FOURTEENTH SERIES

No. 4

Georgetown University Publication

THE REGISTRATION OF EARTHQUAKES

AND

PRESS DISPATCHES ON EARTHQUAKES

FROM

JANUARY 1, 1917, TO JANUARY 1, 1918

BY

F. A. TONDORF, S. J.

WASHINGTON, D. C.

Published by Georgetown University

January to March, 1918

Entered May 16, 1904 at Washington, D. C., as Second-Class Matter
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Bulletin of the

SEISMOGRAPHIC STATION

No. 2, pp. 1-30. January 1, 1918

THE REGISTRATION OF EARTHQUAKES

at the

GEORGETOWN UNIVERSITY STATION

and

PRESS DISPATCHES ON EARTHQUAKES

Received at the

GEORGETOWN STATION

From

January 1, 1917, to January 1, 1918

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F. A. TONDORF, S. J.

CONTENTS.

PAGE

Installation and Equipment 3
Constants 4
Symbols and Notations 5
Tabulation of Shocks 8
Tabulation of Dispatches 24

INSTALLATION AND EQUIPMENT OF THE SEISMOLOGICAL OBSERVATORY OF GEORGETOWN UNIVERSITY.

On the basis of a gift from Patrick H. O'Donnell, A. B. '92, A.M. '93, LL.B. '94, the foundation of the Georgetown University Seismological Observatory became possible. The original equipment consisted of an horizontal and vertical seismograph after Wiechert, each carrying a stationary mass of 80 kilos. These instruments were tentatively located in January, 1911, at the base of the South Tower of the Healy building. It was soon ascertained that this position was unfortunate because of the rocking of the tower, 212 ft. in height, under heavy wind conditions. A cave was promptly excavated beneath the quadrangle, measuring 12 ft. 4 in. in width, 30 ft. 10 in. in length and 11 ft. high. Care was taken to make this new home of the seismographs heat and damp proof. A new Wiechert horizontal seismograph of 200 kg. mass was purchased to take the place of the smaller one, which was thereupon loaned to the Croker Land Expedition for observations in the far North. This later instrument has recently been returned and is now under repair. Its destiny has not as yet been determined upon. The cave also houses the vertical seismograph after Wiechert, two Bosch-Omori pendulums of 25 kilos each, and two conical pendulums after Mainka, of 135 kgs. mass. A concrete building, situated on observatory hill, at an altitude of 159 feet above sea level, shelters a Bosch photographic instrument with pendulums of 200 grams each. The time is automatically registered on these instruments by four contact clocks noting minutes and hours. These clocks are corrected by signals, received through the courtesy of the Western Union Telegraph Company.

CONSTANTS.

CONSTANTS OF THE STATION.

Latitude and longitude of the seismograph room:

ϕ=38° 54′ 25″ N. Lat.

λ=77° 04′ 24″ W. from Greenwich.

TIME. All determinations are reduced to Greenwich mean civil time.

ALTITUDE, 42.4 meters above mean sea level.

GEOLOGY, subsoil of piers: decayed diorite.

CONSTANTS OF THE SEISMOGRAPHS.

BOSCH-OMORI TROMOMETERS (25 Kilos).

	Period.	*Magnification.*	*Damping.*
N-S Component.....	8.6	13.5	0
E-W Component.....	8.8	13.7	0

WIECHERT HORIZONTAL SEISMOGRAPH (200 Kilos).

	Period.	*Magnification.*	*Damping.*
N-S Component.....	5.2	143	0
E-W Component.....	5.4	165	0

MAINKA CONICAL PENDULUM (135 Kilos).

	Period.	*Magnification.*	*Damping.*
N-S Component.....	5.4	70	0
E-W Component.....	4.0	93	0

WIECHERT VERTICAL SEISMOGRAPH (80 Kilos).

Period.	*Magnification.*	*Damping.*
3.0	80	0

SYMBOLS AND NOTATIONS.

1. *Character of the Earthquake.*

ROSSI-FOREL SCALE OF EARTHQUAKE INTENSITIES:

I. *Microseismic shock:* recorded by a single seismograph or by seismographs of the same model, but not by several seismographs of different kinds; the shock felt by an experienced observer.

II. *Extremely feeble shock:* recorded by several seismographs of different kinds; felt by a small number of persons at rest.

III. *Very feeble shock:* felt by several persons at rest; strong enough for the direction or duration to be appreciable.

IV. *Feeble shock:* felt by persons in motion; disturbances of movable objects, doors, windows; creaking of ceilings.

V. *Shock of moderate intensity:* felt generally by everyone; disturbance of furniture, beds, etc., ringing of swinging bells.

VI. *Fairly strong shock:* general awakening of those asleep; general ringing of house bells; oscillation of chandeliers; stopping of pendulum clocks; visible agitation of trees and shrubs: some startled persons leave their dwellings.

VII. *Strong shock:* overthrow of movable objects; fall of plaster; ringing of church bells; general panic, without damage to buildings.

VIII. *Very strong shock:* fall of chimneys, cracks in walls of buildings.

IX. *Extremely strong shock:* partial or total destruction of some buildings.

X. *Shock of extreme intensity:* great disaster, buildings ruined, disturbance of the strata, fissures in the ground, rock-falls from mountains.

d (terrae motus domesticus)	Local shock (origin nearby, perceptible at the station).
v (terrae motus vicinus)	Near shock (origin less than 1,000 kilometers distant).
r (terrae motus remotus)	Distant shock (origin from 1,000 to 5,000 kilometers distant).
u (terrae motus ultimus)	Very distant shock (origin more than 5,000 kilometers).

2. *Phases of the Seismogram.*

P (undae primae)	First phase, or first preliminary tremors.
PRn	Waves n-times reflected at the earth's surface.
S (undae secundae)	Second phase, or second preliminary tremors.
SRn	Waves n-times reflected at the earth's surface.
PS	Waves changed from longitudinal to transverse oscillation, or vice versa, through reflection at the earth's surface.
L (undae longae)	Long waves, chief phase, or principal part.
M (undae maximae)	Greatest motion in the chief phase.
C (cauda)	Tail or end portion.
F (finis)	End of discernible movement.

3. *Nature of the Motion.*

i (impetus) Sudden beginning of the motion.

e (emersio) Gradual beginning of the motion

T (period) Time of one complete oscillation.

A amplitude of the motion, measured from the median line in millimeters. Instrumental trace.

A_E E-W component of A.

A_N N-S component of A.

A_Z Vert. component of A.

REGISTRATION OF EARTHQUAKES AT THIS STATION
From January 1, 1917 to January 1, 1918.

Date.	Character.	Phase.	Time.	Periods.	Amplitude.*			Remarks.
					A_N	A_E	A_Z	
1917			H. M. S.					
‡Jan 26	IIu	e_E	19 39 32					Heavy micro-seisms present.
		e_N	19 39 29					
		F	19 40 17					
Jan. 30	IXu	eP_E	2 57 02					
		eP_N	2 57 02					
		S_E	3 06 22					
		S_N	3 06 25					
		eL_E	3 18 00					
		eL_N	3 18 00					
		M_{E_1}	3 26 28	15			10.0mm	
		M_{N_1}	3 31 32	15	3.2mm			
		M_{E_2}	3 28 26	15			7.3mm	
		M_{N_2}	3 34 41	20	4.0mm			
		M_{E_3}	3 32 23	17			7.3mm	
		M_{N_3}	3 39 08	17	1.8mm			
		M_{E_4}	3 35 37	20			3.7mm	
		M_{E_5}	3 39 36	17			3.2mm	
		C	4 52 00					
		F	5 50 00					
			Bosch-Omori.					
Jan. 30	IXu	eP_E	2 57 00					At 3-25-37 the per
		eP_N	2 57 10					on the E-W com
		S_E	3 06 28					ponent was dis
		S_N	3 06 19					lodged. It re-
		L_E	3 17 16					turned back agai
		L_N	3 17 25					at 3-41-47.
		M_{N_1}	3 27 15	15	61.5mm			
		M_{E_2}	3 44 23	15			24.5mm	
		M_{N_2}	3 30 21	12	60.0mm			
		M_{N_3}	3 35 02	13	58.5mm			
		M_{N_4}	3 38 35	12	27.0mm			
		M_{N_5}	3 44 50	13	18.0mm			
		F	5 40 00					

* Instrumental Trace.

‡ All records, unless otherwise noted, are from grams on Wiechert Horizontal (200) and Vertica (80).

Date.	Character.	Phase.	Time.	Periods.	Amplitude. A_N	Amplitude. A_E	Amplitude. A_Z	Remarks.
			Vertical.					
			H. M. S.					
Jan. 30	IXu	eP	2 56 58					S not discernible.
		L	3 24 01					
		M_1	3 30 49	17			1.3mm	
		M_2	3 37 53	20			0.6mm	
		F	5 29 53					
Jan. 30								What appears to be a long wave is shown at 8-07-17 et postea.
Jan. 31	IIIu	e_E?	4 15 06					Heavy micro-seisms make e very doubtful. No phases discernible after S. F lost in micro-seism. e on Mainka very doubtful. Mainka shows S at 4-22-46. F at 6-00-00.
		e_N?	4 16 06					
		S_E	4 22 57					
		S_N	4 22 57					
Feb. 15	Vu	P_E	0 59 30					Microseisms present. S possibly 10 to 15 seconds sooner. No distinct Main.
		P_N	0 59 30					
		S_E	1 09 02					
		S_N	1 09 03					
		eL	1 24 08					
		F	1 54 00					
Feb. 2(	Xu	iP_E	19 34 15					Time markings poor because of intensity of quake. Hence possible error of 2 to 3 seconds. F lost in second quake.
		iP_N	19 34 17					
		iS_E	19 37 52					
		iS_N	19 38 06					
		eL	19 38 34					
		M_{E_1}	19 40 22	8			48.0mm	
		M_{N_1}	19 40 22	7	49.0mm			
		M_{E_2}	19 41 08	13				

Date.	Character.	Phase.	Time.	Periods.	Amplitude. A_N	Amplitude. A_E	Amplitude. A_Z	Remarks.
			Bosch-Omori.					
			H. M. S.					
Feb. 20	Xr	eP_E	19 34 16					At 19-41-18 needl
		iP_N	19 34 18					off drums of N-
		iS_E	19 37 58					component and re
		S_N	19 38 10					mained off.
		eL_E	19 39 06					F lost in second
		eL_N	19 39 06					quake.
		M_E	19 41 18	8	152.0mm			
		M_N	19 41 52	8		152.0mm		
		F	20 40 00					
			Vertical.					
Feb. 20	Xr	iP	19 34 15					F in cauda of
		S	19 37 54					second quake.
		eL	19 38 38					
		M_1	19 41 21	8			14.0mm	
		M_2	19 43 00	8			11.0mm	
		F?	20 57 00					
Feb. 20	IIIr	e_E?	20 58 06					e and S doubtful
		e_N?	20 58 00					because within
		S_E?	21 04 07					cauda of first
		S_N?	21 04 07					quake.
		eL	21 07 28					
		F	21 21 00					
Feb. 20	IIIr	e	20 58 32					
		L	21 07 14					
		F	21 13 00					
Mar. 3	IIIr	e	10 23 26					Gram very doub
		S_E?	10 29 32					ful because of
		S_N?	10 29 12					microseisms on
		L_E	10 34 15					E-W component.
		L_N	10 34 12					
		F	10 5[illegible] 00					

REGISTRATION OF EARTHQUAKES—*Continued.*

Date.	Character.	Phase.	Time.	Periods.	Amplitude. A_N	Amplitude. A_E	Amplitude. A_Z	Remarks.
			Vertical.					
			H. M. S.					
Mar. 6	IIIu	e_E?	3 12 24					Heavy micro-seisms.
		e_N?	3 12 24					
		S_E?	3 18 45					
		S_N?	3 18 49					F lost in micro-seisms.
		eL_E	3 26 20					
		eL_N	3 26 26					
Mar. 14								Very heavy thickening of trac-ing from 23-24-00 to 23-39-00. Quite certain of seismic origin. Phases not dis-cernible.
Mar. 15	IIIu	e	1 01 21					Heavy micro-seisms.
		eL	1 12 03					Phases difficult to discern.
		F	1 22 00					
Mar. 26	IIIr	e_E	14 12 20					Heavy local dis-turbance. Phases in E-W less dis-tinct. F lost in second quake.
		e_N	14 12 40					
		S_E	14 16 46					
		S_N	14 16 46					
		L_E	14 19 32					
		L_N	14 19 40					
Mar. 26	IIIr	e	14 36 42					Difficult. Micro-seisms.
		S_E	14 41 22					
		S_N	14 41 30					
		F	15 00 00					
Mar. 29	IIIr	e	2 08 23					Microseisms.
		S?	2 11 23					E-W very difficult.
		eL?	2 16 23					All Phases doubt-ful.
		F	2 36 (ca)					
Apr. 21	IIIu	e?	1 05 14					P very uncertain.
		iS_E	1 13 22					Heavy micro-seisms.
		iS_N	1 13 23					
		F	1 50 00					
Apr. 22	III	e	6 24 41					Phases very diffi-cult.
		F	6 52 00					

Date.	Character.	Phase.	Time.	Periods.	Amplitude. A_N	Amplitude. A_E	Amplitude. A_Z	Remarks.
			Vertical. H. M. S.					
Apr. 28	Vr	e_E	16 16 23					Heavy micro-
		e_N	16 16 28					seisms present.
		S_E	16 20 19					No distinct Mai
		S_N	16 20 19					
		eL_E	16 21 10					
		eL_N	16 21 05					
		F	16 57 00					
Apr. 29		L_E	12 45 34					Very heavy micr
		L_N	12 45 51					seisms present.
		F	12 55 00					
May 1	VIIu	eP_E	18 46 06					Microseisms.
		eP_N	18 46 06					
		S_E	18 56 10					
		S_N	18 56 26					
		eL_E	19 02 11					
		eL_N	19 02 17					
		M_E	19 29 47			2.7mm		
		M_N	19 34 17		1.8mm			
		F	21 40 (ca)					
May 3		F	13 48 00					Microseisms. Sheet put on at 12-58-00: at 12-58-00 shows long wave.
May 4	Vu	e	1 40 55					Microseisms.
		L_E?	1 47 18	15				
		L_N?	1 46 10	20				
		F	2 23 00					
May 9	VIu	e_E	16 36 20					Very heavy micr
		e_N	16 36 30					seisms. No dis-
		eL_E?	16 47 43					tinct Main.
		eL_N?	16 47 42					
		L_E	16 57 40	20				
		L_E	16 57 07	20				
		F	17 30 00					
May 25	IIIr	e?	14 52 19					All phases doub
		S_E?	14 57 56					ful.
		S_N?	14 57 49					
		F	15 11 00					

Date.	Character.	Phase.	Time.	Periods.	Amplitude. A_N	Amplitude. A_E	Amplitude. A_Z	Remarks.
			Vertical. H. M. S.					
May 31	VIIu	P_E	8 57 05					Vertical shows P at 8-57-09 discernible. Other phases indistinct.
		P_N	8 57 05					
		S_E	9 4 43					
		S_N	9 4 42					
		L_E	9 15 38	18				
		L_N	9 15 38	18				
		M_E	9 20 02			3.5mm		
		M_N	9 22 38		1.6mm			
		F	11 05 (ca)					
May 31		e_L	19 54 02					Microseisms.
		F	20 10 (ca)					
Jun. 1		e_E	17 06 06					Microseisms. Phases not discernible. e on vertical shows at 17-06-20.
		e_N	17 06 08					
		F	17 17 00					
Jun. 4		e_E	1 38 00					
		e_N	1 38 52					
		L_E	1 59 00	20				
		L_N	1 59 00	20				
		F	2 45 00					
Jun. 7		e_E	3 05 01					
		e_N	3 05 16					
		F	3 35 00					
Jun. 8	VIIr	P_E	0 57 29					
		P_N	0 57 29					
		S_E	1 02 21					
		S_N	1 02 24					
		eL_E	1 05 03					
		eL_N	1 05 04					
		M_E	1 07 04	13		3.7mm		
		M_N	1 07 04	13	1.2mm			
		F	2 31 (ca)					

Date.	Character.	Phase.	Time.	Periods.	Amplitude.			Remarks.
					A_N	A_E	A_Z	
			Vertical.					
			H. M. S.					
Jun. 8	VIIu	P	0 57 28					
		S	1 02 17					
		eL	1 05 08					
Jun. 8		F	2 10 00					
		e_E	3 05 41					
		e_N	3 05 40					
		eL_E	3 15 08					
		eL_N	3 15 11					
		L_E	3 17 17					
		F	3 26 00					
Jun. 10	VIIu	eP_E	4 39 39					
		eP_N	4 39 43					
		S_E	4 45 43					
		S_N	4 45 44					
		eL_E	4 49 45					
		eL_N	4 49 43					
		M_E	4 58 57	17		1.8mm		
		M_N	4 56 12	17	0.3mm			
		F	5 33 00					
Jun. 12		eP_E	2 03 22					F lost in micro-seisms. Phases difficult.
		eP_N	2 03 30					
		eL_E?	2 06 57					
		eL_N?	2 06 57					
		F	2 15 00					
Jun. 13		e_E	7 07 13					Long waves from 7-39-15 to 8-04-00. No distinct Main.
		e_N	7 07 10					
		eL_E?	7 11 33					
		L_E	7 39 15					
		L_N	7 39 16					
		F	9 08 00					
Jun. 16		e_E	15 56 06					Microseisms.
		e_N	15 56 15					
		L_E	16 10 26					
		L_N	16 10 20					
		F	16 30 00					

REGISTRATION OF EARTHQUAKES—*Continued.*

Date.	Character.	Phase.	Time.	Periods.	Amplitude. A_N	Amplitude. A_E	Amplitude. A_Z	Remarks.
			H. M. S.					
Jun. 16		e_E	22 56 04					Heavy micro-seisms.
		e_N	22 56 04					
		L_E	23 10 26	15				
		L_N	23 10 04	15				
		F	23 40 00					
Jun. 24	IVu	e_E	20 07 47					Microseisms.
		e_N	20 07 47					
		S_E?	20 13 40					
		S_N?	20 13 43					
		eL_E?	20 17 00	15				
		eL_N?	20 17 00	15				
		F	21 15 00					
Jun. 26	VIIIu	ePE	6 03 49					Difficult.
		ePN	6 03 48					
		S_E	6 14 48					
		S_N	6 14 48					
		M_E	6 45 04	24		5.4mm		
		M_N	6 43 58	30	2.4mm			
		F	8 56 00					
			Vertical.					
Jun. 26	VIIIu	ePZ	6 03 56					S?
		L_Z	6 38 42	40				
		M_Z	6 45 28					
		F	9 02 00					
Jun. 27	IIIr	e_E	12 32 21					Sheets removed at 13-08-00. Quake still on.
		e_N	12 32 21					
		L_E	12 43 16	30				
		L_N	12 44 55	24				
Jun. 28		L	14 52 00					Microseisms. Local disturb-ances. Difficult.
		F	15 05 00					

Date.	Character.	Phase.	Time.	Periods.	Amplitude. A_N	Amplitude. A_E	Amplitude. A_Z	Remarks.
			H. M. S.					
Jun. 29		eP_E	16 12 46					Microseisms.
		eP_N	16 12 46					
		S_E?						
		S_N	16 19 32					
		eL_E	16 22 48	10				
		eL_N	16 22 54	10				
		L	16 29 00					
		F	17 10 00					
Jun. 30	III	P_E	17 57 01					Microseisms.
		P_N	17 57 01					
		S_E	18 02 12					
		S_N	18 02 13					
		L	18 09 00	20				
		F	18 50 00					
July 1		F	14 02 00					Quake took place while sheets were being changed. Pens taken off at 13-36-00, on at 13-41-00.
July 4		e_E	0 57 13					Microseisms.
		e_N	0 57 21					No distinct Main.
		e_L	1 07 13					
		L	1 31 31					
		L_N	1 31 31					
		F	2 33 00					
July 13		eP_E	5 19 05					
		eP_N	5 19 05					
		S_E	5 22 52					
		S_N	5 22 54					
		eL	5 23 06					
		F	6 10 00					
July 14	IIIu	e_E	21 31 36					Microseisms present.
		e_N	21 31 34					
		S_E	21 43 04					All phases doubtful.
		S_N	21 43 04					
		eL_E	21 50 04					Difficult.
		eL_N	21 50 09					
		F	22 15 00					

Date.	Character.	Phase.	Time.	Periods.	Amplitude. A_N	Amplitude. A_E	Amplitude. A_Z	Remarks.
			H. M. S.					
July 25	IIIr	eP_E	3 28 18					Microseisms.
		eP_N	3 28 18					
		S_E	3 36 37					
		S_N	3 36 31					
		eL	3 49 00					
		eL_N	3 49 00					
		F	4 45 00					
			Vertical.					
July 25	IIIr	eZ	3 28 57					S not discernible.
		eL_Z	3 49 52					
		L_Z	3 51 52	30				
		F_Z	4 11 00					
July 25	IIIr	e_E	22 42 43					Very difficult. All phases doubtful.
		e_N	22 42 43					
		eS_E?	22 50 17					
		eS_N?	22 50 17					
		eL_E?	23 03 17					
		eL_N	23 03 17					
		F	23 40 00					
July 27	VIIr	iP_E	1 06 11					
		iP_N	1 06 11					
		iS_E	1 10 02					
		iS_N	1 10 02					
		eL	1 11 48					F lost in second quake.
		M_E	1 17 00	9		3.72mm		
		M_N	1 16 52	10	1.95mm			
July 27	VIIr	P_Z	1 06 15					
		S_Z	1 10 16					
		eL_Z	1 12 18					
		F	2 35 00					
July 27	Vu	eP_E	3 02 46					No distinct microseisms.
		eP_N	3 02 46					
		iS_E	3 12 01					
		iS_N	3 12 01					
		L	3 17 00	11				
		F	4 00 00					

Date.	Character.	Phase.	Time.	Periods.	Amplitude. A_N	Amplitude. A_E	Amplitude. A_Z	Remarks.
			Vertical. H. M. S.					
July 27	Vu	ePZ	3 02 51					
		SZ	3 12 09					
		LZ	3 33 30	24				
		F	4 00 00					
July 27	IVr	ePE	16 20 13					No distinct Main.
		ePN	16 20 11					
		SE	16 24 13					
		SN	16 24 09					
		eLE	16 25 12	17				
		eLN	16 25 00	17				
		F	17 14 00					
July 27	IIIr	ePZ	16 20 17					
		SZ?	16 24 19					
		eLZ?	16 26 18					
		L	16 30 02	15				
		F	17 00 00					
July 29	IIIr	eN	14 44 49					
		eE	14 44 49					
		LE	15 24 48					
		LN	15 23 30					
		F	16 01 00					
Aug. 5	VIIu	ePE	16 11 12					Microseisms present. P possibly sooner. No distinct Main.
		ePN	16 11 15					
		eLE	16 54 18	24				
		eLN	16 54 18	24				
		F	17 45 00					
Aug. 5	VIIu	ePZ	16 11 21					A possible eZ shows at 16-09-38. Microseisms present.
		eLZ	16 54 21	20-24				
		F	17 50 00					
Aug. 11	IIIr	ePE?	14 44 36					Entire gram doubtful. Heavy microseisms present.
		ePN?	14 44 06					
		SE?	14 49 43					
		SN?	14 49 22					
		eLE?	15 00 23					
		eLN?	15 00 21					
		F	16 (et post	ea.)				

Date.	Character.	Phase.	Time.	Periods.	Amplitude. A_N	Amplitude. A_E	Amplitude. A_Z	Remarks.
			H. M. S.					
Aug. 30	IIIr	e_E	3 30 55					Microseisms present.
		e_N	3 31 08					
		S_E	3 36 46					F lost in second quake.
		S_N	3 36 39					
		eL_E	3 39.4					e shows on vertical at 3-31-13.
		eL_N	3 39.4					
Aug. 30	IIIr	eP_E	4 26 28					Microseisms present.
		eP_N	4 26 29					
		S_E	4 30 05					No distinct Main.
		S_N	4 30 05					
		eL_E	4 31.3					
		eL_N	4 31.5					
		L	4 58 00	30				
		F	6 22 00					
Aug. 30	IIIr	eP_Z	4 26 30					
		S_Z	4 30 05					
		L_Z	4 42 20	21				
		L_Z	5 20 48	22				
		F_Z	5 40 00					
			Mainka.					
Aug. 30	IIIr	eP_E	3 30 38					
		eP_N	3 31 09					
		eS_E	3 36 46					
		eS_N	3 36 45					
		eL_E	3 40.3					
		eL_N	3 40.5					
		F	4 24 00					
Aug. 30	IIIr	eP_E	4 26 34					Other phases doubtful.
		eP_N	4 26 29					
		S_E	4 30 05					
		S_N	4 30 10					
		F	6 57 00					

Date.	Character.	Phase.	Time.	Periods.	Amplitude. A_N	Amplitude. A_E	Amplitude. A_Z	Remarks.
			Mainka. H. M. S.					
Aug. 31	VIr	eP_E	11 43 21					Microseisms present.
		iP_N	11 43 19					
		iS_E	11 48 49					
		iS_N	11 48 49					
		eL_E?	11 51.5					
		eL_N?	11 51.5					
		M_E	11 54 17			1.7mm		
		M_N	11 54 43		0.6mm			
		F	13 54 00					
			Vertical.					
Aug. 31	VIr	eP_Z	11 43 22					
		L_Z	11 56 00					
		F_Z	12 25 00					
Sep. 20		e?	3 46 09					Mainka shows e at 3-47-31. Very heavy microseisms.
		L_E	4 02 18	20				
		L_N	4 01 00	20				
		F	4 40 00					
Oct. 19	IIIu	e_E	16 42 07					Heavy microseisms. Heavy marking because of heavy hauling near observatory. No distinct Main.
		e_N	16 42 12					
		S_E?	16 48 07					
		S_N?	16 47 49					
		eL_E	16 52 18					
		eL_N	16 52 18					
		L_E	16 54 47	24				
		L_N	16 54 48	24				
		F	17 58 00					
Oct. 22	IIIu	e_E?	7 25 47					Heavy microseisms. No distinct Main. Gram difficult.
		e_N?	7 26 21					
		eL_E	7 36 24					
		eL_N	7 37 00					
		L_E	7 38 15	18				
		L_N	7 42 33	24				
		F	8 37 00					

Date.	Character.	Phase.	Time.	Periods.	Amplitude. A_N	Amplitude. A_E	Amplitude. A_Z	Remarks.
			Vertical. H. M. S.					
Nov. 4	IIIu	eE	12 25 27					Heavy micro-seisms.
		eN	12 25 08					
		L	13 08 13	30				Sheet taken off by mistake, at 13-22-00. Quake still on. Difficult.
Nov. 7	III	eE	1 49 11					Heavy micro-seisms.
		eN	1 49 18					
		LE	1 51 20	10				
		LN	1 50 12	10				
		F	2 06 00					
Nov. 14		eE	9 37 56					Microseisms pres-ent.
		eN	9 37 58					
		L	9 58 30	22				
		F	10 31 00					
Nov. 15		e	1 52 06					Heavy micro-seisms. N-S only shows.
		F	2 20 00					
Nov. 16	IIIr	eE	3 39 01					Heavy micro-seisms. S difficult.
		eN	3 39 01					
		SE?	3 49 03					
		SN?	3 49 20					
		eLE	4 10 48	32				
		eLN	4 07 00	30				
		ME	4 18 24	25	0.6mm			
		MN	4 26 37	25	0.4mm			
		F	5 45 00					
Nov. 18		eL	3 56 12					Very pronounced microseisms. F lost in micro-seisms.
		L	4 07 50	30				
Dec. 12	III	e	11 00 09					e doubtful.
		SE	11 04 46					
		SN	11 04 46					
		eL	11 06 03					
		F	11 16					

Date.	Character.	Phase.	Time.	Periods.	Amplitude.			Remarks.
					A_N	A_E	A_Z	
			H. M. S.					
Dec. 21	VIIIu	e_E	18 03 23					Microseisms present but not heavy. P-S on Mainka 7m. 14s.
		e_N	18 03 23					
		S_E	18 10 46					
		S_N	18 10 46					
		L_E	18 20 13	20				
		L_N	18 20 13	21				
		M_E	18 26 27			2.9mm		
		M_N	18 24 59		2.0mm			
		F	19 45					
Dec. 21		e_E?	21 06 10					Heavy microseisms present. S in nowise discernible.
		e_N?	21 05 56					
		eL?	21 18 12					
		F	22 09					
Dec. 21	VIIIu	e_Z	18 03 43					S not discernible. No distinct Main.
		L_Z	18 21 09	20				
		F_Z	19 18					
Dec. 23		e?	15 59 00					Heavy microseisms present.
		L	16 06 02					
		F	16 25					
Dec. 26		e_E?	5 30 04					Gram very difficult. Microseisms present.
		e_N?	5 30 00					
		S_E?	5 34 41					
		S_N?	5 34 29					
		eL?	5 35 24					
		F	5 52					
Dec. 26								Quake between 13hrs. and 14hrs. et postea lost in changing of sheets.
Dec. 28		e_E	21 23 28					Heavy microseisms present. Sinusoidal waves from 21hrs. 49m. to 22hrs. F lost in microseisms.
		e_N	21 23 28					
		eL	21 35.0					
		L	21 41 16	14				

Date.	Character.	Phase.	Time.	Periods.	Amplitude. A_N	Amplitude. A_E	Amplitude. A_Z	Remarks.
			Vertical.					
			H. M. S.					
Dec. 29	VIIIr	iP_E	22 56 30					Heavy micro-seisms present. F uncertain.
		iP_N	22 56 28					
		S_E	23 01 18					
		S_N	23 01 16					
		eL_E	23 03 07	17				
		eL_N	23 03 07	17		2.2mm		
		M_E	23 12 27		1.9mm			
		M_N	23 10 17					
		F	25 (ca)					
Dec. 29	VIIIr	iP_Z	22 56 31					S not quite as certain as P. No distinct main.
		S_Z	23 01 39					
		L_Z	23 05 44	33				
		F_Z	25 00 (ca)					

DISPATCHES OF EARTHQUAKES AT THIS STATION
From January 1, 1917, to January 1, 1918.

Place.	Date.	Time. *	Character.	Source of Information†	Remarks.
Knoxville, Tenn. U. S. A.	Jan. 2.	4h. 30m. A. M.	Pronounced.	A.P.	No Damage.
Table Bluff, Cal. U. S. A.	Jan. 3.	16h. (G.M.T.)	Sensible	S.O.	
Montreal, Quebec	Jan. 5.	Late Night.	Distinctly Felt.	A.P.	
Island of Formosa.	Jan. 6.	Not Indicated.	Severe.	A.P.	300 Killed.
Rawliness, Wyoming, U. S. A.	Jan. 10.	14h. 34m. (G.M.T.)	Sensible.	S.O.	
Saliness, Cal. U. S. A.	Jan. 13.	15h. 15m. (G.M.T.)	Not Indicated.	S.O.	
Lone Pine, Cal. U. S. A.	Jan. 18.	12h. 30m. (G,M.T.)	" "	S.O.	
" " " "	Jan. 19.	8h. 50m. (G.M.T.)	Sensible.	S.O.	
Bishop, Cal. U. S. A.	Jan. 21.	17h. 10m. (G.M.T.)	Not Indicated.	S.O.	
Jefferson City, Tenn. U. S.A.	Jan. 25.	22h. 15m. (G.M.T.)	" "	S.O.	
Island of Bali, Malay Archipelago.	Jan. 25.	Not Indicated.	Disastrous.	A.P.	Dispatch dated, London, Jan. 15th, 4h. 5m. P.M. Over 1000 houses damaged. 50 killed.
Talbott, Tenn. U. S. A.	Jan. 26.	13h. 15m. (G.M.T.)	Not Indicated.	S.O.	
Montreal, Quebec.	Jan. 26.	Afternoon	Distinctly Felt.	A.P.	Felt in Ottawa.
Ogdensburg, N. Y. U. S. A.	Jan. 26.	2h. 34m. P. M.	" "	A.P.	Much Alarm.
Jefferson City, Tenn., U. S. A.	Jan. 27.	21h. (G.M.T.)	Sensible.	S.O.	
Murcia, Spain.	Jan. 28.	22h. 35m. (G.M.T.	Distinctly Felt.	S.O.	
Rebel Creek, Nev. U. S. A.	Jan. 28.	11h. 13m. (G.M.T.)	Sensible.	S.O.	
Panhandle, Texas, U. S. A.	Jan. 28.	19h. 56m. (G.M.T.)	"	S.O.	
Ashford, Wash., U. S. A.	Jan. 28.	17h. 5m. (G.M.T.)	"	S.O.	
Owens Valley, Cal., U. S. A.	Feb. 9.	8h. 30m. P. M.	Moderate.	S.O.	
Los Angeles, Cal., U. S. A.	Feb. 13	5h. 5m. A. M.	Sensible.	S.O.	
Knoxville, Tenn., U. S. A.	March 4.	9h. 7m. P. M.	Distinctly Felt.	A.P.	Second Quake Felt.
Tokio, Japan	March 18.	7h. 20m. A.M.	Heavy.	S.O.	Second Quake Felt 7h. 30m. A. M.
Fillmore, Cal. U. S. A.	March 29.	12h. 6m. A. M.	Sensible.	S.O.	
Stanford, Cal., U. S. A.	March 29.	4h. 59m. A. M.	Slight.	S.O.	
Berkeley, Cal., U. S. A.	April 2.	9h. (G.M.T.)	Sensible.	S.O.	
Victoria	April 4.	Not Indicated.	Distinct.	R.T.	Northeastern Part.
Santa Rita, Cal., U. S. A.	April 5.	11 A. M.	Slight.	S.O.	No Damage.
St. Louis, Mo., U. S. A.	April 9.	20h. 52m. (G.M.T.)	Pronounced.	A.P.	After vibrations 8 minutes. Generally felt throughout the States of Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Missouri, Tennessee, Wisconsin, Mississippi.

* Time, unless otherwise indicated, is local time.

† A.P.—Associated Press.
S.O.—Special Observer
U.P.—United Press.
R.T.—Reuter Telegram.
E.T.—Exchange Telegraph Co.
R.P.—Observatory di Roca di Pappa.

DISPATCHES OF EARTHQUAKES RECEIVED—*Continued.*

Place.	Date.	Time.	Character.	Source of Information.	Remarks.
Summerville, S. C., U. S. A.	April 11,	19h. 1m. (G.M.T.)	Not Indicated.	S.O.	
Santa Barbara, Cal., U.S.A.	April 12.	8h. P. M.	Distinct.	A.P.	No Damage. Felt in Ventura and Oxnard.
Cedarville, Cal. U. S. A.	April 13.	12h. 30m. (G.M.T.)	Sensible.	S.O.	
Nordorf, Cal., U. S. A.	April 13.	4h. 3m. (G.M.T.)	"	S.O.	
Rochester, Nev., U. S. A.	April 15.	10h. 30m. (G.M.T..	Slight.	S.O.	
Fallow, Nev., U. S. A.	April 15.	19h. 2m. (G.M.T.)	Not Indicated.	S.O.	
Cedarville, Cal., U. S. A.	April 16.	6h. (G.M.T.)	" "	S.O.	
Calexico, Cal., U. S.A.	April 18.	3h. 47m. P. M.	Slight.	A.P.	
Los Angeles, Cal., U. S. A.	April 20.	Late Evening.	Distinct.	A.P.	Two shocks in rapid succession. Felt throughout So. California.
Pierson, Idaho, U. S. A.	April 20.	4h. 30m. (G.M.T.)	Not Indicated.	S.O.	
Santa Barbara, Cal., U. S. A.	April 21.	6h. 59m. (G.M.T.)	Not Indicated.	S.O.	
Butte, Montana, U. S. A.	April 23.	3h. 50m. (G.M.T.)	" "	S.O.	
Tuscany, Umbria, Italy	April 26.	Morning.	Violent.	E.T.	Many killed at Monterchi. Considerable damage.
Tuscany, Umbria, Italy	April 30.	Not Indicated.	Not Indicated.	U.P.	Felt principally at Monterchi.
Rio Janeiro, Brazil	May 5.	" "	Slight.	A.P.	Some Damage.
Calabria, Cal., U. S. A.	May 9.	" "	Very Pronounced.	U.P.	No Damage.
Hendrickson, Mo., U. S. A.	May 9.	9h. (G.M.T.)	Not Indicated.	S.O.	
Ogdensburg, N. Y., U. S. A.	May 17.	10h. 8m. (G.M.T.)	Slight.	S.O.	
Calexico, Cal., U. S. A.	May 18.	6h. 6m. (G.M.T.)	Not Indicated.	S.O.	
Yorba Linda, Cal., U. S. A.	May 19.	6h. 35m. (G.M.T. 7h. 19m. (G.M.T.)	Felt Distinctly.	S.O.	
" " " "	May 20.	9h. 45m. (G.M.T.)	" "	S.O.	
Montpelier, Vermont, U. S. A.	May 20.	8h. 59m. (G.M.T.)		S.O.	
Canton, N. Y., U. S. A.	May 22.	9h. 19m. (G.M.T.	Not Indicated.	S.O.	
Odgensburg, N. Y., U. S. A.	May 22.	4h. (G.M.T.)	Sensible.	S.O.	
Needles, Cal., U. S. A.	May 24.	2h. P. M.	"	A.P.	
Imperial Valley, Cal., U. S. A.	May 27.	10h. 6m. P. M.	Heavy.	A.P.	
Brawley, Cal., U. S. A.	May 27.	9h. 30m. (G.M.T.)	Sensible.	S.O.	
Yuma, Arizona, U. S. A.	May 27.	7h. P. M.	Distinct.	A.P.	
Barrett Dam, Cal., U. S. A.	May 28.	6h. 7m. (G.M.T.)	Not Indicated.	S.O.	
Calexico, Cal., U. S. A.	May 28.	7h. 5m. (G.M.T.)	" "	S.O.	
Unga, Alaska,	May 30.	10h. (G.M.T.)	Distinct.	A.P.	Shocks lasted two-minutes.
Brawley, Cal., U. S. A.	May 31.	2h. 10m. (G.M.T.)	"	A.P.	
Cahuilla, Cal., U. S. A.	May 31.	4h. 35m. (G.M.T.	"	A.P.	
" " "	June 1.	8h. 35m. P.M.	Slight.	A.P.	
Victorville, Cal., U. S. A.	June 2.	6h. 30m. A. M.	"	S.O.	

DISPATCHES OF EARTHQUAKES RECEIVED—*Continued.*

Place.	Date.	Time.	Character.	Source of Information.	Remarks.
San Salvador, Nicaragua	June 7.	6h. 35m. P. M.	Disastrous.	A.P.	Volcano of San Salvador became violently active at 8h. 45m. P.M. Besides destruction of San Salvador, the towns of Quelaltipeque, Nejapa, Suchichoto, Prisival, Armenios and Mejicanoa destroyed.
Calexico, Cal., U. S. A.	June 7.	7h. 41m. A. M. 4h. 31m. P. M.	Slight.	S.O.	
" " "					
San Miguel, Cal., U. S. A.	June 8.	7h.34m. P. M.	"	S.O.	
Washington State, U. S. A.	June 8.	6h. 35m.--8h. 45m. P. M.	Varying Intensity.	A.P.	
Terni, Italy	June 11.	Early Morning.	Violent.	A.P.	Four quakes. Considerable Damage.
San Salvador, Nicaragua	June 13.	Not Indicated.	Varying Intensity.	A.P.	No Damage.
San Salvador, Nicaragua	June 14.	" "	" "	A.P.	No Damage.
Heber, Cal., U. S. A.	June 17.	Between 10h.-11h. P. M.	Generally Felt.	S.O.	
Calexico, Cal., U. S. A.	June18.	1h. 55m. A. M.	Sensible.	A.P.	
Owens Valley, Cal., U. S. A.	June 21.	11h. 20m. A. M.	Slight.	S.O.	
Los Angeles, Cal., U. S.A.	June 24.	12h. Midnight.	Distinctly Felt.	S.O.	Second shock felt at 12:30 P. M.
" " " "	June 25.	8h. 15m. P. M.	" "	S.O.	Second shock heavier than first.
" " " "	June 25.	8h. 24m. P. M.	" "		
Pago-Pago, Tutuila, Samoa.	June 25.	6h. 30m. P. M.	Most severe in 50 years.	A.P.	Center of disturbance 75 miles Southwest of Samoa. Minor aftershock felt.
Los Angeles, Cal., U. S. A.	June 26.	3h. 51m. A. M. 1h. 15m. P. M. 1h. 20m. P. M. 1h. 25m. P. M.	Distinctly Felt.	S.O.	
" " " "	June 28.	9h. 50m.--10h. 25m. P. M.	" "	S.O.	
" " " "	June 29.	4h. P. M.	" "	S.O.	
" " " "	June 30.	3h. 1m. A. M.	" "	S.O.	
Owens Valley, Cal., U. S. A.	July 6.	3h. 1m. A.M.	Distinctly Felt.	S.O.	
Arroyo Grande, Cal., U. S. A.	July 7.	3h. 29m. A. M.	Sensible.	S.O.	
Rome, Italy	July 8.	Morning.	Perceptible.	A.P.	Felt at Avezzano.
Bishop, Cal., U. S. A.	July 9.	5h. 15m. (G.M.T.)	Sensible.	S.O.	
Arroyo Grande, Cal., U. S. A.	July 9.	2h. 22m. (G.M.T.)	"	S.O.	
San Luis Obispo, Cal., U. S. A.	July 9.	22h. 22m. (G.M.T.)	"	S.O.	
Arroyo Grande, Cal., U. S. A.	July 9.	2h. 38m. (G.M.T.)	"	S.O.	
		4h. 33m. (G.M.T.)	"		
		4h. 45m. (G.M.T.)	"		

DISPATCHES OF EARTHQUAKES RECEIVED—*Continued.*

Place.	Date..	Time.	Character.	Source of Information.	Remarks.
Mayagnez, Porto Rico	July 13.	6h. 20m. (G.M.T.)	Not Indicated.	A.P.	
Mt. Wilson, Cal., U. S. A.	July 15.	19h. 5m. A. M.	Sensible.	S.O.	
Sierra Madre, Cal., U. S. A.	July 15.	11h. 5m. A. M.	"	S.O.	
Los Angeles, Cal., U. S. A.	July 15.	8h. 15m. P. M.	Slight.	S.O.	
Calexico, Cal., U. S. A.	July 16	6h. 50m. (G.M.T.)	"	S.O.	
Los Angeles, Cal., U. S. A.	July 17.	3h. 19m. P. M.	"	S.O.	
Ferndale, Cal., U. S. A.	July 21.	16h. 50m. (G.M.T.)	Not Indicated.	S.O.	
Los Olivos, Cal., U. S. A.	July 26.	12h. 50m. A. M.	Slight.	S.O.	
San Luis Obispo, Cal., U. S. A.	July 26.	8h. 31m. (G.M.T.	Not Indicated.	S.O.	
Chile, South America.	July 26.	Night.	Severe.	A.P.	Report denied by Chilean Embassy. Stated to have occurred in Argentina.
Santa Maria, Cal., U. S. A.	July 26.	8h. 31m. (G.M.T.	Not Indicated.	S.O.	
San Juan, Porto Rico.	July 27.	2h. 1m. (G.M.T.)	" "	S.O.	
Los Angeles, Cal., U. S. A.	August 3.	2h. 10m. A. M.	Distinctly Felt.	S.O.	
Southern Part of North Island.	Uncertain.	Not Given.	Violent.	R.T.	Dispatch dated London, Aug. 6th. Most severe in sixty years.
Wairarapa, New Zealand.	Uncertain.	" "	Severe.	A.P.	Dispatch dated Wellington, Aug. 9.
Columbia, South America	Sept. 1.	" "	"	A.P.	No Damage.
Aldrich, Minn., U. S. A.	Sept. 3.	3h. 30m. P. M.	Distinctly Felt.	A.P.	Felt generally in North Central Portion of State.
Calexico, Cal., U. S. A.	Sept. 4.	23h. 57m. (G.M.T.)	Not Indicated.	S.O.	
Eureka, Cal., U. S. A.	Sept. 13.	2h. 14m. (G.M.T.)	" "	S.O.	
Calexico, Cal., U. S. A.	Sept. 25.	18 h. 34m. (G.M.T.	" "	S.O.	
Province of Seine and Pisa, Italy.	Oct. 8.	4h. 30m. (G.M.T.)	Sensible.	R.P.	
Basilicata, Italy.	Oct. 13.	16h. (G.M.T.)	Very Noticeable.	R.P.	
Monticassino, Italy.	Oct. 13.	17.6h. (G.M.T.)	Very Strong.	R.P.	
" "	Oct. 14.	14.5h. (G.M.T.)	Slight.	R.P.	
Imperial Valley	Oct. 14.	Not Indicated.	"	S.O.	
Province of Catania, Italy.	Oct. 16.	18.75 h. (G.M.T.	"	R.P.	
Ancona, Italy.	Oct. 21.	9h. 4m. (G.M.T.)	Very Noticeable.	R.P.	
" "	Oct. 21.	15h. 15m. (G.M.T.)	Slight.	R.P.	
Forli, Italy	Oct. 22.	3h. 15m. (G.M.T.)	"	R.P.	
Santa Cara Valley, Cal., U. S. A.	Oct. 26.	1h. 20m.	Sensible.	S.O.	
Chiusdino, Italy.	Oct. 28.	3h. 50m. (G.M.T.)	Slight.	R.P.	
Monticalieri, Italy.	Oct. 28.	18¼h. (G.M.T.)	"	R.P.	
Near Trenta, Italy.	Oct. 30.	22h. (G.M.T.)	Not Indicated.	R.P.	
Foligno (Perugia), Italy.	Nov. 1.	3h. 5m. (G.M.T.)	" "	R.P.	
Vicinity of Lagonegio, Italy.	Nov. 4.	2h. 23m. (G.M.T.)	Slight.	R.P.	

DISPATCHES OF EARTHQUAKES RECEIVED—*Continued.*

Place.	Date..	Local Time.	Character.	Source of Information.	Remarks.
Monticalieri, Italy.	Nov. 4.	13h. 15m. (G.M.T.)	Slight.	R.P.	
Amatrice, Italy.	Nov. 4.	4h. 31m. (G.M.T.)	"	R.P.	
Ancona, Italy.	Nov. 5.	14h. (G.M.T.)	Not Indicated.	R.P.	
" "	Nov. 5.	23h. 47m. (G.M.T.)	Sensible.	R.P.	
Province of Ancona, Italy.	Nov. 6.	0h. 14m. (G.M.T.		R.P.	
Near Rome, Italy.	Nov. 6.	12h. 20m. (G.M.T.)	Not Indicated.	R.P.	
Province of Ancona, Italy.	Nov. 6.	0h. 14m. (G.M.T.)	" "	R.P.	
" " " "	Nov. 6.	12h. 39m. (G.M.T.)	Heavy.	R.P.	
" " " "	Nov. 6.	19h. 30m. (G.M.T.)	Slight.	R.P.	
" " " "	Nov. 7.	1h. 15m. (G.M.T.)	Light.	R.P.	
" " " "	Nov. 7.	16h. 15m. (G.M.T.)	"	R.P.	
" " " "	Nov. 7.	22h. 45m. (G.M.T.)	"	R.P.	
Montecassino, Italy.	Nov. 7.	2h. 30m. (G.M.T.)	Not Indicated.	R.P.	
Ancona, Italy.	Nov. 8.	0h. 50m. (G.M.T.)	Slight.	R.P.	
" "	Nov. 8.	3h. (G.M.T.)	"	R.P.	
" "	Nov. 8.	12h. 30m. (G.M.T.)	"	R.P.	
Near Montecassino, Italy	Nov. 9.	11h. (G.M.T.)	"	R.P.	
Ancona, Italy.	Nov. 10.	16h. 40m. (G.M.T.)	"	R.P.	
Near Montecassino, Italy.	Nov. 10.	2h. 48m. (G.M.T.)	Not Indicated.	R.P.	
Mt. Ranier, Oregon, U. S. A.	During Week Beginning Nov. 11.	Not Given.	Pronounced.	R.P.	
Near Montecassino, Italy.	Nov. 11.	12h. 55m. (G.M.T.)	Not Indicated.	R.P.	
Near Minco, Italy.	Nov. 11.	7h. (G.M.T.)	" "	R.P.	
" " "	Nov. 11.	10h. 30m. (G.M.T.)	" "	R.P.	
Ancona, Italy.	Nov. 11.	13h. 30m. (G.M.T.)	Slight.	R.P.	
" "	Nov. 11.	13h. 45m. (G.M.T.)	Sensible.	R.P.	
" "	Nov. 11.	18h. 15m. (G.M.T.)	Not Indicated.	R.P.	
" "	Nov. 11.	19h. (G.M.T.)	" "	R.P.	
" "	Nov. 11.	23h. (G.M.T.)	" "	R.P.	
Montecassino, Italy.	Nov. 11.	16h. 50m. (G.M.T.)	Not Indicated.	R.P.	
Near Montecassino, Italy.	Nov. 12.	5h. 45m. (G.M.T.)	" "	R.P.	
Ancona, Italy.	Nov. 13..	12h. 30m. (G.M.T.)	Slight.	R.P.	
Tolentino, Italy.	Nov. 13..	2h. 30m. (G.M.T.)	Sensible.	R.P.	
" "	Nov. 13.	3h. (G.M.T.)	"	R.P.	
" "	Nov. 13.	5h. 30m. (G.M.T.)	"	R.P.	
Province of Ancona, Italy.	Nov. 13.	3h. 16m. (G.M.T.)	"	R.P.	
" " " "	Nov. 13.	5h. 42m. (G.M.T.)	Heavy.	R.P.	
" " " "	Nov. 13.	15h. 50m. (G.M.T.)	Sensible.	R.P.	
" " " "	Nov. 13.	17h. 45m. (G.M.T.)	"	R.P.	
Near Florence, Italy	Nov. 14.	9h. (G.M.T.)	"	R.P.	
" " "	Nov. 14.	9h. 50m. (G.M.T.)	"	R.P.	

DISPATCHES OF EARTHQUAKES RECEIVED—*Continued.*

Place.	Date.	Time.	Character.	Source of Information.	Remarks.
Mt. Ranier, U. S. A.	Week Beninning Nov. 11.	Not Given.	Very Perceptible.	S.O.	Dispatch dated, Portland, Oregon, November 16.
Moncalieri, Italy.	Nov. 18.	4h. 15m. (G.M.T.)	Sensible.	R.P.	
Minco, Italy.	Nov. 18.	12h. (G.M.T.)	Not Indicated.	R.P.	
Alvito, Italy.	Nov. 19.	3h. 42m. (G.M.T.)	" "	R.P.	
" "	Nov. 19.	3h. 43m. (G.M.T.)	Slight.	R.P.	
Montecassino, Italy.	Nov. 19.	5h.45m. (G.M.T.)	Not Indicated.	R.P.	
Near Minco, Italy.	Nov. 20.	12h. 15m. (G.M.T.)	" "	R.P.	
Amatrice, Italy	Nov. 20.	13h. 45m. (G.M.T.)	" "	R.P.	
Near Ischia, Italy.	Nov. 20.	18h. 13m. (G.M.T.)	" "	R.P.	
" " "	Nov. 20.	18h. 17m. (G.M.T.)	" "	R.P.	
Castelsaraceno, Italy.	Nov. 21.	2h. (G. M. T.)	Heavy.	R.P.	
" "	Nov. 21.	2h. 30m. (G.M.T.)	"	R.P.	
Ancona, Italy.	Nov. 22.	4h. (G.M.T.)	Slight.	R.P.	
Near Rome, Italy.	Nov. 22.	7h. 31m. (G.M.T.)	Very Feeble.	R.P.	
Montecassino, Italy.	Nov. 22.	11h. 50m. (G.M.T.)	" "	R.P.	
" "	Nov. 22.	23h. 5m. (G.M.T.)	Not Indicated.	R.P.	
Near Montecassino, Italy.	Nov. 23.	1h. 10m. (G.M.T.)	" "	R.P.	
Near Messina, Italy	Nov. 23.	11h. 50m. (G.M.T.)	" "	R.P.	
Montecassino, Italy.	Nov. 25.	14h. 32m. (G.M.T.)	" "	R.P.	
Camerano, Italy.	Nov. 26.	Between 1 & 2 h. (G.M.T.)	" "	R.P.	2 Shocks.
Province of Ancona, Italy.	Nov. 26.	3h. 59m. (G.M.T.)	" "	R.P.	
Arquata del Fonte, Italy.	Nov. 26.	17h. 30m. (G.M.T.)	Slight.	R.P.	
" " " "	Nov. 26.	21h. 30m. (G.M.T.)	"	R.P.	
Messina, Italy.	Nov. 27.	9h. (G.M.T.)	"	R.P.	
Ancona, Italy.	Nov. 27.	19h. 45m. (G.M.T.)	Sensible.	R.P.	
Near Montecassino, Italy.	Nov. 27.	20h. 30m. (G.M.T.)	Not Indicated.	R.P.	
Ancona, Italy.	Nov. 28.	3h. 15m. (G.M.T.)	Sensible.	R.P.	
Near Minco, Italy.	Nov. 29.	3h. 50m. (G.M.T.)	Not Indicated.	R.P.	
Near Montecassino, Italy.	Nov. 29.	4h. 25m. (G.M.T.)	" "	R.P.	
Near Messina, Italy.	Nov. 29.	8h. 40m. (G.M.T.)	" "	R.P.	
Ancona, Italy.	Nov. 29.	14h. 15m. (G.M.T.)	" "	R.P.	
Lazio, Italy.	Nov. 29.	19h. 51m. (G.M.T.)	" "	R.P.	
Ancona, Italy.	Nov. 30.	6h. 30m. (G.M.T.)	Not Indicated.	R.P.	
Arquarta del Fonte, Italy.	Nov. 30.	16h. 30m. (G.M.T.)	Slight.	R.P.	
Ancona, Italy.	Dec. 1.	9h. 58m. (G.M.T.)	Not Indicated.	R.P.	
" "	Dec. 1.	10h. 6m. (G.M.T.)	" "	R.P.	
Moncalieri, Italy.	Dec. 1.	10h. 55m. (G.M.T.)	" "	R.P.	
Montecassino, Italy.	Dec. 2.	13h. 14m. (G.M.T.)	Sensible (Mostly)).	R.P.	
" "	Dec. 2.	13h. 53m. (G.M.T.)	"	R.P.	
" "	Dec. 2.	14h. 3m. (G.M.T.)	"	R.P.	

DISPATCHES OF EARTHQUAKES RECEIVED—*Continued.*

Place.	Date.	Time.	Character.	Source of Information.	Remarks.
Montecassino, Italy.	Dec. 2.	16h. 5m. (G.M.T.)	Sensible.	R.P.	
" "	Dec. 2.	16h. 38m. (G.M.T.)	"	R.P.	
" "	Dec. 2.	19h. 0m. (G.M.T.)	"	R.P.	
" "	Dec. 2.	20h. 16m. (G.M.T.)	"	R.P.	
" "	Dec. 2.	20h. 42m. (G.M.T.)	"	R.P.	
" "	Dec. 2.	23h. 35m. (G.M.T.)	"	R.P.	
Catania, Italy.	Dec. 2.	16h. 30m. (G.M.T.)	Not Indicated.	R.P.	
Badia Tedada, Italy.	Dec. 2.	22h. 30m. (G.M.T.)	Slight.	R.P.	
Montecassino, Italy.	Dec. 3.	0h. 19m. (G.M.T.)	Not Indicated.	R.P.	
" "	Dec. 3.	4h. 22m. (G.M.T.)	" "	R.P.	
Near Catania, Italy.	Dec. 4.	5h. 20m. (G.M.T.)	" "	R.P.	
Terra di Lavoro, Italy.	Dec. 8.	0h. 57m. (G.M.T.)	" "	R.P.	
" " " "					
Idaho Falls, Idaho, U. S. A.	Dec. 12.	4 o'clock A.M. (G.M.T.)	Distinct.	R.P.	No Damage.
Guatemala.	Dec. 25.	11 o'clock P. M.	"	R.P.	Destructive. First shocks light.
"	Dec. 29.		Severe.		Destructive. 125,000 people in streets.
"	Dec. 30.	Not Given.	See Remarks.		Terrible earthquakes continue.

May, Aug-Nov 1917

No. 26

From May 1 to May 31 1917.

Washington, D. C.

Seismological Bulletin

of the Georgetown University Department of Geology

φ=38° 54′ 25″ N λ=77° 4′ 24″ W h=42.4 m Sub-Soil, Decayed Diorite

INSTRUMENTS: Astatic pendulums after Wiechert, 200 kg. (horizontal), 80 kg. (vertical). Astatic pendulums after Mainka, 135 kg., two Bosch-Omori pendulums 25 kg. and two Bosch Photographic pendulums (horizontal) 200 gms.

		V	T_o	ε:1
Wiechert Horizontal (200 kg.) Vertical (80 kg.)	A_N	143	5.2	0
	A_E	165	5.4	0
	A_Z	80	3.0	0

		V	T_o	ε:1
Bosch Photographic Pendulums	A_N			
	A_E			

		V	T_o	ε:1
Mainka	A_N			
	A_E			
Bosch-Omori	A_N	13.5	8.65	0
	A_E	13.7	8.84	0

Date	Character	Phase	Time	Periods	* Amplitude A_N	A_E	A_Z	Δ	Remarks
1917 May 1	VII_u	eP E	18 46 06						Micro-seisms present.
		eP N	18 46 06						
		S E	18 56 10						
		S N	18 56 26						
		eL E	19 02 11						
		eL N	19 02 17						
		M E	19 29 47			2.7mm			
		M N	19 34 17		1.8mm				
		F	21 40(ca)						
May 3		F	13 48 00						Micro-seisms present. Sheet put on at 12h 58m at 12h 59m shows long waves.
May 4	V_u	e	1 40 55						Micro-seisms present.
		L E?	1 47 18	15					
		L N?	1 46 10	20					
		F	2 23 00						
May 9	VI_u	e E	16 36 20						Very heavy micro-present. No distinct Main.
		e N	16 36 30						
		eL E?	16 47 43						
		eL N?	16 47 42						
		I E	16 57 40	20					
		L N	16 57 07	20					
		F	17 30 00						
May 25	III_r	e?	14 52 19						All phases doubtful.
		S E?	14 57 56						
		S N?	14 57 49						
		F	15 11 00						

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		V	T_o	ε:1
Wiechert Horizontal (200 kg.) Vertical (80 kg.)	A_N	143	5.2	0
	A_E	165	5.4	0
	A_Z	80	3.0	0

		V	T_o	ε:1
Bosch Photographic Pendulums	A_N			
	A_E			

		V	T_o	ε:1
Mainka	A_N			
	A_E			
Bosch-Omori	A_N	13.5	8.65	0
	A_E	13.7	8.84	0

Date	Character	Phase	Time	Periods	* Amplitude A_N	A_E	A_Z	Δ	Remarks
1917 May 1	VII_u	eP_E	18 46 06						Micro-seisms present.
		eP_N	18 46 06						
		S_E	18 56 10						
		S_N	18 56 26						
		eL_E	19 02 11						
		eL_N	19 02 17						
		M_E	19 29 47				2.7mm		
		M_N	19 34 17		1.8mm				
		F	21 40(ca)						
May 3		F	13 48 00						Micro-seisms present. Sheet put on at 12h 58m at 12h 59m shows long waves.
May 4	V_u	e	1 40 55						Micro-seisms present.
		L_E?	1 47 18	15					
		L_N?	1 46 10	20					
		F	2 23 00						
May 9	VI_u	e_E	16 36 20						Very heavy micro-present. No distinct Main.
		e_N	16 36 30						
		eL_E?	16 47 43						
		eL_N?	16 47 42						
		I_E	16 57 40	20					
		L_N	16 57 07	20					
		F	17 30 00						
May 25	III_r	e?	14 52 19						All phases doubtful.
		S_E?	14 57 56						
		S_N?	14 57 49						
		F	15 11 00						

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		V	T_o	ε:1
Wiechert Horizontal (200 kg.) Vertical (80 kg.)	A_N	143	5.2	0
	A_E	165	5.4	0
	A_Z	80	3.0	0

		V	T_o	ε:1
Bosch Photographic Pendulums	A_N			
	A_E			

		V	T_o	ε:1
Mainka	A_N			
	A_E			
Bosch-Omori	A_N	13.5	8.65	0
	A_E	13.7	8.84	0

Date	Character	Phase	Time	Periods	* Amplitude A_N	A_E	A_Z	Δ	Remarks
1917 May 1	VII_u	eP E	18 46 06						Micro-seisms present.
		eP N	18 46 06						
		S E	18 56 10						
		S N	18 56 26						
		eL E	19 02 11						
		eL N	19 02 17						
		M E	19 29 47			2.7mm			
		M N	19 34 17		1.8mm				
		F	21 40(ca)						
May 3		F	13 48 00						Micro-seisms present. Sheet put on at 12h 58m at 12h 59m shows long waves.
May 4	V_u	e	1 40 55						Micro-seisms present.
		L E?	1 47 18	15					
		L N?	1 46 10	20					
		F	2 23 00						
May 9	VI_u	e E	16 36 20						Very heavy micro-present. No dis-tinct Main.
		e N	16 36 30						
		eL E?	16 47 43						
		eL N?	16 47 42						
		L E	16 57 40	20					
		L N	16 57 07	20					
		F	17 30 00						
May 25	III_r	e?	14 52 19						All phases doubtful.
		S E?	14 57 56						
		S N?	14 57 49						
		F	15 11 00						

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		V	T_o	ε:1
Wiechert Horizontal (200 kg.) Vertical (80 kg.)	A_N	143	5.2	0
	A_E	165	5.4	0
	A_Z	80	3.0	0

		V	T_o	ε:1
Bosch Photographic Pendulums	A_N			
	A_E			

		V	T_o	ε:1
Mainka	A_N			
	A_E			
Bosch-Omori	A_N	13.5	8.65	0
	A_E	13.7	8.84	0

Date	Character	Phase	Time	Periods	* Amplitude A_N	A_E	A_Z	Δ	Remarks
1917 May 1	VII_u	eP E	18 46 06						Micro-seisms present.
		eP N	18 46 06						
		S E	18 56 10						
		S N	18 56 26						
		eL E	19 02 11						
		eL N	19 02 17						
		M E	19 29 47			2.7mm			
		M N	19 34 17		1.8mm				
		F	21 40(ca)						
May 3		F	13 48 00						Micro-seisms present. Sheet put on at 12h 58m at 12h 59m shows long waves.
May 4	V_u	e	1 40 55						Micro-seisms present.
		L E?	1 47 18	15					
		L N?	1 46 10	20					
		F	2 23 00						
May 9	VI_u	e E	16 36 20						Very heavy micro-present. No distinct Main.
		e N	16 36 30						
		eL E?	16 47 43						
		eL N?	16 47 42						
		I E	16 57 40	20					
		L N	16 57 07	20					
		F	17 30 00						
May 25	III_r	e?	14 52 19						All phases doubtful.
		S E?	14 57 56						
		S N?	14 57 49						
		F	15 11 00						

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		V	T_o	ε:1
Wiechert Horizontal (200 kg.) Vertical (80 kg.)	A_N	143	5.2	0
	A_E	165	5.4	0
	A_Z	80	3.0	0

		V	T_o	ε:1
Bosch Photographic Pendulums	A_N			
	A_E			

		V	T_o	ε:1
Mainka	A_N			
	A_E			
Bosch-Omori	A_N	13.5	8.65	0
	A_E	13.7	8.84	0

Date	Character	Phase	Time	Periods	* Amplitude A_N	A_E	A_Z	Δ	Remarks
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		eP N	18 46 06						
		S E	18 56 10						
		S N	18 56 26						
		eL E	19 02 11						
		eL N	19 02 17						
		M E	19 29 47			2.7mm			
		M N	19 34 17		1.8mm				
		F	21 40(ca)						
May 3		F	13 48 00						Micro-seisms present. Sheet put on at 12h 58m at 12h 59m shows long waves.
May 4	V_u	e	1 40 55						Micro-seisms present.
		L_E?	1 47 18	15					
		L_N?	1 46 10	20					
		F	2 23 00						
May 9	VI_u	e E	16 36 20						Very heavy micro-present. No dis-tinct Main.
		e N	16 36 30						
		eL E?	16 47 43						
		eL N?	16 47 42						
		L E	16 57 40	20					
		L N	16 57 07	20					
		F	17 30 00						
May 25	III_r	e?	14 52 19						All phases doubtful.
		S_E?	14 57 56						
		S_N?	14 57 49						
		F	15 11 00						

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		V	T_o	ε:1
Wiechert Horizontal (200 kg.) Vertical (80 kg.)	A_N	143	5.2	0
	A_E	165	5.4	0
	A_Z	80	3.0	0

		V	T_o	ε:1
Bosch Photographic Pendulums	A_N			
	A_E			

		V	T_o	ε:1
Mainka	A_N			
	A_E			
Bosch-Omori	A_N	13.5	8.65	0
	A_E	13.7	8.84	0

Date	Character	Phase	Time	Periods	* Amplitude A_N	A_E	A_Z	Δ	Remarks
1917 May 1	VII_u	eP	18 46 06						Micro-seisms present.
		eP E	18 46 06						
		eP N	18 46 06						
		S	18 56 10						
		S E	18 56 26						
		S N	18 56 26						
		eL	19 02 11						
		eL E	19 02 11						
		eL N	19 02 17						
		M	19 29 47			2.7mm			
		M E	19 29 47						
		M N	19 34 17		1.8mm				
		F	21 40(ca)						
May 3		F	13 48 00						Micro-seisms present. Sheet put on at 12h 58m at 12h 59m shows long waves.
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		L E?	1 47 18	15					
		L N?	1 46 10	20					
		F	2 23 00						
May 9	VI_u	e	16 36 20						Very heavy micro-present. No distinct Main.
		e E	16 36 30						
		e E?	16 47 43						
		e N?	16 47 42						
		L	16 57 40	20					
		L E	16 57 07	20					
		L N	17 30 00						
		F							
May 25	III_r	e?	14 52 19						All phases doubtful.
		S E?	14 57 56						
		S N?	14 57 49						
		F	15 11 00						

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		V	T_o	ε:1
Wiechert Horizontal (200 kg.) Vertical (80 kg.)	A_N	143	5.2	0
	A_E	165	5.4	0
	A_Z	80	3.0	0

		V	T_o	ε:1
Bosch Photographic Pendulums	A_N			
	A_E			

		V	T_o	ε:1
Mainka	A_N			
	A_E			
Bosch-Omori	A_N	13.5	8.65	0
	A_E	13.7	8.84	0

Date	Character	Phase	Time	Periods	* Amplitude A_N	A_E	A_Z	Δ	Remarks
1917 May 1	VII_u	eP E	18 46 06						Micro-seisms present.
		eP N	18 46 06						
		S E	18 56 10						
		S N	18 56 26						
		eL E	19 02 11						
		eL N	19 02 17						
		M E	19 29 47			2.7mm			
		M N	19 34 17		1.8mm				
		F	21 40(ca)						
May 3		F	13 48 00						Micro-seisms present. Sheet put on at 12h 58m at 12h 59m shows long waves.
May 4	V_u	e	1 40 55						Micro-seisms present.
		L E?	1 47 18	15					
		L N?	1 46 10	20					
		F	2 23 00						
May 9	VI_u	e E	16 36 20						Very heavy micro-present. No distinct Main.
		e N	16 36 30						
		eL E?	16 47 43						
		eL N?	16 47 42						
		L E	16 57 40	20					
		L N	16 57 07	20					
		F	17 30 00						
May 25	III_r	e?	14 52 19						All phases doubtful.
		S E?	14 57 56						
		S N?	14 57 49						
		F	15 11 00						

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		V	T_o	ε:1
Wiechert Horizontal (200 kg.) Vertical (80 kg.)	A_N	143	5.2	0
	A_E	165	5.4	0
	A_Z	80	3.0	0

		V	T_o	ε:1
Bosch Photographic Pendulums	A_N			
	A_E			

		V	T_o	ε:1
Mainka	A_N			
	A_E			
Bosch-Omori	A_N	13.5	8.65	0
	A_E	13.7	8.84	0

Date	Character	Phase	Time	Periods	* Amplitude A_N	A_E	A_Z	Δ	Remarks
1917 May 1	VII_u	eP_E	18 46 06						Micro-seisms present.
		eP_N	18 46 06						
		S_E	18 56 10						
		S_N	18 56 26						
		eL_E	19 02 11						
		eL_N	19 02 17						
		M_E	19 29 47				2.7mm		
		M_N	19 34 17		1.8mm				
		F	21 40(ca)						
May 3		F	13 48 00						Micro-seisms present. Sheet put on at 12h 58m at 12h 59m shows long waves.
May 4	V_u	e	1 40 55						Micro-seisms present.
		L_E?	1 47 18	15					
		L_N?	1 46 10	20					
		F	2 23 00						
May 9	VI_u	e_E	16 36 20						Very heavy micro-present. No dis-tinct Main.
		e_N	16 36 30						
		eL_E?	16 47 43						
		eL_N?	16 47 42						
		I_E	16 57 40	20					
		L_N	16 57 07	20					
		F	17 30 00						
May 25	III_r	e?	14 52 19						All phases doubtful.
		S_E?	14 57 56						
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		F	15 11 00						

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		V	T_o	ε:1
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	A_E			

		V	T_o	ε:1
Mainka	A_N			
	A_E			
Bosch-Omori	A_N	13.5	8.65	0
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		eP_N	18 46 06						
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		L_N?	1 46 10	20					
		F	2 23 00						
May 9	VI_u	e_E	16 36 20						Very heavy micro-present. No dis-tinct Main.
		e_N	16 36 30						
		eL_E?	16 47 43						
		eL_N?	16 47 42						
		L_E	16 57 40	20					
		L_N	16 57 07	20					
		F	17 30 00						
May 25	III_r	e?	14 52 19						All phases doubtful.
		S_E?	14 57 56						
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		V	T_o	ε:1
Bosch Photographic Pendulums	A_N			
	A_E			

		V	T_o	ε:1
Mainka	A_N			
	A_E			
Bosch-Omori	A_N	13.5	8.65	0
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Date	Character	Phase	Time	Periods	* Amplitude A_N	A_E	A_Z	Δ	Remarks
1917 May 1	VII_u	eP	18 46 06						Micro-seisms present.
		eP	18 46 06						
		S	18 56 10						
		S	18 56 26						
		eL	19 02 11						
		eL	19 02 17						
		M	19 29 47				2.7mm		
		M	19 34 17		1.8mm				
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May 3		F	13 48 00						Micro-seisms present. Sheet put on at 12h 58m at 12h 59m shows long waves.
May 4	V_u	e	1 40 55						Micro-seisms present.
		L?	1 47 18	15					
		L?	1 46 10	20					
		F	2 23 00						
May 9	VI_u	e	16 36 20						Very heavy micro-present. No dis-tinct Main.
		e	16 36 30						
		eL?	16 47 43						
		eL?	16 47 42						
		L	16 57 40	20					
		L	16 57 07	20					
		F	17 30 00						
May 25	III_r	e?	14 52 19						All phases doubtful.
		S?	14 57 56						
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		V	T_o	ε:1
Bosch Photographic Pendulums	A_N			
	A_E			

		V	T_o	ε:1
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	A_E			
Bosch-Omori	A_N	13.5	8.65	0
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		S	18 56 26						
		eL	19 02 11						
		eL	19 02 17						
		M	19 29 47				2.7mm		
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		L?	16 47 42						
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		L	16 57 07	20					
		F	17 30 00						
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		S?	14 57 56						
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Bosch Photographic Pendulums	A_N			
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