1969, p. 499-502. [<sup>18</sup>O content of ice in ice sheets during glacial maximum could account for observed changes in marine deposits.]
- EMILIANI, C. Interglacial high sea levels and the control of Greenland ice by the precession of the equinoxes. *Science*, Vol. 166, No. 3912, 1969, p. 1503-04. [Correlation between ages of high sea-level and coincidence of perihelion with northern summer solstice suggests considerable melting of Greenland ice during interglacial periods was climatically controlled.]
- GILLBERG, G. A great till section on Kinnekule, W. Sweden. *Geologiska Föreningens i Stockholm Förhandlingar*, Vol. 91, Pt. 3, No. 538, 1969, p. 313-42. [Discussion of depositional processes and factors which caused variations in them.]
- HORAI, K.-I. Effect of past climatic change on the thermal field of the Earth. *Earth and Planetary Science Letters*, Vol. 6, No. 1, 1969, p. 39-42. [Corrections to heat flow due to glaciation.]
- HOWARTH, P. J., and PRICE, R. J. The proglacial lakes of Breiðamerkurjökull and Fjallsjökull, Iceland. *Geographical Journal*, Vol. 135, Pt. 4, 1969, p. 573-81, plates. [Study of these lakes, the formation of icebergs in them, and discussion of their origin.]
- JONES, J. G. Intraglacial volcanoes of the Laugarvatn region, south-west Iceland—I. *Quarterly Journal of the Geological Society of London*, Vol. 124, No. 495, Pt. 3, 1969 [for 1968], p. 197-211. [Shape and structure of these volcanoes attributed to their having formed within bodies of melt water in an ice sheet. Discussion by G. P. L. Walker, K. R. Early and P. A. Sabine, p. 211.]
- KING, C. A. M. Glacial geomorphology and chronology of Henry Kater Peninsula, east Baffin Island, N.W.T. *Arctic and Alpine Research*, Vol. 1, No. 3, 1969, p. 195-212. [Deglaciation stages and study of moraines.]
- KOOPMANS, B. N., and STAUFFER, P. Glacial phenomena on Mount Kinabalu, Sabah. *Malaysia. Borneo Region. Geological Survey. Bulletin* 8, 1967, p. 25-35, plates. [Evidence that this mountain was capped by ice fields in the Pleistocene; at least two valley glaciers developed.]
- MACNEILL, R. H. Dates relating to the dating of the last major ice sheet in Nova Scotia. *Maritime Sediments*, Vol. 5, No. 1, 1969, p. 3. [Dating of three samples, two relating to beginning and one to end of ice advance.]
- MALAURIE, J. Thèmes de recherche géomorphologique dans le nord-ouest du Groenland. *Centre de Recherches et Documentation Cartographiques et Géographiques. Mémoires et Documents* (Paris), Numéro hors série, 1968, 495 p. [Study of geomorphology of parts of Thule district, north-west Greenland. Sections on frost-shattering, geomorphology of Inglefield Land and Washington Land, talus slopes and effect of running water on sandy slopes.]
- NICHOLS, R. L. Geomorphology of Inglefield Land, North Greenland. *Meddelelser om Grønland*, Bd. 188, Nr. 1, 1969, 109 p. [Study of geomorphology, mainly glacial and periglacial, of this area of north-west Greenland.]
- PÉCHOUX, P.-Y. Traces d'activité glaciaire dans les montagnes de Grèce centrale. *Revue de Géographie Alpine*, Tom. 58, Fasc. 1, 1970, p. 211-24. [Observations of small cirques in central Greece giving evidence of glaciation in the late Quaternary. English abstract.]

- RAY, L. L. Glacial erratics and the problem of glaciation in northeast Kentucky and southeast Ohio—a review and suggestion. *U.S. Geological Survey. Professional Paper* 650-D, 1969, p. D195–99. [Mode of transportation not adequately explained. Possibly Nebraskan ice advanced further than at present thought.]
- WHITE, W. A. Erosion of cirques. *Journal of Geology*, Vol. 78, No. 1, 1970, p. 123–26. [Suggests that cirques form by deepening through glacial erosion of floors rather than by headward sapping of walls.]

## FROST ACTION ON ROCKS AND SOIL. FROZEN GROUND. PERMAFROST

- BENEDICT, J. B. Microfabric of patterned ground. *Arctic and Alpine Research*, Vol. 1, No. 1, 1969, p. 45–48. [Sand grain orientation studied. Possible use in reconstructing soil movement.]
- BLACK, R. F. Slopes in southwestern Wisconsin, U.S.A., periglacial or temperate? *Biuletyn Peryglacjalny*, No. 18, 1969, p. 69–82. [Present temperate climate sufficient to explain most features.]
- BROWN, J. Soil properties developed on the complex tundra relief of northern Alaska. *Biuletyn Peryglacjalny*, No. 18, 1969, p. 153–67. [Study of soils, surface relief and near-surface lithology above permafrost near Barrow, Alaska.]
- CHURSKA, Z. The development of the Drwęca valley slopes in the late-glacial period. *Biuletyn Peryglacjalny*, No. 18, 1969, p. 423–34. [Periglacial deposits and processes which formed them in this region of Poland.]
- DEMEK, J. Cryogene processes and the development of cryoplanation terraces. *Biuletyn Peryglacjalny*, No. 18, 1969, p. 115–25. [Significance of different processes at different stages of terrace development.]
- DYLIK, J. Slope development under periglacial conditions in the Łódź region. *Biuletyn Peryglacjalny*, No. 18, 1969, p. 381–410. [Excursion notes on this part of Poland.]
- IVANOV, N. S. *Teplo- i massoperenos v merzlykh gornyykh porodakh* [Heat and mass transport in frozen soils]. Moscow, Izdatel'stvo "Nauka", 1969. 240 p. [Theoretical study.]
- JAHN, A. Some problems concerning slope development in the Sudetes. *Biuletyn Peryglacjalny*, No. 18, 1969, p. 331–48. [Excursion notes including periglacial effects.]
- KAR, N. R. Studies on the geomorphic characteristics and development of slopes in the periglacial zones of Sikkim and Darjeeling Himalayas. *Biuletyn Peryglacjalny*, No. 18, 1969, p. 43–67. [Field studies and deduction of mechanisms of slope development.]
- KATASONOV, E. M. The typical features of cryogenic eluvium on slopes. *Biuletyn Peryglacjalny*, No. 18, 1969, p. 11–14. [Study of comminution and deformation of deposits *in situ* by freezing of water within them.]
- KINOSHITA, S., and others. Kitami ni okeru tōjō kansoku (Shōwa 42–43 nen tōki), tsuketari dochūsui-idō no kikō oyobi tōchaku tōjō no teionshitsu jikken [Measurement of frost heave in Kitami (1967–68), including low temperature chamber experiments on the mechanism of movement, temperature profile and heaving force]. [By] S. Kinoshita, K. Horiguchi, K. Tanuma [and] T. Ono. *Teion-kagaku: Low Temperature Science*, Ser. A, [No.] 26, 1968, p. 363–81. [English summary, p. 381.]
- LYCZEWSKA, J. Sédiments et processus quaternaires du versant crétacé de la vallée de la Basse-Nida (partie méridionale de la Pologne centrale). *Biuletyn Peryglacjalny*, No. 18, 1969, p. 195–208. [Study of sediments and periglacial processes which formed them in this part of Poland.]
- MACAR, P. Actions périglaciaires et évolution des pentes en Belgique. *Biuletyn Peryglacjalny*, No. 18, 1969, p. 137–52. [Study of fossil periglacial forms in Belgium.]
- OWENS, I. F. Causes and rates of soil creep in the Chilton Valley, Cass, New Zealand. *Arctic and Alpine Research*, Vol. 1, No. 3, 1969, p. 213–20. [Frost action shown to be main cause. Rates measured.]
- PÉCSI, M. Genetic classification of slope sediments. *Biuletyn Peryglacjalny*, No. 18, 1969, p. 15–27. [Suggests classification, including periglacial slope sediments.]
- PÉWÉ, T. L., ed. *The periglacial environment, past and present*. Montreal, McGill-Queen's University Press [and] Arctic Institute of North America, 1969. ix, 487 p. [Book containing the following papers: T. L. Péwé, "The periglacial environment", p. 1–9; R. J. E. Brown, "Factors influencing discontinuous permafrost in Canada", p. 11–53; A. I. Popov, "Underground ice in the Quaternary deposits of the Yana-Indigirka lowland as a genetic and stratigraphic indicator", p. 55–64; A. Rapp and L. Annersten, "Permafrost and tundra polygons in northern Sweden", p. 65–91; J. Brown, "Soils of the Okpilak river region, Alaska", p. 93–128; S. Rudberg, "Distribution of small-scale periglacial and glacial geomorphological features on Axel Heiberg Island, Northwest Territories, Canada", p. 129–59; J. L. Lorenzo, "Minor periglacial phenomena among the high volcanoes of Mexico", p. 161–75; J. W. Marr, "Cyclical change in a patterned-ground ecosystem, Thule, Greenland", p. 177–201; J. Lundqvist, "Earth and ice mounds: a terminological discussion", p. 203–15; P. Bellair, "Soil stripes and polygonal ground in the subantarctic islands of Crozet and Kerguelen", p. 217–22; R. D. Reger and T. L. Péwé, "Lichenometric dating in the central Alaska Range", p. 223–47; A. Weidick, "Investigations of the Holocene deposits around Jakobshavn Isbrae, West Greenland", p. 249–62; K. K. Markov, "The Pleistocene history of Antarctica", p. 263–69; S. A. Harris, "Isostatic recovery near glacier-ice margins: some evidence from Waterloo, Ontario, Canada", p. 271–83; A. Cailleux, "Quaternary periglacial wind-worn sand grains in USSR", p. 285–301; A. Journaux and others, "Distribution, source, and age of the loess on the plain of Caen, Normandy, France", by A. Journaux, M. Helluin, J. P. Lauridou and J. Pellerin, p. 303–20; W. Mullenders and F. Gullentops, "The age of the pingos of Belgium", p. 321–35; P. Macar, "A peculiar type of fossil ice fissure", p. 337–46; E. B. de Ménéval, "Periglacial phenomena recently observed in the terraces of the Seine southeast of Bonnières, France", p. 347–50; R. Gruhn and A. L. Bryan, "Fossil ice wedge polygons in southeast Essex, England", p. 351–63; J. Dylik, "Slope development affected by frost fissures and thermal erosion", p. 365–86; T. D. Ford, "Dolomite tors and sandfilled sink holes in the Carboniferous limestone of Derbyshire, England", p. 387–97; R. B. G. Williams, "Permafrost and temperature conditions in England during the last glacial period", p. 399–410; R. G. West, "Stratigraphy of periglacial features in East Anglia and adjacent areas", p. 411–15; J. J. Bigarella and others, "Processes and environments of the Brazilian Quaternary", by J. J. Bigarella, M. R. Mousinho and J. X. da Silva, p. 417–87. Reviewed on p. 408–09.]

- RAYNAL, R. Mutations en cours dans la morphogénèse périglaciaire au Nord-Ouest du Spitzberg (région du Kongsfjord). *Biuletyn Peryglacjalny*, No. 18, 1969, p. 83–88. [Study of slope evolution and of detailed forms on level ground in Spitzbergen.]
- ROHDENBURG, H. Observations concerning Lateglacial [*sic*] slope-dynamics in Central Europe. *Biuletyn Peryglacjalny*, No. 18, 1969, p. 89–94. [Inference of amount of periglacial development that took place in this period.]
- STARKEK, L. L'évolution des versants des Carpates à flysch au Quaternaire. *Biuletyn Peryglacjalny*, No. 18, 1969, p. 349–79. [Excursion notes including periglacial effects.]
- TOLSTIKHIN, O. N., and FIGUZOVA, V. M., ed. *Naledi Sibiri [Iceings of Siberia]*. Moscow, Izdatel'stvo "Nauka", 1969. 208 p. [Collected papers on many aspects.]
- VELITCHKO, A. A. Milieu géologique et géomorphologique de la zone périglaciaire de la Plaine Est-Européenne. *Biuletyn Peryglacjalny*, No. 18, 1969, p. 183–93. [General description of the geology and geomorphology of the periglacial zone of the east European plain.]
- WASHBURN, A. L. Patterned ground in the Mesters Vig district, northeast Greenland. *Biuletyn Peryglacjalny*, No. 18, 1969, p. 259–330. [Detailed study of patterned ground and discussion of origin.]
- WATSON, E. The slope deposits in the Nant Iago valley, near Cader Idris, Wales. *Biuletyn Peryglacjalny*, No. 18, 1969, p. 95–113. [Interpretation as due to solifluction and slope wash.]

## METEOROLOGICAL AND CLIMATOLOGICAL GLACIOLOGY

- AUER, A. H., jr., and others. Observations of ice crystal and ice nuclei concentrations in stable cap clouds, [by] A. H. Auer, Jr., D. L. Veal and J. D. Marwitz. *Journal of the Atmospheric Sciences*, Vol. 26, No. 6, 1969, p. 1342–43. [Measurements show temperature dependence of ratio of crystals to nuclei.]
- BAILEY, I. H., and others. Isotopic composition of hailstones, by I. H. Bailey, J. R. Hulston, W. C. Macklin and J. R. Stewart. *Journal of the Atmospheric Sciences*, Vol. 26, No. 4, 1969, p. 689–94. [Theory of isotopic fractionation in hailstones and analyses of accreted ice which confirm the predictions.]
- BURROWS, D. A., and ROBERTSON, C.E. Comments on "ice multiplication in clouds". *Journal of the Atmospheric Sciences*, Vol. 26, No. 6, 1969, p. 1340–41. [Comments on paper by P. V. Hobbs, *ibid.*, Vol. 26, No. 2, 1969, p. 315–18.]
- MORGAN, G. M., jr., and PRODI, F. A laboratory observation of hailstone "lobe" formation following the termination of spongy growth by accretion. *Journal of Applied Meteorology*, Vol. 8, No. 5, 1969, p. 840–42. [Possibility that observed lobes are due to protuberances caused by volume change of freezing water inside a spongy ice mass frozen from the outside.]
- ROSINSKI, J., and KERRIGAN, T. C. The role of aerosol particles in the formation of raindrops and hailstones in severe thunderstorms. *Journal of the Atmospheric Sciences*, Vol. 26, No. 4, 1969, p. 695–714. [Study of collected hailstones to determine nature of nucleation process.]
- RUSKIN, R. E. Multiplication of ice embryos by ice-whisker shedding. *Science*, Vol. 166, No. 3907, 1969, p. 906. [Possibility of ice whiskers as formed on evaporating ice forming in cloud conditions and shedding as ice embryos.]
- SCHUEPP, P. H., and LIST, R. Influence of molecular properties of the fluid on simulation of the total heat and mass transfer of solid precipitation particles. *Journal of Applied Meteorology*, Vol. 8, No. 5, 1969, p. 743–46. [Measurements of heat transfer from solid to water used as model experiment to indicate roughness effect on heat and mass transfer of spherical hailstones.]

## SNOW

- DEVINE, J. C. The "snowburst" of 14 March 1969 at Fort Huachuca, Arizona. *Weatherwise*, Vol. 22, No. 6, 1969, p. 236–39. [Meteorological conditions which led to exceptionally cold spell with heavy snow close to Mexican border.]
- FUJINO, K. Sekisetsu naibu de no yūsetsu-sui no ryūka sokudo no sokutei, I [Measurement of flowing down speed of melt water in a snow cover, I]. *Teion-kagaku: Low Temperature Science*, Ser. A, [No.] 26, 1968, p. 87–100. [NaCl used as a tracer to measure penetration of melt water. English summary, p. 100.]
- KIKUCHI, K., and MURAYAMA, M. Kyokuchi sōbiyō mōhi, nunoji no chakusetsu genshō [Snow deposition on fur and cloth used in the polar regions]. *Nankyoku Shiryo: Antarctic Record*, [No.] 36, 1970, p. 78–84. [Study at "Syowa" station on thirteen kinds of fur and cloth of amount of snow and hoar frost deposited. English abstract.]
- LAUSCHER, F. Eine Analyse von Schneehöhen der Slowakei. *Wetter und Leben*, Jahrg. 22, Ht. 1–2, 1970, p. 9–12. [Data on average maximum and monthly snow depths in Slovakia analysed and compared with similar data for Austria. English summary.]
- MAYR, E., and WARTBURG, B. Über die Bodentemperatur unter schneefreier und schneebedeckter Oberfläche. *Wetter und Leben*, Jahrg. 22, Ht. 1–2, 1970, p. 21–24. [Effect of snow cover on soil temperature measurements. English summary.]
- PETERLE, T. J. DDT in Antarctic snow. *Nature*, Vol. 224, No. 5219, 1969, p. 620. [Measurement in snow at "Plateau" station and deduction of possible total amount of DDT in Antarctic snow.]
- SEPPÄNEN, M. Average depth of snow in undulating land in Finland. *Geophysica*, Vol. 9, No. 4, 1967, p. 277–86. [Covers period 1952–63. Also published in *Hydrologisen Toimiston Tiedonantoja*, 27.]
- SHIMIZU, H. Shamen sekisetsu no naibu-hizumi, I [Study on internal strain of snow cover on a slope, I]. *Teion-kagaku: Low Temperature Science*, Ser. A, [No.] 26, 1968, p. 143–68. [Direct observation of strain. English summary, p. 166–68.]

- WAKAHAMA, G. Sekisetsu-nai ni okeru yūsetsu-sui no idō, III—suiri ryūka sokudo himaku ryūka sokudo [Infiltration of melt water into snow cover, III—flowing down speed of melt water in a snow cover]. *Teion-kagaku: Low Temperature Science*, Ser. A, [No.] 26, 1968, p. 77–86. [Measurement of speed of penetration of melt water by two different processes. English summary, p. 85–86.]
- WAKAHAMA, G., and others. Daisetsu-san no sekkei chōsa (dai 3 nendo) [Studies of firn on Mt Daisetsu in summer (third year)]. [By] G. Wakahama, Y. Endo, T. Yamada, H. Ushiki [and] R. Naruse. *Teion-kagaku: Low Temperature Science*, Ser. A, [No.] 26, 1968, p. 215–29. [Results in 1966 of measurements on snow patches in Hokkaido, Japan. English summary, p. 227.]
- WAKAHAMA, G., and others. Sekisetsu-nai ni okeru yūsetsu-sui no idō, II [Infiltration of melt water into snow cover, II]. [By] G. Wakahama, T. Nakamura [and] Y. Endo. *Teion-kagaku: Low Temperature Science*, Ser. A, [No.] 26, 1968, p. 53–75. [Measurement of water content in each layer of a snow cover. English summary, p. 73–75.]
- WINDOM, H. L. Atmospheric dust records in permanent snowfields: implications to marine sedimentation. *Geological Society of America. Bulletin*, Vol. 80, No. 5, 1969, p. 761–82. [Analyses of samples from Antarctic and Greenland and five temperate glaciers and discussion of significance.]