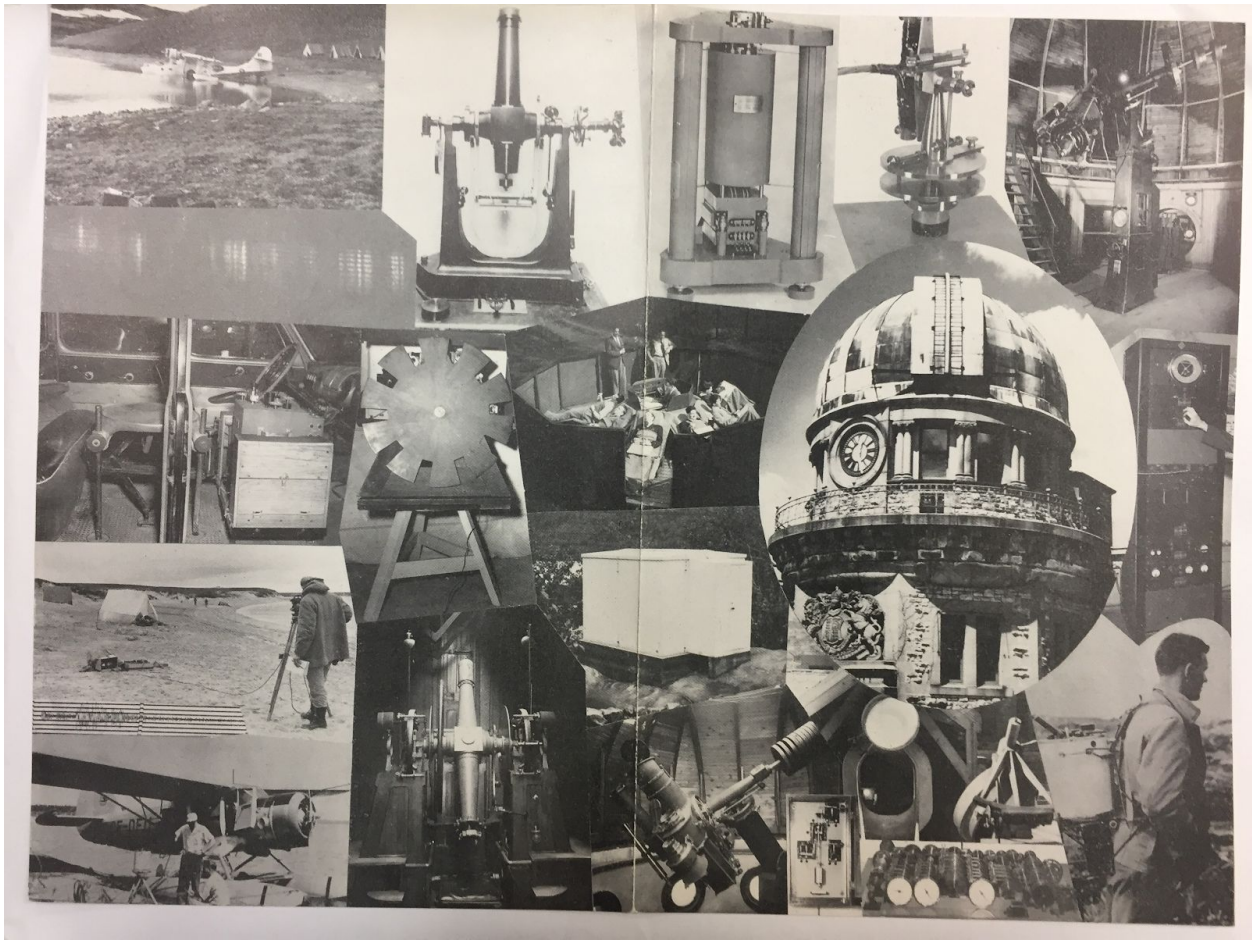

DOMINION OBSERVATORY
OTTAWA, CANADA

At Home

TO THE EASTERN SECTION,
SEISMOLOGICAL SOCIETY OF AMERICA

JUNE SIXTEENTH, NINETEEN FIFTY-ONE

THE DOMINION OBSERVATORY, operated by the Department of Mines and Technical Surveys of the Federal Government, is responsible for research programs in both Astronomy and Geophysics. This work is organized into five divisions. Exhibits have been prepared indicating some of the current activities of each division.

Astronomy

● POSITIONAL ASTRONOMY: A six-inch meridian circle is being used at the present time. The program consists of zenith stars for Ottawa, Greenwich and Richmond, Florida. A second catalogue of star positions has been completed ready for printing. A broken-type transit instrument is used for the time observations. A new photographic zenith tube, ten-inch objective, is mounted and nearly ready for testing. This is a photographic instrument, and automatic in its operation. Primary clocks consist of three quartz crystal clocks and one Shortt Free Pendulum. Time signals are sent to the railway systems, Bell Telephone Co., and are broadcast in three frequencies continuously. The Dominion Observatory is the official source of time for Canada.

Room 18	Time Room. Time-Signal Machines, Clocks, etc.
Rooms 17-17A	Reversible Transits, Photographic Zenith Tube and Meridian Circle.

● STELLAR PHYSICS: The Work of this Division involves a study of the physical characteristics of celestial bodies and of interplanetary and interstellar space. Research now being carried out, or planned for the immediate future, includes both theoretical and observational research on stellar atmospheres; measurement of the lines of interstellar material in stellar spectra; physical investigations of the sun; the systematic photography of meteors with Super-Schmidt cameras; and a program for the combined visual, photographic and radar study of meteors. This last is carried out in cooperation with the National Research Council of Canada.

Room 6B	Horizontal Solar Telescope (view of sun in H_α light if clear).
Room 42	Photographic Meteor Spectra and Radar Echoes.

Geophysics

● TERRESTRIAL MAGNETISM: This Division is responsible for all research relative to the cause and effects of the earth's magnetic field, as carried out in Canada under the auspices of the Department of Mines and Technical Surveys. It maintains two fixed magnetic observatories, Agincourt, Ont., and Meanook, Alta., and two temporary observatories in the Canadian Arctic. It has established approximately 1,500 magnetic stations in Canada where measurements of declination, inclination and force have been made. The Division compiles and constructs all magnetic maps of Canada. It has designed and built new types of universal electrical magnetometers in its laboratory and by their use has fixed the position of the north magnetic pole from the results of recent Arctic operations.

Rooms 37, 38	Displays of Magnetic Maps and Instruments.
Geophysical Laboratory (Observatory House)	Display of Electrical Magnetometers.

● GRAVITY: Relative gravity measurements at some 200 base positions in Canada have been determined by pendulum methods, and the absolute values computed with reference to Ottawa, London, Potsdam and Washington. Tied into these stations are traverses made by means of gravimeters, which permit rapid determination of gravity at relatively close intervals over long closed circuits. The data obtained, consisting of observations at several thousand stations in all parts of Canada, are used to estimate the thickness of the earth's crust, to determine undulations on the geoid and to furnish measurements for studies of isostatic compensation.

Room 2	Gravity Stations and Traverses Plotted on a Map of Canada, regional anomaly maps, etc.

● SEISMOLOGY: The Dominion Observatory maintains a network of seismograph stations across Canada. Stations at Halifax, Seven Falls, Shawinigan Falls, Ottawa and Kirkland Lake send their records to Ottawa for interpretation. A western division to be opened in July 1951, will report on the records from Saskatoon and Victoria and from two new stations to be set up at Vancouver and Alberni. The station at Resolute Bay is under the direction of a seismologist who reports the observations by radio and forwards the records to Ottawa for final interpretation. Principal research energies of the Division have been concentrated on a study of the crustal structure of the Canadian Shield and it is hoped to apply the techniques developed in that program to a detailed study of seismic conditions in British Columbia.

Room 4	Willmore seismometers and Turner galvanometer. Rockburst program records. Photographs of station at Resolute Bay, N.W.T. The Vaults will be open from 3 to 5 p.m.

THE DOMINION OBSERVATORY Ottawa

and

THE ROYAL ASTRONOMICAL SOCIETY OF CANADA Ottawa Centre

AT HOME

Friday, May 26, 1950, 8.30 p.m.

Ground Floor

Vestibule - Transparencies and Photographs
E. Wing, Rm 21 - Library and Reading Room
W. Wing, Rm 17 - Meridian Circle, Transit Instruments
Rm 18 - Time Room, Pendulum Clocks, Crystal Clocks, Chronographs, Time Machine
Rm 19 - Time Service Laboratory

Basement

W. Wing, Rm 4 - Seismographs and Seismic Records
Rm 6a - Microphotometer and Measuring Machine
Rm 6b - Solar Physics Laboratory

Second Floor

E. Wing, Rm 31 - Meteor and Lunar Craters
Rm 32 - Gravity Instruments and Charts
Rm 40 - Stellar Spectroscopy
Rm 42 - Photographic and Radio Meteor Study
W. Wing, Rm 34a - Clockmaker's Test Room
Rm 36b - Computing and Measuring Machines
Rm 37 - Magnetic Instruments
Rm 38 - Magnetic Charts

Main Dome

15-inch Equatorial Telescope - View of Saturn

Front Lawn

8-inch and 6-inch Photographic Telescopes - View of Moon
Gravimeter in Car

Back Lawn

Horizontal Solar Telescope

Refreshments will be served from 9.30 to 11.00 p.m. in Room 16, Ground Floor, West Wing.

Ladies' Cloak Room - Room 35, Second Floor
Gentlemen's Cloak Room - Room 14, Ground Floor

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THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

Ottawa Centre

Honorary President	R. Meldrum Stewart
President	Peter M. Millman
First Vice-President	Duncan A. MacLulich
Second Vice-President	Morris J. S. Innis
Treasurer	Stanley A. Mott
Secretary	Caroline B. Hicks
Assistant Secretary	Margaret A. McKee
Council	C. S. Beals
	Francis W. Matley
	Miriam S. Burland
	George Oltmann
	R. Glenn Madill
Past Presidents	T. L. Tanton
	M. M. Thomson
	Hoyes Lloyd

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Front Cover - The 15-inch Equatorial Telescope and Full Moon.

Back Cover, Top - Perseid Fireball, photographed at Ottawa, Aug. 12, 10.20 p.m., 1949.

Back Cover, Bottom - Electrical Magnetometer, in use in the Canadian Arctic, Summer, 1949.

E V E N I N G M E E T I N G

for

Royal Astronomical Society

of Canada

Ottawa Centre

DOMINION OBSERVATORY

November 26, 1940

GROUND FLOOR	ROOM
Vestibule and Hall	
Register - Transparencies	
Foucault Pendulum	
East Wing	
Library - Reading Room	21
Gentlemen's Cloak Room	12 & 13
West Wing	
Solar Spectrocomparator	
Astronomical Sphere - Charts	
Photographs - Spectra	16
Meridian Circle Room	
Transit Instruments	17
Time Service	
Clocks - Time Machines	18
Radio Time Signals	19
BASEMENT	
Gravity Division	
Eötvös Torsion Balance	At foot
in Field shelter	of stairs
Geophysical Prospecting	
Instruments	4a
Seismological Division	
Seismograph - Records, etc.	4b
Solar Physics Division	
Spectrograph - Camera	
Coelostat	6

FIRST FLOOR	ROOM
East Wing	
Terrestrial Magnetism	
Instruments	31 & 41
Radial Velocity	
Measuring Engines - Spectra	
Photographs	40
Photographic Division	
Photographs - Charts	42
R.A.S.C. Amateur Display	32
West Wing	
Ladies' Cloak Room	36b
Refreshments (9.30 p.m.)	37
DOME	
15-inch Telescope	

NOTE:-In the Dome and in the Meridian Circle Room, visitors may require their wraps.

1940 marks the 50th anniversary of the Royal Astronomical Society of Canada.

BULLETIN B-27 DU SERVICE DE L'HEURE

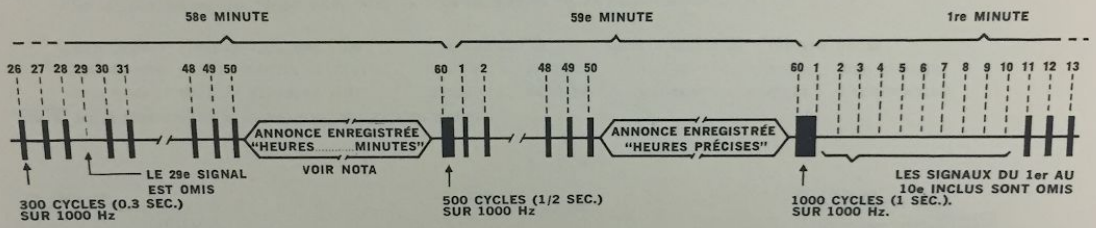
CHU

SERVICE CANADIEN DE L'HEURE

SIGNAUX HORAIRES

CONSEIL NATIONAL DE RECHERCHES DU CANADA
OTTAWA ONTARIO CANADA
K1A 0S1

SÉQUENCES D'ÉMISSION DES DONNÉES HORAIRES DE LA STATION CHU



NOTA: L'ANNONCE ENREGISTRÉE SE FAIT ALTERNATIVEMENT EN ANGLAIS ET EN FRANÇAIS:

"CHU CANADA, EASTERN STANDARD TIME ..... HOURS ..... MINUTES ..... HEURES ..... MINUTES" (MINUTES PAIRES)

"CHU CANADA, HEURE NORMALE DE L'EST ..... HEURES ..... MINUTES ..... HOURS ..... MINUTES" (MINUTES IMPAIRES)

"CHU CANADA, EASTERN STANDARD TIME ..... HOURS EXACTLY" ..... HEURES PRÉCISES" (À L'HEURE PRÉCISE)

CHU EST SITUÉ DANS LA BANLIEUE SUD-OUEST D'OTTAWA PAR 45° 17′ 47″ N, et 75° 45′ 22″ W.

SIGNAUX HORAIRES DE LA STATION CHU

Les signaux horaires du Conseil national de recherches du Canada, transmis d'Ottawa sur les ondes de la station CHU, présentent les caractéristiques suivantes:

L'émission est continue sur trois fréquences, soit 3330, 7335 et 14670 kHz. La puissance est de 3 kW aux fréquences de 3330 et 14670 kHz et de 10 kW à la fréquence de 7335 kHz. On utilise des antennes verticales.

Les trois fréquences d'émission et les signaux horaires proviennent d'un étalon de fréquence à césium comparé quotidiennement à l'étalon primaire canadien à césium.

Les signaux des secondes consistent en 300 cycles d'un son de 1000Hz. Le début du signal marque la seconde précise. Le signal zéro de chaque minute dure ½ seconde et le zéro de chaque heure dure une seconde. Les signaux sont produits au rythme d'un par seconde mais,

1. Le 29e signal de chaque minute est omis.
2. Les signaux du 51e au 59e inclus de chaque minute sont omis; l'intervalle est réservé à l'identification du poste et à l'annonce parlée de l'heure.
3. Les signaux du 1er au 10e inclus sont omis de la première minute de chaque heure.

L'annonce enregistrée de l'heure se fait à chaque minute lors de l'interruption de dix secondes entre la cinquantième et la soixantième seconde. Elle indique le début du signal de la minute ou de l'heure suivante. L'annonce se fait selon le système des 24 heures, alternativement en anglais et en français.

MESURE DU TEMPS

Il y a plusieurs années, la mesure du temps était basée sur la rotation de la Terre (Temps Universel), jusqu'à ce que l'on démontre que cette méthode manquait d'uniformité. Les astronomes ont donc adopté la période de révolution de la Terre autour du Soleil, de l'année 1900, comme base de mesure du Temps qu'ils ont appelé Temps des Ephémérides et qui sert aux calculs astronomiques, mais dont l'emploi quotidien est difficile.

L'évolution de la physique moderne a nécessité le remplacement du pendule par l'horloge à quartz, remplacée à son tour par l'étalon atomique de fréquence. De nos jours, la mesure du temps est basée sur l'étalon à césium* qui a été soigneusement étalonné en le comparant au Temps des Ephémérides et qui, comme lui, demeure uniforme tout au long des années et des saisons.

Le 1er janvier 1972, la seconde atomique (TA) a remplacé la seconde du temps universel (TU1) modifié, dans les services de l'heure au niveau national. Le temps universel coordonné (TUC ou GMT) sera donc en avance sur le TU1 d'environ une seconde par an ce qui conduira à une remise à l'heure d'une seconde précise lorsque ce sera nécessaire, soit le 31 décembre soit le 30 juin, de sorte que la différence DTU1 = TU1—TUC ne dépassera pas 0.7 seconde. La DTU1 déterminée par le Bureau International de l'Heure (BIH) est donnée par la station CHU au dixième de seconde le plus proche en utilisant un groupe de repères de seconde consécutifs divisés en deux. Le nombre de repères des secondes dans le groupe donne la valeur de la DTU1 en dixièmes de seconde. Si le groupe commence au premier repère de seconde de chaque minute, la DTU1 est positive et s'il commence au 9e repère de seconde, la DTU1 est négative.

L'échelle de temps du CNRC, basée sur l'étalon primaire à césium du NRC, ne diffère de l'échelle moyenne du BIH que de quelques microsecondes par année.

*En octobre 1967, le Bureau International des Poids et Mesures a défini la seconde comme étant la durée de 9 192 631 770 périodes de la radiation correspondant à la transition entre les deux niveaux hyperfins de l'état fondamental de l'atome de césium 133.

TIME SERVICE BULLETIN B-27

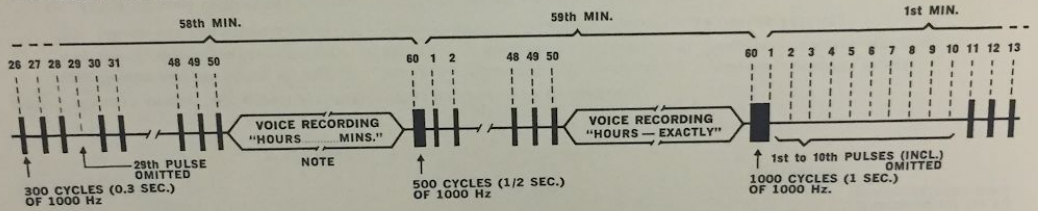
CHU

CANADA'S TIME SERVICE

RADIO TIME SIGNALS

NATIONAL RESEARCH COUNCIL OF CANADA
OTTAWA ONTARIO CANADA
K1A 0S1

CHU DATA TRANSMISSION SEQUENCE



NOTE: VOICE RECORDINGS ALTERNATE IN FRENCH AND ENGLISH:

"CHU CANADA, EASTERN STANDARD TIME ..... HOURS ..... MINUTES ..... HEURES ..... MINUTES" (EVEN MINUTES)
"CHU CANADA, HEURE NORMALE DE L'EST ..... HEURES ..... MINUTES ..... HOURS ..... MINUTES" (ODD MINUTES)
"CHU CANADA, EASTERN STANDARD TIME ..... HOURS EXACTLY" ..... HEURES PRÉCISES" (ON THE HOUR)

CHU IS LOCATED ON THE SOUTH WEST OUTSKIRTS OF OTTAWA AT 45° 17′ 47″ N, 75° 45′ 22″ W.

CHU TIME SIGNALS

The National Research Council of Canada radio time signals broadcast from Ottawa over station CHU have the following characteristics:

Continuous transmission is made on three frequencies, 3330, 7335 and 14670 kHz. Transmitter power output is 3 kW on 3330 and 14670 kHz, and 10 kW on 7335 kHz. Vertical antenna systems are employed.

The three transmitter frequencies and time signals are derived from a cesium frequency standard which is referred daily to the Canadian cesium primary standard.

The seconds' pulses consist of 300 cycles of a 1000 Hz tone. The beginning of the pulse marks the exact second. The zero pulse of each minute is ½ second long, and the zero pulse of the hour is one second long. The pulses occur at the rate of one each second with the following exceptions:—

1. The 29th pulse of each minute is omitted.
2. The 51st to 59th pulses inclusive of each minute are omitted. During this interval station identification and time is announced by voice.
3. The 1st to 10th pulses inclusive are omitted on the first minute of each hour.

A voice recording of the time occurs each minute in the ten second gap between the 50th and 60th second. It refers to the beginning of the minute or hour pulse that follows. The announcement is on the 24 hour system, alternating in French and English.

MEASUREMENT OF TIME

Years ago, the measurement of time was based on earth rotation (Universal Time, UT), which was finally shown to lack uniformity. Astronomers then adopted the period of revolution of the earth around the sun for the year 1900 as the basis for the measurement of time, and called it Ephemeris Time. It forms the basis for all astronomical calculations and forecasts, but it is not readily available for day to day use.

As physical sciences developed, the pendulum yielded to the quartz clock and then to the atomic clock as the primary timekeeper. Today time measurements depend on the cesium atomic clock*, which has been carefully calibrated with respect to Ephemeris Time, and which like it does not vary with the seasons or the years.

On January 1, 1972, the atomic second (AT) replaced the modified UT1 second in national time services. Universal Time Coordinated (UTC or GMT) will therefore gain on UT1 at the rate of about 1 second a year, and will be adjusted by 1 second exactly when required, on either December 31 or June 30 so that the difference DUT1 = UT1—UTC will not exceed 0.7 second. DUT1, as determined by the Bureau International de l'Heure (BIH), is indicated on CHU time signals to the nearest tenth of a second by means of a group of split seconds markers. The number of split seconds markers in the group gives the value of DUT1 in tenths of a second. If the group starts with the first second of each minute, DUT1 is positive; if with the 9th second, DUT1 is negative.

The NRC time scale, based on the NRC primary cesium frequency standard, agrees with the BIH mean time scale to within a few microseconds per year.

*In October 1967 the International Bureau of Weights and Measures defined the second as 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium 133 atom.

EVENING MEETING

Royal Astronomical Society

of Canada

Ottawa Centre

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DOMINION OBSERVATORY

April 10, 1942

Cloak Rooms: Ladies' cloak room is on the first floor, Room 35

Men's cloak room is on the first floor, Room 37

Visitors are advised that they may require their cloaks when visiting the Dome and the Meridian Circle

* * * *

GROUND FLOOR East Wing ROOM

Library - Reading Room 21

Vestibule and Hall

Register - Transparencies
Foucault Pendulum

West Wing

Solar Physics Division

Solar Spectrocomparator -
Co-ordinate Sphere - Charts
Photographs - Spectra 16

Time Service Division

Meridian Circle -
Transit Instruments 17
Clocks - Chronographs 18
Radio Time Signals 19

BASEMENT ROOM

Seismological Division

Model Seismograph -
Records, etc. 4B

Solar Physics Division

Solar Spectrograph -
Camera - Coelostat 6

FIRST FLOOR East Wing

Astrophysical Division

Measuring Engines - Stellar
Spectra - Photographs 40

Photographic Division

Photographs - Charts 42

Terrestrial Magnetism Division

Displays - Instruments - Charts 31& 32

West Wing

Ladies' cloak room 35
Men's cloak room 37
Refreshments (9.30 p.m.) 36B

SECOND FLOOR
C-H-U Transmitters

DOME
Equatorial Telescope

E V E N I N G M E E T I N G

for

Royal Astronomical Society

of Canada

Ottawa Centre

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DOMINION OBSERVATORY

April 8, 1938

GROUND FLOOR East Wing	ROOM
Reception (8.00 to 8.30 p.m.)	12
Library - Reading Room	21
Vestibule and Hall	
Register - Transparencies Foucault Pendulum	
West Wing	
Solar Spectrocomparator Astronomical Sphere - Charts - Photographs - Spectra	16
Meridian Circle - Transit Instruments	17
Time Service - Clocks - Chronographs	18
Radio Time Signals	19
BASEMENT	
Eotvos Torsion Balance in field Shelter	At foot of stairs
Pendulum Apparatus - Geophysical Prospecting Instruments	4-A
Model Seismograph, Records, etc.	4-B
Solar Spectrograph - Camera - Coelostat	6

FIRST FLOOR East Wing	ROOM
Photometer - Measuring Engine	31
Measuring Engines - Stellar Spectra - Photographs	40
Photographic Division Lantern Slides - Photographs - Charts	42
West Wing	
Terrestrial Magnetism - Instruments	38
Refreshments (9.30 p.m.)	37
SECOND FLOOR	
Moll Microphotometer	Midway
Equatorial Telescope	Dome
SMALL DOME	
Photographic Equatorial Telescope	South of Front Door

NOTE:- In the Dome and in the Meridian Circle, visitors may require their wraps.

CLOAK ROOMS

Gentlemen	Ground Floor Rooms 14, 15
Ladies	First Floor Room 36-B

RECEPTION IN ROOM 12

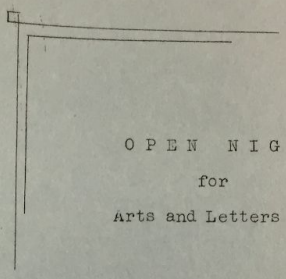
8.00 to 8.30 p.m.

CLOAK ROOMS

Gentlemen	Ground Floor Rooms 14, 15
Ladies	First Floor, Rooms 36-A, 36-B

RECEPTION IN ROOM 12

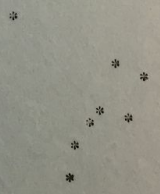
8.00 to 8.30 p.m.



O P E N N I G H T

for

Arts and Letters Club



DOMINION OBSERVATORY

December 19, 1933

GROUND FLOOR East Wing	ROOM
Reception (8.00 to 8.30 p.m.)	12
Library - Reading Room	21
Vestibule and Hall	
Register - Transparencies Foucault Pendulum	
West Wing	
Solar Spectrocomparator - Astronomical Sphere - Charts - Photographs - Spectra	16
Meridian Circle - Transit Instruments	17
Time Service - Clocks - Chronographs	18
Radio Time Signals	19
BASEMENT	
Model Seismograph, Records, etc.	4-B
Solar Spectrograph - Camera - Coelostat	6
Geophysical Prospecting Instruments	4-A
Eötvös Torsion Balance in field Shelter	At foot of stairs

FIRST FLOOR East Wing	ROOM
Photometer - Measuring Engine	31
Measuring Engines - Stellar Spectra - Photographs	40
Lantern Slides - Photographs - Charts	42
West Wing	
Measuring Engine - Solar Spectrograms	34-A
Refreshments (9.30 p.m.)	37
Terrestrial Magnetism - Instruments	38
SECOND FLOOR	
Moll Microphotometer	Midway
Equatorial Telescope	Dome
SMALL DOME	
Photographic Equatorial Telescope	South of Front Door