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DEPARTMENT OF THE INTERIOR
CANADA

HON. THOMAS G. MURPHY, *Minister*

H. H. ROWATT, *Deputy Minister*

PUBLICATIONS

OF THE

Dominion Observatory

OTTAWA

R. MELDRUM STEWART, *Director*

Vol. X

Bibliography of Seismology

No. 10

APRIL, MAY, JUNE, 1931

BY

ERNEST A. HODGSON

OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1931

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Bibliography of Seismology

April, May, June, 1931

901. ADAMS, C. E., "Report of the Dominion Astronomer and Seismologist, for the Year 1929," Extract from the *Annual Report of the Department of Scientific and Industrial Research*, 7 pages, 2 maps, issued as *Dominion Observatory (New Zealand) Bulletin*, No. 79, Wellington, 1931.
902. ADAMS, C. E. and HENDERSON, J., "Seismology of New Zealand," Extract from the *New Zealand Official Year-book, 1931*, issued as *Dominion Observatory (New Zealand) Bulletin*, No. 80, 8 pages, 2 figures, 6 tables, Wellington, 1931.
903. AGAMENNONE, G., "Nuove considerazioni sulla periodicità dei terremoti," *Corriere Adriatico*, Rome, March 11, 1931. G.A.
- AGAR, William M., "A Textbook of Geology, Part I: Physical Geology." See No. 972 of this list.
904. ALFANI, Guido, *D.S.P.*, "Un nouveau type de sismographe photographique," *Ciel et Terre*, June, July, August, 1930, reprinted as a Publication of Osservatorio Ximeniano dei Padri Scolopi, Firenze, No. 143, 1-8, 2 plates, Brussels, 1930.

The seismograph, of horizontal pendulum type, is electromagnetically damped. It is coupled, by means of a permanent magnet mounted on the boom extension, to a mirror mounted on a vertical torsion member and provided with a bit of soft iron on the side of the mirror. In this manner a high magnification is obtained. The author gives a sample record from the new instrument, printed on the same plate with the record for the same earthquake as registered on a Galitzin seismograph.

905. ANGENHEISTER, G., "Handbuch der Experimentalphysik." This Handbuch is being published by W. Wien and F. Harms, under the auspices of Akademische Verlagsgesellschaft, M.B.H., Leipzig. It is edited by Professor Angenheister. The publication is being written by a group of collaborating authors. The following items in this and previous issues of the Bibliography are parts of this extended publication now appearing in sections: Nos. 863, 864, 950, 962, and 982. E.T.
906. AUGHTIE, F., "A Source of Mechanical Vibration for Experimental Purposes," *Philosophical Magazine*, Seventh Series, No. 70, 11, 517-522, 9 figures, London, February, 1931.

The author's abstract reads as follows: "Following a brief *résumé* of early attempts to vibrate a loaded beam in a vertical plane, which were unsuccessful due either to bad wave form or the presence of excessive horizontal movement, a description is given of the final satisfactory method, which gave a controllable amplitude up to 0.002 inch at frequencies from 8 to 35 cycles/sec. with negligible horizontal movement and good wave form. The necessary force for vibrating the beam was obtained from resonant vibrations of an auxiliary mass-spring system tuned to the working frequency. The oscillations were maintained by a small crank and electric motor, and an important feature was the use of solid friction to give a true flat-topped resonance curve, thus permitting small changes of motor speed without variation of amplitude. The equivalent electrical circuit is given of the mechanical filter system used, and records are reproduced of wave forms obtained with different methods."

- BATEMAN, Alan M., "A Textbook of Geology, Part I: Physical Geology." See No. 972 of this list.
907. BODLE, Ralph R., "Earthquake Notes," 2, No. 4, published by the Eastern Section of the Seismological Society of America, Washington, March 30, 1931.
The issue, after making current announcements, presents notes on seismograph stations. Besides activities reported from other stations previously in existence, two new stations—one at Columbia, S.C., and the other at Pittsburgh—are described. Seismograph records from the latter are reproduced. The recent paper by Dr. Macelwane on the South Pacific Earthquake (see No. 956 of this list) is reviewed. Notes of general interest and a tabulation of the epicentres located from November 28, 1930, to March 19, 1931, complete a 10-page bulletin of interest to all working seismologists.
The editor, Ralph R. Bodle, is a member of the staff of the U.S. Coast and Geodetic Survey, Washington, D.C., Items of interest to seismologists, which might properly find place in this publication, should be reported to the editor.
908. BORCHERT, H., "Über die Bildung der ersten Erstarrungskruste der Erde," *Gerlands Beiträge zur Geophysik*, 28, Heft 1-3, 32-54, 1 figure, Leipzig, 1931.
909. BORN, A., "Erdkrustenbewegungen," *Handbuch der Geophysik*, 3, Lieferung 1, Abschnitt III, 349-411, Berlin, 1930.
The *Handbuch der Geophysik* is being published by Gebrüder Borntraeger, Berlin, and edited by Prof. B. Gutenberg. See No. 332 of these lists.
910. BOWIE, William, "Elements of Isostasy—Observations and Interpretation," *Scientific Monthly*, 31, 163-176, New York, August, 1930.
An abstract, signed W. Ayvazoglou, appears in *Geophysical Abstracts*, No. 22 (see No. 954 of this list) at pages 33-34. F.W.L.
911. BROOKS, C. E. P., "Changes of Climate in the Old World during Historic Times," *Quarterly Journal of the Royal Meteorological Society*, No. 238, 57, 13-30, London, January, 1931.
912. BYERLY, Perry, "The California Earthquakes of November 28, 1929, and the Surface Layers of the Earth in California," *Proceedings of the National Academy of Sciences* 17, No. 2, 91-100, Washington, February, 1931.
These earthquakes were the first to be so well recorded by so many stations relatively close to the epicentre. As such, the records merited close study. The author discusses the direct longitudinal wave \bar{P} and also a wave which he designates \bar{P}_s and which is supposed due to compressional waves set up at the surface of the earth on the arrival of the shear wave at that horizon. Although not satisfied with the analysis results, Dr. Byerly gives the deductions as he obtains them from the data treated as outlined in his paper. He finds the thickness of the granitic layer to be indicated as about 23km. The indicated thickness of the intermediate layer is, however, 80 to 90 km.! The depth of focus was computed as 5 km. The author rejects the extraordinary value for the thickness of the intermediate layer and outlines his reasons for so doing.
- CASSINIS, G. and DE MARCHI, L., "Bollettino del Comitato Nazionale Italiano, per la Geodesia e la Geofisica." See No. 919 of this list.
913. CHAMBERLIN, Rollin T., "Isostasy from the Geological Point of View," *Journal of Geology*, 39, No. 1, 1-23, Chicago, January-February, 1931.
The author's summary reads: "The principle of isostasy has come to stay, but it appears to have been overworked. If folded mountain chains were formed by the forces tending toward isostatic equilibrium, departures from adjustment should be greatest immediately before the mountains were built. Making the mountains should restore equilibrium, and the adjustment should be most nearly achieved, and most perfect, just

as the forces had been spent in completing the mountain folding. Just the reverse, however, appears to be the case. Recently folded mountains are particularly out of adjustment. Hence, because of this and other considerations already discussed, we are forced to conclude that mountain folding is primarily independent of isostasy and in direct opposition to it. The mountains are formed in spite of isostasy. Isostatic forces, however, are all in the whole equation of mountain-building forces, and play their appropriate part, but that part is secondary and subordinate. Their function is to preserve balance disturbed by other forces and processes. Isostasy is not an accelerator; rather is it a restrainer. Isostasy works in opposition to mountain folding; it works in opposition to erosion. When things are doing, or done, it tends to restore equilibrium. Limited thus to its proper sphere, it is an important principle and should be used as such."

914. CHAPMAN, S., "The Solar and Lunar Diurnal Variation of Terrestrial Magnetism," *Philosophical Transactions of the Royal Society*, Series A, No. 218, 1-118, London, 1919.

See reference to the above paper in No. 942 of this list.

W.W.D.

915. CHRISTENSEN, Adolf, "Seismologische Studien im Gebiete der Ostalpen," *Gerlands Beiträge zur Geophysik*, 11, 1-105, Leipzig, 1912.

916. CRITIKOS, N. A., "Über die Ursachen der mikroseismischen Bodenunruhe von 4 bis 8 sec. Periode in Athen," *Zeitschrift für Geophysik*, 7, Heft 1-2, 22-26, Göttingen, 1931.

A translation of the author's abstract may be given as follows: An investigation of the correlation between the microseisms at Athens and the meteorological data shows that a land wind from the north appears to be the condition under which the movements are greatest, while winds from the sea, and surf seem to have little effect.

917. DAVISON, Charles, "The Japanese Earthquake of 1923," Thomas Murby and Co., xii+128 pages, 32 text-figures, 6 plates. Price 7s. 6d. net. London, 1931.

The table of contents is as follows:

List of Illustrations.—Part I. Introduction; the earthquake in Tokyo; the earthquake in Yokohama; the earthquake in the epicentral region; the loss of life and property.—Part II. The investigation of the earthquake; the preparation for the earthquake; intensity and nature of the earthquake motion; position of the focus; propagation of the earthquake waves; dislocations of the crust; seismic sea-waves; effects of the earthquake on the ground; after-shocks; the origin of the earthquake.

918. DAVISON, Charles, "The New Zealand Earthquake of February 3," *Nature*, No. 3198, 127, 243-244, London, February 14, 1931.

919. DE MARCHI, L. and CASSINIS, G., "Bollettino del Comitato Nazionale Italiano, per la Geodesia e la Geofisica, Consiglio Nazionale delle Ricerche," Second Series, Anno I, No. 1, 16 pages, Rome, January, 1931.

This is the first issue of the Bulletin of the National Committee of Italy of the International Geodetic and Geophysical Union, which Bulletin is to appear monthly. It is compiled by the Secretary, G. Cassinis, and bears an introduction by the President, L. De Marchi.

The articles in this particular issue are not of direct interest to seismologists, so are not reported. The appearance of the new series is noted for the information of those interested.

- DUNBAR, Carl O., "A Textbook of Geology, Part I: Physical Geology." See No. 972 of this list.

920. EARTHQUAKE RESEARCH INSTITUTE, "The Result of the Precise Levelling carried out along the East Coast of the Province of Idu just before the Occurrence of the Recent Strong Idu Earthquake," *Proceedings of the Imperial Academy*, 6, No. 10, 399-400, 1 figure, Tokyo, December, 1930.
- FLINT, Richard F., "A Textbook of Geology, Part I: Physical Geology." See No. 972 of this list.
921. GEIGER, Ludwig, "Herdbestimmung bei Erdbeben aus den Ankunftszeiten," *Nachrichten der Königlichen Gesellschaft der Wissenschaften zu Göttingen, Mathematisch-physikalische Klasse*, 19 pages, May, 1910.
The original paper outlining the method of determination of an epicentre by applying the Least Squares Theory to arrival times.
922. GHERZI, E., S.J., "On some Long Waves Registered on the Galitzin Vertical Component at the Zi-Ka-Wei Observatory," *Proceedings of the Fourth Pacific Science Congress, Java, 1929*, 2A, 357-362, Batavia, 1930. R.H.F. + W.W.D.
923. GOESSE, John B., S.J., "Seismology at Saint Louis University," *Bulletin of Saint Louis University*, 8, No. 1, Part II, 56-76, April, 1912.
The methods of Galitzin, of Klotz, and of Geiger for determining the epicentre of an earthquake from instrumental data are described and the respective methods applied to the Mexican earthquakes of June 7 and December 16, 1911. The method of Geiger is described on pages 60-76 under the title "Probability Method for the Determination of Earthquake Epicentres from the Arrival Time Only." See No. 921 above.
924. GOLD, S., "Seismology at the Dominion Observatory," *Journal of the Royal Astronomical Society of Canada*, Whole No. 199, 24, No. 10, 442-451, Toronto, December, 1930.
The paper outlines, in popular form, and with several illustrations, the seismological work carried out at the Dominion Observatory, Ottawa, Canada. W.W.D.
925. GREGORY, J. W., "The Machinery of the Earth," *Nature*, No. 3190, 126, 959-963, London, December 20, 1930.
This paper presents the material of the Thomas Hawksley Lecture of the Institution of Mechanical Engineers, as delivered on November 7. The sub-headings are, in order:
"The Structure of the Earth"
"Origin and History of the Earth"
"The Earth in Motion".
926. GREGORY, J. W., "The Earthquake off the Newfoundland Banks of November 1929," *The Geographical Journal*, 77, No. 2, 123-139, February, 1931. W.W.D.+R.R.B.
927. GUTMANN, J., "Jährliche und tägliche Häufigkeitsschwankung der Beben in den Vereinigten Staaten," *Gerlands Beiträge zur Geophysik*, 28, Heft 1-3, 101-113, 10 figures, Leipzig, 1931.
The author's abstract reads: "The earthquakes of the catalogue by N. H. Heck for the U.S.A. are investigated statistically. Neither the criterium by A. Schuster nor the criterium of phases shows a real period in the length of a year or of a day. The distribution in relation to the intensity scale by Rossi-Forel indicates that first of all there are in question quakes of great intensity."
928. HAALCK, H., "Zur Frage der Beschaffenheit des Erdinnern," *Zeitschrift für Geophysik*, 7, Heft 1-2, 68-74, 3 figures, Göttingen, 1931.

929. HAENO, S., "The Radio-seismograph," *Japanese Journal of Astronomy and Geophysics* 8, No. 2, 39-50, 16 text-figures, 1 table, Tokyo, 1931.
The above well-illustrated paper describes clearly the important seismograph developed by Dr. Haeno for use in seismic prospecting.
930. HAURWITZ, B., "Über die Änderung der Schwere im Erdinnern," *Gerlands Beiträge zur Geophysik*, 28, Heft 1-3, 126-128, Leipzig, 1931.
931. HAYASAKA, Ichiro, "The Post-Tertiary Earth-movements and the Distribution of Earthquake Epicentres in the Island of Taiwan (Formosa)," *Proceedings of the Fourth Pacific Science Congress, Java, 1929*, 2B, 819-829, Batavia, 1930.
R.H.F.+W.W.D.
932. HEISKANEN, W., "Isostasy and the Figure of the Earth," *American Journal of Science*, Fifth Series, No. 121, 21, 39-50, 1 figure, bibliography, New Haven, January, 1931.
See also the comments by J. de Graaff Hunter in *Nature*, No. 3207, 127, 593-594, London, April 18, 1931.
Also in this connection see "Note on the Theoretical Basis of Isostasy," by Walter D. Lambert, in *American Journal of Science*, Fifth Series, No. 124, 21, 345-349, New Haven, April, 1931.
Items Nos. 910, 913, 934 and 973 of this list are other current contributions to the subject.
- HENDERSON, J. and ADAMS, C. E., "Seismology of New Zealand." See No. 902 of this list.
933. HONDA, H., "The Pulsatory Oscillations and the Stationary Surface Tremors of the Love Type," *The Geophysical Magazine*, 3, No. 3, 177-181, 2 figures, Tokyo, December, 1930.
934. HUBBERT, M. King and MELTON, F. A., "Isostasy, a Critical Review," *Journal of Geology*, 38, No. 8, 673-695, 5 figures, Chicago, November-December, 1930.
The authors' summary reads: "The fields providing data on the subject of isostasy are geodesy, seismology, and geology. The data of the first, which until recently have provided the main support of the isostatic theory, have been shown by Hopfner to be invalid. The data of the second have only an indirect bearing upon the question. The data of the last are more often than not contrary to isostatic expectations. Hence the theory of isostasy must, for the present, be regarded as resting upon a none too secure foundation and is hardly trustworthy for use as a major premise in present discussions of earth problems."
- HUNTER, J. de Graaff, "Isostasy." See No. 932 of this list.
935. IMAMURA, Akitune, "A Comparison of the Earth-movements Accompanying Volcanic Eruptions with Those Accompanying Earthquakes," *Proceedings of the Fourth Pacific Science Congress, Java, 1929*, 2B, 561-566, Batavia, 1930.
R.H.F. + W.W.D.
936. IMAMURA, Akitune, "On the Secular Variation of Land-level in the Littoral of Central Etigo," *Proceedings of the Imperial Academy*, 6, No. 10, 412-414, 3 figures, Tokyo, December, 1930.
A.I.
937. IMAMURA, Akitune, "On the Block Movement accompanying and following the Great Kwanto Earthquake of 1923," *Proceedings of the Imperial Academy*, 6, No. 10, 415-418, 4 figures, Tokyo, December, 1930.
A.I.

938. IMAMURA, Akitune, "On the Recent Destructive Idu Earthquake of 1923," *Proceedings of the Imperial Academy*, 6, No. 10, 419-422, 3 figures, Tokyo, December, 1930.

A.I.

939. IMAMURA, Akitune, "On the Block Movements that Preceded and Accompanied the Severe Tokyo Earthquake of May 21, 1928—Active Faults across the City of Tokyo," *Proceedings of the Imperial Academy*, 7, No. 1, 1-4, 5 figures, Tokyo, January, 1931.

A.I.

940. IMAMURA, Akitune, "A Seismometric Study of the North Idu Earthquake of November 26, 1930," *Japanese Journal of Astronomy and Geophysics*, 8, No. 2, 51-65, 5 text-figures, 6 plates, Tokyo, 1931.

The paper presents a thorough discussion of the data which throw light on the mechanics of the earthquake indicated.

941. ISHIMOTO, M. and TAKAHASI, R., "Séismes d'Ito et l'observation sur les variations de l'inclinaison de la surface terrestre" (in Japanese with lengthy summary in French), *Bulletin of the Earthquake Research Institute, Tokyo Imperial University*, 8, Part 4, 427-458, 1 plate, December, 1930.

The summary, which is too long to be reproduced here, deals with the inclination observations made at Ito and Kawana after the earthquakes of February 14 and April 22, 1930, discussing them with reference to the seismic phenomena at Ito.

942. JEFFREYS, Harold, "The Revision of Seismological Tables," *Monthly Notices of the Royal Astronomical Society, Geophysical Supplement*, 2, No. 7, 329-348, London, January, 1931.

The author's concluding summary reads: "A reduction of 85 earthquakes recorded in the last $3\frac{1}{2}$ years of the *International Seismological Summary*, and well observed over epicentral distances from under 20° to over 80° , has led to a fresh determination of the errors in the tables at present in use, which have been compared with those obtained in earlier investigations. It is believed that the resulting times are accurate to within about 1 second for both P and S, except possibly between 20° and 30° . The apparent velocities of P and S at short epicentral distances have been redetermined, and their probable errors are substantially reduced. There appears to be a sudden increase of velocity for waves emerging at about 20° . This corresponds to a discontinuity at a depth of about 270 km., corresponding apparently to one inferred by S. Chapman from the diurnal variations of terrestrial magnetism." See reference in No. 914 of this list.

943. JEFFREYS, Harold, "The Mechanics of Mountains," *Nature*, No. 3197, 127, 219, London, February 7, 1931.

The too-brief note presents the "substance of a lecture by Dr. H. Jeffreys, F.R.S., on 'The Mechanics of Mountains,' at the Geological Society of London, on December 31, 1930. . . Emphasis is laid on the importance of recognizing the intermediate layer in discussions of the mechanics of geological processes. Isostatic readjustment can take place by horizontal outflow in this layer as in the lower layer, though much more slowly, and this process may play an important part in the formation of geosynclines and the levelling of old mountain systems."

An abstract of this paper is given also in *Philosophical Magazine*, No. 71, 11, 799-800, London, March, 1931.

944. JOLY, John, "The Surface History of the Earth" (Second Edition), Oxford University Press, xxi+211 pages, 13 plates. Price 8s. 6d. net. London, 1930.

A review by Arthur Holmes appears in *Nature*, No. 3198, 127, 227-228, London, February 14, 1931, under the caption, "The Theory of Geological Thermal Cycles".

A review by Chester R. Longwell is published in the *American Journal of Science*, Fifth Series, No. 123, 21, 272-273, New Haven, March, 1931.

945. (1) JONES, E. Lester, "Work of the U.S. Coast and Geodetic Survey Which has a Bearing on the Development of the Pacific Region," *Proceedings of the Fourth Pacific Science Congress, Java, 1929*, 2A, 197-202, Batavia, 1930.

One section of the paper deals with the relation of earthquake epicentres and ocean deeps. W.W.D.

945. (2) JONES, E. Lester, "Recommendation to the Fourth Pacific Science Congress," *Proceedings of the Fourth Pacific Science Congress, Java, 1929*, 2A, 231-232, Batavia, 1930.

A recommendation that Manila should be made a central station for determining epicentres for that part of the Pacific lying west and southwest of Hawaiian islands; also that Batavia be selected for the same work for the region south and southeast of the continent of Asia. W.W.D.

946. JONES, J. H., "The Microid Seismograph," Griffin and Tatlock, Ltd., London. See advertisement in *Nature*, No. 3195, 127, Page i of Supplement, London, January 24, 1931.

The advertisement announces the above publication on "a super-sensitive instrument intended for the detection of the two compressional waves set up by artificial explosions."

947. KATO, Yosio and NAKAMURA, Saemontaro, "On the Piezo-electric Accelerometer and Its Use in the Measurement of the Velocity of the Elastic Waves Produced by Artificial Shocks," *Science Reports of the Tohoku Imperial University, Series I*, 19, No. 6, 761-772, Sendai, December, 1930.

For a previous report of this same instrument see No. 735 of these lists. The abstract published by the authors reads: "The writers have constructed a new piezo-electric accelerometer. The piezo-electric potential is amplified by a valve amplifier. The plate current in the galvanometer circuit is compensated by using two valves in parallel. The sensibility as accelerometer is 0.0003 cm./sec.² per unit displacement on record. Accordingly, in the meaning used in seismometry in ordinary cases, it has magnification (V) from 10⁶ to 10¹⁰ for shocks whose period of oscillation is from one to 1/50 sec. Or a displacement of one millimeter on the record corresponds to a displacement of ground of 10⁻⁶ to 10⁻¹⁰ mm. if its period is 1 to 1/50 sec.

"With this instrument the velocity of elastic waves in the soil was measured. For that purpose an inertia-less time signal was designed.

"The velocities of longitudinal and traverse waves in the soil were 403 m./sec. and 197 m./sec., respectively.

"Microseisms were also recorded. It was found that an oscillation whose period varies from one to two seconds is predominant at Sendai."

- KNOPF, Adolph, "A Textbook of Geology, Part I: Physical Geology." See No. 972 of this list.

948. KORTE, Walter, "Beiträge zur experimentellen Seismik," *Zeitschrift für Geophysik*, 7, Heft 1-2, 57-68, 7 figures, Göttingen, 1931.

949. KREIS, Alfred, "Über die Beseitigung des Störenden Einflusses der Schaukelung bei Universalseismographen mit drei Komponenten," *Annalen der Schweizerischen Meteorologischen Zentralanstalt*, 23-29, 12 text figures, Zürich, 1929.

950. KRUMBACH, G., "Seismik," *Handbuch der Experimentalphysik*, 25, Teil 2, 464-566, with 58 illustrations, Leipzig, 1931.

For particulars regarding the *Handbuch* see No. 905 of this list.

The above comprises the second, third, and fourth chapters dealing with the subject indicated. For an announcement regarding the first chapter see No. 962 of this list.

In this section the author deals with the various instruments. Following an historical introduction, the theory of seismic instruments is dealt with at some length. Then follows a description of seismographs in general and of some of the more important special types in particular. The method of taking the constants concludes the chapter. In Chapter 3 the subject of records receives attention, and leads to a discussion of time curves and phases. The chapter deals also with methods of determining the epicentre and with the subject of microseisms. Chapter 4 is devoted to a study of the structure of the earth. The section concludes with a brief account of the seismological services of Germany and the various lines of research now receiving attention there.

951. KUNITOMI, S. I., "Note on the Abnormal Propagation of Seismic Wave," *Proceedings of the Fourth Pacific Science Congress, Java, 1929*, 2A, 17-20, Batavia, 1930.

R.H.F. + W.W.D.

952. KUNITOMI, S. I., "Seismometrical Study of the Great Kwanto Earthquake Occurred on September 1st, 1923," *The Geophysical Magazine*, 3, No. 3, 149-164, 2 tables, 5 diagrams, Tokyo, December, 1930.

- LAMBERT, Walter D., "Note on the Theoretical Basis of Isostasy." See No. 932 of this list.

953. LANDSBERG, H., "Beobachtungen zur PL-Welle," *Gerlands Beiträge zur Geophysik*, 29, Heft 1, 64-68, 2 figures, Leipzig, 1931.

The author's English summary reads: "New observations of the PL-wave found by O. Somville in the case of diagrams produced by the earthquakes of the middle parts of Italy are given from the records of the Taunus-Observatory. The wave is found, too, at another focus of the Mediterranean district and it seems to have appeared also in the case of an island-quake. The time curve published by Somville is completed and drawn as far as 2500 km."

- LEE, A. W. and WHIPPLE, F. J. W., "Studies in Microseisms: (a) The Question of Diurnal Variation; (b) The Variation of Amplitude with Period." See No. 998 of this list.

954. LEE, Frederick W., "Geophysical Abstracts," United States Bureau of Mines, No. 21 (Circular 6441), pp. 1-30, January; No. 22 (Circular 6452), pp. 31-59, February; No. 23 (Circular 6461), pp. 60-85, March; No. 24 (Circular 6478), pp. 86-111, April, Washington, 1931.

F.W.L.

Attention is drawn to the reports of patents granted in the United States on methods or apparatus for geophysical prospecting. These appear on pages 106-110 of No. 24. Six are for seismometers or methods involving their use.

955. LEHMANN, I., "The Earthquake of 22 III 1928," *Gerlands Beiträge zur Geophysik*, 28, Heft 1-3, 151-164, Leipzig, 1931.

The author's summary reads: "In the earthquake of 22 III 1928 the observations of P for distances from about 30 to 45 degrees and from about 80 to 90 degrees follow the Byerly-Jeffreys time-curve very closely. For distances from 78 to 94 degrees from the epicentre, where the European stations are, the S phase has been studied more particularly. S_n is found to be a strong phase which is very well defined; up to 90 degrees the equation of the time-curve is: $S_n - C = 22 \text{ m. } 28 \text{ s.} + (\Delta - 80^\circ) \times 10.7 \text{ s.}$ $S_{cP}S$ precedes S_n from a distance of 81.7 degrees. Its time-curve cannot be determined with much certainty, since the beginning of the phase is weak and there are irregularities in its appearance."

— LONGWELL, Chester R., "A Textbook of Geology, Part I: Physical Geology." See No. 972 of this list.

956. MACELWANE, James B., S.J., "The South Pacific Earthquake of June 26, 1924," *Gerlands Beiträge zur Geophysik*, 28, Heft 1-3, 165-227, 5 plates, 72 figures, Leipzig, 1931.

The author's abstract is too lengthy to be reproduced in this list. One of the most interesting results of his investigation is the discovery of satisfactory instrumental evidence that the S'-wave exists; that is to say that shear waves appear to be propagated by the core. The reference in the author's abstract reads: "The S waves have been observed in the shadow zone of P and as far as $\Delta = 167.3^\circ$. They seem to have a linear travel time-curve like that of P. A later S' phase has been observed beginning like P' in the shadow zone of P. Its travel time-curve branches at about $\Delta = 145^\circ$ into S₁' and S₂' corresponding to P₁' and P₂'; and the travel times are not very different from those calculated by Gutenberg (1914) for shear waves through the core of the earth. However, no focal zone was found." The large number of reproductions from seismograms make it easy and profitable to follow the arguments of the author.

— MARTIN, H. and MEISSER, O., "Beitrag zur Schaffung einer Zeitnormale äusserster Konstanz." See No. 963 of this list.

957. (1) MATUYAMA, Motonori, "Gravity Measurements in Tyosen and Manchuria," *Proceedings of the Fourth Pacific Science Congress, Java, 1929*, 2B, 745-747, Batavia, 1930.

957. (2) MATUYAMA, Motonori, "Study of the Underground Structure of Suwa Basin by Means of the Eötvös Gravity-Variometer," *Proceedings of the Fourth Pacific Science Congress, Java, 1929*, 2B, 869-872, Batavia, 1930. R.H.F. + W.W.D.

958. McCOMB, H. E. and WEST, Clarence J., "List of Seismological Stations of the World," *Bulletin of the National Research Council*, No. 82, 1-119. Price \$1.50. Washington, 1931.

This is the second edition of the list. It may be obtained from the Publication Office, National Research Council, Washington, D.C.

The stations are first listed in alphabetical order. For each is given: postal address; official in charge and other personnel; geographical co-ordinates, elevation, foundation, etc.; instruments and date when installed; supporting institution or affiliated organization; publication.

Altogether, more than 350 stations are listed, each being assigned a serial number for index purposes—a convenient method since some stations are commonly referred to in seismological literature by more than one name.

The instrumental constants are given in a separate tabulation. They are listed, first by make of instrument, and within that category alphabetically by names of stations concerned.

Finally, the stations are arranged by countries, the number index following each.

The new list meets a distinct need in seismology. It will be welcomed by all working seismologists.

959. McLAUGHLIN, Donald H., "Geophysical Prospecting in 1930," *Mining and Metallurgy*, No. 289, 12, 22-26, New York, February, 1931.

A review, signed W. Ayvazoglou, appears in *Geophysical Abstracts*, No. 22 (see No. 954 of this list), pages 47-48. F.W.L.

960. MEINESZ, Vening, "Results of Gravity Determinations upon the Pacific and the Organization of Further Research," *Proceedings of the Fourth Pacific Science Congress, Java, 1929*, 2B, 661-667, Batavia, 1930. R.H.F. + W.W.D.

961. MEISSER, O., "Die Schallausbreitung in der Atmosphäre bei künstlichen Sprengungen," *Physikalische Zeitschrift*, **30**, 170-175, 7 text figures, Leipzig, 1929.

O.M.

The paper describes and explains the distribution of areas of audibility about an explosion set off for the purpose of studying such phenomena.

962. MEISSER, O., "Seismik," *Handbuch der Experimentalphysik*, **25**, Teil 2, 441-463, 17 illustrations, Leipzig, 1931.

For particulars regarding the *Handbuch*, see No. 905 of this list.

The above is the first chapter dealing with the subject indicated. For an announcement regarding the second, third, and fourth chapters see No. 950 of this list.

In this section the author deals with the theory of earthquake waves. The treatment is under the following heads:

1. Elastic Constants.
2. Free Waves in an Elastic Isotropic Medium of Infinite Extent.
3. Reflection and Refraction at a Boundary Surface.
4. Reflection at the Surface.
5. Coupled Elastic Waves in an Elastic Medium of Infinite Extent but Bounded by a Plane Surface. (*ein Halbraum*).
 - (a) Rayleigh Waves.
 - (b) Shear Waves (*Querwellen*).
 - (c) Rayleigh Waves in a Layered Medium.
 - (d) Group Velocity.
6. Periods of the Seismic Waves.
7. Dissipation of Energy in the Case of Surface Waves.

O.M.

963. MEISSER, O. and MARTIN, H., "Beitrag zur Schaffung einer Zeitnormale äusserster Konstanz," *Physikalische Zeitschrift*, **32**, Heft 6, 233-243, 13 text figures, Leipzig, 1931.

O.M.

The authors present a method of comparing two periodicities with a precision of the order of 10^{-7} of the unit of time concerned, and for a duration as great as ten minutes.

— MELTON, F. A. and HUBBERT, M. King, "Isostasy, a Critical Review." See No. 934 of this list.

964. (1) MIYABE, Naomi, "On the Vertical Earth Movement in the Kwanto District," *Proceedings of the Imperial Academy*, **6**, No. 10, 405-408, 2 figures, Tokyo, December, 1930.

964. (2) MIYABE, Naomi, "On the Relation between Horizontal and Vertical Movements of Earth's Crust in Kwanto District," *Proceedings of the Imperial Academy*, **6**, No. 10, 409-411, Tokyo, December, 1930.

965. MOTHEs, Hans, "Seismographen im Dienst der Gletscherforschung," *Forschungen und Fortschritte*, **6**, Nr. 28, 363-365, Berlin, 1930.

— NAKAMURA, Saemontaro and KATO, Yosio, "On the Piezo-electric Accelerometer and Its Use in the Measurement of the Velocity of the Elastic Waves Produced by Artificial Shocks." See No. 947 of this list.

966. NATIONAL RESEARCH COUNCIL, U.S.A., "The Physics of the Earth's Crust." The National Research Council is sponsoring a series of nine bulletins on the above general topic. The subjects to be dealt with are: Volcanology; The Figure of the Earth; Meteorology; The Age of the Earth; The Internal Constitution of the Earth; Seismology; Oceanography; Field Methods of Detecting Unhomogeneities of the Earth's Crust; Terrestrial Magnetism and Electricity.

The first four of these are now ready for distribution. The others will be published as they are completed. Each is entrusted to a group of experts for the subject concerned. A leaflet describing the four bulletins which have so far appeared and giving details regarding the others may be obtained through the Publication Office, National Research Council, Washington, D.C., U.S.A.

967. NAVARRO NEUMANN, M. Ma. S., S.J., "Un petit grain blanc, enregistré par des séismographes," *Zeitschrift für Geophysik*, 7, Heft 1-2, 26-33, 3 figures, Göttingen, 1931.

968. NEUMANN, Frank, "The Velocity of Seismic Surface Waves over Pacific Paths," *Proceedings of the Fourth Pacific Science Congress, Java, 1929*, 2B, 705-709, Batavia, 1930.

A discussion on Love- and Rayleigh-waves based on records obtained by two Milne-Shaw seismographs at Honolulu. See also No. 368 of these lists. W.W.D.

969. NEUMANN, Frank, "Seismological Report, October, November, December, 1927," United States Department of Commerce, Coast and Geodetic Survey, Serial Publication No. 503, 57 pages, 1 map, Washington, 1931.

970. ODDONE, E., "Il terremoto dell'Irpinia del 23 Luglio 1930," *Bollettino del Comitato Nazionale Italiano per la Geodesia e la Geofisica*, Seconda Serie, Anno I, N. 2, 17-20, Pisa, February, 1931.

In this same issue of the *Bollettino*, on pages 27-28, is given an account of the proceedings of the Section of Seismology at the Stockholm meeting of the International Geodetic and Geophysical Union. Professor Oddone was appointed President of this Section at the Stockholm meeting. The next Assembly is to meet at Lisbon in October, 1933.

971. OMURA, H., "On the Revision, after the Great Earthquake, of the Altitude of the Initial Mark for Geodetic Levelling," *Proceedings of the Fourth Pacific Science Congress, Java, 1929*, 2B, 1073-1074, Batavia, 1930.

The above appears in abstract form only. It refers to the levelling in the vicinity of the epicentre of the Tokyo (or Kwanto) earthquake of September 1, 1923.

W.W.D.

972. PIRSSON, L. V. and SCHUCHERT, Charles, "A Textbook of Geology, Part I: Physical Geology (by the late L. V. Pirsson)," Third Edition, revised by William M. Agar, Alan M. Bateman, Carl O. Dunbar, Richard F. Flint, Adolph Knopf, and Chester R. Longwell, revision edited by Chester R. Longwell. John Wiley and Sons, vii + 488 pages, 322 figures. Price \$3.75. New York, 1929.

A review by A. C. Woodford is published in the *Journal of Geology*, 39, No. 1, 87-89, Chicago, January-February, 1931. Some of the chapters of particular interest to seismologists are entitled: "Volcanoes and Volcanism," "Warping, Folding, and Fracturing in the Earth's Crust," "Earthquakes," "Nature of the Earth's Interior," "Origin and History of Mountains," and "Chronology of Earth History."

973. PUTNAM, George R., "Isostatic Compensation in Relation to Geological Problems," *Journal of Geology*, 38, No. 7, 590-600, Chicago, 1930. F.W.L.

974. RENVIST, H., "Die Erdbeben Finnlands," *Zeitschrift für Geophysik*, 7, Heft 3-4, 145-149, Göttingen, 1931.

This paper originally appeared in the journal *Fennia*, 54, 1, 1-113, Helsingfors, January, 1930. It is here summarized in some detail, in German, by Prof. Tams.

The following abstract has been translated into English from one furnished by the author of the above summary: The paper is a detailed discussion of the seismicity of Finland. For the period 1610 to 1929 macroseismic data for a total of 235 earthquakes have been compiled. For the past four decades during which the records have been complete, there has been a yearly average of three earthquakes. The intensity has reached a maximum not greater than six of the Mercalli-Cancani scale, but the areas affected by the tremors were extensive. The graphical exposition of the seismicity is of a new type which is most informative. It shows the connection between the earthquakes and the progress of elevation of the Fennoscandinavian shield. There is presented a statistical investigation of the daily and yearly cycles in the case of the definitely-known earthshocks. There is a discussion of the mechanics of the earthquakes. The author presents a graphical demonstration of the connection between various areas and their corresponding seismicity by means of the hypsographic curve of the earth's surface. E.T.

975. REPETTI, William C., S.J., "The Hinatuan Earthquake of June 13th, 1929," *Seismological Bulletin, Manila Observatory*, 28-33, 4 tables, 1 map, Manila, January-June, 1930. W.C.R.

976. RODÉS, L., S.J., "Période diurne et annuelle dans la distribution de 1944 tremblements de terre enregistrés par un même sismographe," *Gerlands Beiträge zur Geophysik*, 28, Heft 1-3, 238-240, Leipzig, 1931.

A previous paper by the author, bearing the same title as above, was reported in these lists as No. 880.

977. SAGISAKA, Kiyonobu, "A Relation between the Motion at a Hypocentre and the Types of Seismogram," *The Geophysical Magazine*, 3, No. 3, 165-176, 5 figures, Tokyo, December, 1930.

- SCHUCHERT, Charles and PIRSSON, L. V., "A Textbook of Geology, Part I: Physical Geology." See No. 972 of this list.

978. SLEATOR, W. W., "The Propagation of Energy by Waves and the Amplitude of a Light Wave," *Journal of the Optical Society of America*, 21, No. 3, 187-204, Ithaca, March, 1931.

The introductory paragraph reads: "The ideas presented in this paper were collected and arranged in preparation for courses in sound and light, and perhaps their systematic presentation will be interesting to other teachers. While entirely elementary, these ideas are not as familiar as they very well might be." The paper is illustrated by means of nine text-figures. Vector methods are used throughout.

979. SVERDRUP, H. U., "The Origin of the Deep Water of the Pacific Ocean as Indicated by the Oceanographic Work of the 'Carnegie'," *Gerlands Beiträge zur Geophysik*, 29, Heft 1, 95-105, 2 maps, 12 diagrams, Leipzig, 1931.

- TAKAHASI, R and ISHIMOTO, M., "Séismes d'Ito et l'observation sur les variations de l'inclinaison de la surface terrestre." See No. 941 of this list.

980. TAMS, Ernst, "Das südatlantische Grossbeben vom 27. Juni 1929," *Centralblatt für Mineralogie, Geologie und Palaontologie*, Abteilung B, Heft 12, 481-483, Stuttgart, December, 1930.

The author has furnished an abstract in German, the translation of which is as follows: "The epicentre of the above earthquake has been located in the vicinity of the northwest end of the South Sandwich submarine rift (54°·0 S.: 29°·6 W.)—a position which is geotectonically significant. In spite of the distance involved, the location, by means of microseismic data, seems quite accurate. It agrees with macroseismic observations since reported from South Georgia, 400 km. west of the epicentre, where actual shaking was experienced, at the time of the earthquake, of an intensity 4 on the Mercalli-Cancani Scale." E.T.

981. TAMS, Ernst, "Das grosse sibirische Meteor vom 30. Juni 1908 und die beiseinem Niedergang hervorgerufenen Erd- und Luftwellen," *Zeitschrift für Geophysik*, 7, Heft 1-2, 34-37, Göttingen, 1931.

A short discussion of the seismic and atmospheric circumstances connected with the above-mentioned meteor-fall, on the basis of available literature. E.T.

982. TAMS, Ernst, "Die Seismizität der Erde," *Handbuch der Experimentalphysik*, 25, Teil 2, 361-437, 12 illustrations, Leipzig, 1931.

For particulars regarding the *Handbuch*, see No. 905 of this list.

The above section is divided into four chapters dealing respectively with the following topics:

1. Frequency and Intensity of the Earthquakes.
 2. Geographical Distribution of the Earthquakes.
 3. Causes of Earthquakes. Seismogenesis and the Structure of the Surface Features of the Earth.
 4. Earthquake cycles.
- E.T.

— TAMS, Ernst, "Die Erdbeben Finnlands." See No. 974 of this list.

983. TERADA, Torahiko, "On Luminous Phenomena Accompanying Earthquakes," *Proceedings of the Imperial Academy*, 6, No. 10, 401-404, Tokyo, December, 1930.

984. TERADA, Torahiko, "On the Heat Generated by the Deformation of the Earth Crust," *Bulletin of the Earthquake Research Institute, Tokyo Imperial University*, 8, Part 4, 377-383, December, 1930.

985. TSUBOI, Chuji, "A Note on the Analytical Treatments of the Horizontal Deformation of the Earth's Crust," *Bulletin of the Earthquake Research Institute, Tokyo Imperial University*, 8, Part 4, 384-392, December, 1930.

986. TSUBOI, Chuji, "Report on the Activity of the Earthquake Research Institute, Tokyo Imperial University, in the Former Half of 1930," *Gerlands Beiträge zur Geophysik*, 28, Heft 1-3, 355-362, Leipzig, 1931.

Previous reports by the author of the activities of the above institution were reported as Nos. 584 and 673 of these lists.

987. TSUYA, Hiromichi, "On the Geologic Structure of Ito District, Idu," *Bulletin of the Earthquake Research Institute, Tokyo Imperial University*, 8, Part 4, 409-426, 1 plate, December, 1930.

988. TURNER, H. H., "International Seismological Summary, 1927, April, May, June," University Observatory, 109-232, Oxford, 1931.
Among other discussions of deep focus phenomena, the author deals with "Effect of Deep Focus on L".
989. ULLER, Karl, "Die Entwicklung des Wellen-Begriffes, IV," *Gerlands Beiträge zur Geophysik*, 27, Heft 1, 102-125, Leipzig, 1930.
An abstract signed H. H. Ho., appears in *Science Abstracts*, Section A, Physics, No. 397, 34, London, January, 1931, as No. 69, page 16.
990. ULLER, Karl, "Die wahre Kugelwelle," *Zeitschrift für Geophysik*, 7, Heft 1-2, 108-116, 5 figures, Göttingen, 1931.
991. VAN DIJK, G., "De Aardbeving in Italië van 28 December 1908," *Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap*, Second Series, 26, No. 2, Leiden, 1909. G.v.D.
992. VAN DIJK, G., "De seismografen, hun beginsel, inrichting en registreering," *Verlagen der Geologische Sectie van het Geologisch-Mijnbouwkundig Genootschap voor Nederland en Koloniën, Elfde bijzondere vergadering gehouden op Zaterdag 20 Februari 1915 in het Instituut voor Mijnbouwkunde te Delft*, 7 pages in reprint, Delft, 1915. G.v.D.
993. (1) VISSER, S. W., "On the Evidence of Very Deep Earthquake Foci near West Java," *Proceedings of the Fourth Pacific Science Congress, Java, 1929*, 2A, 229-230, Batavia, 1930. R.H.F. + W.W.D.
993. (2) VISSER, S.W., "The Speed of Seismic Long Waves along the Pacific," *Proceedings of the Fourth Pacific Science Congress, Java, 1929*, 2A, 421-425, Batavia, 1930. R.H.F. + W.W.D.
994. VON DEM BORNE, H., "Die Entstehung der Meereswellen," *Gerlands Beiträge zur Geophysik*, 28, Heft 1-3, 55-58, Leipzig, 1931.
995. VON SCHMIDT, Oswald, "Theorie der 3-Schichten-Seismic," *Zeitschrift für Geophysik*, 7, Heft 1-2, 37-56, 4 figures, Göttingen, 1931.
The paper develops the theory of the propagation paths of artificially generated earth-waves in the case of a three-layered surface. The theory is based on the assumption that the path skirts the lower surface of the second discontinuity, entering it and leaving at the critical angle.
996. VRKLJAN, V. S., "Zur Theorie der gedämpften Schwingungen," *Zeitschrift für Physik* 67, Heft 3-4, 289-291, Berlin, 1931.
997. WADATI, K., "Three Kinds of Earthquakes Observed in Japan," *Proceedings of the Fourth Pacific Science Congress, Java, 1929*, 2A, 125-140, Batavia, 1930. R.H.F. + W.W.D.
- WEST, Clarence J. and McCOMB, H. E., "List of Seismological Stations of the World." See No. 958 of this list.

998. WHIPPLE, F. J. W. and LEE, A. W., "Studies in Microseisms: (a) The Question of Diurnal Variation, (b) The Variation of Amplitude with Period," *Monthly Notices of the Royal Astronomical Society, Geophysical Supplement*, 2, No. 7, 363-373, London, January, 1931.
999. WILLIS, Bailey, "Living Africa: a Geologist's Wanderings through the Rift Valleys," McGraw-Hill Publishing Co., xv + 320 pages, with plates and maps. Price 20 s. London, 1930.
A review of this book, signed R.H.R., appears in the *Geological Magazine*, No. 800, 68, No. 2, 92-93, London, February, 1931.
1000. YAMAGUTI, Seiti, "Relation between Tidal Phases and the Earthquakes," *Bulletin of the Earthquake Research Institute, Tokyo Imperial University*, 8, Part 4, 393-408, 8 pages of diagrams, December, 1930.

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