

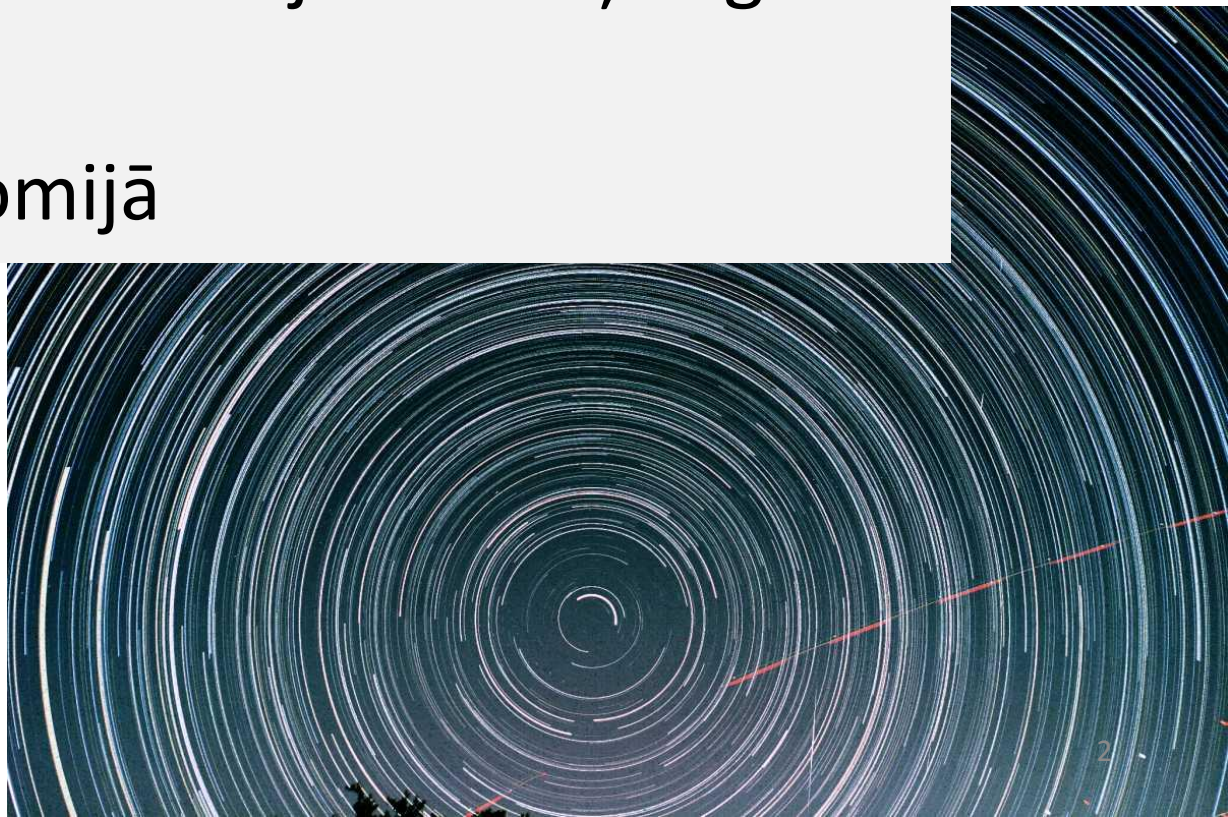
Laika vienādojums un tā pielietojums

Mārtiņš Gills

LAB sanāksme, 2013.05.08

Gandrīz ideāla laika skaitīšana

- Zvaigžņu laiks
- Novērojam ļoti tālu esošus objektus
- Minimālas Zemes rotācijas izmaiņas gadu tūkstošu laikā
- Pielieto astronomijā

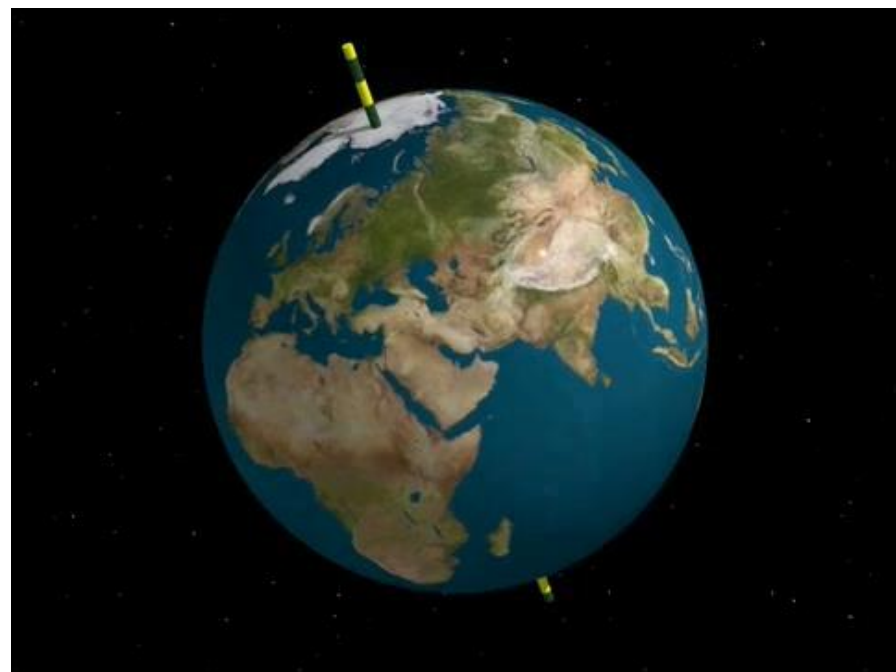


Zemes rotācija ap savu asi

Attiecībā pret zvaigznēm

23h 56m 4,098 903 691s

Bet – praktiskas grūtības ar
zvaigžņu novietojuma
fiksēšanu



Ērtāk izmantot Sauli

- Saule – labi saskatāms objekts
- Diennakts, 24h 00m 00s



Saulei specifiskais

- Atšķirīga situācija:
 - novērojam relatīvi tuvu esošu objektu
 - gada laikā tā atrašanās vieta (leņķiskais augstums) pie debess mainās
- Problēma – leņķiskais Saules kustības ātrums pie debess gada laikā mainās!
- **Diennakts garums ir vidējā vērtība, un nav spēkā katru dienu.**



(c) Ladányi Tamás



(C) 2012 Tunc Tezel

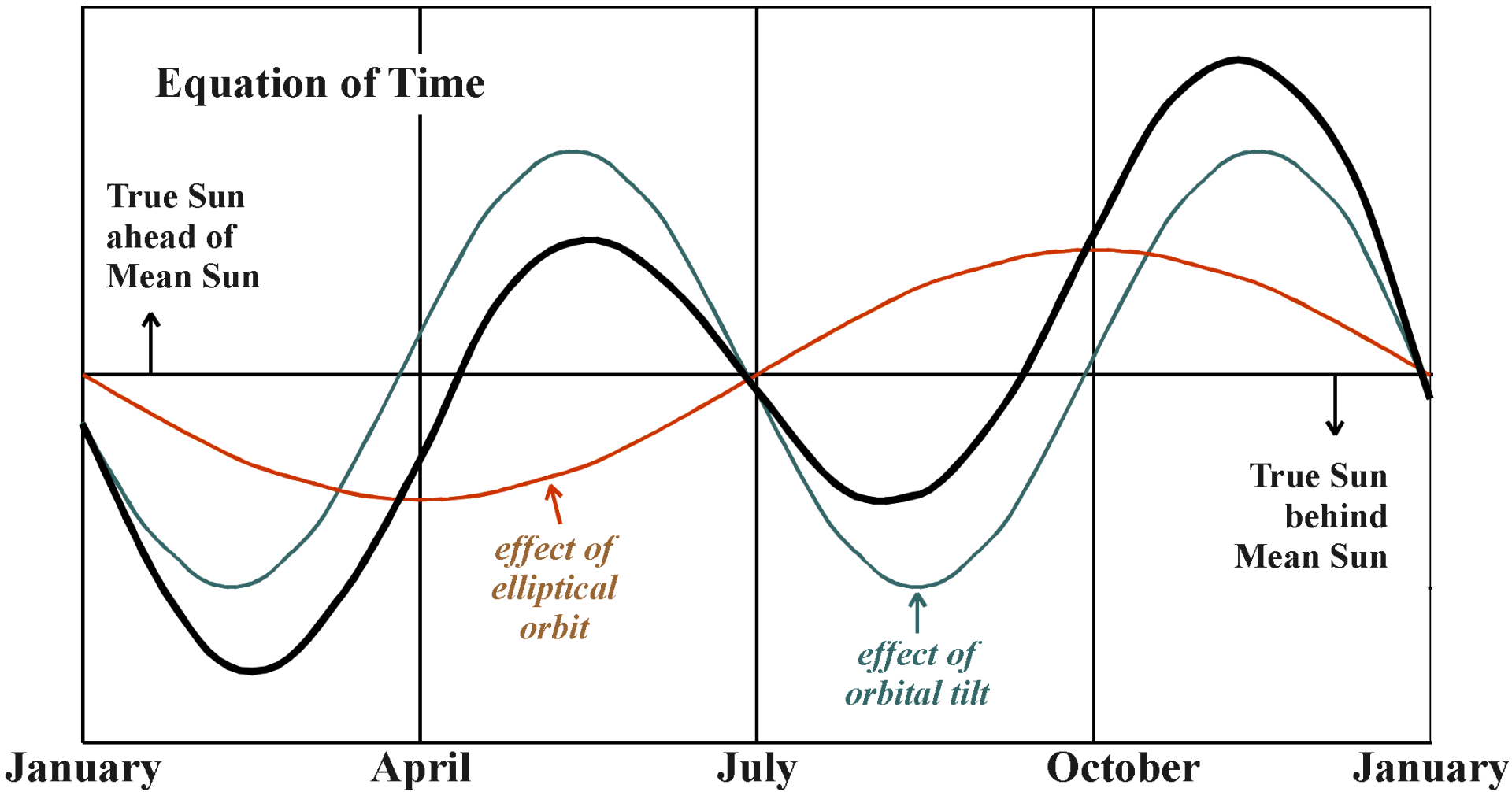
Laika vienādojums

$$T_E = T_R - T_M$$

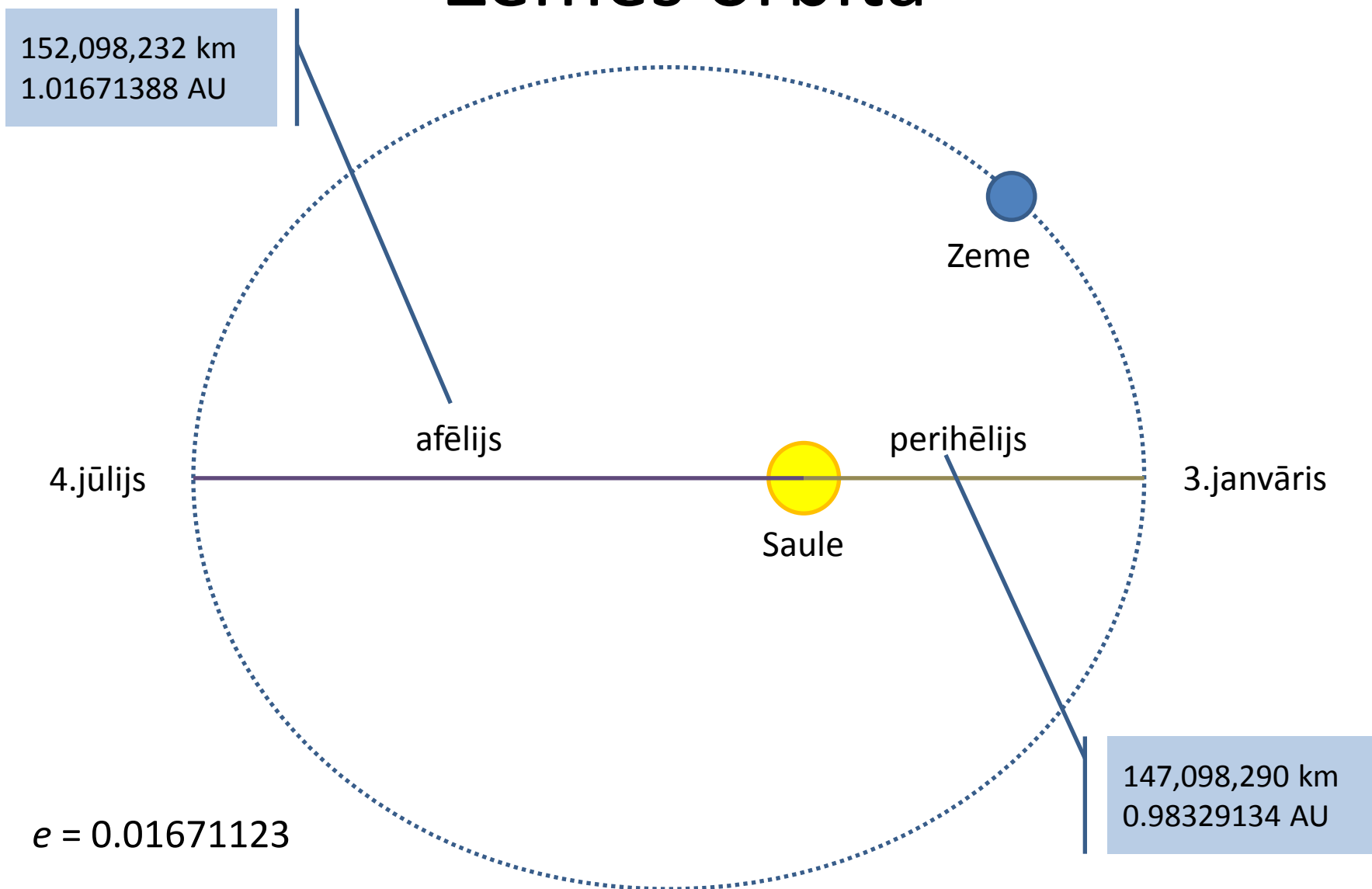
Laika vienādojums =

Saules reālajai pozīcijai atbilstošais laiks –

Saules vidējai pozīcijai atbilstošais laiks



Zemes orbīta



Ekliptika

A

R

Capella

Jupiters

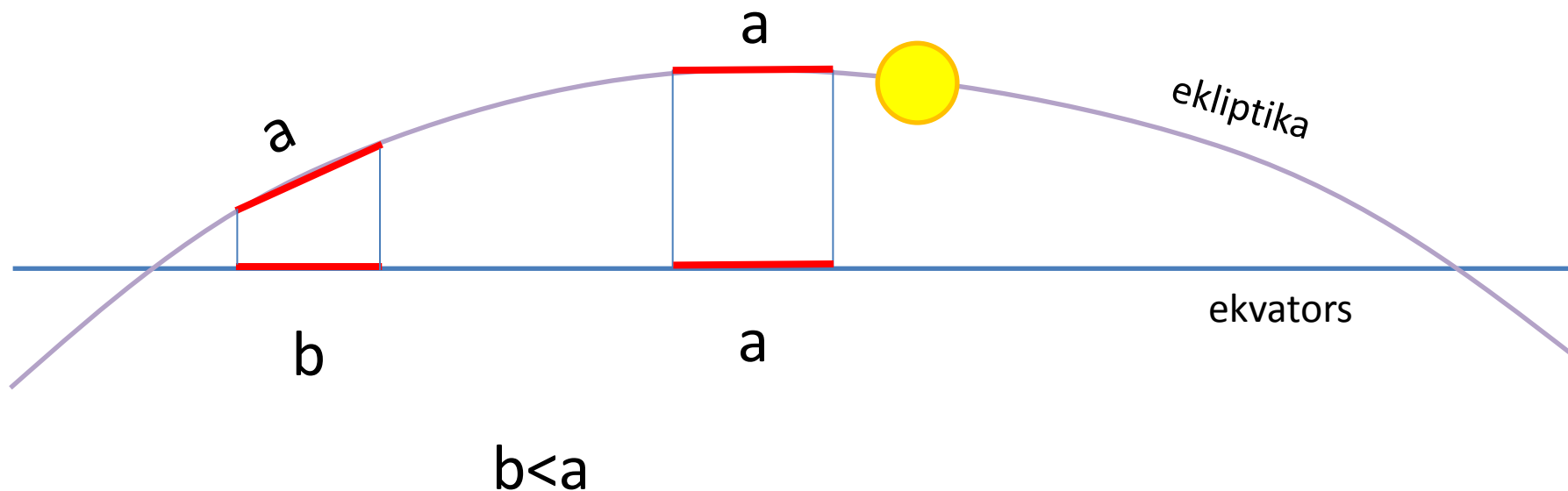
Prócyon

Betelgeuse

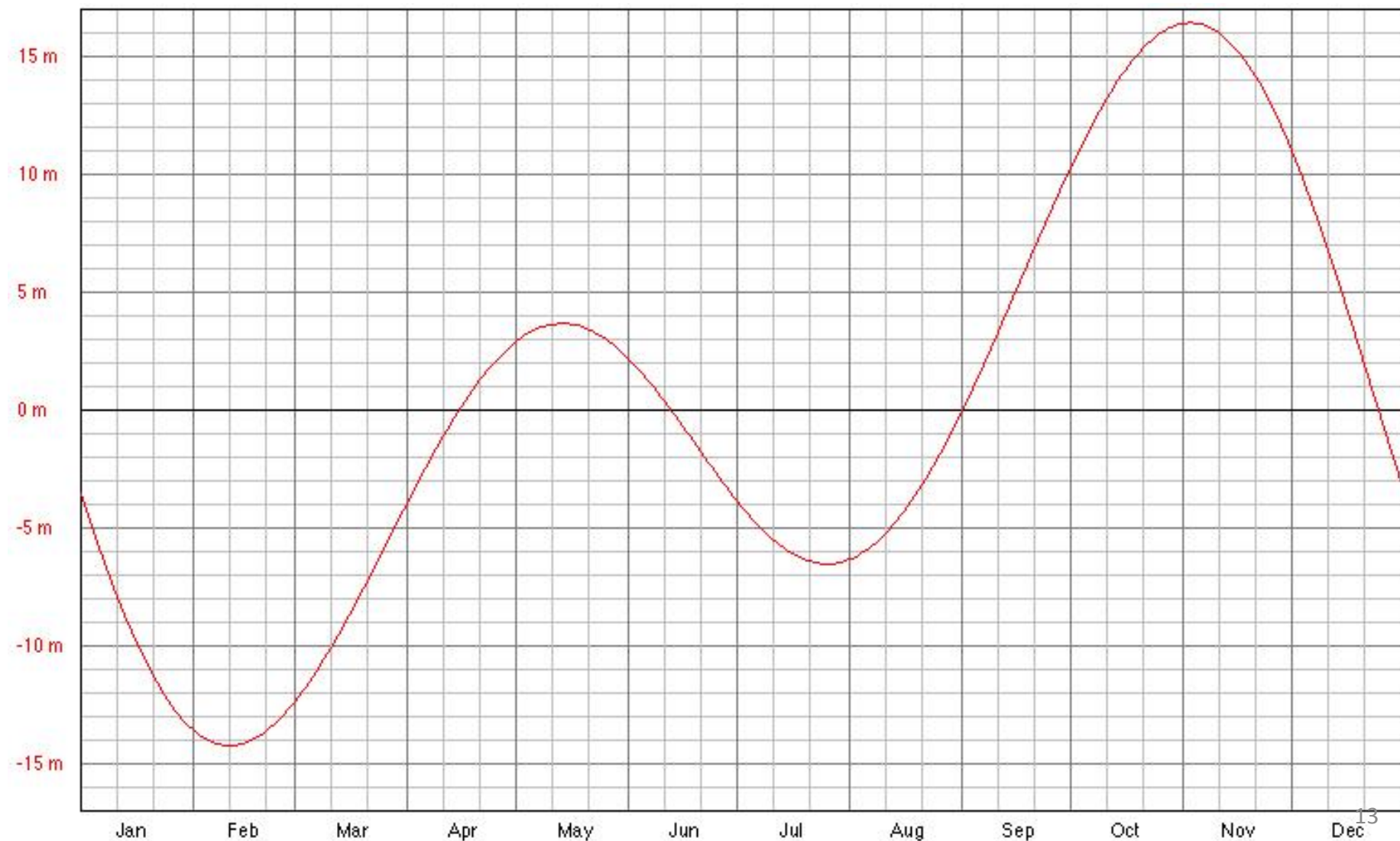
Rigel

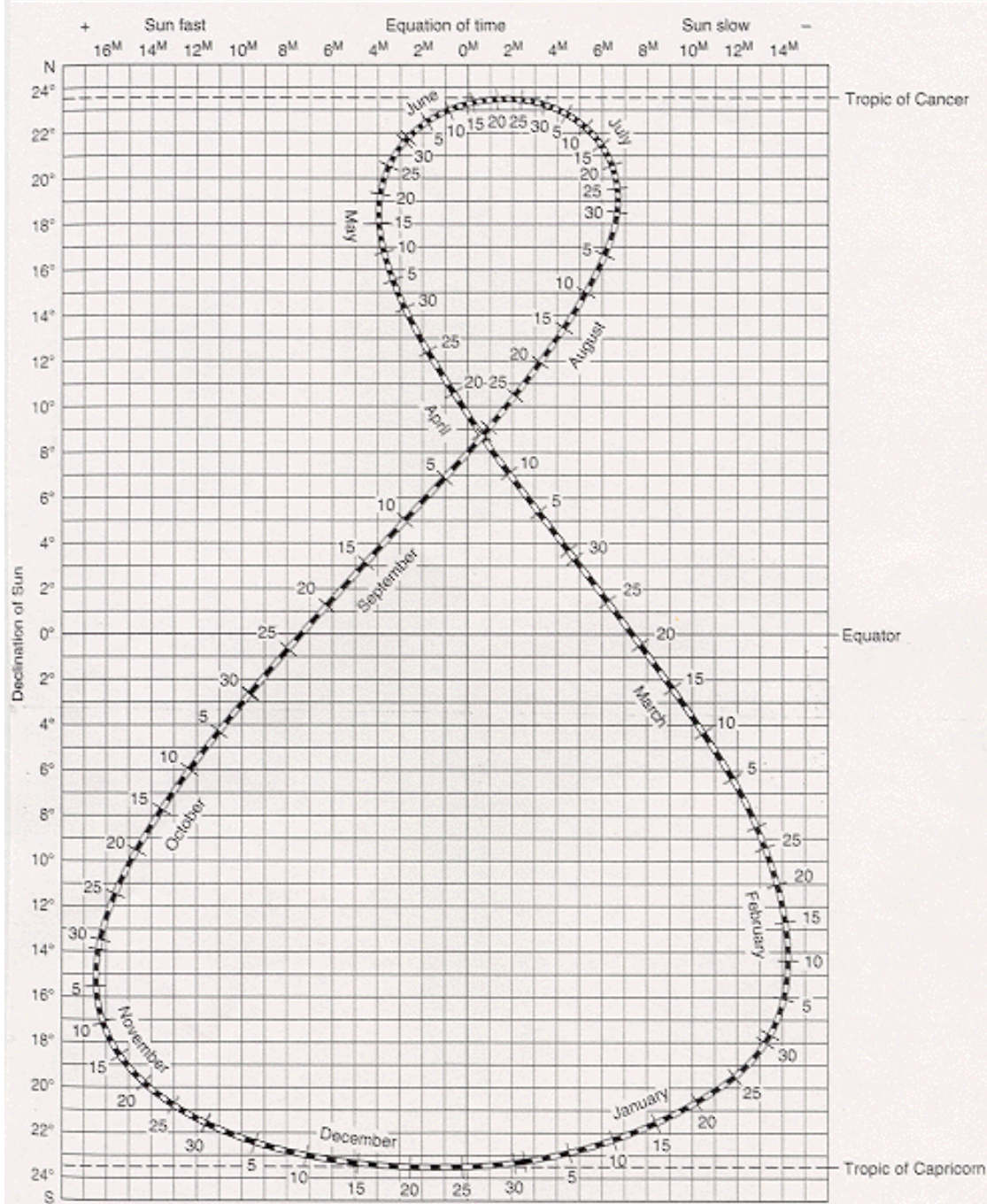
23,5°

Leņķiskā ātruma izmaiņas



Summārais laika vienādojums





The analemma. Data courtesy of U.S. Coast and Geodetic Survey.

Laika vienādojums saules
pulksteņos

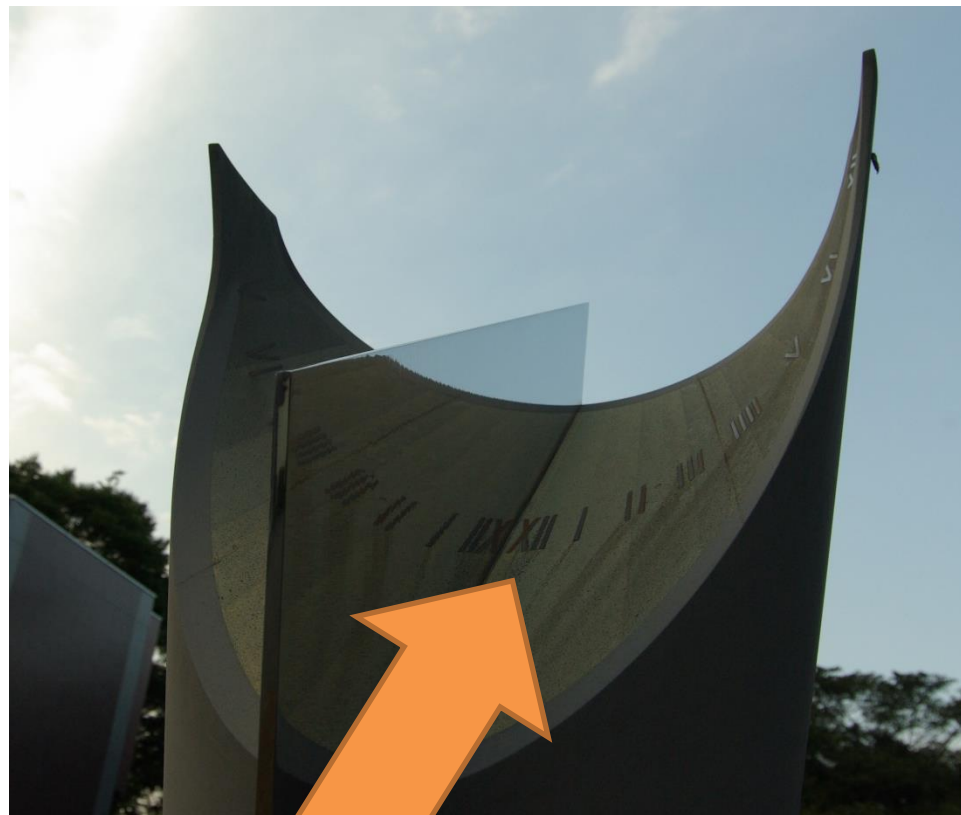
Ko rāda vietējā laika saules pulksteņi:



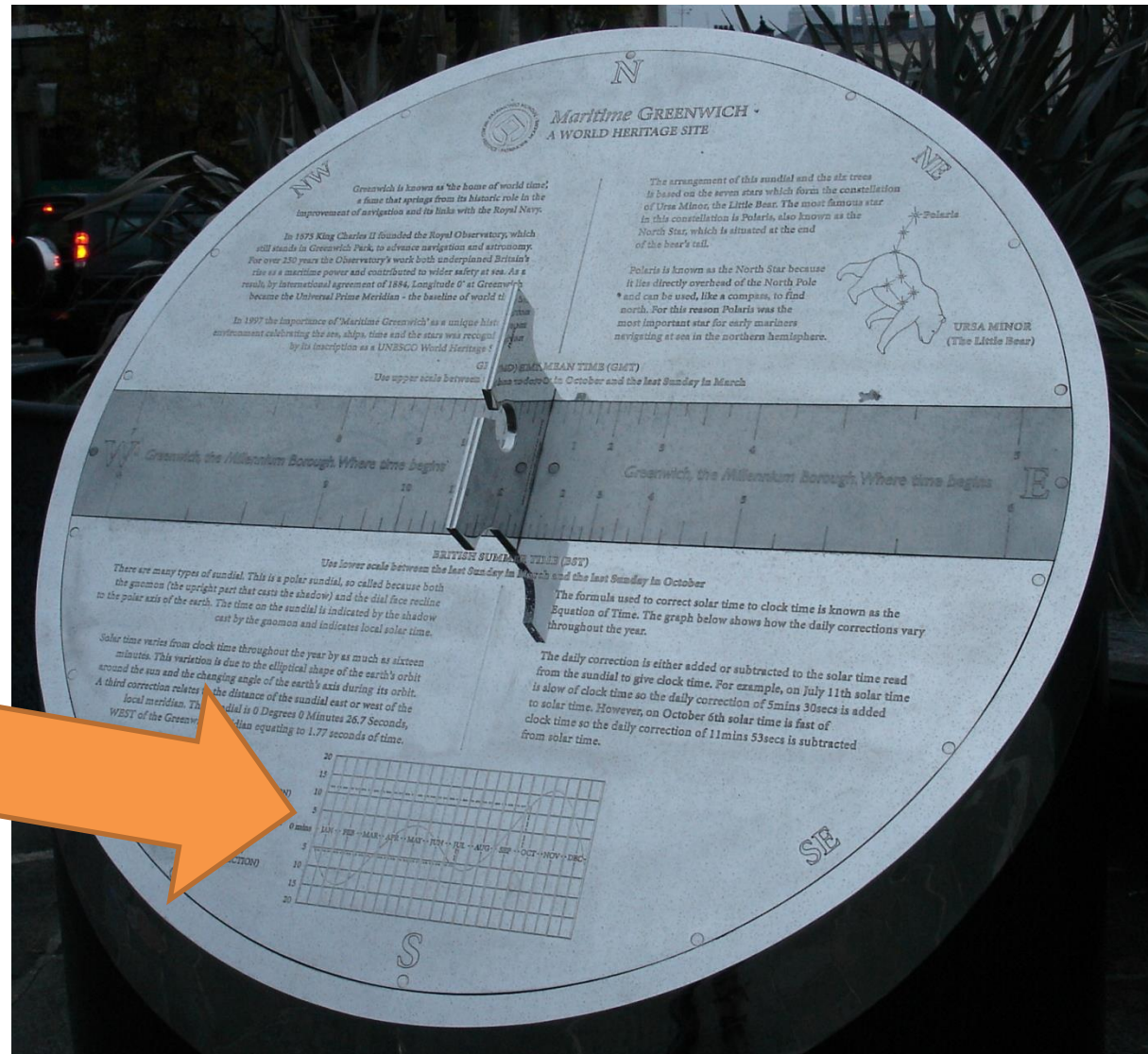
Pusdienas laiks (dienas vidus, Saule ir dienvidos) ir pl 12.

Ko rāda jostas laika saules pulksteņi:

Pusdienas laiks ir pl. 12 tikai tad, ja pulkstenis atrodas uz attiecīgās laika joslas meridiāna. Pārējos gadījumos pl. 12 ir novirzīts par laiku, kas atbilst joslas meridiāna un attiecīgās vietas ģeografiskā garuma starpībai.

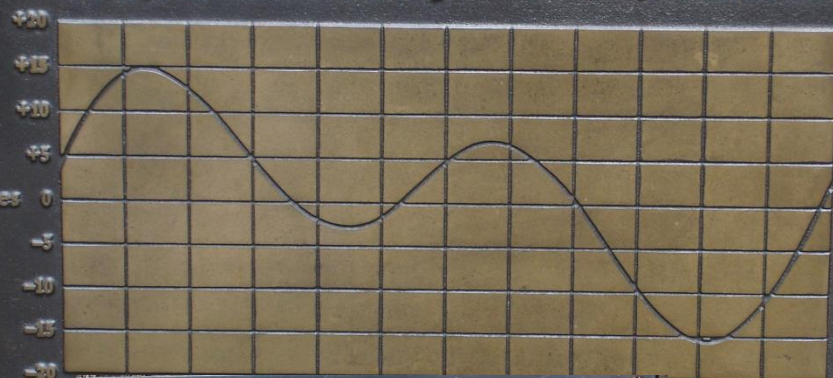


Papildu grafiks/tabula precīzam laikam



The Seven Dials Sundial Pillar - How To Tell The Time

The Sundials show local apparent solar time. To convert this to Greenwich Mean Time (GMT) use the graph below. Find today's date and add or deduct the number of minutes shown (+ or - on the graph) to the time showing on the sundials, to obtain GMT.

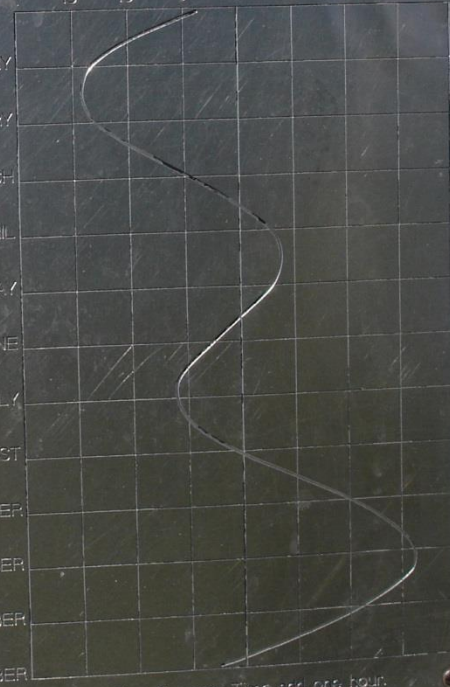


Example:
Nov 1 6 m
Sundial time 1200
Correction from graph -16
GMT 1144

Greenwich Mean Time may be obtained by applying a correction shown in this graph.

ADD MINUTES SUBTRACT
15 10 5 0 5 10 15

JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER



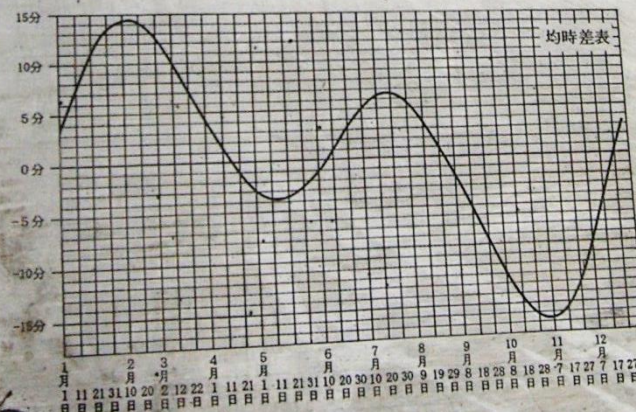
During British Summer Time add one hour



時刻の読み方

上部円形の中央、金属板の斜辺が太陽の光を受けて、ガラス板に影を落とします。
その影の線のところの数字が現在の時刻を示します。
より正確に知るときは、下の均時差表により算出します。

$$\text{平均太陽時(時計の時刻)} = \text{真太陽時(日時計の時刻)} + \text{均時差(表の数値)}$$



寄 贈
祝賀会実行委員会
デザイン
小野行雄
協 力
(有)ユーホー
江州建設
(株)橋建築事務所

Time (GMT) of solar noon at Blackfriars
 When British Summer Time is in operation (add one hour)

Date	January	February	March	April	May	June
1st	12:04	12:13	12:13	12:04	11:57	11:58
11th	12:08	12:15	12:10	12:01	11:57	12:00
21st	12:12	12:14	12:07	11:59	11:57	12:02

Date	July	August	September	October	November	December
1st	12:04	12:07	12:00	11:50	11:44	11:49
11th	12:06	12:06	11:57	11:47	11:44	11:54
21st	12:07	12:03	11:53	11:45	11:46	11:59

Ciparnīcas papildelementi





Stundu līnijas datumiem



שעון שמש
לשעון אידופא

למהצית השנה
מראשון לחודש יולי
עד המש עשרה
לחודש דצמבר

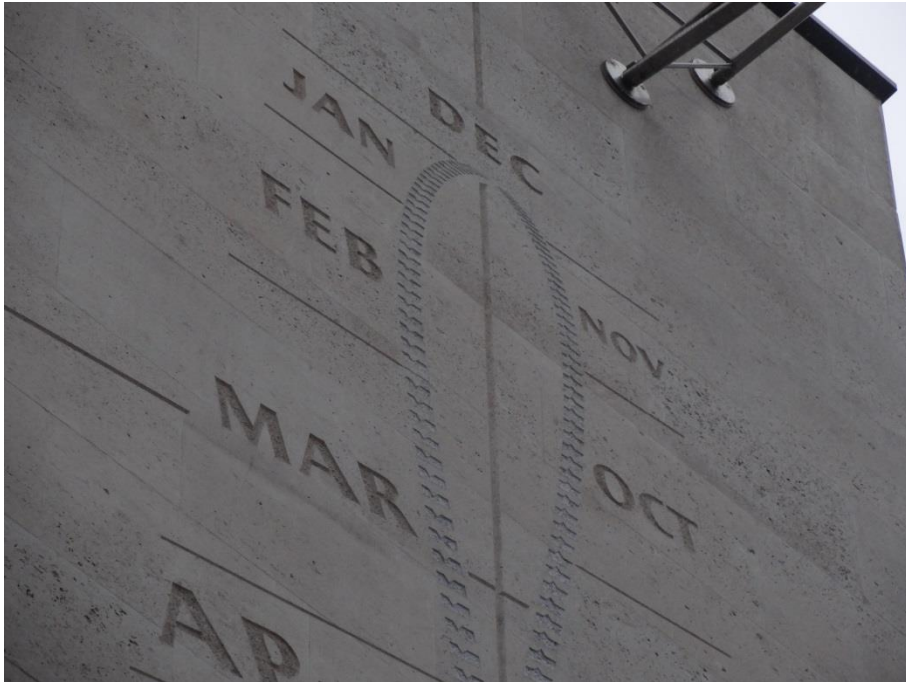
שנה

יאנואר

Gnomona forma



Īpašas stundas markieris



Stundu markieri mēneša vidus datumiem



Analemmatiskie saules pulksteņi





Heliochronometri



Laika vienādojums tehniskās
iekārtās



Laika vienādojums ekskluzīvos
pulksteņos

Girard-Perregaux



287 000 USD

Audemars Piguet



70 000 USD

no instrukcijas...

True noon and mean noon

You can see a tremendous difference when observing the exact time on a wristwatch at which **true noon** occurs for several days in a row. Over the entire year, **true noon** occurs sometimes at the **mean noon**, sometimes earlier, sometimes later. This positive or negative difference between **mean noon** and **true noon** is called the equation of time.

The "Equation du temps" indicates **true noon** accurately. The **mean noon** at Le Brassus (6°12'0") is indicated on the engraved bezel of the equation of time, at 12.35 CET (Central European Time). The equation of time hand adds or subtracts the value of the equation of time corresponding to the day of the year to indicate **true noon**. The sun's culmination corresponds to the moment when the minute hand is superimposed on the equation of time hand and an equation of time value of +14 minutes is noted. **True noon** is when solar time corresponds to noon, local time.

Let us now turn to **true noon** at different times of year. When solar time indicates that the sun is in its culmination at Le Brassus on 11 February, it is 12.49 CET (Central European Time). The minute hand is superimposed on the equation of time hand and an equation of time value of +14 minutes is noted.

On 15 April, **true noon** occurs at 12.35 at Le Brassus (equation of time 0 min.). **True noon** and **mean noon** (indicated on the equation of time bezel) coincide.

On 3 November, **true noon** occurs at 12.19 CET (Central European Time) at Le Brassus. The equation of time value is -16 minutes.



On 11th February in Le Brassus true noon is at 12:49 pm



On 15th April in Le Brassus true noon is at 12:35



On 3rd November in Le Brassus true noon is at 12:19

Paldies!

Mārtiņš Gills
www.saulespulkstenis.lv