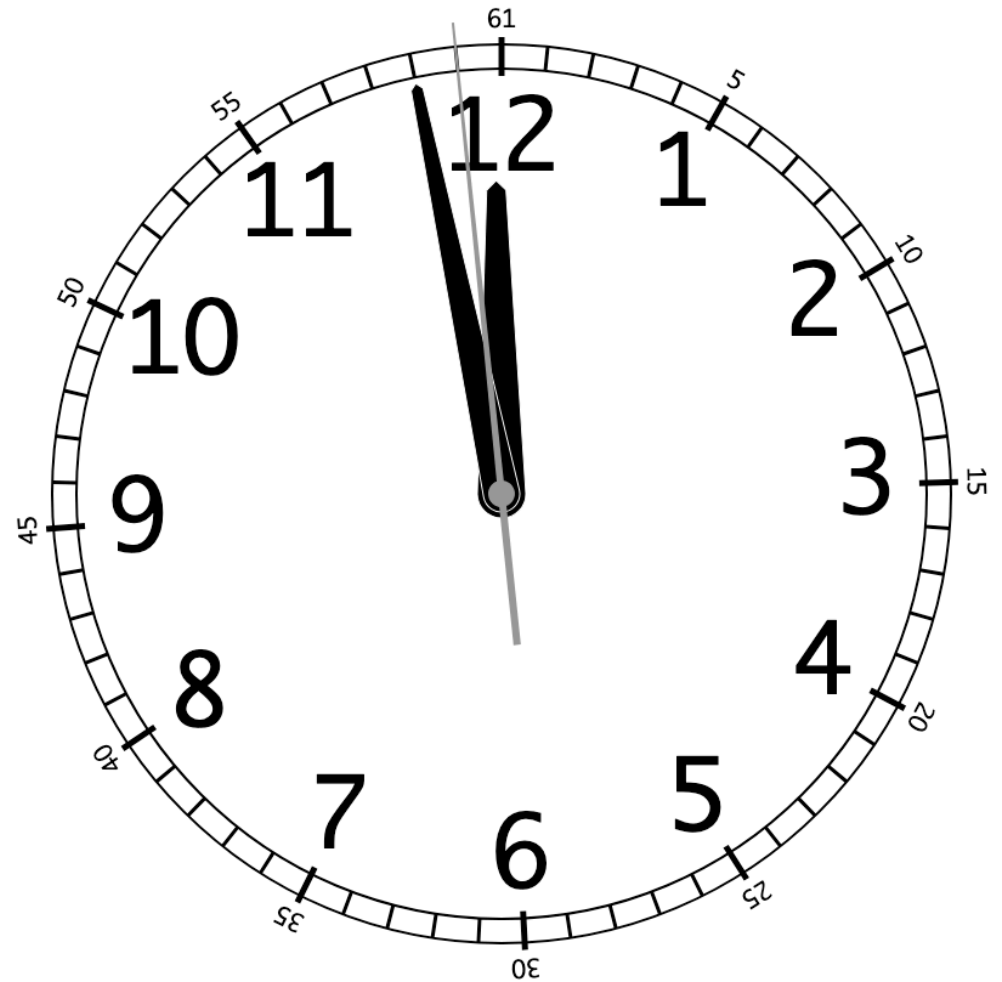
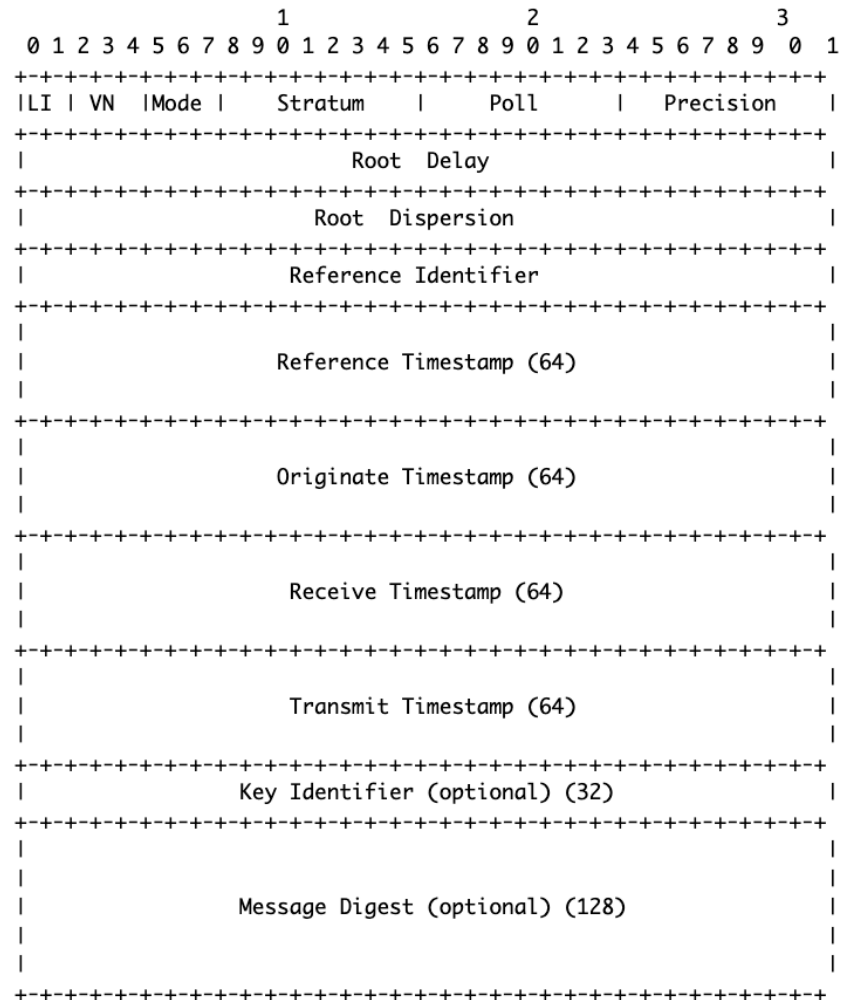


Where does
my computer
get the time from?



Where does
my computer
get the time from?

NTP



Where does
my computer
get the time from?

NTP

David Mills

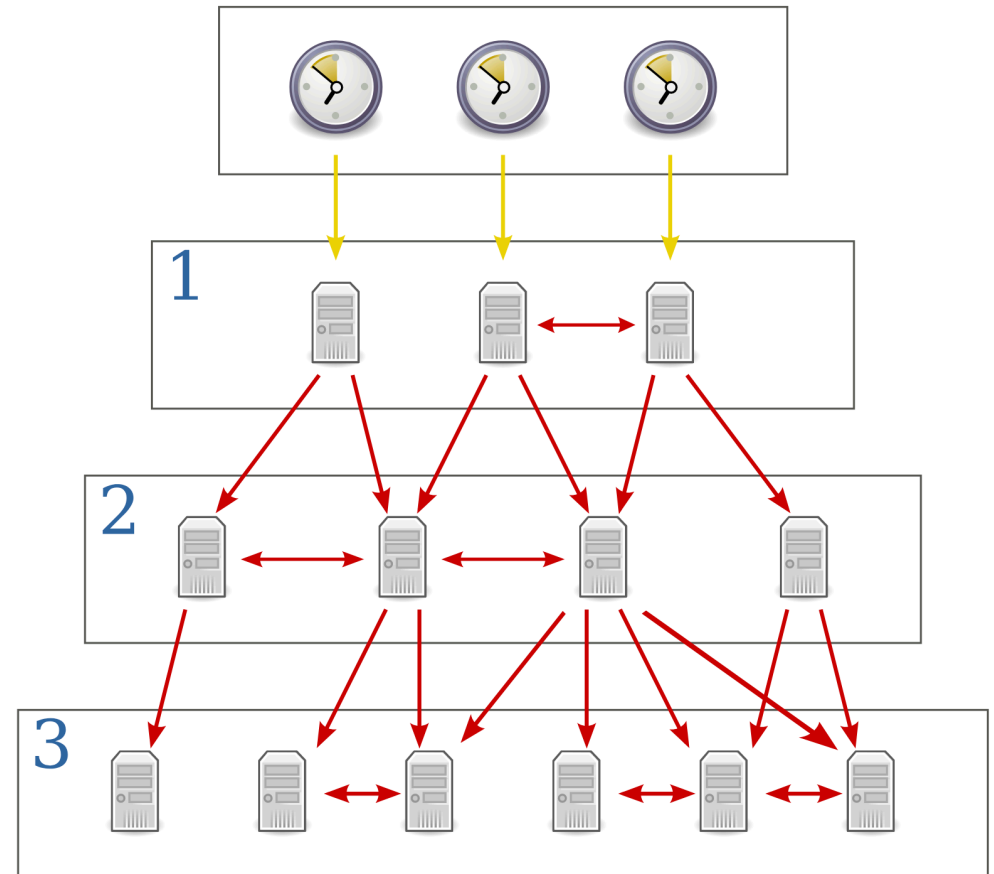


Where does
my computer
get the time from?

NTP

Where does
NTP
get the time from?

NTP



Where does
NTP
get the time from?

GPS



Where does
NTP
get the time from?

GPS



public domain / gps.gov

Where does
GPS
get the time from?



public domain / gps.gov

Where does
GPS
get the time from?

Schriever ~~AFB~~

Space Force Base

Colorado



Where does
GPS
get the time from?

Schriever ~~AFB~~

Space Force Base

Colorado



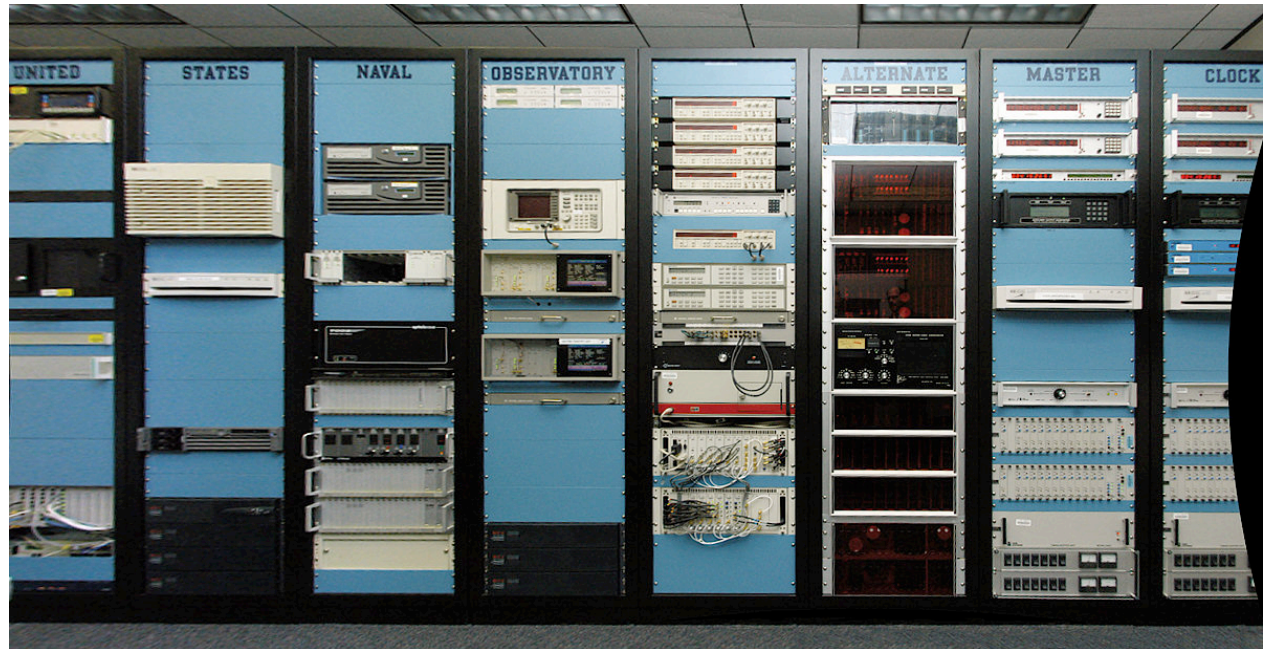
Where does
Schriever SFB
get the time from?



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Where does
Schriever SFB
get the time from?

USNO alternate
master clock



Where does
Schriever SFB
get the time from?

US Naval Observatory
Washington DC



public domain / navy.mil

Where does
the USNO
get the time from?



public domain / navy.mil

Where does
the USNO
get the time from?

atomic clocks



Where does
the USNO
get the time from?

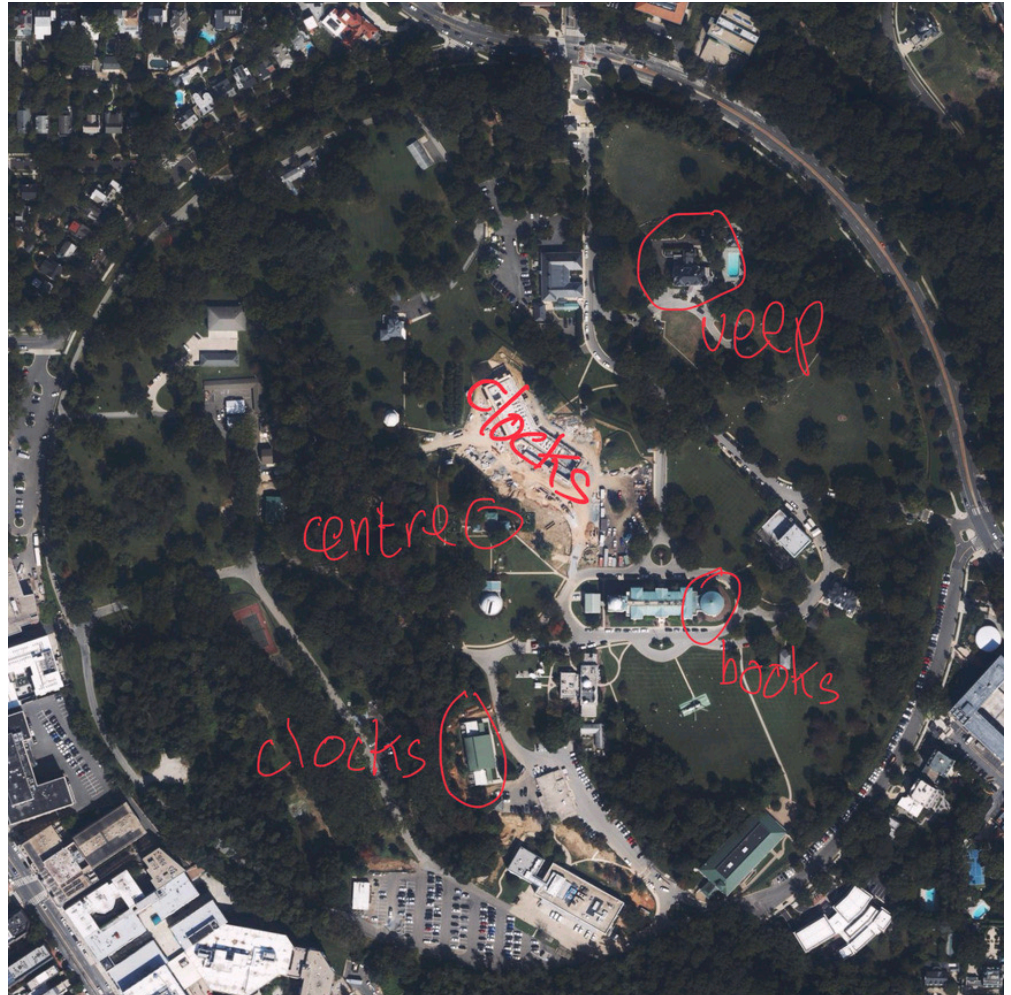
atomic clocks



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Where does
the USNO
get the time from?

atomic clocks



Apple Maps

Where does
the USNO
get the time from?

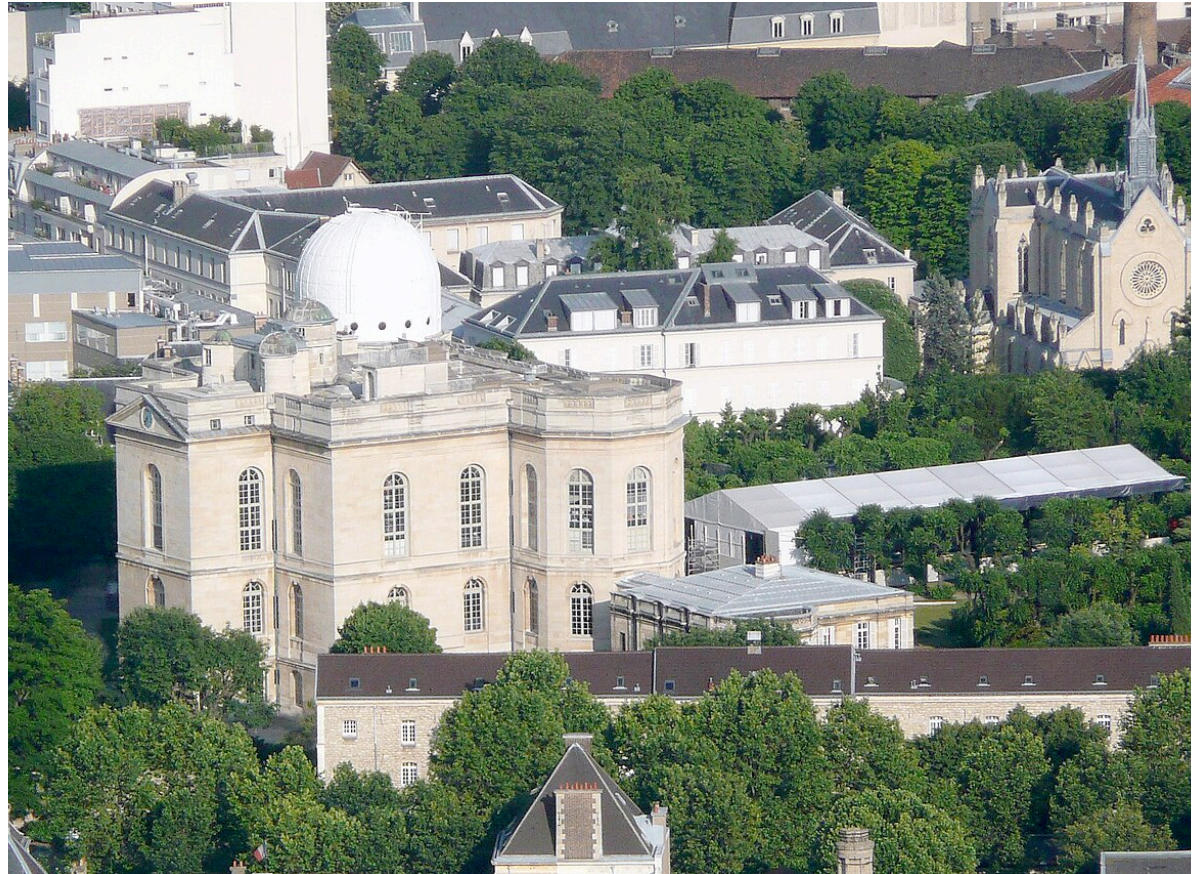


public domain / navy.mil

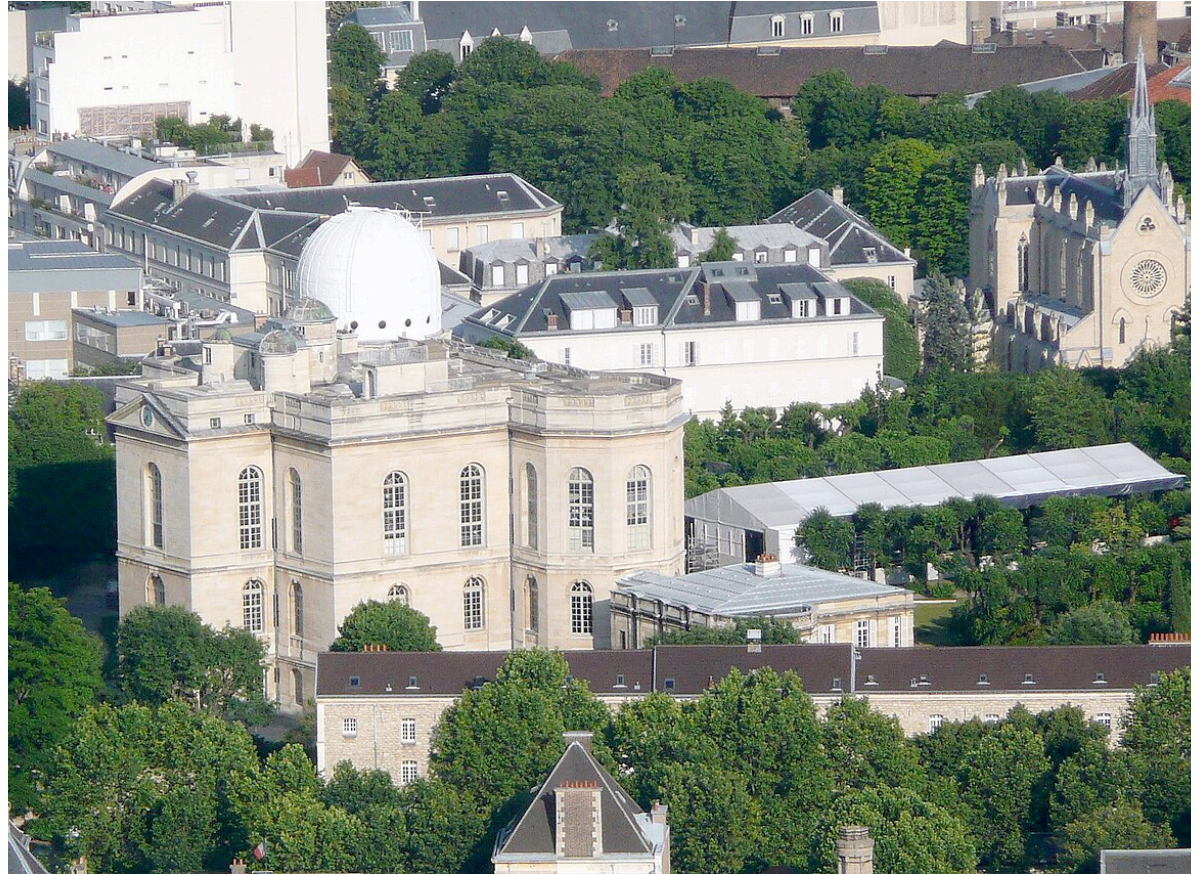
Where does
the USNO
get the time from?

IERS

Observatoire
de Paris



Where does
the IERS
get the time from?



Where does
the IERS
get the time from?

US Naval Observatory
Washington DC



public domain / navy.mil

Where does
the USNO
get the time from?



public domain / navy.mil

Where does
the USNO
get the time from?

BIPM

Sèvres / Saint-Cloud
Paris



Where does
the BIPM
get the time from?



Where does the BIPM get the time from?

NIST, NPL, OP, USNO
etc. usw.

CIRCULAR T 422
2023 MARCH 09, 16h UTC

ISSN 1143-1393

BUREAU INTERNATIONAL DES POIDS ET MESURES
THE INTERGOVERNMENTAL ORGANIZATION ESTABLISHED BY THE METRE CONVENTION
PAVILLON DE BRETEUIL F-92312 SEVRES CEDEX TEL. +33 1 45 07 70 70 tai@bipm.org

The contents of the sections of BIPM Circular T are fully described in the document "Explanatory supplement available at https://webtai.bipm.org/ftp/pub/tai/other-products/notes/explanatory_supplement_v0.6.pdf

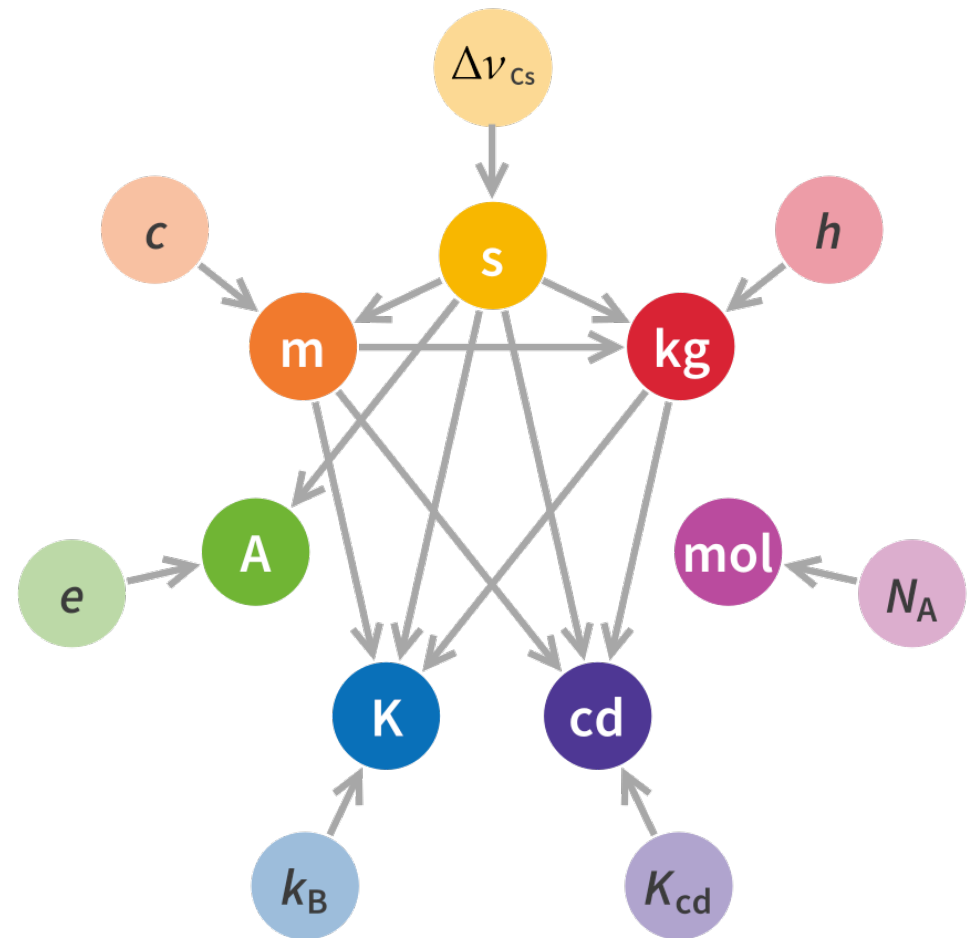
1 - Difference between UTC and its local realizations UTC(k) and corresponding uncertainties.
From 2017 January 1, 0h UTC, TAI-UTC = 37 s.

Date 2023 MJD	0h UTC	JAN 30 59974	FEB 4 59979	FEB 9 59984	FEB 14 59989	FEB 19 59994	FEB 24 59999	Uncertainty/ns	Notes	
Laboratory k		[UTC-UTC(k)]/ns						uA	uB	u
AGGO (La Plata)		1084.8	1075.2	1069.9	1038.4	1048.6	1035.9	0.7	2.9	3.0
AOS (Borowiec)		3.9	4.0	3.5	3.0	2.4	2.3	0.3	3.4	3.4
APL (Laurel)		-0.7	-0.4	-0.2	0.6	0.2	0.7	0.3	19.2	19.2
AUS (Sydney)		-534.0	-527.5	-533.5	-524.0	-504.0	-497.4	0.3	2.9	2.9 (1)
BEV (Wien)		-15.0	-27.5	-16.7	-1.4	-3.5	4.5	0.3	2.9	2.9
BFKH (Budapest)		6631.8	6669.7	-	-	-	6806.8	1.5	20.0	20.1
BIM (Sofiya)		17347.0	17387.7	17432.4	17493.4	17540.5	17574.8	0.3	7.3	7.3
BIRM (Beijing)		5.5	4.2	1.6	-1.8	-1.2	0.9	0.3	3.3	3.3
BY (Minsk)		2.2	2.0	0.5	-1.1	-2.5	-2.3	1.5	3.1	3.4
CAO (Cagliari)		-2160.4	-2268.4	-2382.8	-2497.5	-2611.2	-2732.5	1.5	20.0	20.1
CH (Bern-Wabern)		-1.3	-0.7	-0.7	-0.9	-1.7	-2.7	0.3	1.8	1.8
CNES (Toulouse)		-2.0	-2.9	-2.6	-4.1	-4.5	-3.6	0.3	2.9	2.9
CNM (Queretaro)		-2.7	1.0	3.2	-2.0	-5.5	-2.4	1.5	4.1	4.4
CNMP (Panama)		-1.1	-0.1	-4.4	-0.3	-0.9	-2.8	0.3	5.4	5.4
DFM (Horsholm)		-10.5	-12.7	-14.8	-17.8	-20.5	-23.1	0.3	2.9	2.9
DFNT (Tunis)		7766.7	7861.7	7960.6	8052.1	8147.4	8233.9	0.7	20.0	20.0
DLR (Oberpfaffenhofen)		-1.6	-6.1	-9.3	-8.4	-7.2	-6.7	0.3	2.9	2.9
DMDM (Belgrade)		-13.4	-8.7	0.4	9.7	4.9	6.5	0.3	3.7	3.8
DTAG (Frankfurt/M)		-4.8	-1.2	2.1	5.3	7.3	7.9	0.3	3.2	3.2
EIM (Thessaloniki)		-	-	-	-	-	-	-	-	-
ESA (Noordwijk)		2.2	1.9	1.4	0.3	-0.6	-1.1	0.3	2.8	2.8
HKO (Hona Kona)		990.8	47.1	53.2	57.6	77.3	87.2	0.3	3.5	3.5 (2)

Where does
the BIPM
get the time from?

Systeme internationale
d'unités

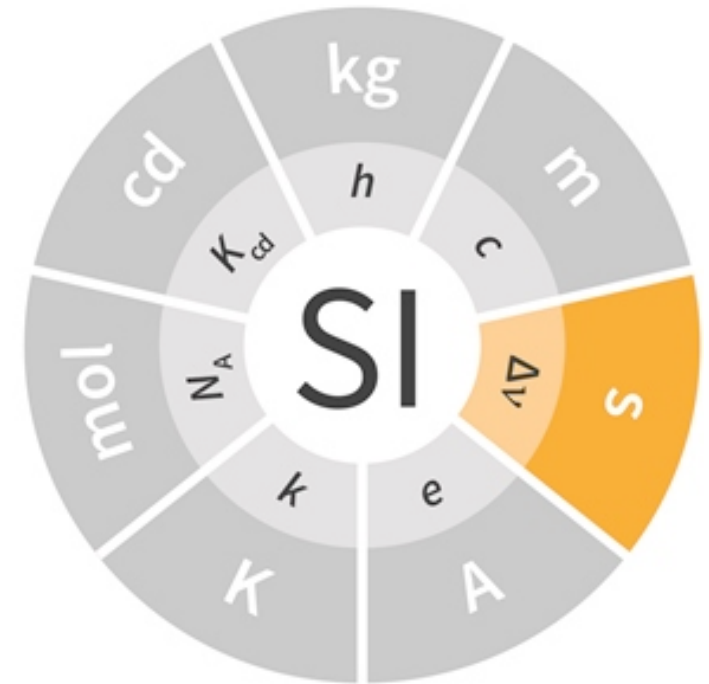
Conférence générale
des poids et mesures



Where does
the BIPM
get the time from?

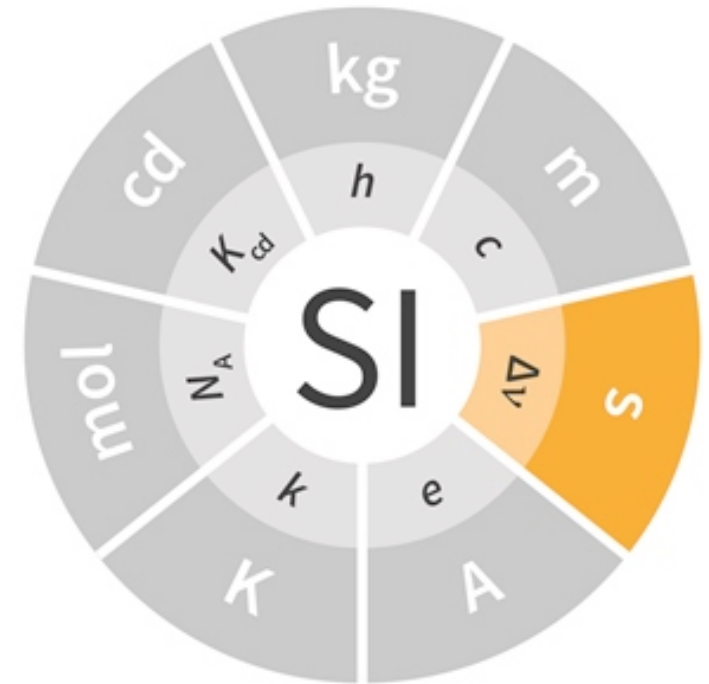
Systeme internationale
d'unités

Conférence générale
des poids et mesures



$$1 \text{ s} = \frac{9\,192\,631\,770}{\Delta\nu_{Cs}}$$

Where did
the CGPM
get the time from?



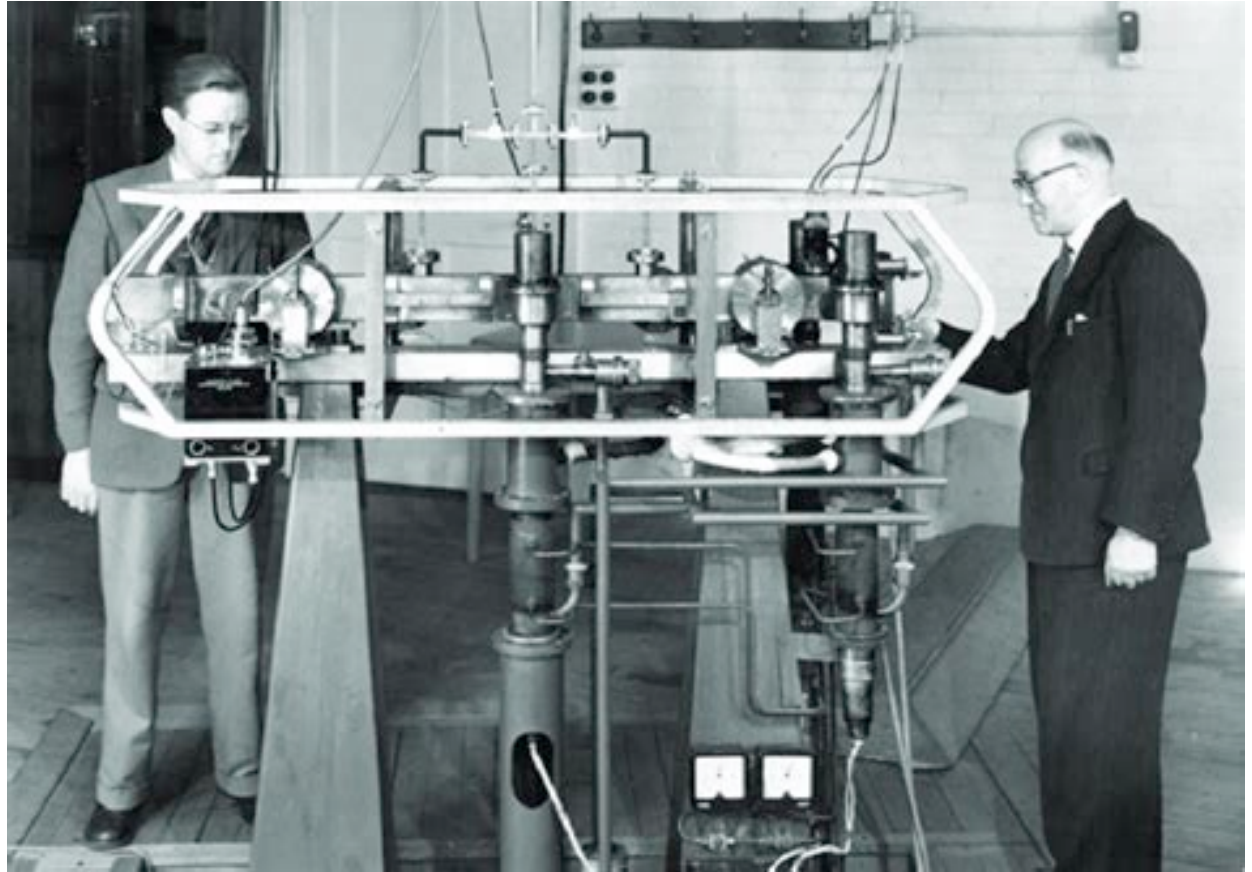
$$1 \text{ s} = \frac{9\,192\,631\,770}{\Delta\nu_{Cs}}$$

Where did
the CGPM
get the time from?

Essen & Parry

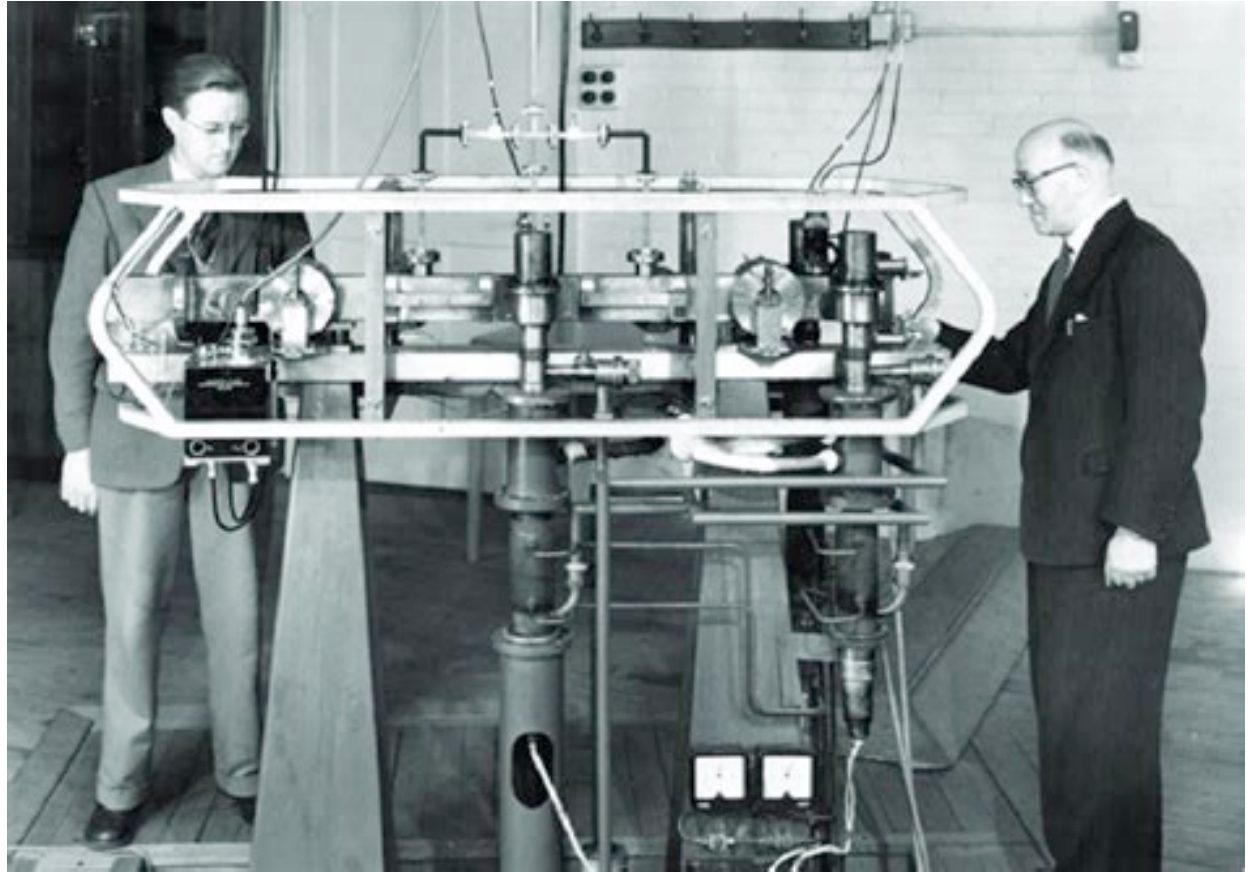
NPL

Teddington



public domain / NPL

Where did
Essen & Parry
get the time from?



public domain / NPL

Where did
Essen & Parry
get the time from?

US Naval Observatory
Washington DC



public domain / navy.mil

Where did
the CGPM
get the time from?

Markowitz (USNO)

WWV (NBS)

Essen (NPL)



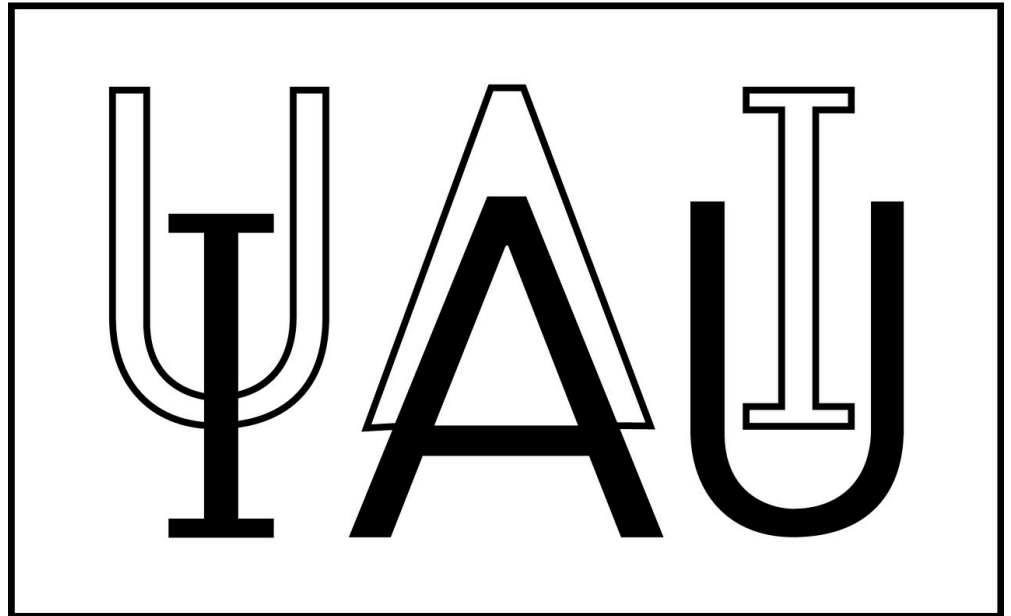
USNO



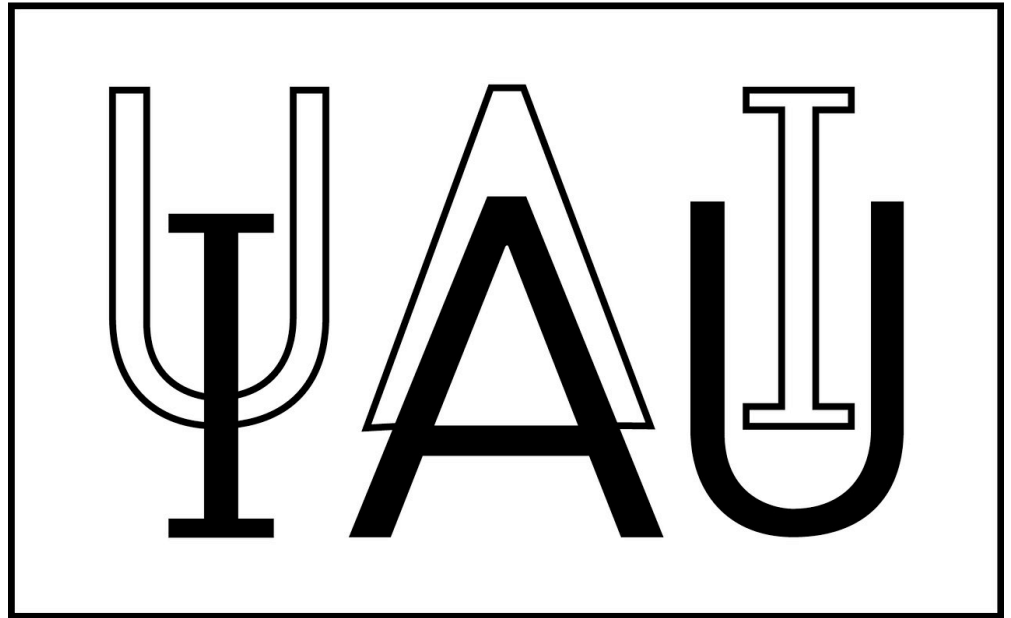
NPL

Where did
Markowitz
get the time from?

IAU general assembly
Rome 1952



Where did
the IAU
get the time from?



Where did
the IAU
get the time from?

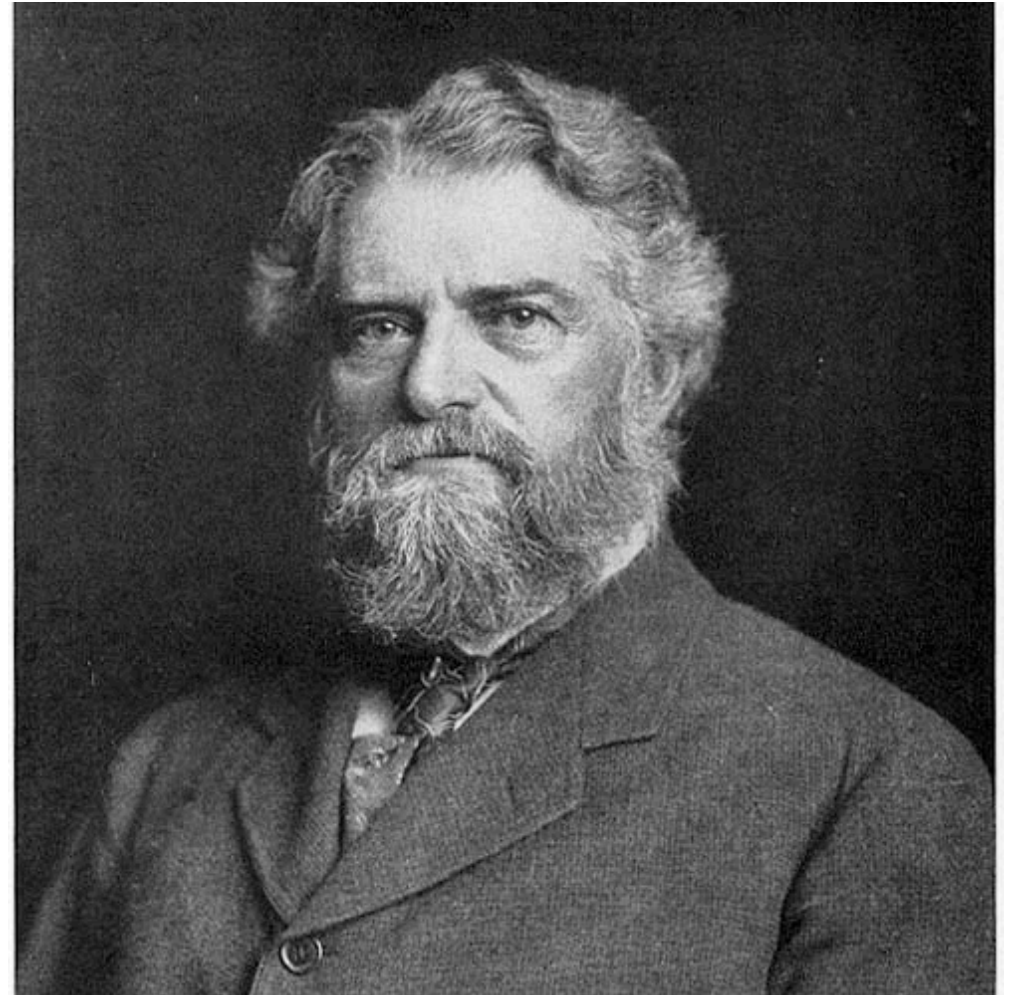
Simon Newcomb

1896

TABLES
OF THE
MOTION OF THE EARTH
ON ITS AXIS
AND AROUND THE SUN
BY
SIMON NEWCOMB.

Where did
the IAU
get the time from?

Simon Newcomb



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**Where did
the IAU
get the time from?**

**Simon Newcomb
USNO and
nautical almanac office**



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