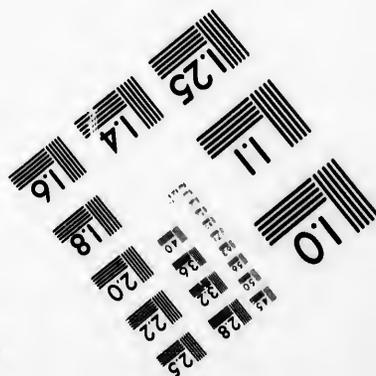
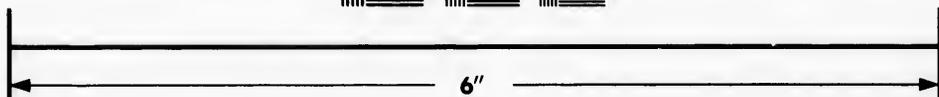
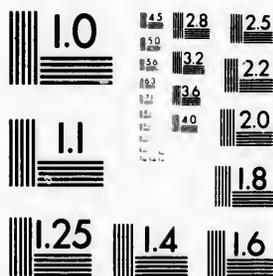


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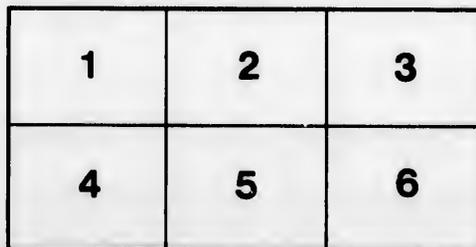
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Royal Canadian Institute,
Toronto.

UNIFICATION
OF
THE ASTRONOMICAL, CIVIL, AND NAUTICAL DAYS.

*Report of the Joint-Committee of The Canadian Institute and
The Astronomical and Physical Society of Toronto.*

COMMITTEE :

SANDFORD FLEMING, C.M.G., LL.D., C.E.—*Chairman.*

ARTHUR HARVEY, Esq.

GEORGE KENNEDY, M.A., LL.D.

ALAN MACDOUGALL, M. INST., C.E.

CHARLES CARPMAEL, M.A., F.R.A.S.

JOHN A. PATERSON, M.A.

G. E. LUMSDEN, Esq.

The Joint-Committee, appointed by The Canadian Institute and The Astronomical and Physical Society of Toronto, have the honour to report on that branch of the subject of Time-reckoning specially referred to them.

The unification of the reckoning of the day has long been under consideration. Sir John Herschell, in his "Outlines of Astronomy," alluded to the advantages which would result from bringing into agreement the Civil, the Astronomical, and the Nautical Days. He pointed out that the adoption of the Civil Day for Astronomical purposes would but slightly inconvenience Astronomers, and that in a question which concerns all other classes of men, Astronomers should resolve to act on general principles and cheerfully submit to a small inconvenience in view of the far wider interests which would be benefited. "Uniformity," he said, "in nomenclature and mode of reckoning in all matters relating to time, space, weight, measures, etc., is of such vast and paramount importance in every relation of life as to outweigh every consideration of technical convenience or custom."

The Civil Day begins at midnight and ends at the midnight following. The Astronomical Day begins at noon of the Civil Day and continues until the following noon. The Nautical Day concludes at noon of the Civil Day, having commenced at the preceding noon.

It is obvious that any given date extends over, or into, three different Days. Take for example, Wednesday, June 13th. By Astronomical and Nautical reckonings, only half of this date in each case is on Wednesday; the first half of June 13, according to Nautical reckoning,

is on Tuesday, June 12, while the second half of the same date, (June 13th), according to Astronomical reckoning, is on Thursday, June 14th, Civil Time.

In this we have the elements of confusion, and it is not surprising that The Washington International Conference of 1884 recommended that the Civil Day should take the place of the Astronomical and Nautical Days for all purposes. The recommendations of the Washington Conference must be held to carry weight, as this assembly comprised representatives of science from twenty-five nations specially called together to consider questions of Time-reckoning. Among them were Astronomers of world-wide fame, as well as men who held high rank as navigators. They were unanimous in the opinion that as soon as practicable the Astronomical and Nautical Days should be arranged everywhere to coincide with the Civil Day.

The Civil Day is the reckoning used by the generality of mankind. It is the exact mean between the Astronomical and Nautical Days, and differs precisely twelve hours from both. To effect a complete coincidence, it is only necessary to shift Astronomical and Nautical Days each twelve hours, and this shifting will bring both to the Civil Day. Many ships have already abandoned Nautical Time and date their logs according to Civil reckoning; all ships would use the one reckoning only, if the Nautical Almanac and Ephemerides generally were arranged for Civil Time. There can be no doubt whatever that the marine of all nations would benefit by the change.

If we consider the subject simply in its relation to the Nautical Almanac and Navigation, the unification of Time-reckoning would simplify the calculations of mariners and reduce the chances of error. One correspondent (Dr. Johnston of McGill University) points out very truly "that the omission of even a single step in an oft-repeated process of calculation has an obvious advantage; when the simplification removes at the same time that most dangerous source of error, an ambiguous expression, it becomes a great gain." He says that the subject resolves itself unto a question of practical utility, viz., what is the greatest good of the greatest number? The Nautical Almanac, as its name implies is for the use primarily of navigators, who are very numerous and yearly, increasing. Compared with the men who guide the floating tonnage of the world, astronomers are extremely few in number, and Astronomers as a class are skilled calculators; moreover, Astronomers can make their calculations under the most favourable circumstances, consequently with the least liability to error, as they are removed from the disturbing influences to which seamen are frequently exposed.

The Joint-Committee considered it important to ascertain how far Astronomers generally would support the proposal which would practically abolish the Astronomical Day. On April 21st, 1893, a Circular was issued to Astronomers of all nations, inviting replies to the following question, viz.: "Is it desirable, all interests considered, that on and after the first day of January, 1901, the Astronomical Day, should everywhere begin at Mean Midnight?" The Circular was sent to every Astronomer whose name appears in the general list of Observatories and Astronomers prepared by Mr. Lancaster, of the Royal Observatory of Brussels, with the following result. 171 replies in all have been received, a complete list of which is appended; of these 108 are in favour and 63 are not in favour of the proposed change. Many of the former are strongly and earnestly in favour of the adoption of the Civil Day for Astronomical purposes, while the writers of some of the latter seem to have been under a misapprehension. They object to the adoption of the Civil Day on the ground that its division into two series of 12 hours, designated A. M. and P. M., would be inconvenient for Astronomers. It is obvious that this objection has no weight, as the 24 Hour-notation would remain associated with Astronomical reckonings as at present; moreover, indications are not wanting that the Astronomical practice of counting the hours in a single series from 1 to 24, will gradually win its way into general favour in civil life. The 24 Hour-notation has already been introduced into use over wide districts in Canada, in the whole of Italy, and throughout the Indian Empire, and there is a movement in Europe, in Australia, as well as in the United States of America, especially among Railway men, to bring this mode of reckoning the hours into general use.

In classifying the replies from Astronomers according to the countries from which they have been received, the votes for or against the change, stand as follows:—

IN FAVOUR OF THE CHANGE.

AUSTRIA.	AUSTRALIA.	BELGIUM.
CANADA.	COLOMBIA.	ENGLAND.
FRANCE.	GREECE.	ITALY.
IRELAND.	JAMAICA.	MADAGASCAR.
MEXICO.	ROUMANIA.	RUSSIA.
SCOTLAND.	SPAIN.	UNITED STATES.

UNFAVOURABLE TO THE CHANGE.

GERMANY.	HOLLAND.
NORWAY.	PORTUGAL.

According to this classification of the Astronomers heard from, those of eighteen countries are in favour, and those of four are against, the adoption of the recommendations of The Washington International Conference of 1884 with respect to the Astronomical and Nautical Days. If we compare the shipping of the countries thus classified, (and the shipping has an important relation to the Nautical Almanac), we find that the first list, that is to say, the countries in favour of adopting the Civil Day for Astronomical purposes, represents $\frac{17}{20}$, or 85 per cent., of the tonnage of the world's marine.

Thus it appears that there is a preponderating weight of opinion among Astronomers themselves, that a change should be made in the Astronomical Day. The Joint-Committee, therefore, feel warranted in recommending that the Home Authorities be informed of the facts and that a respectful appeal be made to have the Nautical Almanac adapted to the change, proposed to take effect at the beginning of the coming Century. The Joint-Committee are of opinion that the proper course is to lay before His Excellency the Governor General a respectful Memorial asking His Excellency to bring the whole matter to the attention of the Imperial Government in order that some common international understanding may be reached, by which all nations shall assent to the change; and in order that the Nautical Almanac which has to be prepared four or five years in advance may be made conformable to the change.

All which is respectfully submitted.

SANDFORD FLEMING.

Chairman,

*Joint-Committee of The Canadian Institute and
The Astronomical and Physical Society of Toronto.*

Toronto, 10th May, 1894.

REPLIES RECEIVED TO THE FOLLOWING QUESTION SENT APRIL 21ST,
1893, TO THE ASTRONOMERS OF ALL NATIONS:—

“Is it desirable, all interests considered, that on and after the first day of January, 1901, the
Astronomical Day should everywhere begin at Mean Midnight?”

NAME.	OBSERVATORY, ETC.	PLACE.	COUNTRY.	ANS.
Abbe, Cleveland...	United States Weather Bureau	Washington ...	United States ...	Yes.
Anguiano, Angel...	National Astronomical Observatory	Tacubayo.....	Mexico.....	Yes.
Anton, Dr. Ferdi- nand.....	Marine Observatory.....	Trieste.....	Austria.....	Yes.
Arcimis, A. F.....	Meteorological Institute	Madrid.....	Spain.....	Yes.
Ashley, Miss Mary..	Private Observatory.....	Bath.....	England.....	No.
Auwers, Dr. A.....	Academy of Science.....	Berlin.....	Germany.....	No.
Backhouse, F. W..	Private Observatory	Sunderland.....	England.....	Yes.
Bacon, Chas. A.....	Smith Observatory.....	Beloit, Wis.	United States...	Yes.
Bardwell, Elizabeth.	Mount Holyoke College Observatory.....	S. Hadley, Mass.	United States...	Yes.
Barnes, Willis S....	Private Observatory.....	Charlestown, Ind.	United States...	Yes.
Bauschinger, Dr. J..	Royal Bogenhausen.....	Munich, Bavaria.	Germany.....	No.
Becker, Prof. Dr. E.	University Observatory.....	Strasburg.....	Germany.....	No.
Bœ, A. de.....	Private Observatory.....	Antwerp.....	Belgium.....	Yes.
Bürgen, Prof. Dr. C.	Marine Observatory.....	Wilhelmshaven	Germany.....	Yes.
Braun, Dr. Chas. ...	Kalocsa Observatory.....	Kalocsa, Hungary	Austria.....	Yes.
Brown, M. V.....	McKim Observatory.....	Greencastle, Ind.	United States...	No.
Bruns, Dr. H.....	University Observatory.....	Leipzig.....	Germany.....	No.
Burckhalter, Chas.	Chabot Observatory	Oakland, Cal. ..	United States...	Yes.
Carpmael, Chas....	The Observatory	Toronto.....	Canada.....	Yes.
Chambers, G. F....	Northfield Grange Observa- tory.....	Eastbourne.....	England.....	Yes.
Chree, Chas.	Kew Observatory.....	Richmond.....	England.....	Yes.
Christie, W. H. M..	Royal Observatory.....	Greenwich.....	England.....	Yes.
Cobl, John N.....		Philadelphia.....	United States...	Yes.
Colton, A. L.....	Lick Observatory.....	Mount Hamilton, Cal.....	United States...	No.
Combe, F. P.....	Royal Observatory.....	Tananarivo.....	Madagascar.....	Yes.
Comstock, Geo. C..	Washburn Observatory.....	Madison, Wis. ...	United States...	No.
Contarino, Francesco	Capo di Monte.....	Naples.....	Italy.....	Yes.
Deichmuller, Prof. Dr. F.....	University Observatory.....	Bonn.....	Germany.....	No.
Deville, E.....	Surveyor General.....	Ottawa.....	Canada.....	Yes.
Egnitis, D.....	Royal Observatory	Athens.....	Greece.....	Yes.
d'Engelhardt, Dr. Baron.....	d'Engelhardt Observatory.....	Dresden.....	Germany.....	No.
Epstein, Dr. Th....	Private Observatory.....	Frankfort, A. M.	Germany.....	Yes.
Esmond, Darwin W.	Geraldine Observatory.....	Newburgh, N. Y.	United States...	Yes.
Ewell, Marshall D..	Private Observatory.....	S. Evanston, Ill.	United States...	Yes.
Fenyi, J.....	Haynald Observatory	Kalocsa, Hungary	Austria.....	Yes.
Fergoler, Em.	Capo di Monte Observatory,	Naples.....	Italy.....	No.
Flint, A. L.....	Washburn Observatory	Madison, Wis. ...	United States...	No.
Folie, F.....	Royal Observatory.....	Uccle.....	Belgium.....	Yes.
Fulton, Robt. B....	University Observatory.....	University, Miss.	United States...	Yes.
Fuss, V.....	School for Pilots.....	Kronstadt.....	Russia.....	Yes.

NAME.	OBSERVATORY, ETC.	PLACE.	COUNTRY.	ANS.
Galle, Dr. Andreas	Royal Institute of Geology..	Potsdam.....	Germany.....	No.
Galle, Dr. J. G....	University Observatory.....	Breslau.....	Germany.....	No.
Gaudibert, C. M....	Private Observatory.....	Vaison.....	Paris.....	Yes.
Gautier, R.....	Geneva Observatory.....	Geneva.....	Switzerland.....	No.
Gedeonow, D.....	Astro-Physical Observatory..	Tashkend.....	Russia.....	Yes.
Geelmuyden, Dr. H.	University Observatory.....	Christiania.....	Norway.....	No.
Giacomelli, Dr. Fr.	Capitol Observatory.....	Rome.....	Italy.....	Yes.
Giovanozzi, Dr. G.	Ximenian Observatory.....	Florence.....	Italy.....	Yes.
Glauser, J.....	Railway Engineer.....	Zurich.....	Switzerland.....	Yes.
Gogow, Prof. Cons..	University Observatory.....	Bucharest.....	Roumania.....	Yes.
Gonzales, José M..	Flammarion Observatory.....	Bogota.....	Colombia.....	Yes.
Gore, J. Ellard....	Private Observatory.....	Ballysodare.....	Ireland.....	Yes.
Gruss, Prof. Dr. G.	Imperial Observatory.....	Prague.....	Bohemia.....	No.
Hadden, David E..	Private Observatory.....	Alta, Iowa.....	United States...	Yes.
Hall, Maxwell....	Government Meteorologist..	Montego Bay....	Jamaica.....	Yes.
Hanig, Dr. C.....	Hamburg Observatory.....	Hamburg.....	Germany.....	No.
Hartwig, Dr. Ernest	C. Rameis Observatory.....	Bamberg, Bavaria	Germany.....	No.
Harzer, Prof. Dr. Paul	Ducal Observatory.....	Gotha.....	Germany.....	No.
Hastings, Chas....	Yale University Observatory	New Haven, Conn	United States...	Yes.
Haywood, John....	Otterbein " Observatory	Westerville, Ohio	United States...	Yes.
Hess, F.....	Private Observatory.....	Fort Dodge, Iowa	United States...	Yes.
Holden, Dr. E. S.	Lick Observatory.....	Mount Hamilton, Cal.	United States...	No.
Hopkins, B. J.....	Private Observatory..	London.....	England.....	Yes.
Horr, Dr. Asa....	Private Observatory.....	Dubuque, Iowa	United States...	Yes.
Hoxie, Capt. R. L.	Field Observatory.....	Willets Pt., N. Y.	United States...	Yes.
Jacoby, Harold....	Columbia College Observatory	New York.....	United States...	No.
Johnson, Rev. S. J.	Private Observatory.....	Bridport.....	England.....	Yes.
Johnston, Alex....	McGill University.....	Montreal.....	Canada.....	Yes.
Kammerman, A....	Geneva Observatory.....	Geneva.....	Switzerland.....	No.
Kirk, Ed. Bruce....	Private Observatory.....	Barrhead.....	Scotland.....	Yes.
Knobel, Ed. B....	Late President Royal Astro- nomical Society.	London.....	England.....	Yes.
Knopf, Dr. Otto....	Grand Ducal Observatory...	Jena, Saxe Weimar.	Germany.....	Yes.
Kobold, Dr. H....	University Observatory.....	Strasbourg.....	Germany.....	No.
Kortazzi, J.....	Naval Observatory.....	Nicolaieff.....	Russia.....	Yes.
Kreutz, Prof. Dr. H.	Royal Observatory.....	Kiel.....	Germany.....	No.
Krone, Herman....	Royal Technical School....	Dresden.....	Germany.....	Yes.
Krueger, Prof. Dr. A.	Royal Observatory.....	Kiel.....	Germany.....	No.
Küstner, Dr. F....	"	Bonn.....	Germany.....	No.
Laughton, J. K....	Royal Naval College Obser- vatory.....	Greenwich.....	England.....	Yes.
Ledger, Rev. E....	Gresham College Observatory	London.....	England.....	Yes.
Legge, Dr. Alf. di.	Capitol Observatory.....	Rome.....	Italy.....	Yes.
Lehmann, P.....	Royal Observatory.....	Berlin.....	Germany.....	No.
Leite, Duarte....	Polytechnical Academy.....	Porto.....	Portugal.....	No.
Lenahan, Henry A..	Sydney Observatory.....	Sydney.....	Australia.....	Yes.
Lewis, Thomas....	Royal Observatory.....	Greenwich.....	England.....	Yes.
Lindelöf, Dr. L....	Counsellor of State.....	Helsingfors, Fin- land.....	Russia.....	Yes.
Lohse, Dr. O.....	Astro-Physical Observatory.	Potsdam.....	Germany.....	Yes.
Lorentzen, Dr. G..	Rameis Observatory.....	Bamberg.....	Germany.....	No.
Mayer, Lt. Chas...	Private Observatory.....	Parenzo.....	Austria.....	No.
Mazelle, Edouard..	Marine Observatory.....	Trieste.....	Austria.....	Yes.

NAME.	OBSERVATORY, ETC.	PLACE.	COUNTRY.	ANS.
Schiaparelli, J. V...	Royal de Brera.....	Milan.....	Italy.....	No.
Schorr, Dr. Richard	Hamburg Observatory.....	Hamburg.....	Germany.....	No.
Schur, Prof. Dr. W.	Royal Observatory.....	Göttingen.....	"	No.
Searle, G. M.....	Catholic University Observa- tory.....	Washington.....	United States...	Yes.
Serviss, Garrett P..	Private Observatory.....	Brooklyn.....	United States...	Yes.
Seyboth, J.....	Imperial Observatory.....	Pulkova.....	Russia.....	No.
Sidgreaves, Walter..	Jesuit College Observatory..	Stonyhurst.....	England.....	No.
Smith, H. I.....	Hobart College Observatory.	Geneva, N. Y.	United States...	Yes.
Solar Physics Com- mittee, <i>per</i> Capt. Abney.....	South Kensington Depart- of Science.....	London.....	England.....	Yes.
Stechert, Dr. C.....	Hamburg Observatory.....	Hamburg.....	Germany.....	No.
Sternock, Lt.-Col. R. von.....	Military Institute.....	Vienna.....	Austria.....	Yes.
Stockwell, John.....	Private Observatory.....	Cleveland, Ohio.	United States...	No.
Stone, E. J.....	Radcliff Observatory.....	Oxford.....	England.....	No.
Stoney, G. Johnstone	Formerly Assistant to Earl of Rosse.....	Dublin.....	Ireland.....	Yes.
Stroobant, Dr. P... Struvé, Otto.....	Royal Observatory..... 'Ancien Directeur' Pulkova Observatory.....	Uccle.....	Belgium.....	Yes.
Swift, Lewis.....	Warner Observatory.....	St. Petersburg... Rochester, N. Y.	Russia..... United States...	Yes. Yes.
Tatlock, John.....	New York.....	United States...	Yes.
Tennant, Lt. Gen. J. F.....	Private Observatory.....	London.....	England.....	No.
Thirion, J.....	Jesuit Observatory.....	Louvain.....	Belgium.....	Yes.
Tillo, Gen. Alexis de	Corresponding Member Aca- demy of Science, Paris....	St. Petersburg...	Russia.....	Yes.
Trouvelot, E. L....	Astro-Physical Observatory..	Meudon.....	France.....	Yes.
Turner, H. H.....	Royal Observatory.....	Greenwich.....	England.....	Yes.
Valle, F.....	National Astronomical Obser- vatory.....	Tacubayo....	Mexico.....	Yes.
Veeder, Dr. A. M... Very, Frank W....	Private Observatory..... Alleghany Observatory.....	Lyons, N. Y.... Alleghany.....	United States... United States...	Yes. Yes.
Vinot, J.....	Astro-Physical Observatory..	Paris.....	France.....	Yes.
Vogel, Prof. Dr. H. C.	Astro-Physical Observatory..	Potsdam.....	Germany.....	No.
Wanach, Dr. B.... Weinek, Dr. Ladis- laus.....	University Observatory..... Imperial & Royal Observatory	Strasburg..... Prague, Bohemia.	Germany..... Austria.....	No. Yes.
Weyer, Dr. G. D. E.	University Observatory.....	Kiel.....	Germany.....	No.
White, E. J.....	Melbourne Observatory.....	Melbourne.....	Australia.....	Yes.
Williamson, Prof. J.	Kingston Observatory.....	Kingston.....	Canada.....	Yes.
Wilson, Wm. E.... Wittram, Prof. Dr. Th.....	Private Observatory..... Imperial Observatory.....	Rathowen..... Pulkova.....	Ireland..... Russia.....	Yes. No.
Wittstein, Dr. A... Wolf, Dr. Max....	Private Observatory..... University Observatory.....	Leipzig..... Heidelberg.....	Germany..... Germany.....	No. Yes.
Yendell, P. S.....	Private Observatory.....	Dorchester, Mass.	United States...	No.
Zenger, Chas. Venc.	Polytechnic School Observa- tory.....	Prague.....	Austria.....	Yes.
Zelbr, Dr. Karl....	Private Observatory.....	Brünn.....	Austria.....	No.

67

ANS.
No.
No.
No.
Yes.
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REPLIES.

Classified according to the Countries from which they have been received.

	TOTALS.	YEAS.	NAYS.	MAJORITIES.
Austria	12	7	5	In favour
Australia	2	2	0	In favour
Belgium	6	6	0	In favour
Canada	5	5	0	In favour
Colombia	1	1	0	In favour
England	20	16	4	In favour
France	4	4	0	In favour
Germany	38	7	31	Against
Greece	1	1	0	In favour
Holland	1	0	1	Against
Italy	11	8	3	In favour
Ireland	4	4	0	In favour
Jamaica	1	1	0	In favour
Madagascar	1	1	0	In favour
Mexico	5	5	0	In favour
Norway	1	0	1	Against
Portugal	1	0	1	Against
Roumania	1	1	0	In favour
Russia	11	6	5	In favour
Scotland	1	1	0	In favour
Spain	2	2	0	In favour
Switzerland	4	2	2	Equal
United States	38	28	10	In favour
Totals	171	108	63	18
				4

