No. -4-   From   to   192
                 March 1   March 16, 1928

HARVARD UNIVERSITY, CAMBRIDGE, MASS., U.S.A.

RECORD OF THE SEISMOGRAPHIC STATION

DEPARTMENT OF GEOLOGY AND GEOGRAPHY

$\phi = 42° 22' 36'' $ N. $\lambda = 71° 06' 59'' $ W. Gr. $h = 5.367$ M.   FOUNDATION: Glacial sand over clay.

TIME: Mean Greenwich, midnight to midnight.

INSTRUMENTS: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration).

N-S air damped, 10:1; T=15s.   E-W "damped" 1.5:1 ca.   T=15s

No.	Date	Phase	Time	Periods	Amplitudes	Δ	REMARKS
			h. m. s.	s.	μ.	Kms.	
B10	Mar 9	e_{EN}	18-27-34	10		(16,000)	U. S. Coast and
		e_{EN}	18-34-26	12			Geodetic prelimi-
		e_N	18-37-08				nary determination
		e_N	18-41-10				3°N 128°E approx.
		i_N	18-44-32				
		e_E	18-45-06				
		i_N	18-45-44				
		e_N	19-14-08				
		M_{1N}	19-23-38	28	42		
		M_{2N}	19-25-54	20	14		
		M_{3N}	19-28-36	22	27		
		M_{4N}	19-30-32	20	42		
		M_{5N}	19-31-49	16	21		
		M_{6N}	19-33-08	19	31		
		M_{7N}	19-35-57	16	19		
		M_{8N}	19-37-54	18	18		
		M_{9N}	19-39-44	18	24		
		M_{10N}	19-42-08	16	17		
		L_N	19-44-08 to 20-04 ca				
		e_N	20-04-54	16			
		e_N	20-07-00				
		L_N	20-10-16 to 20-13-00	16	8		
		e_N	20-16-32 to 20-18-56				
		F_E	20-14 ca				
		F_N	20-41 ca				
511	Mar 16	eSR_{1EN}	5-39-02			(13,944)	(125.5° per St. Louis preli- minary determina- tion---O=5h01m00s 23°S 171°E)
		eL_N	5-50-36	32	29		
		eL_E	5-57-46				
		M_{1N}	6-05-48	20	17		
		M_{1E}	6-06-38		(14mm trace)		
		iM_{2N}	6-06-35 to 6-09-06	20	25		

(Concluded on sheet -5-)

(For explanation of Symbols see other side)

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PR_2.............   "   "   twice reflected, and time of arrival at station.

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M................Maximum of Long waves, and time of arrival.

M^1, M^2, M^3, etc. ...Successive maxima.

$Lrep_1$............Long waves reaching the station from the antipodes of the epicentre (anticentre); path 40,000 kms. − Δ.

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ca ....Approximately.

T................Period, complete time of oscillation; for simple pendulum;

$$2\pi \sqrt{\frac{l}{g}}$$

To...............Period of undamped pendulum of seismograph.

Te...............Period of earth particle.

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			h. m. s.	s.	μ.	Kms.	
	Mar 16	(Concluded)					
B11		eM_{3N}	6-09-06 to				
			6-10-52	19	20		
		iM_{4N}	6-10-52 to				
			6-12-06				
		iM_{2E}	6-12-56				
		M_{5N}	6-12-36				
		iM_{3E}	6-13-50		(21mm trace)		
		M_{6N}	6-16-40 to				
			6-20-12	16	13		
		iM_{4E}	6-19-00 to				
			6-21-30		(15mm trace)		
		M_{5E}	6-23-54		(7mm trace)		
		L	6-20-12 to				
			6-24-00				
		M_{7N}	6-24-44				
		M_{8N}	6-30-23				
		M_{9N}	6-31-48				
		M_{10N}	6-33-32				
		M_{11N}	6-34-28 to				
			6-36-36				
		M_{12N}	6-36-40 to				
			6-37-40				
		M_{13N}	6-38-04 to				
			6-43 ca	18	5		
		L_N	6-45-16 to				
			6-58 ca				
		eM_{14N}	6-59-30 to				
			7-02 ca		-1		
		e_N	7-04-28				
		L_N	7-05-44 to				
			7-09 ca				
		eM_{15N}	7-09-48 to				
			7-13-36	18	5		
		M_{16N}	7-13-40 to				
			7-15-20	18	5		
		M_{17N}	7-15-20 to				
			7-21 ca				

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(anticentre); path 40,000 kms. $- \Delta$.

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ca . . . . Approximately.

T . . . . Period, complete time of oscillation; for simple pendulum;

$$2\pi \sqrt{\frac{l}{g}}$$

To . . . . Period of undamped pendulum of seismograph.

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	Mar 16		h. m. s.	s.	μ	Kms.	
B11		M_{18N}	7-21-36 to 7-24-54				
		M_{19N}	7-26.7 to 7-31 ca				
		F_N	7-37				
B12	Mar 22	O	4-16-41			3810	St. Louis preliminary determination: 14.5°N 95.8°W
		iP	4-23-45				
		iPR_{1N}	4-24-43				
		i_{PN}	4-25-17				
		i_{SN}	4-29-21				Press reports from Mexico City and Vera Cruz
		eS_E	4-29-25				
		eSR_{1N}	4-31-09				
		eSR_{2N}	4-31-57				
		i_N	4-32-09				
		$i(L?)_N$	4-33-23				
		i_N	4-33-29				
		M_{1N}	4-36-49				
		iM_{2N}	4-36-45	20	70		
		iM_{3N}	4-37-37	19	198		
		M_{4N}	4-40-29	19	175		
		M_{5N}	4-41-21	19	143		
		M_{6N}	4-43-09	19	117		
		M_{7N}	4-44-49	19	120		
		M_{8N}	4-46-25	14	67		
		M_{9N}	4-48-01	14	41		
		M_{10N}	4-49-49	14	41		
		M_{11N}	4-50-33	14	41		
		L_N	4-51- to 4-56	14	21		
		M_{12N}	4-57-09	15	22		
		L_N	4-57.5 to 5-07	16	26		
		iL_N	5-26-09 to 5-27-29	12	6		
		L_N	5-27.5 to 5-34-49				
		L_N	5-35-09	16	5+		
		L_N	5-36 to 5-51				
		F_N	6-11 ca				

Issued April 5. 1928

L. Don Leet, Observer

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			h. m. s.	s.	μ.	Kms.	
B13	Apr 3	eL_N	17-14.5	18-20			
		F	17-27 ca				
B16	Apr 9	(e_N)	(17-43-53)			(6300)	U.S. Coast & Geodetic
		(e)	(17-51-44)				Preliminary Determinatic
		eL	18-00-30				13.0 S 69.5 W
		eM	18-04-44	20	trace 5mm		
		F	18-40 ca				
		O	(17-34-04)				
B17	Apr 13	e	23-23-05			(4000)	U.S. C&G.S. prelim.
		e	23-35-13				determination gives
		e	23-38-41				12.8 N. 95.0 W
		e	23-34-31				O--23-15-40
		(eL)	23-36.9				
		(eM)	23-39.1	19			
		M	23-44.7	11	1.5 mm trace		
		L	23-45 to 23-56				
		L	23-57 to 00-04				
		F	00-32 ca				
B18	Apr 14	O	(9-00-37)			(7340)	
		e(p)	(9-11-13)				
		e	9-18-57				
		e(S)	9-20-00				
		e	9-23-57				
		eL	9-30-13				
		eM	9-33-05	24			
		M	9-42-21	15	1 mm trace		
		L	9-43 to				
			9-50	14	1 mm	"	
		F	10-30 ca				
B19	Apr 17	O	(3-25.7)			(3000)	U.S.C. & G.S. prelim.
		eP	3-31-28				determination gives
		eS	3-36-23				Lat. 16 N
		i_N	3-37-03				Long. 95.5 W
		eL_I	3-38-46				
		i	3-42-50				(Absolute time uncertai
		eL_{II}	3-44-46				within two seconds)
		M1	3-47				
		M2	3-48				
		F	4-30 ca				

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No. -8-   From April 18, 1928   to April 30, 1928

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			h. m. s.	s.	μ.	Kms.	
B20	Apr 19	iS	19-42-52			(7200)	U.S.C.& G.S. gives
		e	19-43-54			(L-S)	O 19-23-00
		e	19-55-52				Lat 43.3 N
		e	19-54-33				Long 24.8 E
		eL	19-55-04				Preliminary Determina⁺
		M	19-57-44	24	2.5 trace		
		L	19-59 to				
			20-17	16			
		F	30-45 ca				
B21	Apr 25	eL	23-37-59			(200)	Reported from
		M	23-38-06				Western Maine
		F	23-33-21				
B22	Apr 27	e	20-53-16				
		L	21-09	17			
		L	21-15	17	.5 mm trace		
		F	21-25				

L. Don Leet, Observer

(For explanation of Symbols see other side)

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γu............Milligal, or 1/1000 gal. acceleration of 10 micra per sec. per sec. (Klotz).

ϕ............Latitude.

λ............Longitude from Greenwich.

h............Elevation above mean sea-level.

Δ............Distance, from epicentre to station; deduced from records.

ca............Approximately.

T............Period, complete time of oscillation; for simple pendulum;

$$2\pi\sqrt{\frac{l}{g}}$$

To............Period of undamped pendulum of seismograph.

Te............Period of earth particle.

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M............Theoretical magnification of seismograph.

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RECORD OF THE SEISMOGRAPHIC STATION
DEPARTMENT OF GEOLOGY AND GEOGRAPHY

$\phi = 42° \, 22' \, 36''$ N. $\lambda = 71° \, 06' \, 59''$ W. Gr. $h = 5.367$ M.   FOUNDATION: Glacial sand over clay.

TIME: Mean Greenwich, midnight to midnight.

INSTRUMENTS: Two Bosch-Omori 100 kg. horizontal pendulums (mechanical registration).

No.	Date	Phase	Time	Periods	Amplitudes	Δ	REMARKS
			h. m. s.	s.	μ.	Kms.	
B23	May 1	e(L)	19-32-32				
		M	19-33-26	12	1 mm trace		
		F	19-32-40				
B24	May 14	O	22-14-33			5400	
		iP	22-23-27				
		i	22-35-34		3 mm		
		iS	22-30-31		3 mm		S amplitude large
		iSR1	22-34-07				and L unusually
		iSR2	23-35-59				small relatively
		eL	22-33-03				
		F	1-45 ca				
B25	May 15	iP	2-44-59			5180	O 2-36-19
		eS	2-51-51				
		eL	2-53				
		F	3-30 ca				
B26	May 27	eS	10-14-38			(10,000)	U.S.C.&G.S. pre-
		eL	10-36				liminary determination
		M1	10-43	20	2 mm		39 N. 149 E.
		M2	10-51.5				O 9-51
		F	11-25 ca				

L. Don Leet, Observer

(For explanation of Symbols see other side)

EXPLANATION OF SYMBOLS

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No.	Date	Phase	Time	Periods	Amplitudes	Δ	REMARKS
			h. m. s.	s.	μ	Kms.	
B27	June 15	eL	7-27 to 7-41				
B28	June 15	eL	18-33 to 18-50				
B29	June 17	O	3-19-07			3900	(By Macelwane Tables)
		iP	3-33-18				U.S.C.&G.S. gives
		iPR1	3-37-20				preliminary
		iPR2	3-37-44				Lat. 14 N
		i	3-38-28				Long. 96 W
		e	3-29-56				
		i	3-31-04				
		eS	3-31-48		7 mm trace		
		i	3-35-34				
		iL	3-36-08				
		i	3-37-04				
		eM	3-38-36				
		M1	3-41.3				
		M2	3-42.8	14	21 mm		(All amplitudes
		M3	3-45	14	34 Mm		on N-S comp.)
		i	3-46.4				
		M4	3-48.4	12	35 mm		
		M5	3-49.3	12	40 mm		
		M6	3-52.5	12	25.5 mm		
		M7	4-06.3	12	16 mm		
		i	4-30-30				
		eLrep	5-53				
		F	6-38 ca				
B30	June 21	O	(16-26.9)			(5300)	U.S.C.&G.S. pre-
		i	16-43-55				liminary determi-
		i	16-46-49				nation:
		i	16-47-32				Lat. 61.3 N
		eL	16-50-17				Long. 148.7 W
		M1	16-53.5	14	21 mm		
		M2	16-55.0	14	14 mm		
		M3	16-56.5	12	14.5		
		M4	16-58.2	12	12.5		
		F	18-30 ca				
B31	June 29	e	23-24.3				St. Louis pre-
		e	23-37.3				liminary determi-
		M1	23-55.8				nation:
		M2	24-01.8				Lat. 18 S.
		F	24-50 ca				Long. 172 E
							O--23-49-23

L. Don Leet, Observer

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			h. m. s.	s.	μ.	Kms.	
B32	July 7	e	3–55.9				Obscured by Micro-
		L	3–59.0	Irr.			seisms.
		L	4–01.6				Probably nearby epi-
		F	4–09 ca				center (cf. Ottawa
							#3200)
B33	July 9	e	22–04.5				
		i	22–19.5				
		L	22–24	14	¼ mm		
		L	22–29	20			
		L	22–36	18			
		F	23–05				
B34	July 10	(e)	(2–11)				
		(e)	(2–17.5)				
		L	2–22				
		L	2–26 to				
			2–35				
		F	2–45 ca				
B35	July 18	O	19–04–48			5400	U.S.C.&G.S. pre-
		iP	19–13–42				liminary determi-
		iS	19–20–46				nation:
		i	19–22–48				Lat. 6.5 S
		eSR1	19–24–20				Long. 79.5 W
		eL	19–28–18				
		M1	19–34–50	18	2.5 mm		
		M2	19–39	16			
		F	20–36 (Room entered)				
B36	July 30	e	2–52.0				
		L	3–03 to				
			3–08.5	20	.5 mm		
		F	3–15 ca				

L. Don Leet,
Observer

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No. _12_ From August 1, 1928 to

HARVARD UNIVERSITY, CAMBRIDGE, MASS., U.S.A.

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			h m s	s.	μ.	Kms.	
B37	Aug 4	O	18—26—05			3740	U.S.C.&G.S. gives
		iP	18—33—04				Lat 14 N
		iS	18—38—36				Long. 98 W
		i(SR1)	18—40—38				
		i(SR3)	18—41—34				
		eL	18—43—20				
		i	18—48—36				
		M1	18—49.8	20	15 mm		
		F	20—20 ca				
B38	Sept 2	e(S)	0—05—45				
		e	0—09—35	8			
		e(L)	0—10.9				
		M	0—15.9	(17)			
		F	0—35 ca				
B39	Sept 11	O	12—36—34			4440	U.S.C.&G.S. gives
		eP	12—44—34				Lat 42 N
		ePR1	12—45—57				Long. 131.9 W
		eS	12—50—35				
		eL	12—56—17				
		L	13—39.0				
		F	13—50				
B40	Sept 22	O	7—30—40	(Ottawa)		(14,000)	St. Louis gives
		eL$_E$	8—32.4	20			Preliminary O =
		eM1$_E$	8—37.5	19			7—31
		M2$_E$	8—45				Lat 14 S
		F$_E$	9—15				Long 164 E
B41	Oct 9	O	3—00—30			3740	(Klotz Tables)
		iP$_E$	3—07—29				U.S.C.&G.S. gives
		i$_E$	3—09—59				Lat. 15 N
		iS$_E$	3—13—01				Long 97 W
		iSR1$_E$	3—15—06				
		eL$_E$	3—15—33		70 mm (Resonance)		
		F$_E$	4—45				
B42	Oct 25	O	(12—33.0)	(M—L)		(3700)	U.S.C.&G.S. gives
		eL$_E$	13.51.4				Lat 12. N
		iM$_E$	13—53—38				Long 86 W
		F$_E$	13—05 ca				

L. Don Leet, Observer

October 28, 1928; 13 h GMT Instruments stopped and dismantled
to prepare for installation of
Milne-Shaw Seismographs Nos. 43 & 44
L.D.L

(For explanation of Symbols see other side)

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F.................Finis, end of record on seismogram.
n.................Superposed phase of another earthquake; e.g., Pn.
e.................(emersio), emergence of a phase not well defined; e.g., eP, eL.
i.................(impetus), a sharply defined impulse; e.g., iP, iS.
A_N..............Amplitude of the N–S component of earth particle, deduced from the motion of the pendulum, usually L or M.
A_E..............The same for the E–W component of motion.
A_Z..............The same for the vertical component of motion.
γ.................Gal, or unit acceleration, one centimetre per sec. per sec.
γu...............Milligal, or 1/1000 gal. acceleration of 10 micra per sec. per sec. (Klotz).
ϕ.................Latitude.
λ.................Longitude from Greenwich.
h.................Elevation above mean sea-level.
Δ.................Distance, from epicentre to station; deduced from records.
ca ....Approximately.
T.................Period, complete time of oscillation; for simple pendulum;

$$2\pi \sqrt{\frac{l}{g}}$$

To...............Period of undamped pendulum of seismograph.
Te...............Period of earth particle.
h, m, s..........Time, Greenwich Mean Time, midnight to midnight.
M...............Theoretical magnification of seismograph.
Ma..............Actual magnification, for damping ratio and periods of earth particle and undamped pendulum.
V_P, V_S, V_L........Velocity of P, S, and L waves respectively. (Klotz.)
*................(large star) Epicentre. (After A. Siebert.)

The following notation proposed by Wiechert is employed in many publications. The characters are implied by Δ and A.

I, Notable; II, striking; III, strong; referring to the intensity of earthquakes.

d................(domesticus), a local shock; e.g., Id.
v................(vicinus), a nearby earthquake, under 1000 kms. distant; e.g., IIv.
r................(remotus), a distant earthquake, from 1000 to 5000 kms.
u................(ultimus), a very distant earthquake, over 5000 kms. distant.

Measurements in the Metric System.

kms. ....Kilometers (1000 kms. = 621.38 English statute miles. 111.1 kms. = 1°).
M or m..........meter (s). (1 m. = 3.28083 feet.)
mm. ....Millimeters (1 mm. = 0.03937 in.).
μ................Micron, 1/1000th of a millimeter = 0.00003937 in.

BIBLIOGRAPHY

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