water present in the soil pores, and latent heat is released (or absorbed) behind the freezing front depending on the temperature distribution. Moreover, the latent heat from fusion of ice formed from soil water may be different from that of bulk water due to soil-water interaction forces. Third, the Fourier heat equation, which implies conduction of heat only, does not adequately describe the heat-flow process as water is moved to the freezing front by hydraulic and thermal gradients. Some investigators believe in the existence of a "threshold" gradient—either hydraulic or thermal—that must be exceeded before water will commence to flow at all. However, experiments to date have not been sufficiently conclusive to convince all skeptics. It is evident that these matters are subjects for intensive research if reliable predictions of changes in thermal regime are to be accomplished.

The uncertainties that remain in the measurement and prediction of the mechanical properties of frozen ground were brought sharply into focus. That the deformation process is strongly dependent on time and temperature has long been recognized. Rheological models to predict overall behavior have been formulated and described mathematically. Even if this phenomenological approach to the problem is successfully developed (although we are still far from reaching this stage) it will hardly be possible to scale the results of laboratory experiments to prototype conditions without due cognizance of the main physical processes involved—such as refreezing of water and melting of ice during creep and the movement of mineral particles by the freezing process. In the interim, such questions as the adfreezing strength of frozen ground around embedded piles, the long-term bearing capacity of footings and caissons, and the magnitude and time-rate of the deformations to be expected, will continue to be determined on a semi-empirical basis—a situation that is not too heartening in the face of the larger and more complex projects currently being contemplated in the far North. The proposed Rampart Dam, on the Yukon River northwest of Fairbanks, Alaska, is a case in point. If completed, the dam will impound a body of water larger and deeper than Lake Erie.

Considerable progress in soil exploration and site selection was recorded. The role of logistics and of climate and terrain variables is now well understood. The use of indirect methods, such as topographic maps, airphoto interpretation, and vegetal cover as aids in site selection has been carefully documented. Seismic and electrical resistivity techniques have been adapted for mapping the thickness of the "active zone" and the depth to rock, as well as the thickness of permafrost over large (and even relatively small) regions. Core-drilling techniques using refrigerated drilling fluids have been developed and relatively undisturbed samples of all types of frozen ground can now be obtained at costs that are no longer prohibitive. Precision thermistors for measuring ground temperatures with an accuracy better than 0.02°C are available. The most favorable sites for a given project can readily be selected, and detailed data on subsurface conditions can be obtained economically. The element of "surprise" previously considered acceptable in permafrost construction is no longer excusable.

Workable design practices for many common engineering problems have evolved. Water mains and sewers are carried above ground in insulated "utilidors." Planned wastage or the circulation of heated water, to prevent freezing of water supply lines, is monitored and carefully controlled. The location of dependable water supplies is often a serious problem. For example, at Kotzebu, Alaska, it was found necessary to reclaim sea water to service the hospital and school. Experiments are under way to treat and recirculate waste water (and even sewage) for entire cities by procedures similar to those used in space capsules. Highways and airfields have been successfully constructed by maintaining the ground cover and providing a sufficient thickness of nonfrost-susceptible granular base, with good drainage conditions, to avoid thawing of permafrost during the short summer season.

Large-scale earthworks, such as may be encountered in open pit mining or in the diversion of rivers, involve enormous energy requirements. Nuclear blasting has been considered, and small-scale experiments conducted, but to our knowledge no project of this type has thus far been attempted. Increasing the temperature (and even thawing) of permafrost with solar radiation over areas covered with plastic sheets, or the application of artificial heat, has been used in the Soviet Union in an effort to reduce the energy requirements. To date, mechanical energy such as conventional blasting, rippers, and power shovels have proved to be more economical.

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Proceedings will be available in the summer of 1964 and may be obtained by writing to Building Research Advisory Board, National Academy of Sciences, 2101 Constitution Avenue, NW, Washington, D.C.

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Forthcoming Events

March

9–10. **Aerodynamic Testing** Conf., American Inst. of Aeronautics and Astronautics, Washington, D.C. (J. N. Fresh, David Taylor Model Basin, Code 630, U.S. Navy, Washington, D.C.)

10–14. American Inst. of **Chemical Engineers**, New Orleans, La. (AIChE, 345 E. 47 St., New York 17)

11–12. Instrument Soc. of America, 14th conf. on **instrumentation** for the iron and steel industry, Pittsburgh, Pa. (N. F. Simcic, Research Laboratory, Jones and Laughlin Steel Corp., 900 Agnew Rd., Pittsburgh 30)

11–13. National Federation of **Science Abstracting and Indexing Services**, annual, San Antonio, Tex. (R. A. Jensen, The Federation, 324 E. Capitol St., Washington, D.C.)

12. **Interplanetary Monitoring Platform**

Experiments, symp., Greenbelt, Md. (C. P. Boyle, Code 207, Goddard Space Flight Center, Greenbelt, Md. 20771)

12–13. **Information** Organization, New Brunswick, N.J. (S. Artandi, Graduate School of Library Service, Rutgers Univ., New Brunswick)

13–14. **Louisiana Acad.** of Sciences, Baton Rouge. (H. J. Bennett, Dept. of Zoology, Louisiana State Univ., Baton Rouge)

13–14. Institute of **Management** Sciences. 11th intern., Pittsburgh, Pa. (IMS, Box 273, Pleasantville, N.Y.)

13–14. Effects of **Shock and Vibration** on the human body, Denver, Colo. (A. E. Paige, Dept. of Electrical Engineering, University of Denver, Denver)

14–15. **Endocrinology**, 2nd annual symp., Salisbury, N.C. (H. Nushan, Medical Service, Veterans Administration Hospital, Salisbury)

14–19. American Assoc. of **Psychiatric Clinics for Children**, annual, Chicago, Ill. (AAPCC, 250 W. 57 St., New York 19)

15–19. **Microcirculation**, 3rd European conf., Jerusalem, Israel. (E. Davis, Capillary Research Laboratory, Hadassah Univ. Hospital, P.O. Box 499, Jerusalem)

15–21. American Congr. on **Surveying and Mapping** and the American Soc. of **Photogrammetry**, conv., Washington, D.C. (D. Landen, ASP, 4949 Old Chain Bridge Rd., McLean, Va.)

17–18. **Hypervelocity Flight** Techniques, symp., Denver, Colo. (W. G. Howell Denver Research Inst., Univ. of Denver, Denver, Colo. 80210)

17–19. Society for **Nondestructive Testing**, Los Angeles, Calif. (D. E. O'Halloran, Northrop Corp., 1001 E. Broadway, Hawthorne, Calif.)

17–19. Statistical Assoc. Methods for **Mechanized Documentation**, symp., Washington, D.C. (M. E. Stevens, Natl. Bureau of Standards, Washington, D.C. 20234)

17–20. Society of **Biological Chemistry**, Paris, France. (P. Malangeau, Executive Committee, 4, Avenue de l'Observatoire, Paris 6e)

18–19. **Mycotoxins in Foodstuffs**, intern. symp., Cambridge, Mass. (G. N. Wogan, Rm 16-210-B, Massachusetts Inst. of Technology, Cambridge 02139)

18–20. **Chemurgic Council**, 28th natl. conf., Philadelphia, Pa. (J. W. Ticknor, Chemurgic Council, 350 Fifth Ave., New York 1)

18–21. Latin **Medical** Union, intern. congr., Rome, Italy. (B. Urso, Policlinico Umberto I, Viale Policlinico, Rome)

18–21. American **Orthopsychiatric** Assoc., Chicago, Ill. (M. F. Langer, 1790 Broadway, New York 19)

19–22. International Assoc. for **Dental Research**, 42nd meeting, Los Angeles, Calif. (J. C. Muhler, 1120 W. Michigan St., Indianapolis, Ind. 46202)

20–24. National Assoc. for **Research in Science Teaching**, Chicago, Ill. (G. G. Mallinson, Western Michigan Univ., Kalamazoo)

20–24. National **Science Teachers** Assoc., Chicago, Ill. (R. H. Carleton, 1201 16th St., NW, Washington, D.C.)

21–3. British **Computer** Soc., conf., Edinburgh, Scotland. (Secretariat, I.E.E., Savoy Pl., London, W.C.2, England)

21–23. Asian-Pacific **Dental** Federation, 4th congr., Singapore and Malaya. (B. B. Eraña, Manila Doctors Hospital, Isaac Peral St., P.O. Box 373, Manila, Philippines)

21–24. **Cybernetic Medicine**, 3rd intern. congr., Naples, Italy. (A. DeChiara, 348, Via Roma, Naples)

22–25. American Assoc. of **Dental Schools**, 41st annual, Los Angeles, Calif. (AADS, 840 Lake Shore Dr., Chicago 11, Ill.)

23–24. Society for **Economic Botany**, 5th annual, Chapel Hill, N.C. (D. J. Rogers, New York Botanical Garden, Bronx Park, N.Y.)

23–25. Federation of European **Biochemical** Societies, 1st, London, England. (FEBS, Lister Inst., Chelsea Bridge Rd., London, S.W.1)

23–26. Institute of **Electrical and Electronics Engineers**, intern. conv., New York, N.Y. (IEEE, Box A, Lenox Hill Station, New York 21)

23–26. **Gas Chromatography**, 2nd intern. symp., Houston, Tex. (A. Zlatkis, Dept. of Chemistry, Univ. of Houston, Houston)

23–26. American **Physical** Soc., Philadelphia, Pa. (K. K. Darrow, Columbia Univ., New York 27)

24–26. Physics and Dynamics of **Clouds**, conf., American Meteorological Soc., Chicago, Ill. (Miss D. L. Bradbury, Dept. of Geophysical Sciences, Univ. of Chicago, Chicago)

25–27. **Aerospace Bearings**, USAF-Southwest Research Inst. conf., unclassified, San Antonio, Tex. (P. M. Ku, SwRI, 8500 Culebra Rd., San Antonio)

25–27. **Entomological** Soc. of America, Northcentral branch, Omaha, Neb. (G. E. Guyer, Dept. of Entomology, Michigan State Univ., East Lansing)

26–28. **Michigan Acad.** of Science, Arts and Letters, East Lansing (G. G. Mallinson, Western Michigan Univ., Kalamazoo)

26–28. Southern Soc. for **Philosophy and Psychology**, 56th annual, Lexington, Ky. (D. Calvin, Psychology Dept., Univ. of Kentucky, Lexington)

27–28. American **Ethnological** Soc., Pittsburgh, Pa., (N. F. S. Woodbury, U.S. National Museum, Smithsonian Institution, Washington, D.C.)

27–28. **Seismological** Soc. of America, annual, Seattle, Wash. (K. V. Steinbrugge, SSA, 465 California St., San Francisco 4, Calif.)

27–28. **Pennsylvania Acad. of Science**, University Park, Pa. (P. C. Martin, Point Park Junior College, Pittsburgh, Pa.)

27–29. Society for the Study of **Evolution**, annual, Chapel Hill, N.C. (H. H. Ross, Illinois Natural History Survey, Urbana)

28–30. American Assoc. of Colleges of **Pharmacy**, Detroit, Mich. (C. W. Bliven, 1507 M St., NW, Washington, D.C. 20005)

29–2. Association of American **Geographers**, annual, Syracuse, N.Y. (AAG 1201 16th St., NW, Washington, D.C.)

30–2. American Assoc. of **Junior Colleges**, Bal Harbour, Fla. (W. G. Shannon, AAJC, 1777 Massachusetts Ave., NW, Washington, D.C. 20036)

31–3. American Assoc. of **Anatomists**,

Denver, Colo. (L. B. Flexner, Dept. of Anatomy, Univ. of Pennsylvania, Philadelphia 4)

31–3. **Calcified Tissues**, European symp., Liége, Belgium. (L. J. Richelle, 32, Boulevard de la Constitution, Liége)

April

1. **Thermoplastic Materials**, conf., Soc. of Plastics Engineers, Akron, Ohio. (W. H. Nicol, RETEC, Goodyear Tire and Rubber Co., Akron 16)

1–2. **Engineering Aspects of Magnetohydrodynamics**, symp., Cambridge, Mass. (G. S. Janes, Avco Everett Research Laboratories, Everett 49, Mass.)

1–2. Methods for Measurement of **Weak Beta-Emitters**, Karlsruhe-Leopoldshaven, Germany. (Gesellschaft Deutscher Chimiker, Gesellschaftsstelle, Postfach 9075, Frankfurt/Main, Germany)

1–3. **Structures and Materials**, American Inst. of Aeronautics and Astronautics, 5th annual conf., Palm Springs, Calif. (R. R. Dexter, AIAA, 2 E. 64 St., New York, N.Y.)

1–3. **Optical** Soc. of America, spring meeting, Washington, D.C. (M. E. Warga, OSA, 1155 16th St., NW, Washington, D.C. 20036)

1–4. National Soc. for **Programmed Instruction**, annual, San Antonio, Tex. (NSPI Program Committee, Trinity Univ., 715 Stadium Dr., San Antonio, Tex.)

1–5. Latin **Oto-Rhino-Laryngology** Soc., 15th congr., Bologna, Italy. (G. Motta, Via Modica 6, Milan, Italy)

2–3. American Soc. of **Civil Engineers**, Engineering Mechanics Div., spring conf., Boston, Mass. (ASCE, 33 W. 39 St., New York 18)

2–3. Alexander Graham Bell Assoc. for the **Deaf**, southeastern meeting, New Orleans, La. (R. Tegeder, Utah School for the Deaf, 846 20th St., Ogden)

2–3. **Obstetrics and Gynecology**, seminar, Gainesville, Fla. (Mrs. D. Miller, Div. of Postgraduate Education, College of Medicine, Univ. of Florida, Gainesville)

2–3. Industrial Applications of New **Technology**, conf., Atlanta, Ga. (Director, Short Courses and Conferences, Georgia Inst. of Technology, Atlanta, Ga. 30332)

2–4. American Acad. of **Oral Pathology**, Bethesda, Md. (R. J. Gorlin, Univ. of Minnesota, Minneapolis)

2–4. Association of **Surgeons** of Great Britain and Ireland, annual, St. Andrews, Scotland (Secretariat, 47 Lincoln's Inn Fields, London, W.C.2, England)

2–5. British **Medical** Assoc., clinical meeting, Northampton, England. (D. Gullick, Tavistock Sq., London, W.C.1)

3–4. **Biology** colloquium, Corvallis, Ore. (C. M. Gilmour, School of Science, Oregon State Univ., Corvallis)

3–4. Society for **Industrial and Applied Mathematics**, midwest regional meeting, Cedar Rapids, Iowa. (W. J. Jameson, Collins Radio Co., 120–11, Cedar Rapids)

3–5. **Fleming's Lysozyme**, 3rd intern. symp., Milan, Italy. (G. Podio, Museo della Scienza e della Tecnica, Via Modica, 6, Milan)

3–5. American Soc. of **Internal Medicine**, annual, Atlantic City, N.J. (A. V. Whitehall, 3410 Geary Blvd., San Francisco, Calif.)