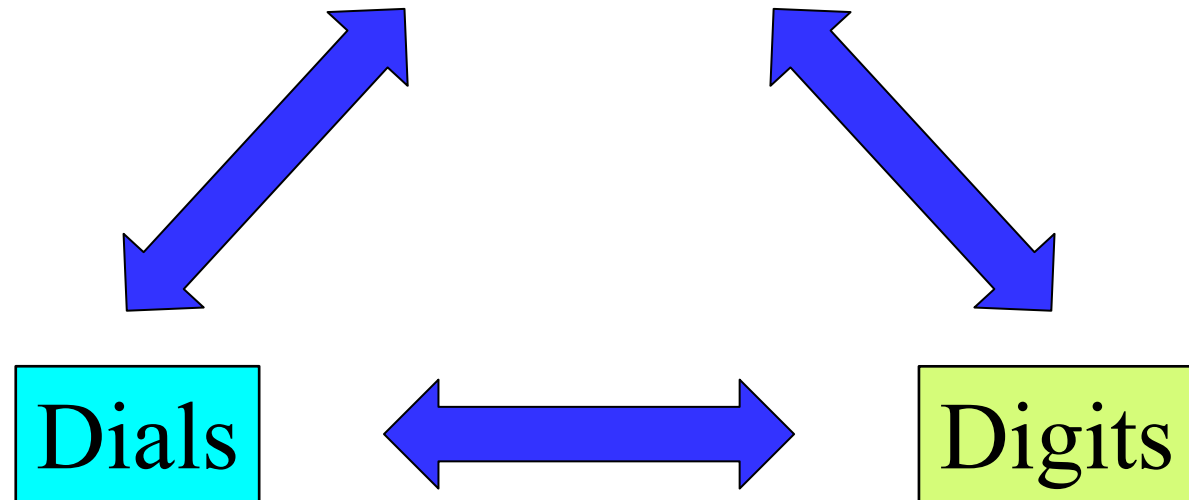


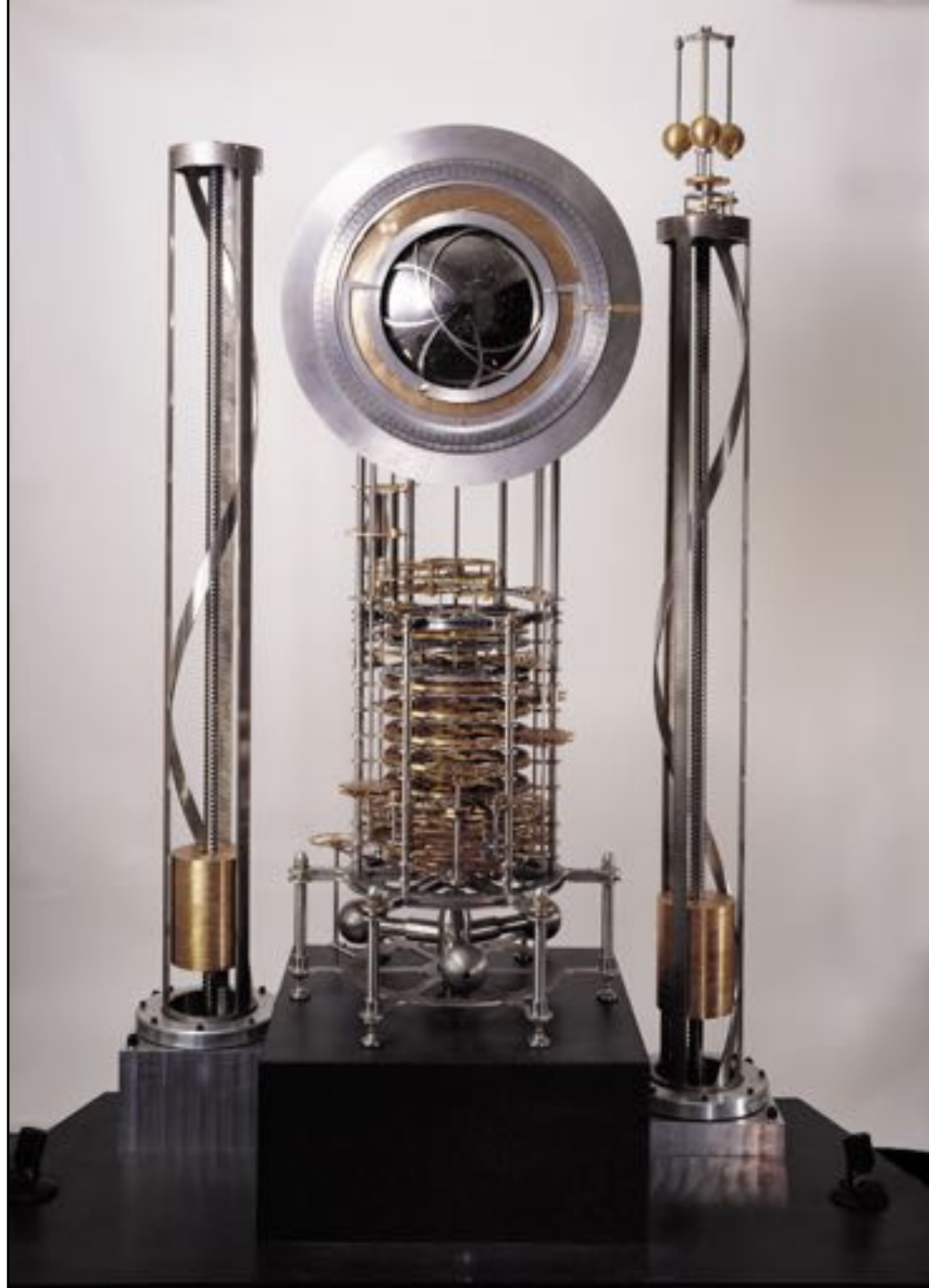
The Analemma



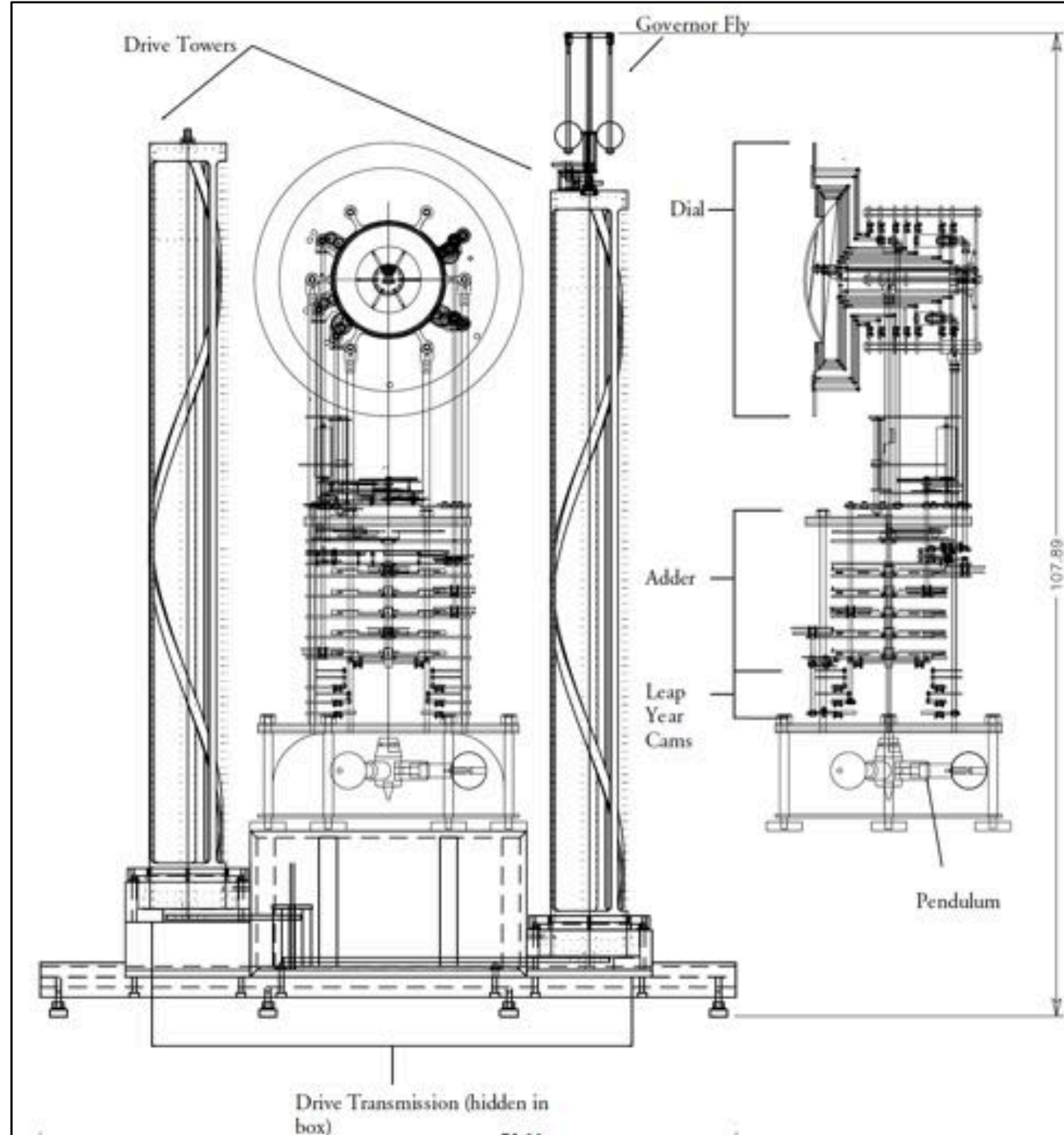
... some unusual combinations

A digression:

The Clock of the Long Now



Its plans are free ☺



It's synchronised with the sun at noon each sunny day

(12) **United States Patent**
Hillis

(10) **Patent No.:** **US 6,612,041 B1**

(45) **Date of Patent:** **Sep. 2, 2003**

(54) **DIURNAL SOLAR EVENT TRIGGERING
MECHANISM**

(75) **Inventor:** **W. Daniel Hillis, Toluca Lake (CA)**

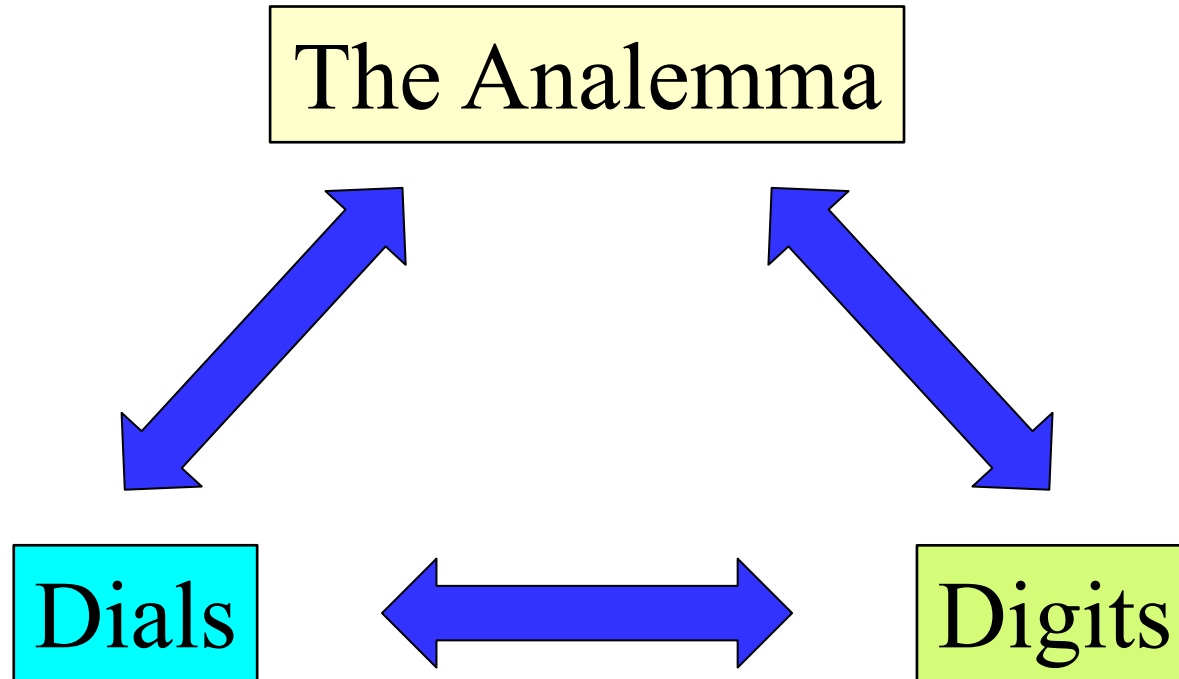
(73) **Assignee:** **The Long Now Foundation, Sausalito,
CA (US)**

(*) **Notice:** Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 179 days.

(21) **Appl. No.:** **09/636,001**

(22) **Filed:** **Aug. 9, 2000**

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... some unusual combinations

The Analemma

Another digression:

The Ptolomaic (earth-centred) view of the universe

Question:

Which of these appears to be the fastest to go round the earth (i.e. takes the least time)?

The Sun?

The Moon?

The 'Superior' Planets?

The Fixed Stars?

Two
volunteers
please

First order approximation of where the Sun will be at, say, 12:00:

On the
north-south
meridian

Second order correction for where the Sun will be at, say, 12:00 in Wellington:

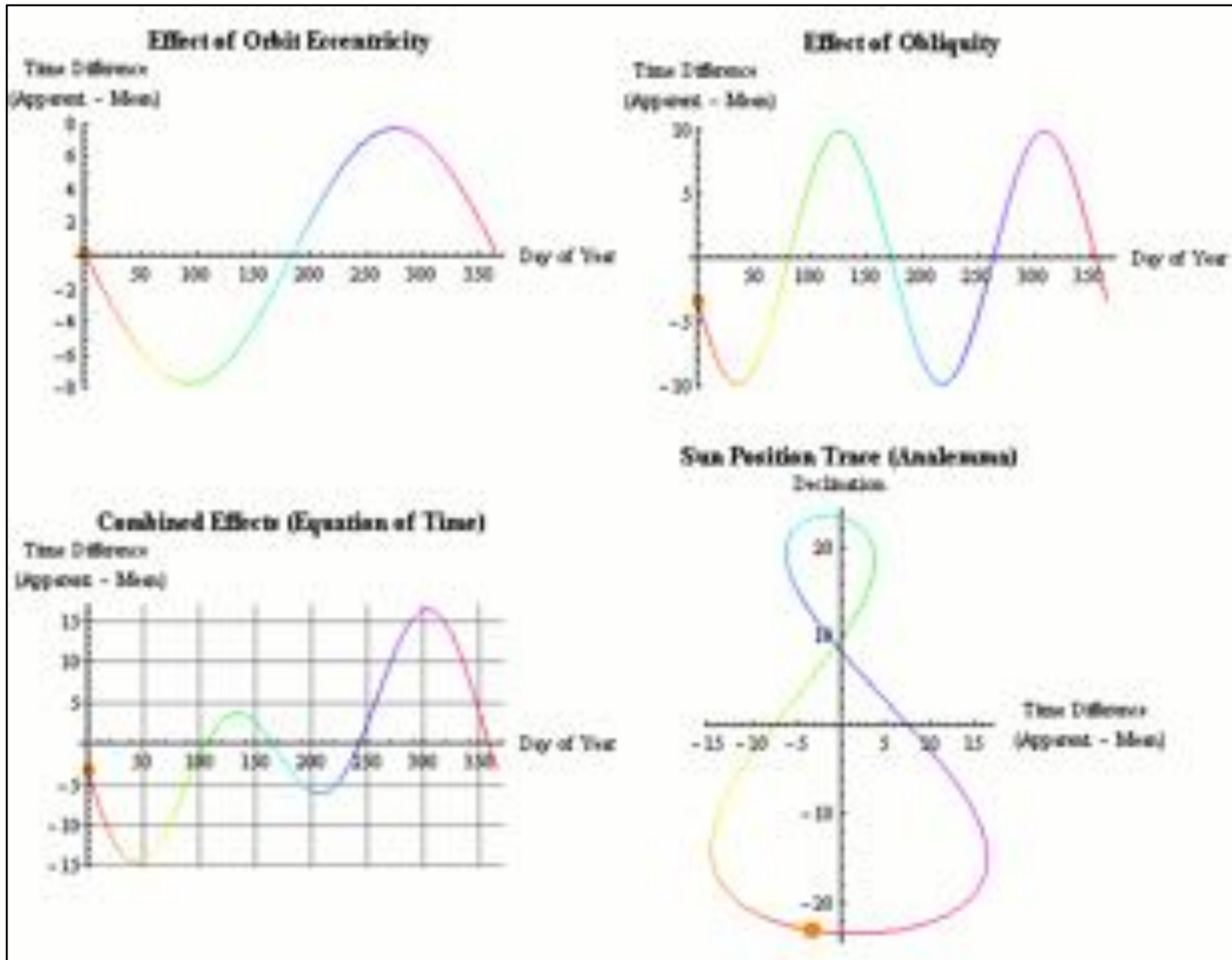
**~4 degrees east of the
north-south
meridian**

For today, 2017-05-03, sunrise is 07:10; sunset is 17:25; therefore Sun is on the meridian at ~12:17; so at 12:00 it will be about 4 degrees to the east

Third order correction for where the Sun will be at, say, 12:00 in Wellington:

~4 degrees east of the
north-south
meridian,
high in summer
low in winter

Fourth and fifth order corrections for where the Sun will be at, say, 12:00 in Wellington:



**The analemma as viewed
from the northern
hemisphere . . .**

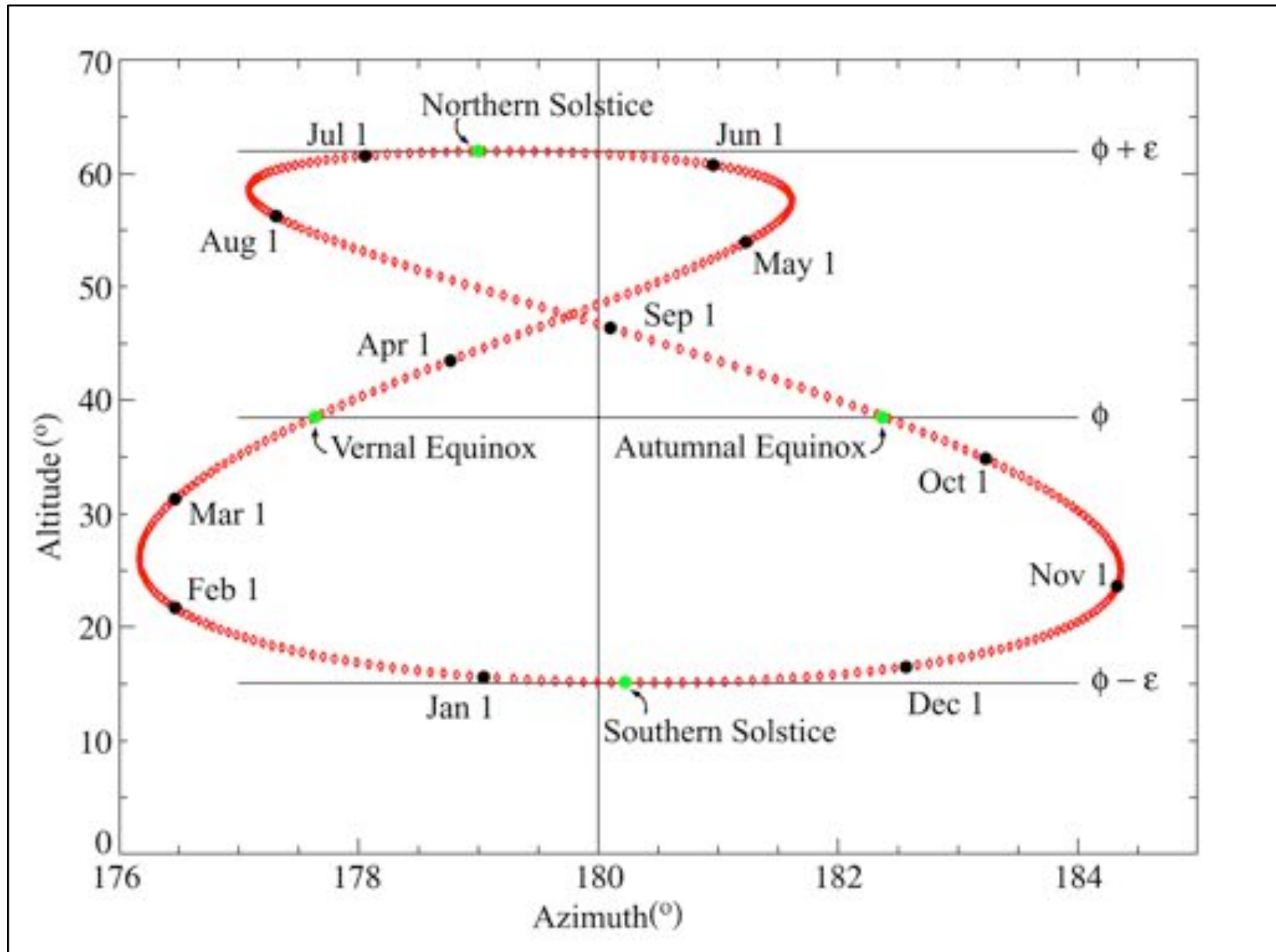


... and as viewed from the southern hemisphere (Buenos Aires)



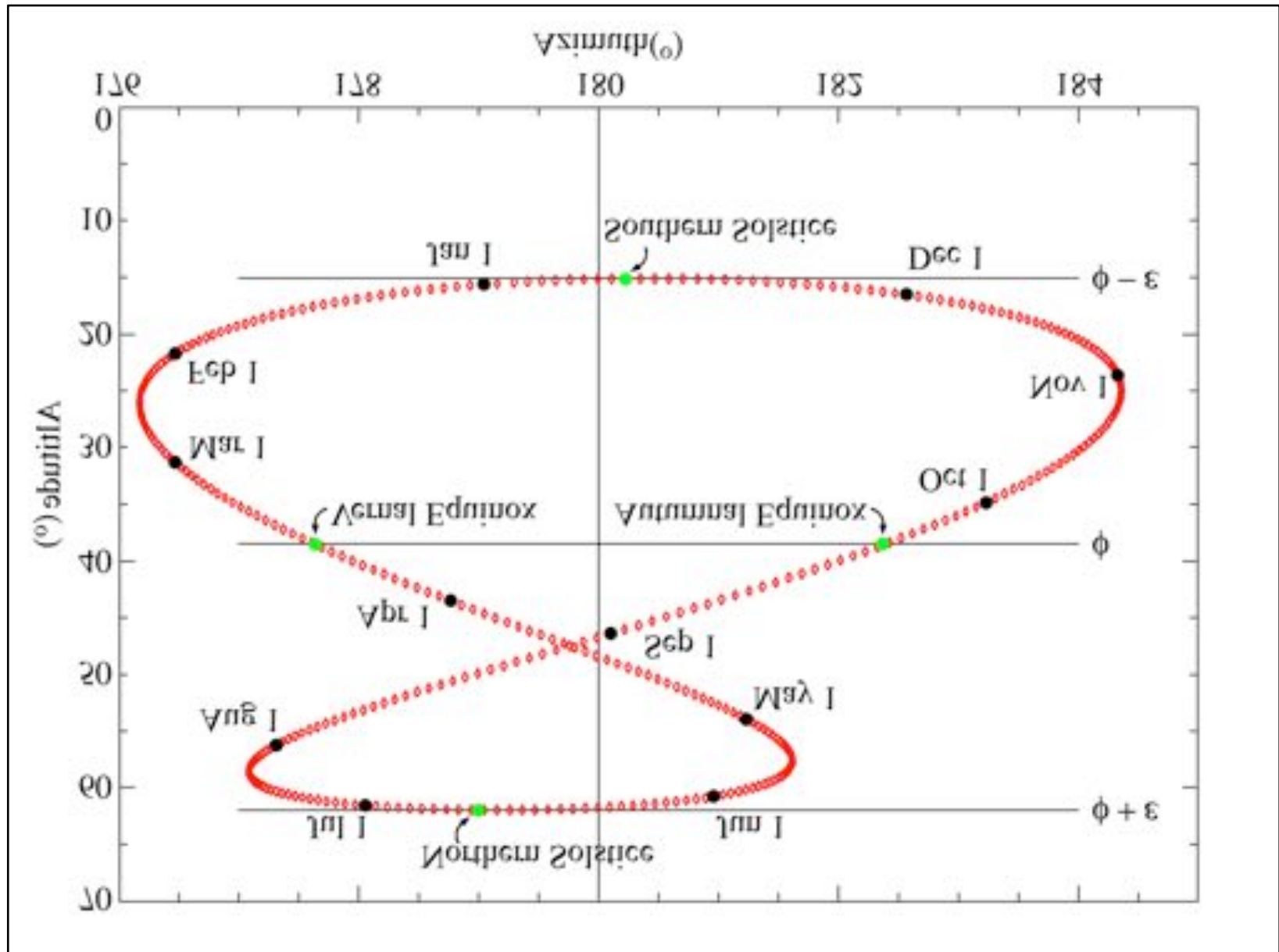
Enzo De Bernardini
Buenos Aires, Argentina
enzo@enzoastro.com

So where was the sun on the analemma today?



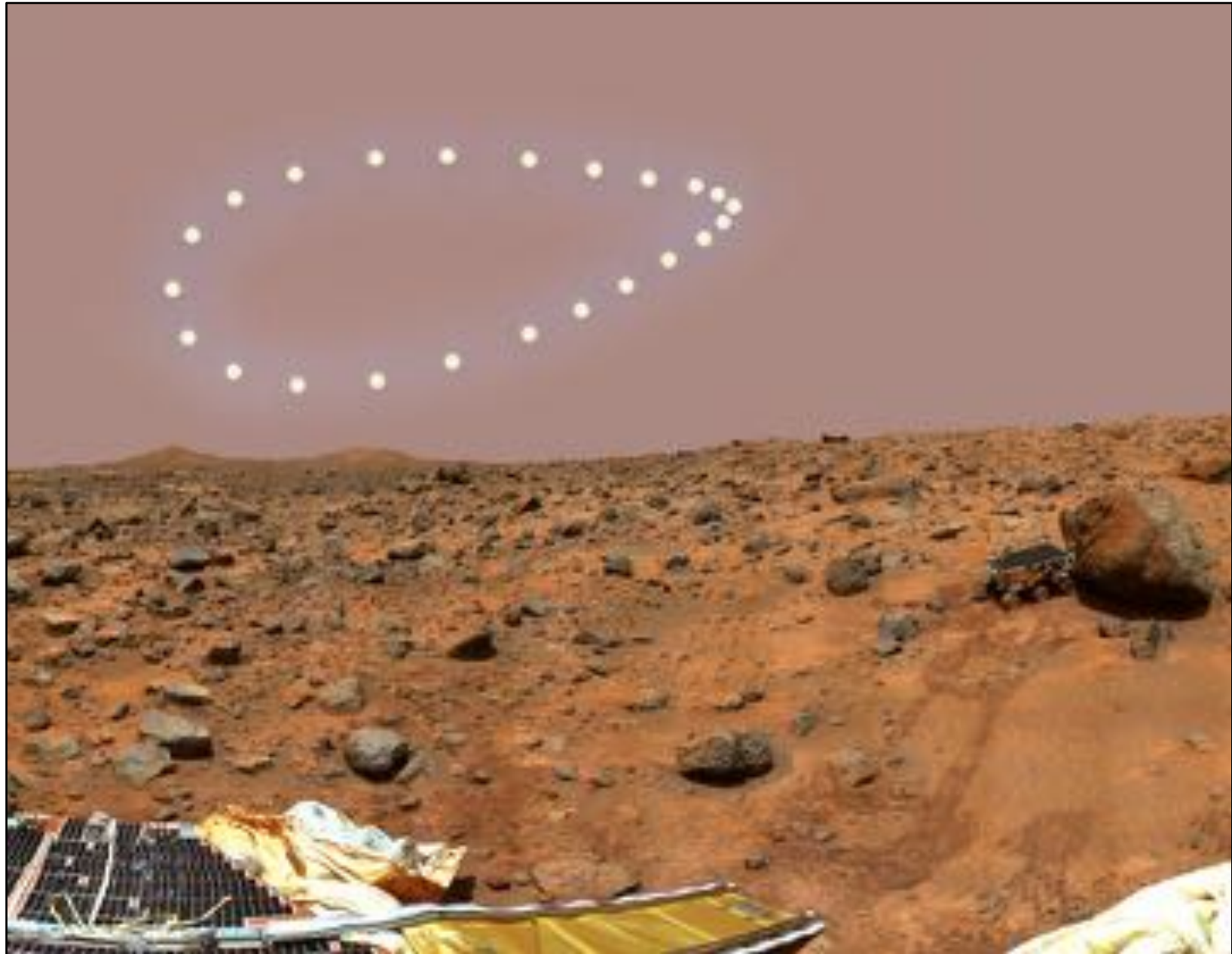
Analemma plotted as seen at noon GMT from the Royal Observatory, Greenwich

So where was the sun on the analemma today – as seen from Wellington?

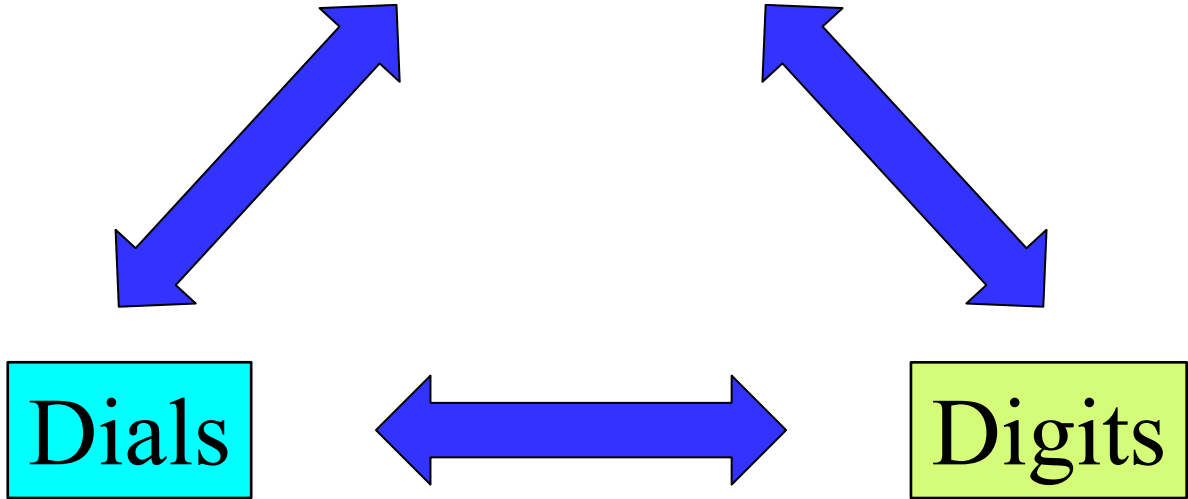


Analemma plotted as seen at noon GMT from Wellington, NZ

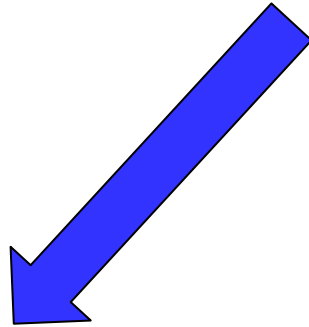
Other planets have different analemmas (note – the image below is a simulation)



The Analemma



The Analemma

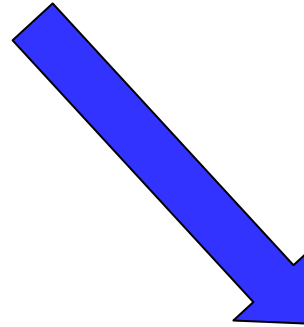


Dials

Why do we know that this is a northern hemisphere sundial and gnomon?



The Analemma

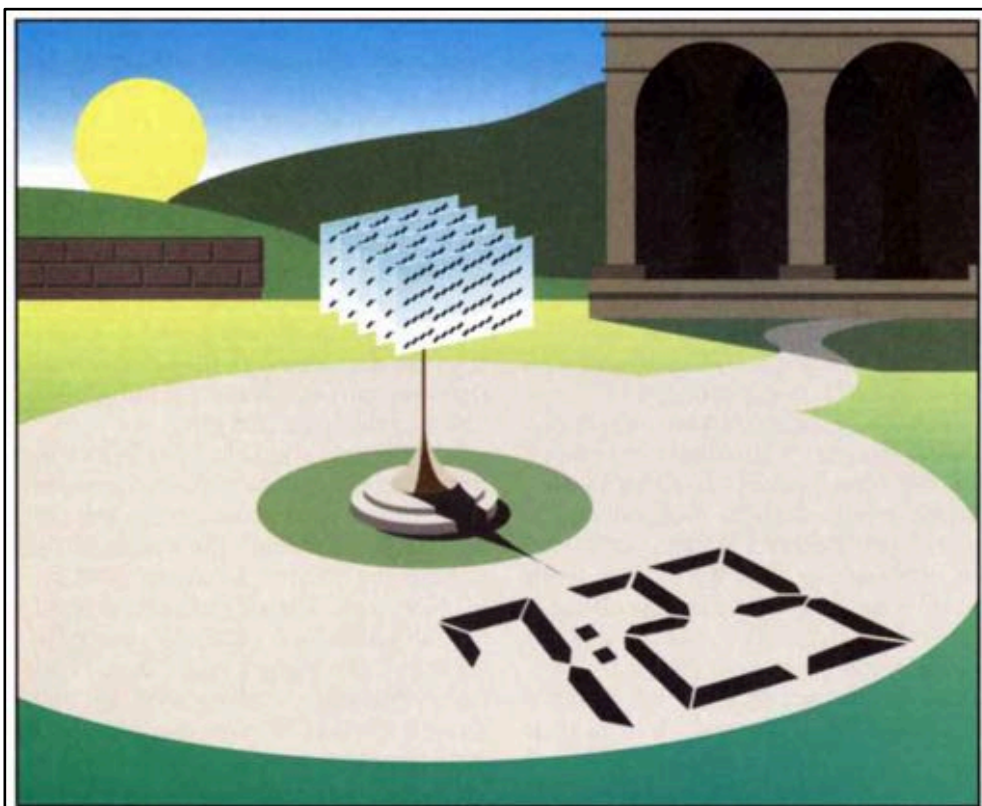


Dials

Digits



What in Heaven Is a Digital Sundial?

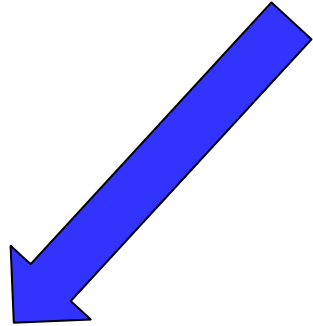


DIGITAL SUNDIAL stands in the courtyard of the Cartesian Monastery, home of Brother Benjamin and the Euclidean monks.

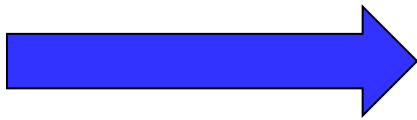
“Gödel, Escher, Bach: An Eternal Golden Braid” by Douglas Hofstadter (1979)



The Analemma

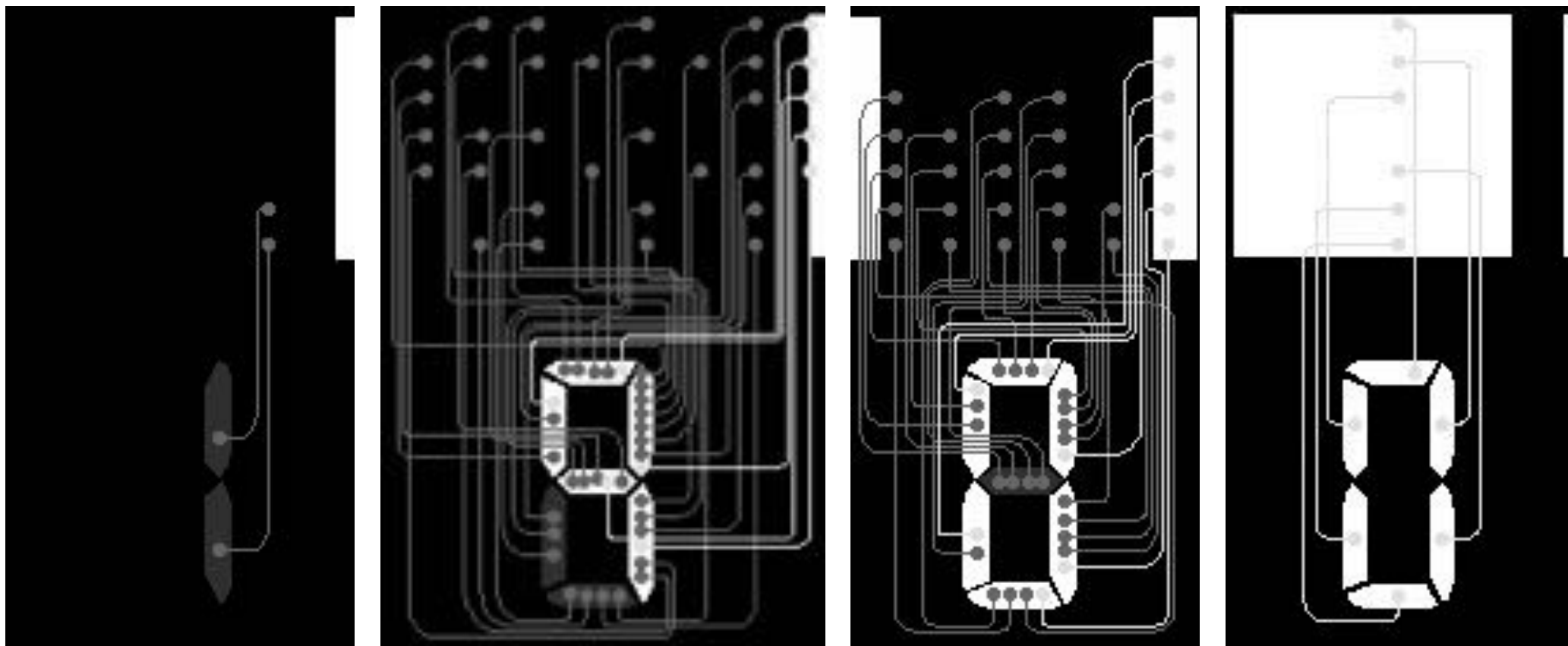


Dials



Digits

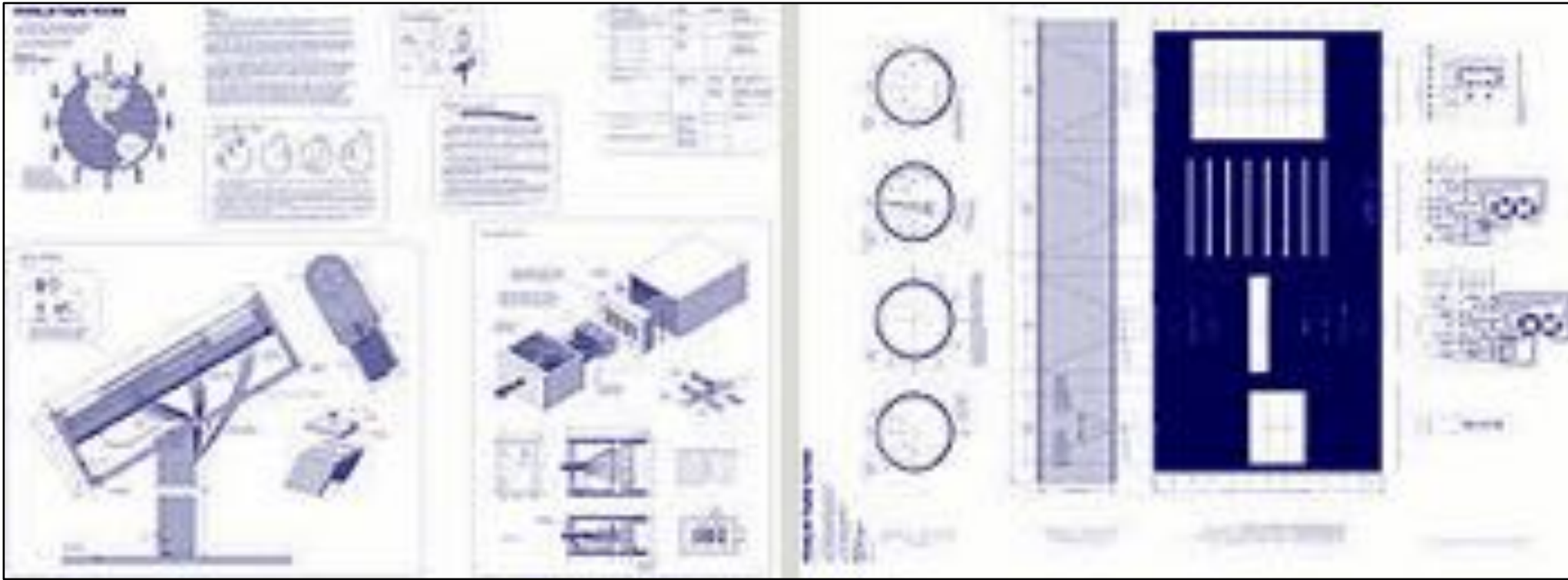
In 1984 Steve Hines had designed an optical analogue-to-digital converter, patented in 1988



Building on that basic principle, the HinesLab digital sundial can be made from plans . . .



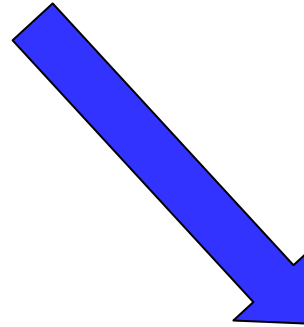
... that can be purchased for US\$100



The HinesLab digital sundial in action:



The Analemma



Dials

Digits

Then some time later, I came across an implementation of the idea published in SciAm

United States Patent [19]

Scharstein et al.

[54] DIGITAL SUNDIAL

[76] Inventors: **Hans Scharstein**, Euskirchenerstr. 37, 53894 Mechernich; **Werner Krotz-Vogel**, Weserstr. 13, 53332 Bornheim, both of Germany; **Daniel Scharstein**, 4 Pleasant View Ter., Middlebury, Vt. 05753

[21] Appl. No.: 487,343

[22] Filed: Jun. 7, 1995

[30] Foreign Application Priority Data

Sep. 7, 1994	[DE]	Germany	44 31 817.0
Sep. 7, 1994	[DE]	Germany	9414484 U

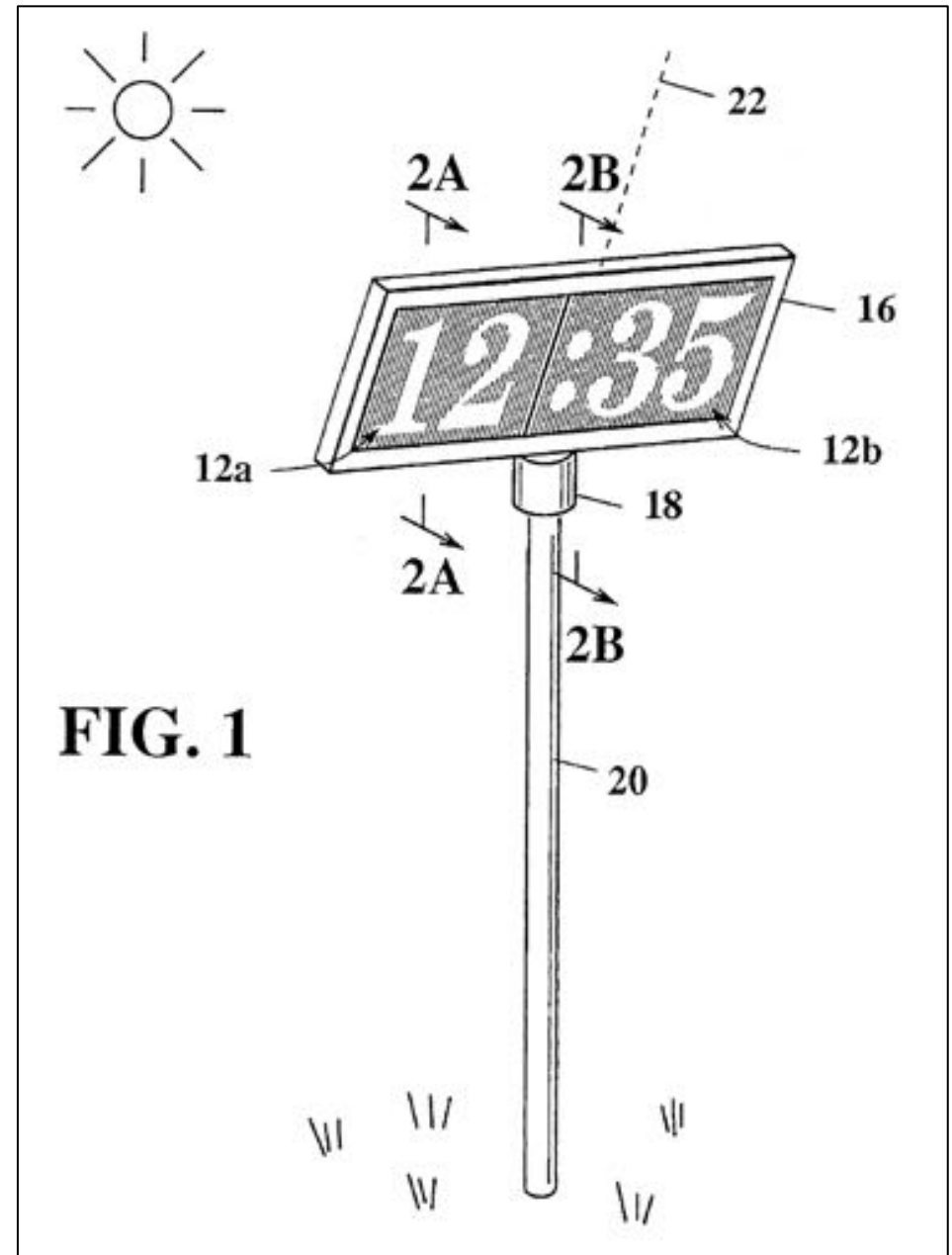


FIG. 1

The basics of how it works are described in the patent

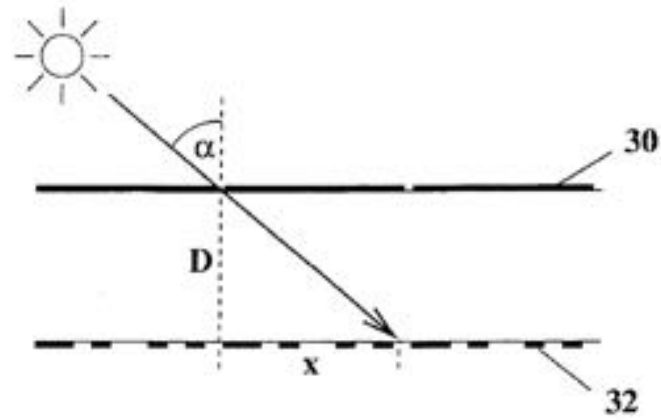


FIG. 5

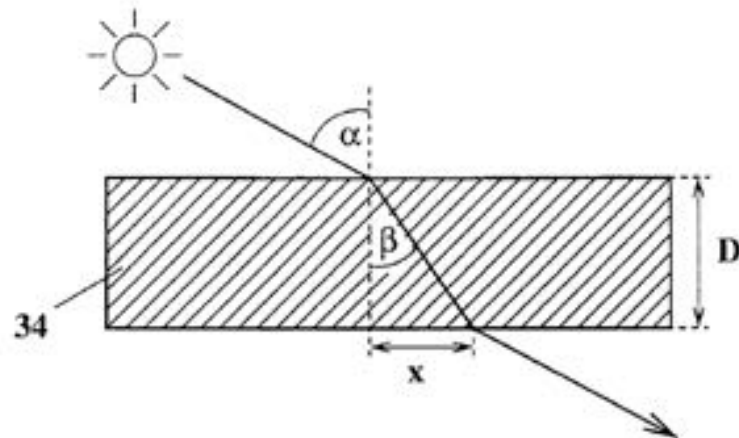


FIG. 6

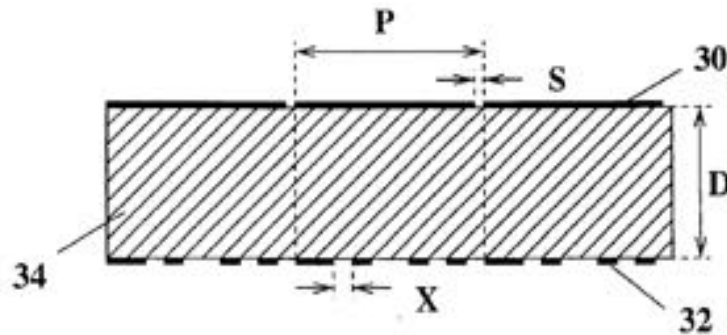


FIG. 7

**Bring on
the analogue
projector . . .**

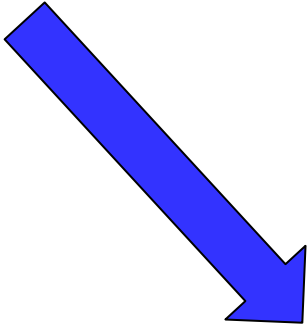
For €91+p, digitalsundial.com will deliver a bespoke sundial for latitudes in 10 degree steps



digitalsundial.com started out by making larger sundials for public places, which it still does



The Analemma



Dials

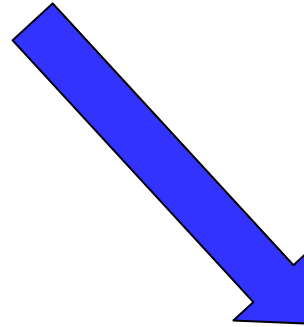
Digits

Then I came across Mojoptix's (Julien Coyne) sundial which is like the 'GEB' cube

Julien's video on YouTube about how he designed his digital sundial is well worth watching



The Analemma



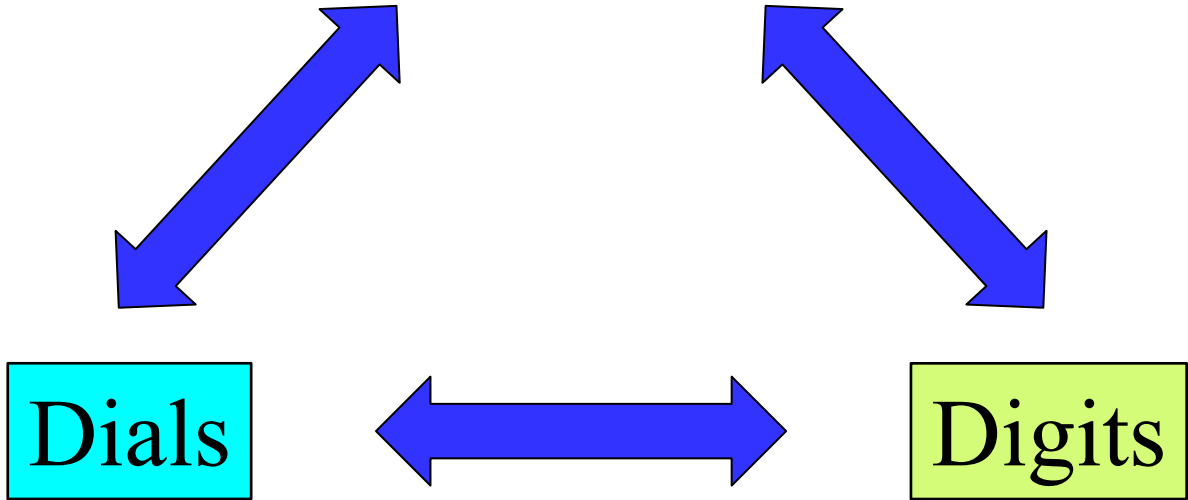
Dials

Digits

Here's another idea based on the analemma, a 'concept' for a public space digital sundial



The Analemma



The Analemma

Dials

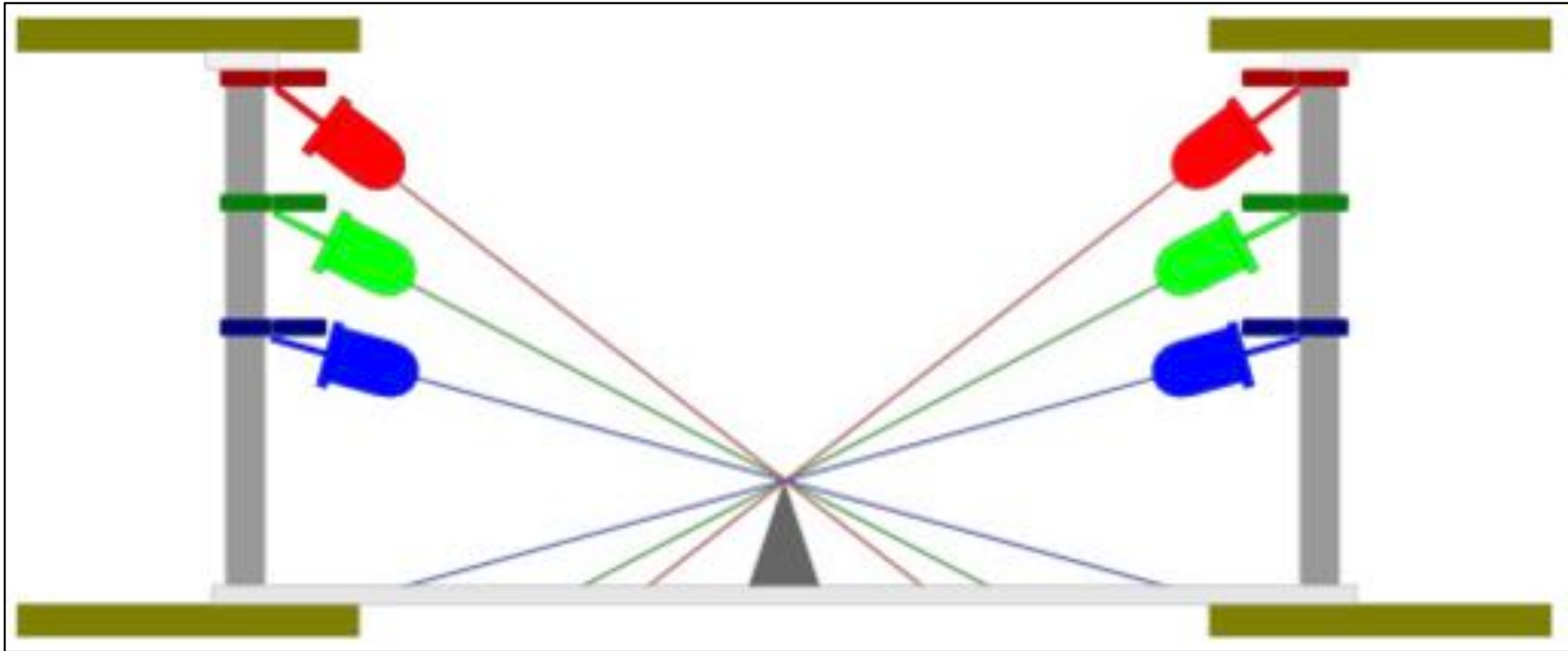


Digits

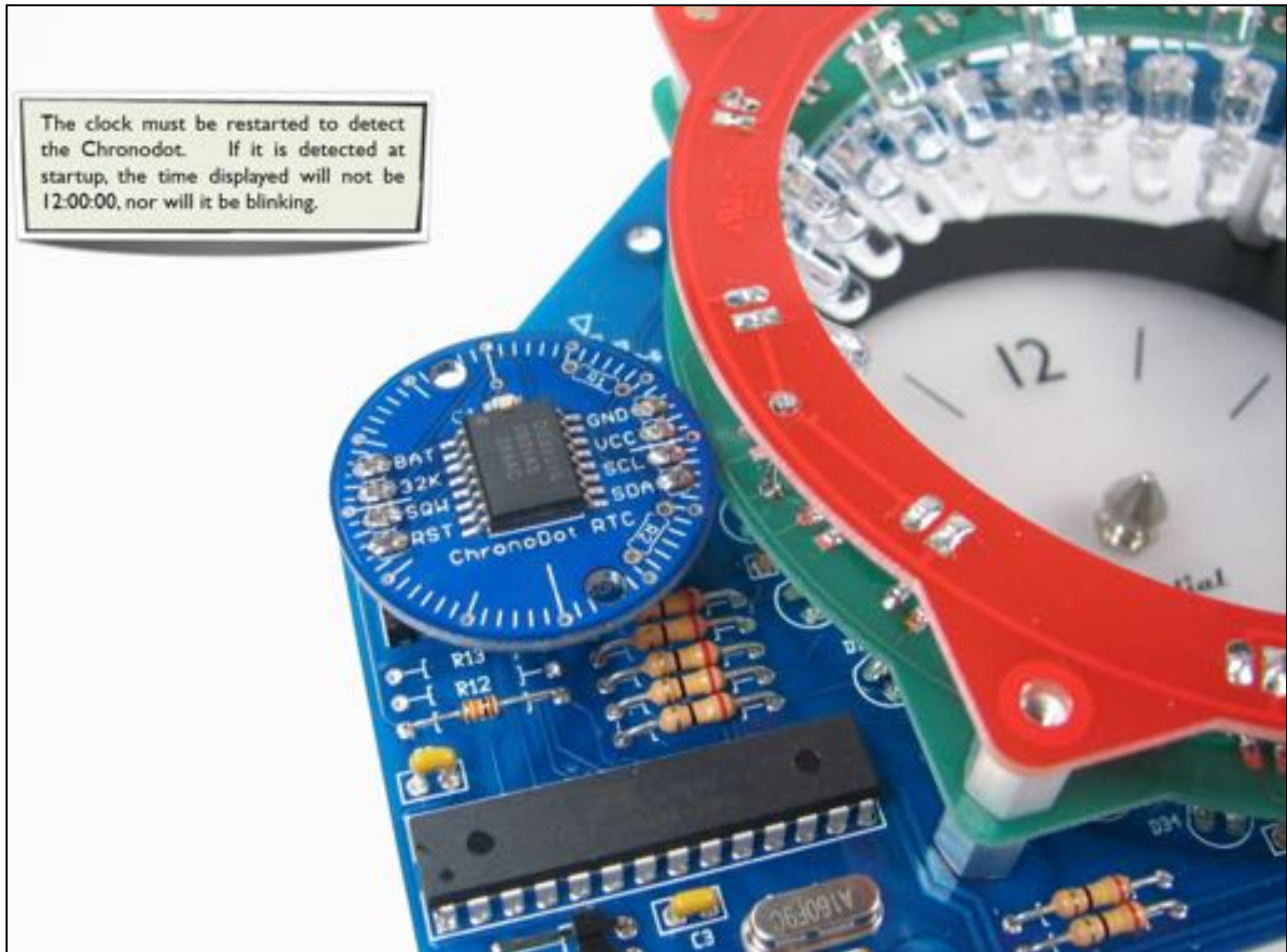
Finally, I gave in to the temptation to make a digital clock with a 'sundial' display



The basic principle of how the 'Bulbdial' clock works is fairly simple . . .



... but the actual implementation – even as a kitset – is quite challenging



Which link directions have I not discussed directly?

