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. 12

OCTOBER, NOVEMBER, DECEMBER, 1931

BY

ERNEST A. HODGSON

OTTAWA
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PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
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1101. Adams, L. H., "The Compressibility of Fayalite and the Velocity of Elastic Waves in Peridotite with Different Iron-magnesium Ratios," *Gerlands Beiträge zur Geophysik*, **31**, Heft 1-3, Leipzig, 1931.

The author's summary reads: "From measurements on the effect of pressure on the volume of (1) a rock consisting of olivine containing 7 per cent FeO and (2) pure fayalite (Fe_2SiO_4) it has been found that the compressibility, β, of forsterite (Mg_2SiO_4) is $0{\cdot}82 \times 10^{-6}$ and $0{\cdot}73 \times 10^{-6}$ per bar respectively at atmospheric pressure and at 15000 bars. The latter pressure is equivalent to a depth of about 50 km. below the surface of the earth. For fayalite, the compressibility is notably higher, namely, $0{\cdot}96 \times 10^{-6}$ and $0{\cdot}84 \times 10^{-6}$ at 1 and 15000 bars respectively. The velocity of longitudinal waves through rocks varying in composition between pure forsterite and pure fayalite would therefore range between 8·6 and 7·1 km./sec. at a pressure of 15000 bars. On the reasonable assumption that in peridotite within the earth the molecular ratio of MgO to FeO is about 4 to 1, the velocity of longitudinal waves in this peridotite would be 8·2 km./sec. at a depth of 50 km. (disregarding the unknown effect of temperature). It may be noted that previous measurements on pyroxenes have shown that in the enstatite-hypersthene series the variation of velocity with iron-content is much less than in the olivine series; the velocity of longitudinal waves at P = 15000 in any enstatite-hypersthene can not be far from 7·4 km./sec."

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1103. Arakawa, H., "Note on the After-shocks of an Earthquake," *Geophysical Magazine*, **4**, No. 1, 67-72, Tokyo, July, 1931.

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1106. Bodle, Ralph R., "Earthquake Notes," Published by the Eastern Section of the Seismological Society of America, **3**, Nos. 1 and 2, 23 pages, 3 text figures, Washington, September, 1931.

In addition to current notes of interest to seismologists, this issue presents the Abstracts of the Proceedings of the 1931 Meeting of the Eastern Section of the Seismological Society of America, at Columbia, S.C. Abstracts of papers by Lynch, Hodgson, Macelwane, Taber, Heck, Smith, Leet, McComb, Neumann, Wenner, Sohon, Weed, and McAdie are given. The titles of these are reported in this issue of the *Bibliography* as cross references to the above publication.

The editor of *Earthquake Notes*, 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 the publication should be reported to the editor.

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The first article was reported as No. 820 of these lists.

1108. CARLI, F. D., "Il terremoto di Villa Atuel (Argentina)," *Bollettino della Società Sismologica Italiana*, **29**, No. 3-4, 3-7, 1 illustration, Rome, 1931.

1109. DAVISON, C., "The Idu (Japan) Earthquake of Nov. 26, 1930," *Nature*, No. 3230, **128**, 552-553, London, September 26, 1931.

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1111. DORE, P., "Indirizzi antichi e recenti nello studio della teoria della propagazione delle onde sismiche," *Bollettino del Comitato Nazionale Italiano per la Geodesia e la Geofisica*, Second Series, **1**, No. 8, 117-123 (to be continued), Pisa, August, 1931.

1112. EDGE, A. B. Broughton and LABY, T. H., "The Principles and Practice of Geophysical Prospecting: being the Report of the Imperial Geophysical Experimental Survey," Cambridge University Press, 372 pages, 261 illustrations, 1931.
The report deals with electrical, gravimetric, magnetic, and seismic methods. The applications of these methods in Australia are first described, after which the details and principles involved are discussed. The sections devoted to the seismic method are on pages 194-233 and 328-349. The report is particularly valuable in that it gives concise but sufficiently-detailed accounts of the experience of the officers of the survey with an unusual freedom from apparent bias or reserve.

—— EGINITIS, D., "Rapport sur les travaux de la section géodynamique de l'Observatoire d'Athènes," pages 200-202 of the *Proceedings of the Section of Seismology of the International Geodetic and Geophysical Union for the Stockholm Meeting, 1930*. See No. 1171 of this list.

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The authors' summary reads: "Investigations of the Mexican shocks of January 2, 15, and 17, 1931, as recorded at stations in California, have shown that the travel-time curve of the P-waves at distances between 9° and 15° is nearly a straight line. At these distances the amplitudes of the P-waves are very small, as is to be expected from theory. At greater distances $dt/d\Delta$ decreases, and the amplitudes are larger. The data are not sufficient to decide whether the changes are abrupt or not. No S-waves could be found between 9° and 15°. The calculated velocities of the P-waves are near 8·2 kilometers per second at depths between 40 and 80 kilometers, increasing slightly with greater depths. It is possible that the velocity decreases very slightly at some depths between 40 and 80 kilometers, but there is no sign of any discontinuity at depths between 40 and more than 500 kilometers. The S-waves seem to be affected a little more at depths between 40 and 100 kilometers than the P-waves. It is not impossible that at some depth between 40 and 80 kilometers there is a transition from the crystalline to the glassy state."

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—— HECK, N. H., "Progress of Seismological Work in the United States, July 1, 1927, to January, 1930," pages 171-191 of the *Proceedings of the Section of Seismology of the International Geodetic and Geophysical Union for the Stockholm Meeting, 1930*. See No. 1171 of this list.

The above progress report appears translated into French.

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The author, in the above address presented before the Franklin Institute on Thursday, April 2, 1931, stresses the need of co-ordination of the theoretical and the practical, or engineering, sides of earthquake study. N.H.H.

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A profusely illustrated pamphlet describing the activities of the Department of Geophysics of the Colorado School of Mines. It presents also a schematic chart showing courses required at the School for various degrees. A table of selected books and journals giving information on geophysical methods is appended.

A much more extended list of such books is given by the same author, together with his associate Dart Wantland, as No. 3 of the same volume of the above-mentioned *Quarterly*. This pamphlet of 24 pages (price 50c.) analyses the list of references according to the various methods and to various phases of each method.

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The author's summary reads: "The problem of the surface wave of Rayleigh's type propagating along the surface of a heterogeneous material, of which Lamé's constants λ and μ increase linearly with increasing depth, and the density remains constant throughout the material, was solved approximately under some assumptions. And the expressions showing the velocity, the dispersion of the wave propagation and the displacement components of the particles of the material and so on were obtained."

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1129. ISHIMOTO, Mishio, "Un sismographe accélérométrique et ses enregistrements," *Bulletin of the Earthquake Research Institute*, **9**, Part 3, 316-332, 12 illustrations, Tokyo, September, 1931.

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The author's summary reads: "(1) Examination of the data contained in the *International Seismological Summary*, and of Byerly's results for the Montana earthquake, leads to the conclusion that for $\Delta < 25°$ the times of transmission for P and S, apart from constant terms, closely fit the formulae:

$$T_P = 14{\cdot}30\Delta - 2{\cdot}00\ (\Delta/10)^3$$
$$T_S = 25{\cdot}70\ \Delta - 3{\cdot}50\ (\Delta/10)^3$$

The cube terms are about double those given previously.

"(2) P and S at stations within this range are usually followed by other pulses at intervals of about 8 s. It seems probable that the curious behaviour of the S residuals, derived from the *Summary*, is due to the reading of one or other of these later pulses for S.

"(3) The later pulses may be due to internal reflexion in the upper layers."

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—— KODAIRA, T., NASU, N., and KISHINOUYE, F., "Recent Seismic Activities in the Idu Peninsula (Part I)." See No. 1159 of this list.

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1136. KOLDERUP, Niels Henr. and KRUMBACH, Gerhard, "Das Nordseebeben vom 24. Januar 1927," *Zeitschrift für Geophysik*, **7**, Heft 5-6, 225-232, Braunschweig, 1931.

The authors determined the position of the epicentre by a graphical modification of the Galitzin method of equal arrival times at pairs of stations. They then discuss the earthquake with relation to the seismicity of Norway.

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The author's English summary reads: "On April 1, 1931, an earthquake took place in the middle parts of the river Saar and the western part of the Hunsrück mountains. The heaviest shocks did not exceed the intensity 5 of the Mercalli-Sieberg Scale. The focus was situated near the river Saar not far from the boundary of the Devonic parts of the Rhenanian mountains and the formations of the valley of the Saar and Nahe. The time-distance curves show no exceeding anomalies compared with those found for earlier quakes. The depth of the focus was not more than 10 kms." H.L.

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—— LA RUE, Wilton W. and MCCOLLUM, Burton, "Seismograph Work with Existing Wells." See No. 1147 of this list.

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—— LEET, L. Don, "Effect of Instrument Location on Seismographic Recording at Harvard." See page 15 of *Earthquake Notes*, reported as No. 1106 of this list.

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An interesting and valuable compendium of information regarding seismological services in Mexico and also regarding seismology in general.

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—— MACELWANE, James B., S.J., "Our Present Knowledge of the Interior of the Earth." See pages 11-12 of *Earthquake Notes*, reported as No. 1106 of this list.

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—— MCADIE, Alexander, "Precautionary Measures for Minimizing Loss of Life in Earthquakes." See page 23 of *Earthquake Notes*, reported as No. 1106 of this list.

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—— MCCOMB, H. E., "Problems Involved in the Establishment of Seismological Stations." See pages 16-17 of *Earthquake Notes*, reported as No. 1106 of this list.

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—— MIHAILOVIĆ, Jélenko, "Rapport sur le service séismologique du Royaume Yougoslave 1927-1930," pages 240-244 of the *Proceedings of the Section of Seismology of the International Geodetic and Geophysical Union for the Stockholm Meeting, 1930.* See No. 1171 of this list.

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The author lists the earthquakes that have been recorded in Cuba, and especially in the vicinity of Santiago. He offers a theory to explain the earthquakes and draws certain conclusions regarding the construction of the Santiago viaduct and other engineering structures. S.T.

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—— NEUMANN, Frank, "Principles Underlying the Interpretation of Seismograms." See page 17 of *Earthquake Notes*, reported as No. 1106 of this list.

—— NIKIFOROFF, P., "La séismologie dans l'URSS," pages 232-239 of the *Proceedings of the Section of Seismology of the International Geodetic and Geophysical Union for the Stockholm Meeting, 1930*. See No. 1171 of this list.

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—— ODDONE, E., "Rapport sur l'état de la séismologie en Italie," pages 204-206 of the *Proceedings of the Section of Seismology of the International Geodetic and Geophysical Union for the Stockholm Meeting, 1930*. See No. 1171 of this list.

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1167. PROVIERO, A., "Intorno ad alcuni recenti studi sullo smorzamento dei sismografi," *Bollettino della Società Sismologica Italiana*, **29**, No. 3-4, 22-30, Rome, 1931.

1168. RAMIREZ, John Emilio, S.J., "The Earthquakes of August 29 and September 1, 1930, in the New Madrid Region," *Bulletin of the Seismological Society of America*, **21**, No. 2, 159-169, 1 map, Stanford, June, 1931.

—— RENQVIST, Henrik, "Rapport sur le service séismologique en Finlande," pages 191-192 of the *Proceedings of the Section of Seismology of the International Geodetic and Geophysical Union for the Stockholm Meeting, 1930*. See No. 1171 of this list.

—— RICHTER, Charles F. and GUTENBERG, Beno, "On Supposed Discontinuities in the Mantle of the Earth." See No. 1118 of this list.

—— RICHTER, Charles F. and GUTENBERG, Beno, "Pseudoseisms Caused by Abnormal Audibility of Gunfire in California." See No. 1119 of this list.

—— RICHTER, Charles F. and WOOD, Harry O., "A Study of Blasting Recorded in Southern California." See No. 1197 of this list.

—— RICHTER, Charles F. and WOOD, Harry O., "Recent Earthquakes near Whittier, California." See No. 1198 of this list.

1169. RIEBER, Frank, "Results of Elastic-wave Surveys in California and Elsewhere," *Bulletin of the American Association of Petroleum Geologists*, **14**, No. 12, 1557-1571, Tulsa, 1930.

F.W.L.

1170. ROMBERG, Arnold, "Influence of Wire or Ribbon Suspension on the Horizontal Pendulum," *Bulletin of the Seismological Society of America*, **21**, No. 3, 224-228, Stanford, September, 1931.

1171. ROTHÉ, E., "Comptes rendus des séances de la quatrième conférence réunie à Stockholm du 14 au 23 août 1930," Publication of the Section of Seismology, International Geodetic and Geophysical Union, 330 pages, Strasbourg, 1931.

On pages 50-74 of the above publication appears the Report of the Secretary—Professor Rothé. It is given first in French and then in English.

On pages 192-197 of the above publication, the same author presents the "Rapport sur l'état de la séismologie en France."

Attention is drawn to the reports on "Tables d'hodographes," and on "Notation séismographique internationale," given on pages 246-251 and 251-262 respectively of the *Proceedings*.

1172. RYBNER, J., "Investigations on the Theory of the Galitzin Seismograph," *Gerlands Beiträge zur Geophysik*, **31**, Heft 1-3, 259-281, Leipzig, 1931.

The author's summary reads: "The following is a preliminary account of an investigation on the theory of the Galitzin seismograph. The research is based on the extended form of the differential equation given by Wenner, from which the results are derived by means of the Heaviside Operational Calculus.

"A general solution for any movement of the soil is obtained in the form of a definite integral and particular solutions are worked out for the movements $x = \sin\omega t$ and $x = e^{at} \sin\omega t$, both starting at $t = 0$. The results are shown in curves, and a method of utilizing such curves for a speedy evaluation of the records is sketched.

"A general equation for the movement of the galvanometer by the usual determination of the constants is given. Finally, the possibility of improving the seismograph by altering its constants is briefly discussed."

1173. SAGISAKA, K., "On the Velocity of a Seismic Wave in the Upper Layers of the Earthcrust," *Geophysical Magazine*, **4**, No. 2, 147-155, 4 text figures, Tokyo, September, 1931.

The author concludes from his study of the trajectories of seismic waves determined in the case of several Japanese earthquakes that, "at least in central Japan and Kwanto district, there exists no such a discontinuity stratum as that assumed by Mohorovičić."

—— SALINAS, Salazar, "Le service séismologique au Mexique," pages 221-227 of the *Proceedings of the Section of Seismology of the International Geodetic and Geophysical Union for the Stockholm Meeting, 1930*. See No. 1171 of this list.

1174. (1) SARASOLA, S., S.J., "Se pueden predecir los terremotos?" *Noticias Cientificas publicadas por el Observatorio Nacional de San Bartolomé (Colombia)*, **3**, No. 25-26, 135-138, Bogota, 1929.

1174. (2) SARASOLA, S., S.J., "Los terremotos y los cambios en la corteza terrestre," *Noticias Cientificas publicadas por el Observatorio Nacional de San Bartolomé (Colombia)*, **3**, No. 29, 220-221, Bogota, 1930.

1174. (3) SARASOLA, S., S.J., "Un eminente sismologo. En memoria del Reverendo Padre Tondorf, S.J.," *Noticias Cientificas publicadas por el Observatorio Nacional de San Bartolomé (Colombia)*, **4**, No. 32, 69-70, Bogota, 1930.

1175. SCRASE, F. J., "The Reflected Waves from Deep Focus Earthquakes," *Proceedings of the Royal Society*, Series A, **132**, 213-235, 10 text figures, London, July, 1931.

The author's summary reads: "The effect of an abnormally deep focus on the reflected waves of eathquakes is considered. In general a number of supplementary reflected waves may occur and if the focus is sufficiently deep, they should produce

definite separate phases on the records. The times of travel of both the supplementary waves and the more normal waves have been derived for several depths of focus, C. G. Knott's paths of longitudinal and transverse waves being taken as a basis.

"It is found that the commencements of the additional phases can generally be recognized on the seismograms and that the times of transit are in reasonable agreement with the calculated times. This, it is considered, is definite confirmation of the occurrence of deep focus earthquakes. Further, the appearance of the supplementary reflected waves provides a means of recognizing a deep focus earthquake from the records of a single station.

"The results of the investigation favour the idea that the initial phase of an earthquake is a direct compressional wave and is not generated by reflexion of a distortional wave." F.J.S.

1176. SEZAWA, Katsutada, "A Kind of Waves Transmitted over a Semi-infinite Solid Body of Varying Elasticity," *Bulletin of the Earthquake Research Institute*, **9**, Part 3, 310-315, Tokyo, September, 1931.

1177. SEZAWA, Katsutada and NISHIMURA, Genrokuro, "Movement of the Ground Due to Atmospheric Disturbance in a Sea Region," *Bulletin of the Earthquake Research Institute*, **9**, Part 3, 291-309, Tokyo, September, 1931.

The authors conclude that:

"(1) The movement of the ground is composed of four kinds of displacements; namely the displacement due to the transmission of shallow water waves, that due to Rayleigh-waves, that due to distortional waves, and that due to dilatational waves.

"(2) The velocity of the transmission of the displacement of the body due to shallow water waves is equal to that of shallow water waves, while the transmission of the displacements of other kinds have their own velocities peculiar to the respective waves.

"(3) The amplitudes of the deformation of the solid body due to Rayleigh-waves and also to shallow water waves change as inverse square root of the epicentral distance, while those due to the dilatational and distortional waves diminish as inverse square of the epicentral distance.

"(4) Microseisms due to a disturbed weather occurring in a different region are chiefly due to long water waves, including breakers at the coast, advancing near the observing station, but not the seismic waves directly transmitted from the region of the disturbed weather. The action of the long water waves is, however, relatively small compared with that of breakers.

"(5) The amplitude of the ground due to pulsatory original disturbance of long periods is smaller than that due to short periods, even though the amplitude of the disturbing pressure is kept constant."

1178. SIEBERG, A., "Die Erforschung des Erdinnern. Arbeitsmethoden und Ergebnisse," *Handbuch der biologischen Arbeitsmethoden*, Abteilung X, Heft 8, 883-942, 30 illustrations, Berlin, 1930.

A short review by H. Martin appears in *Geologisches Zentralblatt*, **45**, No. 1, 17 (item 55), Leipzig, August 15, 1931.

—— SMITH, L. L., "The Charleston Earthquake." See pages 14-15 of *Earthquake Notes*, reported as No. 1106 of this list.

—— SOHON, F. W., S.J., "The Determination of the Constants of the Galitzin Seismographs." See page 21 of *Earthquake Notes*, reported as No. 1106 of this list.

1179. SOMMER, H. Henrietta, "On the Question of Dispersion in the First Preliminary Seismic Waves," *Bulletin of the Seismological Society of America*, **21**, No. 2, 87-158, Stanford, June, 1931.

The general conclusion is that there is no evidence for dispersion in waves of longitudinal type given by observation of periods. It is shown that, if dispersion did exist, the travel time of the beginning would be a continuous function of epicentral distance, and, therefore, Mohorovičić's curves are not evidence for dispersion. The observations of the epicentral distances at which P_1, P_2, and P_n are most frequently recorded are contrary to dispersion. In the Alaskan earthquake here studied, the distribution of first motion (condensation or rarefaction) is very complicated. Dispersion offers no explanation for this fact, and it is believed that complex movements at the source are responsible for the observed distribution.

—— SOMVILLE, O., "État de la séismologie dans Congo Belge: Station séismologique de Guba," pages 169-170 of the *Proceedings of the Section of Seismology of the International Geodetic and Geophysical Union for the Stockholm Meeting, 1930*. See No. 1171 of this list.

1180. SPLENDIANI, G., "L'osservatorio meteorico-sismico del Seminario di Camerino," *Bollettino Società Sismologica Italiana*, **29**, No. 3-4, 31-35, Rome, 1931.

1181. STECHSCHULTE, V. C., S.J., "Deep Focus Earthquakes," *Nature*, No. 3233, **128**, 673-674, London, October 17, 1931.

The above note refers to the paper of the same title by F. J. Scrase, reported as No. 1078 of these lists.

1182. STONELEY, R., "Deep Focus Earthquakes," *Nature*, No. 3211, **127**, page 740, London, 1931.

The above article refers to the paper of the same title by F. J. Scrase, reported as No. 1078 of these lists.

1183. STONELEY, R., "The Thickness of the Continental Layers of Europe," *Monthly Notices of the Royal Astronomical Society, Geophysical Supplement*, **2**, No. 8, 429-433, London, June, 1931.

The author's summary reads: "Data concerning the periods and group-velocities of Love waves are found by measurement of selected seismograms. To separate the Love waves from Rayleigh waves, records are chosen in which the waves reach the recording station in an easterly azimuth. The waves of group-velocities greater than 3·7 km./sec. give 12 km. for the thickness of the granitic layer, supposed half the thickness of the intermediate layer. If velocities down to 3·5 km./sec. are included, the corresponding thickness of the granitic layer is 13 km. The inclusion of lower group-velocities would require taking the sedimentary layer into account. The measures afford data for studying this effect, but the formulae become much more complicated."

—— TABER, Stephen, "The Seismic Belt near Santiago de Cuba." See page 13 of *Earthquake Notes*, reported as No. 1106 of this list.

1184. TABER, Stephen, "The Structure of the Sierra Maestra Near Santiago de Cuba," *Journal of Geology*, **39**, No. 6, 532-557, 16 illustrations, Chicago, August-September, 1931.

The author's abstract reads: "The rocks of the Sierra Maestra near Santiago de Cuba are chiefly well-stratified volcanic breccias and tuffs, with interbedded limestones and andesitic intrusives. The mountains are simple block mountains, uplifted along

normal east-west faults and tilted toward the north. The uplift and tilting have accompanied the subsidence of the great Bartlett Trough that lies between Cuba and Jamaica.

"The fault blocks are of different age. The oldest, and highest, forms the coastal ridge west of Santiago Bay. It possibly received part of its present elevation during the Pleistocene, but the uplift has continued intermittently down to the present time. The Sierra de Boniato, farther inland and northwest of Santiago, has been uplifted in post-Pleistocene time. Immediately in front of it on the south is a lower ridge, known as the Puerto Pelado, with scarp so fresh that its age must be measured in hundreds of years rather than tens of thousands. The region is unstable, and the displacements may be expected to continue at any time." S.T.

1185. Taber, Stephen, "The Problem of the Bartlett Trough," *Journal of Geology*, **39**, No. 6, 558-563, 1 map, Chicago, August-September, 1931.

The author's abstract reads: "Little is known concerning the great submarine troughs, although they must be classed among the major tectonic features of the earth. The Bartlett Trough offers many advantages for purposes of research. The present status of the problem is here briefly outlined and methods are suggested for continuing the investigation of its origin and structure."

As one of the subdivisions of the discussion on *Origin and Structure*, the seismological evidence is presented. The subdivision closes with the paragraph: "Seismograph stations are now located at Port-au-Prince, Haiti; Kingston, Jamaica; Havana, Cuba; Merida, Mexico; and other places more distant from the trough. It would help if seismographs could be installed at Santiago, Cuba, and on Grand Cayman Island." S.T.

—— Takayama, Takeo and Fujiwhara, Sakuhei, "On Crack Systems Especially Those of Echélon Formation." See No. 1113 of this list.

1186. Terada, Torahiko, "On Luminous Phenomena Accompanying Earthquakes," *Bulletin of the Earthquake Research Institute*, **9**, Part 3, 225-255, Tokyo, September, 1931.

1187. Tillotson, Ernest, "On an Earthquake near Imotski, Yugoslavia, 1923 March 15," *Monthly Notices of the Royal Astronomical Society, Geophysical Supplement*, **2**, No. 8, 416-429, London, June, 1931.

The records for epicentral distances up to 20 degrees were studied. Phases P, P^*, P_g, S, S^*, and S_g were verified and also the possible compressional wave in the sedimentary layer here called P_s and previously noticed by Jeffreys. Its possible S equivalent, S_s was also observed. There are indications in some records of two more pulses, coming immediately after P and S respectively, which have been studied by Stoneley. Travel times for P agree best with Jeffrey's tables. The thicknesses of the various layers appear to be: sedimentary 4 km., granitic 13 km., intermediate 25·3 km., and depth of focus 12 km., reckoned from the top of the granitic layer.

1188. Tokyo Imperial University, "Outline of Investigations of the Great Idu Earthquake," *Bulletin of the Earthquake Research Institute, Tokyo Imperial University*, **9**, Part 1, 111-114, March, 1931.

1189. Tsuboi, Chuji, "On the Results of Fifth Precise Levellings in the Tango Earthquake District," *Proceedings of the Imperial Academy*, **7**, No. 6, 234-237, Tokyo, June, 1931.

1190. Tsuboi, Chuji, "On the Results of Repeated Precise Levellings around Idu Peninsula," *Bulletin of the Earthquake Research Institute*, **9**, Part 3, 271-290, 11 text figures, Tokyo, September, 1931.

1191. Tsuya, Hiromichi, "Petrographic Notes on the Sedimentary Rocks of Southwest Sagami Province (Part II)," *Bulletin of the Earthquake Research Institute*, **9**, Part 3, 353-373, Tokyo, September, 1931.

—— Turner, H. H., "Address of the President of the Section of Seismology," pages 35-50 of the *Proceedings of the Section of Seismology of the International Geodetic and Geophysical Union for the Stockholm Meeting, 1930.* See No. 1171 of this list.

The text of the address is given first in English and then in French. Professor Turner died suddenly while presiding at the Conference of which the above was the opening address.

1192. Uller, Karl, "Die Entwicklung des Wellen-Begriffes, VI," *Gerlands Beiträge zur Geophysik*, **31**, Heft 1-3, 40-82, 2 text figures, Leipzig, 1931.

A bibliography of 16 items lists earlier publications by the same author, all dealing with some part of wave theory.

1193. Union Géodésique et Géophysique Internationale, "Quatrième Assemblée Générale réunie à Stockholm, 15-23 août 1930, Procès-verbaux des séances," Publication of the International Research Council, 100 pages, Toulouse, 1931.

—— Visser, S. W., "Seismological Observations in the Netherlands and in the Netherlands East Indies," pages 227-230 of the *Proceedings of the Section of Seismology of the International Geodetic and Geophysical Union for the Stockholm Meeting, 1930.* See No. 1171 of this list.

1194. Wanner, E., Beiträge zum Studium der PS-Phase und Mächtigkeit der Molasse unterhalb Zürich," *Gerlands Beiträge zur Geophysik*, **32**, 231-241, 7 text figures, Leipzig, 1931.

E.W.

—— Wantland, Dart and Heiland, C. A., "A Selected List of Books and References on Geophysical Prospecting." See No. 1122 of this list.

—— Weed, Arthur J., "A Seismograph for Use in Earthquake Regions." See page 22 of *Earthquake Notes*, reported as No. 1106 of this list.

A picture of the seismograph is given, supplementing the brief description of the abstract.

—— Wenner, Frank, "Status of Instruments under Construction." See pages 18-20 of *Earthquake Notes*, reported as No. 1106 of this list.

—— Whipple, F. J. W., "Seismology in Great Britain 1927-1930," pages 198-199 of the *Proceedings of the Section of Seismology of the International Geodetic and Geophysical Union for the Stockholm Meeting, 1930.* See No. 1171 of this list.

1195. Whipple, F. J. W., "On Methods of Estimating the Heights Reached by the Air-waves Which Descend in Zones of 'Abnormal Audibility'," *Gerlands Beiträge zur Geophysik*, **31**, Heft 1-3, 158-168, 2 text figures, Leipzig, 1931.

1196. WILIP, J., "Experimentelle Prüfung von Verspätungsfragen bei der galvanometrischen Registriermethode," *Zeitschrift für Geophysik*, **7**, Heft 5-6, 219-225, Braunschweig, 1931.

A galvanometrically-recording seismograph was arranged in such a way that it recorded also directly and optically, with high magnification. The instrument, so equipped, was then subjected to periodic oscillations, the two records being obtained side by side. The galvanometric method gave excellent records without lag even in the case of short-period oscillations.

1197. WOOD, Harry O. and RICHTER, Charles F., "A Study of Blasting Recorded in Southern California," *Bulletin of the Seismological Society of America*, **21**, No. 1, 28-46, 2 text figures, Stanford, March, 1931.

1198. WOOD, Harry O. and RICHTER, Charles F., "Recent Earthquakes near Whittier, California," *Bulletin of the Seismological Society of America*, **21**, No. 3, 183-203, 4 text figures, Stanford, September, 1931.

1199. YABE, Hisakatsu, "Geological Growth of the Tokyo Bay," *Bulletin of the Earthquake Research Institute*, **9**, Part 3, 333-339, Tokyo, September, 1931.

—— YASUDA, Ch. and NASU, N., "Seismometrical Report." See No. 1158 of this list.

1200. ZELLER, W., "Praktische und theoretische Untersuchung von Schwingungsmessern zur Aufnahme und Beurteilung von Verkehrserschütterungen," *Zeitschrift für Bauwesen*, **80**, No. 7, July, 1930.

Table of Contents: Theory of Instruments; Vibration-meters, Piezo-electric Accelerometers—Absolute Intensity-scale for Earthquakes and Artificial Vibrations—Results of Measurements. W.H.

LIST OF COLLABORATORS

The items for this issue of the Bibliography were compiled while the editor was stationed at the Geophysical Laboratory of Saint Louis University. The compilation was made possible through the kindness of Rev. James B. Macelwane, S.J., Dean of the Graduate School and Director of the Department of Geophysics, who arranged that all incoming scientific journals containing articles on seismology or allied subjects should pass through the hands of the editor. Although none of the listed items is marked with Dr. Macelwane's initials, his co-operation in the work of the entire issue is hereby gratefully acknowledged.

The initials appended to various items throughout the Bibliography indicate, in each case, the contribution by the respective collaborator.

Gutenberg, Beno, B.G.
220 North San Rafael Avenue,
Pasadena, California, U.S.A.

Hiller, W., W.H.
Württembergische Statestisches Landsamt,
Stuttgart, Germany.

Imamura, Akitune, A.I.
Seismological Institute,
Tokyo Imperial University, Tokyo, Japan.

Landsberg, H., H.L.
Frankfurt, Germany.

Lee, Frederick W., F.W.L.
Editor, *Geophysical Abstracts*,
United States Bureau of Mines,
Washington, D.C., U.S.A.

Leet, L. Don, L.D.L.
Harvard University,
Cambridge, Mass., U.S.A.

Lehmann, I. (Miss), I.L.
Copenhagen, Denmark.

Taber, Stephen, S.T.
University of South Carolina,
Columbia, S.C., U.S.A.

Scrase, F. J., F.J.S.
Kew Observatory,
Richmond, Surrey, England.

SUBJECT INDEX FOR THE YEAR 1931

The following subject index for the items listed in the *Bibliography of Seismology* for the year 1931 has been prepared in the same form as that for the items listed in 1930 (see pages 136-138, Vol. X, No. 8 of these *Publications*) and may be considered a continuation of that index.

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O3. Organizations for Seismological Investigations; Inaugurations, Reports, New Equipment, etc.: Nos. 825, 844, 852, 870, 875, 891, 900, 901, 919, 924, 945(1), 945(2), 958, 966, 986, 1021, 1067, 1106, 1110, 1112, 1122, 1145, 1158, 1164, 1165, 1171, 1180, 1193.

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P2. Physics, Experimental, As Applied to Seismological Problems: Nos. 810, 813, 839, 841, 848, 851, 874, 895, 906, 963, 1034, 1082.

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R1. Records, Evaluation of Earthquake: Nos. 811, 955, 956, 967, 977, 1049, 1064, 1084, 1133, 1106.
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R2. Reports, Seismological; Regular Series: Nos. 815, 869, 901, 907, 969, 988, 1031, 1068, 1074, 1106.
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R2.1. Reviews of Various Phases of Seismology: Nos. 816, 858, 997, 1085, 1106, 1144, 1171.

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S3. Seismic Prospecting: Nos. 807, 820, 845, 846, 859, 863, 864, 947, 948, 954, 959, 963, 965, 995, 1003, 1032, 1051, 1055, 1059, 1069, 1083, 1107, 1112, 1141, 1142, 1143, 1147, 1169, 1197.
See also E3. (Explosions).

T1. Textbooks; General Treatises on Seismology or Its Applications: Nos. 833, 837, 838, 905, 950, 962, 972.

T2. Tidal Loading; Its Effects; Sea-level Pressure Changes, etc.: Nos. 1000, 1097.

T4. Time-Distance Curves, Tables, etc.: Nos. 866, 878, 887, 896, 942, 953, 955, 956, 993(2), 1106, 1125, 1132, 1144, 1175, 1187, 1194.

V1. Vibrations of the Ground, Buildings, etc., Caused by Non-seismic Disturbances Other Than Explosions, as Traffic, Machinery, Falling Weights, Meteors, Frost: Nos. 839, 892, 906, 981, 1016, 1047, 1119, 1200.

V2. Volcanoes in Relation to Earthquakes: Nos. 935, 1021.
See also P1. (Pacific Problems).

W1. Waves, Studies of Earthquake; Based on Observational Data, Velocity, Paths, Nature, etc.: Nos. 829, 878, 887, 896, 922, 951, 953, 961, 968, 978, 993(1), 994, 1039, 1040, 1054, 1072, 1084, 1101, 1111, 1132, 1169, 1173, 1175, 1177, 1179, 1187, 1194, 1195.
See also E3. (Explosions), F1. (Foci), M3. (Mathematical Physics), O4. (Origins), R1. (Records), S3. (Seismic Prospecting), T1. (Texts), T4. (Time-Distance Curves), and V1. (Vibrations).