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.

CONFERENCES

[CLOUD PHYSICS.] *Project Skywater. Proceedings: Skywater Conference I. Physics and chemistry of nucleation.* Denver, Colorado, U.S. Dept. of the Interior, Bureau of Reclamation, [1967]. vi, 419 p. [Proceedings of conference held 10–12 July 1967. Papers include: V. J. Schaefer, "Some thoughts on ice nuclei", p. 3–20; N. Fukuta, "Review of physics of ice nucleation and its application to weather modification", p. 21–126; T. G. Owe Berg, "Nucleation and growth in cloudseeding", p. 127–46; P. V. Hobbs, "The propagation of the ice phase in the atmosphere", p. 147–61; F. P. Parungo and J. P. Lodge, Jr., "Freezing of aqueous solutions of non-polar gases", p. 161–70; F. P. Parungo and J. P. Lodge, Jr., "Amino acids as ice nucleators", p. 171–86; F. P. Parungo and J. Wood, "Freezing of aqueous solutions of macromolecules", p. 187–91; N. Gokhale, "Ice formation by contact nucleation", p. 192–98; L. R. Koenig, "The origin of ice crystals in the atmosphere", p. 199–211; J. Hallett, "Laboratory study of ice nucleating ability of mineral particulates", p. 212–31; T. E. Hoffer, "Some aspects of nucleation on lead iodide", p. 232–44; W. G. Finnegan, "Chemical and physical properties of freezing nuclei from pyrotechnic combustion", p. 246–84; F. K. Odencrantz and R. W. Buecher, "Temperature dependence of the polarity of electrical charges on ice crystals", p. 285–304; P. St.-Amand, "Nucleation by silver iodide and similar materials", p. 305–53.]

RIEHL, N., *and others, ed. Physics of ice: proceedings of the international symposium on physics of ice, Munich, Germany, September 9–14, 1968. Edited by N. Riehl, B. Bullemer, H. Engelhardt.* New York, Plenum Press, 1969. xix, 642 p. [For details of papers see elsewhere in this list.]

GENERAL GLACIOLOGY

GLEN, J. W. Implications of ice physics for problems of field glaciology. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 585–93.) [Review of cross-links between ice physics and other branches of glaciology.]

GLACIOLOGICAL INSTRUMENTS AND METHODS

BLEIL, C. E. A new method for growing crystal ribbons. *Journal of Crystal Growth*, Vol. 5, No. 2, 1969, p. 99–104. [Method of growing crystal ribbons without a shaping aperture. Ice and germanium used.]

KANE, H. S. A neutron probe for the determination of snow density and its use in Antarctica. *Ohio State University. Institute of Polar Studies. Report* No. 28, 1969, vi, 76 p. [Description of apparatus and its use during a traverse in Dronning Maud Land.]

SWANSON, R. H. A system for making remote and undisturbed measurements of snow settlement and temperature. *Proceedings of the Western Snow Conference*, 36th annual meeting, 1968, p. 1–5. [Method for mounting and dropping transducers and subsequently locating and reading them.]

ZELLER, A. N. Preliminary investigation of the effect of deglaciation upon the thermoluminescence of rock. (*In* McDougall, D. J., *ed. Thermoluminescence of geological materials. Proceedings of a NATO Advanced Research Institute on applications of thermoluminescence to geological problems.* London and New York, Academic Press, 1968, p. 519–23.) [Method for determining time since rock was exposed to solar radiation tested with measurements on Rosenlaui Gletscher, Switzerland.]

PHYSICS OF ICE

BISHOP, P. G., *and* GLEN, J. W. Electric polarization effects in pure and doped ice at low temperatures. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 492–501.) [Observations of current which flows when an ice crystal, cooled in an electric field, is reheated.]

BROWNSCOMBE, J. L., *and* THORNDIKE, N. S. C. Freezing and shattering of water droplets in free fall. *Nature*, Vol. 220, No. 5168, 1968, p. 687–89. [Laboratory observations of percentage of droplets which shatter on freezing and of effect of NaCl in suppressing this.]

BULLEMER, B., *and others.* Protonic conduction of ice. Part I: high temperature region, [by] B. Bullemer, H. Engelhardt, N. Riehl. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 416–29.) [Experimental study of D.C. conductivity of ice.]

CAMP, P. R., *and others.* Electrical conduction in ice, [by] P. R. Camp, W. Kiszenick, D. Arnold. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 450–70.) [A.C. and D.C. measurements and their interpretation.]

COBB, A. W., *and* GROSS, G. W. Interfacial electrical effects observed during the freezing of dilute electrolytes in water. *Journal of the Electrochemical Society*, Vol. 116, No. 6, 1969, p. 796–804. [Measurement of freezing potential, charge separation across phase boundary, and chemical composition of phases during freezing of dilute solutions of about 50 salts, acids and bases.]

COLE, R. H., *and* WÖRZ, O. Dielectric properties of ice I. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 546–54.) [Measurements over wide temperature and frequency range.]

COPE, F. W. Nuclear magnetic resonance evidence using D_2O for structured water in muscle and brain. *Biophysical Journal*, Vol. 9, No. 3, 1969, p. 303–19. [Nuclear magnetic resonance of D_2O in rat muscle and brain shows its structure to be more like ice than water.]

CORIELL, S. R., *and* HARDY, S. C. Morphological stability of a cylinder. *Journal of Research of the National Bureau of Standards*, Sect. A, Vol. 73A, No. 1, 1969, p. 65–78. [Theory of stability of shape of cylindrical ice crystal growing in supercooled water.]

CORIELL, S. R., *and* HARDY, S. C. Morphology of unstable ice cylinders. *Journal of Applied Physics*, Vol. 40, No. 4, 1969, p. 1652–55. [Wave-length of sinusoidal perturbations in the shape of ice single crystal cylinders growing in supercooled water measured as function of supercooling.]

CROSS, J. D. Scanning electron microscopy of evaporating ice. *Science*, Vol. 164, No. 3876, 1969, p. 174–75. [Observations show marked differences between single-crystal and polycrystalline ice.]

CROSS, J. D. Study of the surface of ice with a scanning electron microscope. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 81–94.) [Difference between appearance of polycrystalline and single-crystal ice.]

DANTL, G. Elastic moduli of ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 223–30.) [Ultrasonic measurements of longitudinal and transverse velocity and deduction of single crystal elastic constants down to −140°C.]

EDDY, J. A., *and* MACQUEEN, R. M. Infrared scattering observations in the upper atmosphere. *Journal of Geophysical Research*, Vol. 74, No. 13, 1969, p. 3322–30. [Contribution of scattering by ice crystals and other scatterers assessed. Water drops and ice crystals account for observed phenomena.]

EIBEN, K. Irradiation-produced solvated electrons in ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 184–94.) [Observations of stability of solvated electrons in ice and interpretation.]

ENGEL, J. Hydrogen bonds in biological systems. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 138–51.) [General review of part hydrogen bonds play in biological systems.]

ENGELHARDT, H., *and others*. Protonic conduction of ice. Part II: low temperature region, [by] H. Engelhardt, B. Bullemer, N. Riehl. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 430–42.) [Conduction experiments using proton-injecting electrodes at low temperatures.]

FAURE, P. Étude d'un modèle dynamique du réseau cristallin de la glace. *Journal de Physique*, Tom. 30, Nos. 2–3, 1969, p. 214–20. [Dynamical model of hexagonal ice with two force constants used to deduce low frequency vibration. Deduction of dispersion curves and frequency spectrum and comparison with neutron scattering. English abstract.]

FERNANDEZ, R. Growth of ice in flowing water and sodium chloride solutions. *Dissertations Abstracts*, B, Vol. 29, No. 4, 1968, p. 1337-B. [Rate of growth in basal plane measured and compared with theoretical model. Abstract of Ph.D. thesis submitted to Syracuse University, N.Y. Microfilm or xerographic copy order (University Microfilms, Ann Arbor, Mich., U.S.A.) no. 68–13,824.]

FISCHER, S. F., *and* HOFACKER, G. L. Theory of the mobility of structural defects in ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 369–84.) [One-dimensional theoretical model for electrical point defect migration in ice.]

FISCHER, S. F., *and others*. Spectral behavior of defects in ice—quasiparticle model, [by] S. F. Fischer, G. L. Hofacker, M. A. Ratner. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 385–400.) [Theoretical study of infra-red absorption spectrum of defects in ice.]

FUKUDA, A., *and* HIGASHI, A. X-ray diffraction topographic studies of the deformation behaviour of ice single crystals. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 239–50.) [Observations of dislocation movement, identification of Burgers vectors, dislocation velocity measurements.]

GLEN, J. W. Structure and point defects of ice: their effect on the electrical and mechanical properties. *Science Progress* (Oxford), Vol. 57, No. 225, 1969, p. 1–21. [Review of recent work on high pressure phases of ice and on electrical and mechanical properties of ice and explanation in terms of defects.]

GLOCKMANN, H. P. Conduction anomalies and polarization in ice at low temperatures. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 502–13.) [Observations of charge release when ice crystals, cooled in electric field, are reheated.]

GOSAR, P. Proton-proton and proton-lattice interactions in ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 401–15.) [Theoretical study of Bjerrum defect migration.]

GRÄNICHER, H. Evaluation of dielectric dispersion data. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 527–33.) [Discussion of how to interpret dielectric data from bridge measurements.]

GRÄNICHER, H. On the interpretation of the pressure dependence of properties controlled by lattice defects. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 534–40.)

GRÄNICHER, H. Review on problems of the physics of ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 1–18.) [Survey of present position.]

HAHNE, E., *and* GRIGULL, U. Some experiments on the regelation of ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 320–28.) [Observations of wire penetration rate and comparison with theory.]

HALLETT, J. Nucleation and growth of ice crystals in water and biological systems. (*In* Hawthorne, J., *ed. Low temperature biology of foodstuffs*. Oxford, New York, Pergamon Press, 1968, p. 23–52.) [Survey of knowledge of nucleation and growth of ice crystals.]

HALTENORTH, H., *and* KLINGER, J. Diffusion of hydrogen fluoride in ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 579–84.) [Measurements with precautions against surface diffusion.]

HAMILTON, W. C., *and others*. Deuteron arrangements in the high-pressure forms of ice, [by] W. C. Hamilton, [W.] B. Kamb, S. J. Laplaca, A. Prakash. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 44–58.) [Neutron diffraction study of D_2O ice II, ice III, ice V and ice IX.]

HANDLER, E. S. Single crystal X-ray diffraction study of H_2O, D_2O, $H_2{}^{18}O$ hexagonal ice. *Dissertations Abstracts*, B, Vol. 29, No. 6, 1968, p. 2002-B. [Lattice constant changes on substituting D and ^{18}O in ice. Abstract of Ph.D. thesis submitted to Polytechnic Institute of Brooklyn. Microfilm or xerographic copy order (University Microfilms, Ann Arbor, Mich., U.S.A.) no. 68–16,247.]

HANSEN, J. E., *and* CHEYNEY, H. Theoretical spectral scattering of ice clouds in the near infrared. *Journal of Geophysical Research*, Vol. 74, No. 13, 1969, p. 3337–46. [Calculations for wave-lengths 1–4 μm show reflectivity is sensitive to particle size.]

HAZLEWOOD, C. F., *and others*. Evidence for the existence of a minimum of two phases of ordered water in skeletal muscle, by C. F. Hazlewood, B. L. Nichols [and] N. F. Chamberlain. *Nature*, Vol. 222, No. 5195, 1969, p. 747–50. [Evidence for ice-like structures for the water near proteins from nuclear magnetic resonance spectrometry.]

HELMREICH, D. Elastic anomalies of ice at low temperatures. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 231–38.) [Anomalies in elastic constant measurement on pure and HF-doped ice near 105 K.]

HIGASHI, A. Mechanical properties of ice single crystals. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 197–212.) [Review of present knowledge.]

HOBBS, P. V., *and* KETCHAM, W. M. The planar growth of ice from the pure melt. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 95–112.) [Study of mechanism of growth and of development of preferred orientation.]

HOLMES, D. E., *and others*. Effect of oxygen on the determination of hydrogen atom yields in irradiated ice matrices, [by] D. E. Holmes, N. B. Nazhat and J. J. Weiss. *Zeitschrift für Naturforschung*, Bd. 24A, Ht. 3, 1969, p. 481. [Dissolved oxygen molecules have important effect on electron spin resonance signal due to hydrogen atoms in irradiated acid ices.]

IKAWA, S.-I., *and* MAEDA, S. Infrared intensities of the stretching and librational frequencies of H_2O, D_2O, and HDO in solids. *Spectrochimica Acta*, Vol. 24A, No. 5, 1968, p. 655–65. [Measurement and interpretation of infra-red spectra of ice and discussion of resulting frequencies.]

JACCARD, C. Thermoelectric effect in ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 348–62.) [Review of experiments and discussion of their theoretical interpretation.]

JOHNSON, D. A. The separation of charge due to the fracture of freezing water drops. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 603–10.) [Experimental measurements.]

JONES, S. J., *and* GLEN, J. W. Impurity effects on the plasticity of ice and their explanation in terms of hydrogen reorientation. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 217–22.) [Marked softening of ice single crystals at low temperatures by dissolved HF and possible interpretation.]

KAHANE, A. Experimental and theoretical studies on the DC conductivity of ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 443–49.) [Determination of activation energies in experiments using ion exchange membranes.]

KAHANE, A., *and others*. Dopage selectif de la glace monocristalline avec de l'hélium et du néon, [par] A. Kahane, J. Klinger, M. Philippe. *Solid State Communications*, Vol. 7, No. 15, 1969, p. 1055–56. [Experiments show that He and Ne, but not A, can be dissolved in ice.]

KETCHAM, W. M., *and* HOBBS, P. V. An experimental determination of the surface energies of ice. *Philosophical Magazine*, Eighth Ser., Vol. 19, No. 162, 1969, p. 1161–73. [Determination of ice–water vapour, ice–water and ice–ice (grain boundary) surface free energies.]

KRAUSZ, A. S. An experimental investigation of strain relaxation in ice. *Scripta Metallurgica*, Vol. 2, No. 11, 1968, p. 615–19. [Experiments on the reverse plastic deformation of columnar grained ice when stress is removed are interpreted in terms of dislocation mobility theory.]

KVAJIĆ, G., *and others*. Rejection of impurities by growing ice from a melt, [by] G. Kvajić, V. Brajović, E. R. Pounder. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 120–31.) [Use of radioactive tracer technique to locate impurities.]

LEVI, L., *and* AUFDERMAUR, A. N. Orientation of ice crystals grown by accretion of supercooled droplets. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 620–30.) [Experiments and their interpretation.]

MASCARENHAS, S. Charge and polarization storage in ice crystals. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 483–91.) [Studies of Costa Rabeiro effect, thermo-electrets and possible ferroelectricity.]

MOGENSEN, O. E. Positron annihilation in the water–ice system. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 171–77.) [Phenomena observed when positrons annihilate in water or ice and possible relation to peculiar behaviour of protons in ice.]

MOSSOP, S. C., *and* JAYAWEERA, K. O. L. F. AgI–NaI aerosols as ice nuclei. *Journal of Applied Meteorology*, Vol. 8, No. 2, 1969, p. 241–48. [Laboratory cloud chamber study. Comparison of results with different theories.]

MOUNIER, S., *and* SIXOU, P. A contribution to the study of conductivity and dipolar relaxation in doped ice crystals. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 562–70.) [Measurements using blocking electrodes.]

MPEMBA, E. B., *and* OSBORNE, D. G. Cool? *Physics Education*, Vol. 4, No. 3, 1969, p. 172–75. [A beaker of hot water, placed in a refrigerator, freezes quicker than a beaker of cool water. Possible explanation.]

MÜLLER-KRUMBHAAR, H. Neutron and gamma activated nucleation of Tyndall-flowers in ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 132–37.) [Experimental study of Tyndall flower formation in irradiated ice.]

MUGURUMA, J. Influence of the surface layer on the plastic deformation of ice single crystals. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 213–16.) [Removal of mechanically worked surface layer greatly increases maximum stress in constant strain-rate tests.]

NOLL, G. Segregation of ammonium fluoride into ice single crystals. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 113–19.) [Ammonium fluoride is not taken up into ice stoichiometrically; acid components predominate.]

ONSAGER, L. Protonic semiconductors. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 363–68.) [Review of electrical conductivity by mobile protons in ice and similar materials.]

PICK, M. A. The specific heat of ice Ih. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 344–47.) [Measurements from 80 to 230 K show anomaly near 120 K.]

PLUMMER, W. T. Infrared reflectivity of frost and the Venus clouds. *Journal of Geophysical Research*, Vol. 74, No. 13, 1969, p. 3331–36. [Laboratory data for frost particles <2 μm in diameter in spectral range 0.9–3.4 μm. Similarity of results with reflectivity of Venus clouds.]

RABIDEAU, S. W., *and* FINCH, E. D. Structural studies of ice polymorphs by neutron diffraction, proton and deuteron nuclear magnetic resonance. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 59–80.) [Studies on ice Ih, Ic, II, V and IX.]

REITER, R., *and* CARNUTH, W. Charge separation in ice needles containing traces of NO_3^- ions. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 611–19.) [Observation of different behaviour of ice crystals with traces of NO_3^- ions and discussion of explanation.]

RENKER, K. B., *and* BLANCKENHAGEN, P. VON. Lattice dynamics of ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 287–304.) [Calculation of frequency distribution function and comparison with inelastic neutron scattering, infra-red and thermal results.]

RONCA, L. B. Thermoluminescence of ice. (*In* McDougall, D. J., *ed. Thermoluminescence of geological materials. Proceedings of a NATO Advanced Research Institute on applications of thermoluminescence to geological problems.* London and New York, Academic Press, 1968, p. 257–66.) [Peak height ratios for frost crystals, snow and ice after various stress histories.]

ROULLEAU, M. The influence of an electric field on the freezing of water. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 631–40.) [Observations on effect of uniform and non-uniform fields on nucleation of supercooled water droplets.]

RUEPP, R., *and* KÄSS, M. Dielectric relaxation, bulk and surface conductivity of ice single crystals. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 555–61.) [Measurements over wide temperature and frequency range.]

RUNNELS, L. K. Diffusion and relaxation phenomena in ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 514–26.) [Review of work on point defects in ice including dielectric relaxation, elastic relaxation, spin-lattice relaxation and diffusion.]

RYAN, B. F., *and* MACKLIN, W. C. The growth of ice in supercooled aqueous solutions. *Journal of Crystal Growth*, Vol. 2, No. 6, 1968, p. 337–40. [Growth rates parallel and normal to basal plane in KF, CsF and LiI and sucrose solutions.]

SAFFORD, G. J., *and others*. Neutron inelastic scattering and X-ray studies of aqueous solutions of dimethylsulphoxide and dimethylsulphone, [by] G. J. Safford, P. C. Schaffer, P. S. Leung, G. F. Doebbler, G. W. Brady and E. F. X. Lyden. *Journal of Chemical Physics*, Vol. 50, No. 5, 1969, p. 2140–59. [Data indicate that dipole interactions and hydrogen bonding of dimethylsulphoxide inhibit formation of ice Ih on freezing and explain its cryoprotective properties.]

SEIDENSTICKER, R. G., *and* LONGINI, R. L. Impurity statistics in ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 471–82.) [Calculation of effect of impurities and surfaces on defect concentrations.]

SIEGLE, G., *and* WEITHASE, M. Interpretation of the proton spin-lattice relaxation in hexagonal ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 571–78.)

SIKSNA, R. Models for the water molecule and related ions. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 178–83.) [Descriptions of plastic models of use in discussing pure and doped ice.]

STATZ, G., *and* LIPPERT, E. The nature of the hydrogen bond. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 152–70.) [General review of hydrogen bonding.]

SUGISAKI, M., *and others*. Calorimetric study of glass transition of the amorphous ice and of the phase transformation between the cubic and the hexagonal ices, [by] M. Sugisaki, H. Suga and S. Seki. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 329–43.) [Calorimetric measurements.]

SUSSMANN, J. A. Electric resonance: application to the hydrogen bond. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 541–45.) [Possibility of resonance absorption by protons in hydrogen bonds.]

TAKAHASHI, T. Electric charge generation by the breaking of frost under a temperature gradient. *Journal of the Meteorological Society of Japan*, Vol. 47, No. 1, 1969, p. 23–28. [Laboratory experimental study of electric charge when frost bridging gap between two ice hemispheres is broken.]

WEISS, J. J. Formation and structure of colour centres in irradiated ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 195–96.) [Discussion of paper by K. Eiben in same symposium. Suggests vacancy-D-defect complex as trapping site for electrons in ice.]

Weiss, J. J. Trapping of electrons in irradiated ice. *Philosophical Magazine*, Eighth Ser., Vol. 20, No. 164, 1969, p. 259–65. [Discussion of the form of trap, believed to be a vacancy associated with Bjerrum defects.]

Whalley, E. Infrared spectrum of ice Ih in the range 4 000 to 15 cm^{-1}. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 271–86.) [Explanation of observed spectrum in terms of processes occurring in ice and of proton disorder.]

Whalley, E. Structure problems of ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 19–43.) [Review of knowledge of the crystal structure of ice including the high-pressure phases.]

Wolff, H. The vapor pressure isotope effect of ice and its isomers. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 305–19.) [Theoretical interpretation of effect.]

Wolff, H., *and* Wolff, E. Über den Dampfdruck-Isotopie-Effekt von Wasser und Eis. *Berichte der Bunsengesellschaft für physikalische Chemie*, Bd. 73, Nr. 4, 1969, p. 393–99. [Vapour pressure ratios of different isotopic water molecules of water and ice calculated and compared with published data. English summary.]

Workman, E. J. Atmospheric electrical effects resulting from the collision of supercooled water drops and hail. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 594–602.) [Laboratory simulation experiments and their interpretation.]

Young, I. G. Improved technique for electrical measurements on ice and other doped solids. *Journal of Applied Physics*, Vol. 40, No. 5, 1969, p. 2345–50. [Suggests resistivity measurements should be made perpendicular, rather than parallel to growth direction. Results for ice doped with HCl including partition coefficient.]

Land ice. Glaciers. Ice shelves

Ambach, W., *and others*. Studies on vertical total-beta-activity profiles of fission products in the accumulation area of the Stubacher Sonnblickkees (Hohe Tauern, Salzburg, Austria), by W. Ambach, H. Eisner, F. A. Prantl and H. Slupetzky. *Pure and Applied Geophysics*, Vol. 74, 1969, p. 83–91. [Measurements and possible use for dating.]

Ambach, W., *and others*. Tritium profiles in two firn cores from Alpine glaciers and tritium content in precipitation in the Alpine areas, [by] W. Ambach, H. Eisner, and G. Sauzay. *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. B, Vol. 18, No. 1, 1969, p. 93–104. [Determination from cores of the T content of precipitation on Kesselwandferner (Austria) and Jungfraujoch (Switzerland).]

Baranowski, S. Tension cracks and ice tunnels in the terminal part of the median moraine of Werenskioldbreen, Vestspitsbergen. (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results*. Warszawa, Wydawnictwa Geologiczne, 1968, p. 321–28.) [Observation of watercourses in moraine-covered ice at the end of this glacier.]

Brückl, E., *and* Steinhauser, P. Seismische Eisdickenmessung auf dem Vernagtferner. *Anzeiger der math.-naturw. Klasse der Österreichischen Akademie der Wissenschaften*, Jahrg. 1967, Nr. 10, p. 266–73. [Seismic depth measurements on the Vernagtferner, Austria.]

Brückl, E., *and others*. Die Ergebnisse der seismischen Gletschermessungen am Dachstein im Jahre 1967, von E. Brückl, G. Gangl und P. Steinhauser. *Arbeiten aus der Zentralanstalt für Meteorologie und Geodynamik*, Ht. 4; *Zentralanstalt für Meteorologie und Geodynamik in Wien. Publikationen*, Nr. 190, 1969, 24 p. [Seismic depth measurements of Schladminger Gletscher and Hallstätter Gletscher in this region of Austria. English summary.]

Bull, C. B. B. The 1978–1980 surge of the Sherman Glacier, south-central Alaska. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 841–43. [Prediction of surge resulting from debris slide. Discussion by W. F. Budd, G. de Q. Robin and S. G. Collins, p. 843.]

Campbell, P. I., *and others*. Glacier survey in Alberta, [by] P. I. Campbell, I. A. Reid and J. Shastal. *Canada. Department of Energy, Mines and Resources. Inland Waters Branch. Water Survey of Canada. Report Series* No. 4, 1969, iv, 16 p., maps [in folder at back]. [Studies of volume changes of Athabasca Glacier and Saskatchewan Glacier.]

Campbell, W. J., *and* Rasmussen, L. A. Three-dimensional surges and recoveries in a numerical glacier model. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 979–86. [Linear viscous theory of flow in glacier surges. Discussion by W. F. Budd and J. T. Hollin, p. 985–86.]

Collier, J. Beneath the advancing glacier. *Geographical Magazine*, Vol. 41, No. 6, 1969, p. 462–64. [Observations in caves beneath Tverråbreen, Norway.]

Czerwiński, J. Notes on certain thermokarsting phenomena in the marginal part of Werenskioldbreen, Vestspitsbergen. (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results*. Warszawa, Wydawnictwa Geologiczne, 1968, p. 329–32.) [Study of effects of streams on the lower parts of this glacier.]

Feltrin, F., *and* Piovano, G. Studi e ricerche sul Ghiacciaio di Prè de Bar (Monte Bianco). *Bollettino del Comitato Glaciologico Italiano*, 2 Ser., No. 15, Pt. 1, 1965, [pub.] 1969, p. 91–100. [Report of measurements of ice front, and ice velocity, and of thermal drilling and installation of thermometers on this Italian glacier.]

Field, W. O. Current observations on three surges in Glacier Bay, Alaska, 1965–1968. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 831–39. [Description of surges on Tyeen, Rendu and Carroll Glaciers. Discussion by M. F. Meier, p. 839.]

Harrison, A. E. Glacial activity preceding the 1956 Muldrow Glacier surge in Alaska. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 1001–07. [Photographic evidence for a normal ice wave prior to the 1956 surge.]

Hattersley-Smith, G. Recent observations on the surging Otto Glacier, Ellesmere Island. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 883–89. [Discussion by E. F. Roots, W. Blake, Jr., M. F. Meier and L. Lliboutry, p. 889.]

Hewitt, K. Glacier surges in the Karakoram Himalaya (Central Asia). *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 1009–18. [Collection of evidence for surges in this region.]

HOINKES, H. C. Surges of the Vernagtferner in the Ötztal Alps since 1599. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 853–61. [Reports of surges suggest periodic action with 82-year cycle. Discussion by F. Mayr, p. 861.]

HOLLIN, J. T. Ice-sheet surges and the geological record. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 903–10. [Discussion of the evidence for and against large-scale surges of ice sheets. Discussion by J. B. Bird, p. 910.]

HORVATH, E. A., *and* FIELD, W. O. References to glacier surges in North America. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 845–51. [Tabulated list of surges and bibliography.]

ILICETO, V., *and* ANDRIEUX, P. Mesures électriques sur le glacier de la Marmolada (Alpes Orientales). *Bollettino del Comitato Glaciologico Italiano*, 2 Ser., No. 15, Pt. 1, 1965, [pub.] 1969, p. 71–90. [Electrical resistivity measurements on this Italian glacier and interpretation in terms of stratigraphy and ice thickness. English and Italian summaries.]

JONAS, J. J., *and* MÜLLER, F. Deformation of ice under high internal shear stresses. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 963–68. [Extrusion of ice through transparent plastic dies and study of recrystallization processes. Discussion by L. E. Nielsen, R. H. Goodman, L. Lliboutry, and J. Weertman, p. 967–68.]

LESCA, C. Metodo per la mesura della velocità superficiale dei ghiacciai. *Atti e Rassegna Tecnica della Società degli Ingegneri e degli Architetti di Torino*, Nuova Serie, An. 23, No. 2, 1969, p. 30–35. [Tellurometric measurements of ice surface velocity on Ghiacciaio di Prè de Bar.]

LIESTØL, O. Glacier surges in West Spitsbergen. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 895–97. [Summary of surges on a number of Vestspitsbergen glaciers.]

LLIBOUTRY, L. Contribution à la théorie des ondes glaciaires. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 943–53. [Theory of glacier surges due to two-valued sliding velocity for a single value of friction. Discussion by C. B. B. Bull, J. F. Nye, W. F. Budd and J. Weertman, p. 952–53.]

LØKEN, O. H. Evidence of surges on the Barnes Ice Cap, Baffin Island. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 899–901. [Evidence from morphology and moraine patterns that two parts of the ice cap have surged in the past. Discussion by R. P. Goldthwait and W. Blake, Jr., p. 900–01.]

MAKAREVICH, K. G., *and others*. *Oledeneniye Zailiyskogo Alatau* [*Glacierization of the Zailiyskiy Alatau*]. [*By*] *K. G. Makarevich, N. N. Pal'gov, G. A. Tokmagambetov, Ye. N. Vilesov, P. A. Sudakov, R. G. Golovkova, T. Ya. Denisova, N. D. Yegorova*. Moscow, Izdatel'stvo "Nauka", 1969. 288 p. (Rezul'taty Issledovaniy po Mezhdunarodnym Geofizicheskim Proyektam. Glyatsiologiya. IX Razdel Programmy MGG, No. 23.) [Summary of investigations in this part of Kazakhstan and Kirghizia 1957–65. English abstract, p. 277–79.]

MEIER, M. F. Seminar on the causes and mechanics of glacier surges, St. Hilaire, Canada, September 10–11, 1968: a summary. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 987–89. [Summary of papers presented at this conference and of questions still unsolved. For details of the papers see elsewhere in this list.]

MEIER, M. F., *and* POST, A. S. What are glacier surges? *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 807–17. [Analysis of 204 surging glaciers in western North America and definition of three types. Discussion by L. Lliboutry, W. F. Weeks, G. de Q. Robin, J. Weertman, and W. F. Budd, p. 816–17.]

MÜLLER, F. Was the Good Friday Glacier on Axel Heiberg Island surging? *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 891–94. [Description of advance which is border case of surge.]

NIELSEN, L. E. The ice-dam, powder-flow theory of glacier surges. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 955–61. [Discussion by A. D. Stanley, G. Holdsworth, S. G. Collins and J. Weertman, p. 959–61.]

NOUGIER, J., *and* LORIUS, C. Étude géologique et physico-chimique de carottes profondes de glace (Terre Adélie). *Revue de Géographie Physique et Géologie Dynamique*, Deuxième Sér., Vol. 11, Fasc. 2, 1969, p. 165–70. [Physical, chemical and mineralogical study of ice cores from glacier de l'Astrolabe and deduction of origins of bottom materials. English abstract.]

NYE, J. F. A calculation of the sliding of ice over a wavy surface using a Newtonian viscous approximation. *Proceedings of the Royal Society*, Ser. A, Vol. 311, No. 1506, 1969, p. 445–67. [Exact calculation of sliding by a combination of regelation and plastic flow without cavitation for a linear viscous material.]

PETERSON, D. N., *and* MCKENZIE, G. D. Observations of a glacier cave in Glacier Bay National Monument, Alaska. *Bulletin. National Speleological Society* (Washington, D.C.), Vol. 30, No. 3, 1968, p. 47–54. [Observations in cave beneath a glacier including ice stalactites, stalagmites and columns, draperies, sublimation crystals and hair ice.]

PYTTE, R., *ed.* Glasiologiske undersøkelser i Norge 1968. *Rapport fra Hydrologisk Avdeling*, 1969, Nr. 5, [i], 149 p., maps. [Report on year's work on mass balance, ice velocity, glacier mapping, run-off, sediment transport and sedimentation in a pro-glacial lake. English summary, p. 133–47.]

ROBIN, G. DE Q. Initiation of glacier surges. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 919–28. [Theory of stress instabilities as cause of surges. Discussion by W. F. Budd, L. Lliboutry, J. Weertman and A. C. Palmer, p. 926–28.]

ROBIN, G. DE Q., *and* BARNES, P. Propagation of glacier surges. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 969–77. [Theory of glacier surges based on laboratory observations of flow of ice near melting point at high strain-rates. Discussion by W. F. Budd and S. G. Collins, p. 976–77.]

RÖTHLISBERGER, H. Evidence for an ancient glacier surge in the Swiss Alps. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 863–65. [Lateral moraines in upper section of Göschener valley explained as caused by a surge. Discussion by J. Weertman, p. 865.]

RUTTER, N. W. Comparison of moraines formed by surging and normal glaciers. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 991–99. [Study of two moraines one of which is thought to have been the result of a surge.]

SCHYTT, V. Some comments on glacier surges in eastern Svalbard. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 867–73. [Description of the formation of Bråsvellbreen and other surges in the area. Discussion by J. T. Hollin, G. de Q. Robin and E. F. Roots, p. 871–73.]

SLUPETZKY, H., *and* SLUPETZKY, W. Ergebnisse der Gletschermessungen im obersten Stubachtal (Hohe Tauern) in den Jahren 1960–1967. 63.–65. *Jahresbericht des Sonnblick-Vereines*, 1965–67 [pub. 1968], p. 43–51. [Glacier variations of the Stubacher Sonnblickkees, Ödenwinkelkees and Riffelkees, Austria.]

STANLEY, A. D. Observations of the surge of Steele Glacier, Yukon Territory, Canada. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 819–30. [Discussion by L. D. Taylor, M. F. Meier, L. Lliboutry and S. G. Collins, p. 829–30.]

STEINHAUSER, P. Seismische Untersuchungen zur Gletscherforschung in den österreichischen Alpen. 63.–65. *Jahresbericht des Sonnblick-Vereines*, 1965–67 [pub. 1968], p. 51–72. [Review of past work on seismic velocities in Austrian glaciers, discussion of variations and their relation with morainic load and theories of glacier flow.]

STENBORG, T. Studies of the internal drainage of glaciers. *Geografiska Annaler*, Vol. 51A, Nos. 1–2, 1969, p. 13–41. [Work on Mikkaglaciären and Storglaciären shows development of two separate internal drainage systems.]

THORARINSSON, S. Glacier surges in Iceland, with special reference to the surges of Brúarjökull. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 875–82. [Table of surges in Iceland since 1890 and discussion of surges of one of the outlets of Vatnajökull. Discussion by M. F. Meier, E. F. Roots, R. P. Goldthwait and W. O. Field, p. 882.]

TONINI, M., *and* ROSSI, G. Il Ghiacciaio della Marmolada. Variazioni della massa glaciale dopo 15 anni. *Bollettino del Comitato Glaciologico Italiano*, 2 Ser., No. 15, Pt. 1, 1965, [pub.] 1969, p. 9–21. [Study of surface level changes of this Italian glacier from 1951 to 1966.]

VIVIAN, R. Fiches des glaciers français. La Mer de Glace. *Revue de Géographie Alpine*, Tom. 57, Fasc. 3, 1969, p. 659–63. [Brief summary of knowledge of this glacier.]

VIVIAN, R., *and* FERRIER, J. Fiches des glaciers français. Le glacier de Saint-Sorlin. *Revue de Géographie Alpine*, Tom. 57, Fasc. 3, 1969, p. 655–58. [Summary of knowledge of this glacier.]

WEERTMAN, J. Water lubrication mechanism of glacier surges. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 929–42. [Discussion by L. Lliboutry, M. F. Meier, H. Röthlisberger and W. F. Weeks, p. 939–42.]

WENDLER, G. Characteristics of the glaciation of the Brooks Range, Alaska. *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. B, Vol. 18, No. 1, 1969, p. 85–92. [Statistical study of glaciers shows many more on northern slopes than southern and more on eastern than western.]

WILSON, A. T. The climatic effects of large-scale surges of ice sheets. *Canadian Journal of Earth Sciences*, Vol. 6, No. 4, Pt. 2, 1969, p. 911–18. [Discussion of ice-age mechanism based on surges of Antarctic ice sheet. Discussion by W. J. Campbell, G. de Q. Robin, L. A. Bayrock, L. Goodrich, A. Ohmura, L. Lliboutry and J. Weertman, p. 915–18.]

ZANON, G. Ricerche sul bilancio di massa glaciale, con applicazione al Ghiacciaio della Marmolada (Alpi Orientali). *Bollettino del Comitato Glaciologico Italiano*, 2 Ser., No. 15, Pt. 1, 1965, [pub.] 1969, p. 23–69. [Mass balance studies in 1964–65 and 1965–66 on this Italian glacier. English summary.]

ICEBERGS. SEA, RIVER AND LAKE ICE

ADDISON, J. R. Electrical properties of saline ice. *Journal of Applied Physics*, Vol. 40, No. 8, 1969, p. 3105–14. [Study of complex dielectric permittivity of artificial sea ice as a function of frequency, temperature and salinity.]

BOLSENGA, S. J. River ice jams: a literature review. *U.S. Army. Corps of Engineers. Lake Survey District. Research Report* 5–5, 1968, iii, 568 p. [Summaries of published papers on river ice jam characteristics and methods of prevention and removal.]

CARSTENS, T. Hydraulics of river ice. *La Houille Blanche*, 23e An., No. 4, 1968, p. 271–84. [Theory of flow of buoyant solid particles by water and application to ice in rivers. Model investigation of dam in Iceland famous for ice production.]

DYKINS, J. E. Tensile and flexure properties of saline ice. (*In* Riehl, N., *and others, ed. Physics of ice* . . . . New York, Plenum Press, 1969, p. 251–70.) [Strength as a function of grain size, orientation and structure, temperature and salinity.]

OLAUSSON, E., *and* JONASSON, V. C. The Arctic Ocean during the Würm and Early Flandrian. *Geologiska Föreningens i Stockholm Förhandlingar*, Vol. 91, Pt. 2, No. 537, 1969, p. 185–200. [Discussion of conditions under which Arctic Ocean is ice-covered. Salinity stratification believed responsible, and hence glacial period causes ice-free ocean.]

PORRAS, A. Picture of the month. Observation of icebergs from satellites. *Monthly Weather Review*, Vol. 97, No. 5, 1969, p. 405. [Observations of icebergs discharged from Lambert Glacier into Prydz Bay, Antarctica.]

SWITHINBANK, C. W. M. Giant icebergs in the Weddell Sea, 1967–68. *Polar Record*, Vol. 14, No. 91, 1969, p. 477–78. [Report of two giant icebergs seen in satellite photographs.]

GLACIAL GEOLOGY

ACHARD, R., *and* JAYET, A. Sur l'extension respective des glaciers du Rhône et de l'Arve, au cours de la période würmienne, au voisinage du Mont-Salève. *Société de Physique et d'Histoire Naturelle de Genève. Comptes Rendus*, Tom. 2, No. 3, 1967 [pub. 1968], p. 188–200. [Petrographic study of moraines used to reconstruct former extension of glaciers in this region of France.]

BARANOWSKI, S. Changes of the front of Werenskioldbreen (Vestspitsbergen) and its forefield during the Holocene (preliminary report). (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results.* Warszawa, Wydawnictwa Geologiczne, 1968, p. 317–20.) [Attempt to reconstruct former movements of this glacier.]

BRAVARD, Y. Erosion et remplissage quaternaires dans l'Est du Bas-Dauphiné. *Revue de Géographie Alpine*, Tom. 57, Fasc. 3, 1969, p. 471–74. [Recent soundings in this region of France give new evidence on glacial overdeepening. English abstract.]

COWAN, W. R. Notes on a sinuous till-cored ridge, south-east of Schefferville. *Cahiers de Géographie de Québec*, 12e An., No. 26, 1968, p. 291–94. [Description of this ridge and its interpretation as an in-filled subglacial tunnel.]

DUMAS, B., *and* TRICART, J. Observations à la communication de B. Dumas: Place et signification des glacis dans le quaternaire. *Bulletin de l'Association Française pour l'Étude du Quaternaire*, 5e An., No. 17, 1968, p. 315–18. [Reply by Dumas to comments by A. Cailleux to a paper by Dumas, and further comments by J. Tricart.]

FLORIN, M.-B., and WRIGHT, H. E., *jr.* Diatom evidence for the persistence of stagnant glacial ice in Minnesota. *Geological Society of America. Bulletin*, Vol. 80, No. 4, 1969, p. 695–704. [Interpretation of lake deposits.]

GIDON, M., *and* MONJUVENT, G. Essai de coordination des formations quaternaires de la moyenne Durance et du Haut-Drac (Hautes-Alpes). *Bulletin de l'Association Française pour l'Étude du Quaternaire*, 6e An., No. 19, 1969, p. 145–61. [Reconstruction of surface of Quaternary glacier in this region of France and implications for glacial deposits. English summary.]

GRAY, J. T. Glacial history of the eastern Mealy Mountains, southern Labrador. *Arctic*, Vol. 22, No. 2, 1969, p. 106–11. [Reconstruction of Wisconsin glaciations in this area.]

HILL, A. R., *and* PRIOR, D. B. Directions of ice movement in north-east Ireland. *Proceedings of the Royal Irish Academy*, Sect. B, Vol. 66, No. 6, 1968, p. 71–84. [Evidence from erratics, till fabrics and striae for complex series of ice movements with frequent changes of centres of dispersal.]

HILLEFORS, Å. Die würmeiszeitlichen Eisbewegungen und der Verlauf der Deglaziation im Kattegat und im südöstlichen Skagerrak. *Meddelelser fra Dansk Geologisk Forening*, Bd. 18, Ht. 3–4, 1968, p. 315–43. [Study of ice movement and deglaciation in area between Denmark, Norway and Sweden. English abstract. Also published as *Lund Studies in Geography*, Ser. A, No. 44, 1969.]

JAHN, A. Raised shore lines and terraces at Hornsund, and postglacial vertical movements on Spitsbergen. (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results.* Warszawa, Wydawnictwa Geologiczne, 1968, p. 173–76.)

JEWTUCHOWICZ, S. Glacial geomorphology in Sørkapp Land, Vestspitsbergen. (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results.* Warszawa, Wydawnictwa Geologiczne, 1968, p. 313–15.) [Observations of accumulation landforms on Gåshamnøyra, and of ablation processes on the glacier Bungebreen which reveal the nature of glacial deposition.]

LAVERDIÈRE, C. Le vocabulaire de la géomorphologie glaciaire. IV. *Cahiers de Géographie de Québec*, 12e An., No. 26, 1968, p. 291–94. [Discussion of many aspects of French terminology in glacial geology, in particular as used by L. Lliboutry in *Traité de glaciologie*.]

LINDSAY, J. F. The glacial origin of Carboniferous conglomerates west of Barraba, New South Wales: discussion. *Geological Society of America. Bulletin*, Vol. 80, No. 5, 1969, p. 911–14. [Discussion of paper by A. H. White, ibid., Vol. 79, No. 6, 1968, p. 675–86.]

MONJUVENT, G. Essais morphologiques sur un piedmont alpin. II. La vallée morte de Bièvre-Valloire. *Revue de Géographie Alpine*, Tom. 57, Fasc. 3, 1969, p. 487–514. [Discussion of origin (purely glacial) of this dry valley. English abstract.]

PIASECKI, H. Talus cones in the Hornsund region, Vestspitsbergen. (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results.* Warszawa, Wydawnictwa Geologiczne, 1968, p. 201–09.) [Description of these cones and their dating.]

PIAZ, G. V. DAL. Antichi alvei glaciali abandonati nell'alta Valle d'Aosta. *Bollettino del Comitato Glaciologico Italiano*, 2 Ser., No. 15, Pt. 1, 1965, [pub.] 1969, p. 113–22. [Study of abandoned watercourses interpreted as old subglacial channels in this area of Italy. French summary.]

SUGDEN, D. E. The age and form of corries in the Cairngorms. *Scottish Geographical Magazine*, Vol. 85, No. 1, 1969, p. 34–46. [Analysis of shape, size and position of cirques in this region of Scotland and interpretation of their origin.]

SZUPRYCZYŃSKI, J. Deglaciation in southern Vestspitsbergen. (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results.* Warszawa, Wydawnictwa Geologiczne, 1968, p. 305–12.) [Glacial and fluvio-glacial deposits near the glaciers in this area studied and interpreted.]

SZUPRYCZYŃSKI, J. Research on glacial deposits and land forms in the area of Hornsund, Vestspitsbergen. (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results.* Warszawa, Wydawnictwa Geologiczne, 1968, p. 295–304.) [Summary of work done.]

TANITTE, A. Réflexions sur le glaciaire cartusien autochtone. *Revue de Géographie Alpine*, Tom. 57, Fasc. 3, 1969, p. 515–28. [Evidence for local Quaternary glacial action in the Grande Chartreuse range in France. English abstract.]

VAUMAS, E. DE. Essai de classement synthétique des phénomènes et des formes de relief glaciaires. *Revue de Géographie Alpine*, Tom. 57, Fasc. 3, 1969, p. 435–64. [Classification of geomorphological features due to ice and frost.]

VEYRET, P. L'auge de Chamonix: une vallée glaciaire d'un type particulier. *Revue de Géographie Alpine*, Tom. 57, Fasc. 3, 1969, p. 559–70. [Study of the glacial geology of the Chamonix valley which has many unique features.]

VIVIAN, R., *and* RICQ DE BOUARD, M. Moraine de versant et confluences glaciaires: étude de morphologie glaciaire sur le plateau de St. Nizier entre Drac et Furon. *Revue de Géographie Alpine*, Tom. 57, Fasc. 3, 1969, p. 529–43. [Study of Quaternary moraine deposits to determine where two confluent glaciers flowed. English summary.]

WELCH, R., *and* HOWARTH, P. J. Photogrammetric measurements of glacial landforms. *Photogrammetric Record*, Vol. 6, No. 31, 1968, p. 75–96. [Use of photogrammetric methods on repeated aerial photographs to give geomorphological information on changing landforms such as eskers, kames, ice-dammed lakes and coastal features.]

ZANELLA, E. Osservazioni preliminari sul morenico stadiale dell'alta Val Chisone. *Bollettino del Comitato Glaciologico Italiano*, 2 Ser., No. 15, Pt. 1, 1965, [pub.] 1969, p. 101–11. [Study of end moraines in this Italian valley.]

FROST ACTION ON ROCKS AND SOIL. FROZEN GROUND. PERMAFROST

ANDERSON, D. M., *and others*. Bentonite debris flows in northern Alaska, [by] D. M. Anderson, R. C. Reynolds [and] J. Brown. *Science*, Vol. 164, No. 3876, 1969, p. 173–74. [Description of these flows believed to be a result of periglacial environment.]

BARBAROUX, L. Les cols géométriques striés de la Baie du Roi (Vestspitzbergen). *Bulletin de l'Association Française pour l'Étude du Quaternaire*, 5e An., No. 17, 1968, p. 251–66. [Study of patterned ground in Kongsfjord area.]

CZEPPE, Z. Movements of soil due to frost on the north coast of Hornsund, Vestspitsbergen. (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results*. Warszawa, Wydawnictwa Geologiczne, 1968, p. 195–99.)

DUTKIEWICZ, L. Congelifluction lobes of the south coast of Hornsund, Vestspitsbergen. (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results*. Warszawa, Wydawnictwa Geologiczne, 1968, p. 259–64.) [Description of this form of patterned ground and discussion of its nature and importance.]

DYLIK, J. Research by the periglacial group "Hornsund-South". (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results*. Warszawa, Wydawnictwa Geologiczne, 1968, p. 251–57.) [Brief survey of work done in this area by Polish I.G.Y. expedition and bibliography.]

JAHN, A. Quantitative investigations of periglacial processes at Hornsund, Vestspitsbergen. (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results*. Warszawa, Wydawnictwa Geologiczne, 1968, p. 177–83.) [Summary of measurements of frost action on soil, frost heaving, solifuction, and other processes.]

JAHN, A. Research by the periglaciological group "Hornsund-North". (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results*. Warszawa, Wydawnictwa Geologiczne, 1968, p. 167–71.) [Brief survey of work done in this area by Polish I.G.Y. expedition and bibliography.]

KLATKA, T. Microrelief of slopes in the coastal area south of Hornsund, Vestspitsbergen. (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results*. Warszawa, Wydawnictwa Geologiczne, 1968, p. 265–82.) [Study of periglacial forms in this area.]

SZCZEPANKIEWICZ, S. Geomorphological processes active in the periglacial zone at Hornsund, Vestspitsbergen. (*In* Birkenmajer, K., *ed. Polish Spitsbergen expeditions 1957–1960. Summary of scientific results*. Warszawa, Wydawnictwa Geologiczne, 1968, p. 185–94.) [Measurements of soil movements and observations of deposits left by running water.]

VORREN, K.-D. Evig tele i Norge. *Ottar*, 1967, No. 1 (No. 51), 26 p. [Occurrence of permafrost in Norway.]

METEOROLOGICAL AND CLIMATOLOGICAL GLACIOLOGY

AVER, A. H., *jr.*, *and* MARWITZ, J. D. Comments on "The collection and analysis of freshly fallen hailstones". *Journal of Applied Meteorology*, Vol. 8, No. 2, 1969, p. 303–04. [Report of technique of collecting hailstones superior to that reported by K. A. Browning and others, ibid., Vol. 7, No. 4, 1968, p. 603–12, and reply by Browning, p. 304.]

BENSON, C. S. Ice fog. *Engineering and Science* (Pasadena), Vol. 32, No. 8, 1969, p. 15–19. [Popular account of ice fog problem in Fairbanks, Alaska.]

SCHUEPP, P. H., *and* LIST, R. Mass transfer of rough hailstone models in flows of various turbulence levels. *Journal of Applied Meteorology*, Vol. 8, No. 2, 1969, p. 254–63. [Liquid flow models used to simulate convective mass transfer of smooth and rough hailstones.]

VITTORI, O. A., *and others*. Natural tracer distribution in hailstones, by O. A. Vittori, F. Prodi, G. Morgan and G. Cesari. *Journal of the Atmospheric Sciences*, Vol. 26, No. 1, 1969, p. 148–52. [Chemical analysis of hailstone slice residues.]

SNOW

BLOCH, M. R., *and* LUECKE, W. Uneinheitliche Verschiebungen der Ionenverhältnisse zwischen Meereswasser und Niederschlägen durch Gischtbildung. *Naturwissenschaften*, 55. Jahrg., Ht. 9, 1968, p. 441. [Ion ratios in rain and snow are not those in sea water.]

HARRISS, R. C., *and* WILLIAMS, H. H. Specific-ion electrode measurements on bromine, chlorine and fluorine in atmospheric precipitation. *Journal of Applied Meteorology*, Vol. 8, No. 2, 1969, p. 299–301. [Includes analysis of snow deposits from various sites near Hamilton, Ontario, Canada.]

JAIL, M. Un remarquable effet de lombarde: les chutes de neige de Pâques 1969 en Haute-Maurienne. Note préliminaire. *Revue de Géographie Alpine*, Tom. 57, Fasc. 3, 1969, p. 613–21. [Report of remarkably heavy snowfall over a small area in this region of France. Description of unusual form of snow. Possible causes.]

LAUSCHER, F. Ein Diagramm zur Abschätzung monatlicher Durchschnittshöhen der Schneedecke ostalpiner Orte. *Wetter und Leben*, Jahrg. 21, Ht. 7–8, 1969, p. 167–72. [Relation between mean monthly snow-cover depth and maximum snow depth. Use to predict snow variation from annual precipitation and altitude.]

LAUSCHER, F. Ein Diagramm zur klimatischen Abschätzung grösster Schneehöhen. *Wetter und Leben*, Jahrg. 21, Ht. 5–6, 1969, p. 117–24. [Analysis of long-period mean values of greatest annual depth of snow cover in Austria. English summary.]

LOUP, J. Durée de la couverture nivale sur un adret et sur un ubac dans la région d'Embrun (Hautes Alpes). *Revue de Géographie Alpine*, Tom. 57, Fasc. 3, 1969, p. 593–608. [Difference in snow cover period on two aspects of slopes in this region of the French Alps.]

YEN, Y.-C., *and* DOTSON, J. W. Harmonic analysis of snow temperatures. *Journal of Geophysical Research*, Vol. 74, No. 13, 1969, p. 3443–46. [Analysis of data from Camp Century, Greenland. Deduction of thermal parameters.]