The Jerusalem Teddy Park Sundial

The beam of light emitted from the Sun takes about 8 minutes and 20 seconds to reach the sundial. This is due to the fact that the Sun is at an average distance of about 150 million km from the Earth.

The sundial is a device which is intended to display the time according to the relative position of the Sun in its apparent motion across the sky. The sundial represents the cyclical nature of the Sun's motion across the sky, as it is seen during the day and throughout the year.

This sundial is the result of a unique design. The stone base of the sundial is inclined at an angle equal to the geographical latitude in which it is erected – **31** degrees, **46** minutes and **32** seconds, northern latitude. In this design, the gnomon - the pointer which casts the shadow, also known as the indicator **-** is parallel to the stone base of the sundial, unlike sundials in which the gnomon is perpendicular to the stone base or inclined at an angle which is equal to the latitude of its location. In addition, a special sight is available at the top of the gnomon, through which the North Star, Polaris, can be seen in proximity to the point where the Earth's rotational axis intersects the celestial sphere.

The indentation at the center of the stone base of the sundial is intended to cast a circle of light on the bottom plate. Every day throughout the year at the same time (e.g. at noon Daily Mean Time) the circle of light falls on the bottom plate in a slightly different location, due to the apparent motion of the Sun across the sky during the year. If we connect all the dots we receive a shape resembling the figure **8**, which is called an 'Analemma'.

The sundial depicts the cyclical nature of the Sun's apparent motion across the sky. Two factors dictate the location of the Sun on the sky throughout the year:

- The Earth's rotation on its axis, which causes the Sun to seem as if it changes its place in the sky during the day. The shadow of the gnomon is cast on a set of scale marks, which in turn indicate the time throughout the day.
- The Earth's orbit around the Sun. Due to the inclination of the Earth's rotation axis relative to the ecliptic, at an angle of 23.44^0, the Sun appears to reach different heights when on the meridian – low in the winter, high in the summer. Accordingly, the shadow cast by the ring located in the middle of the gnomon changes, northern in winter and southern in summer.

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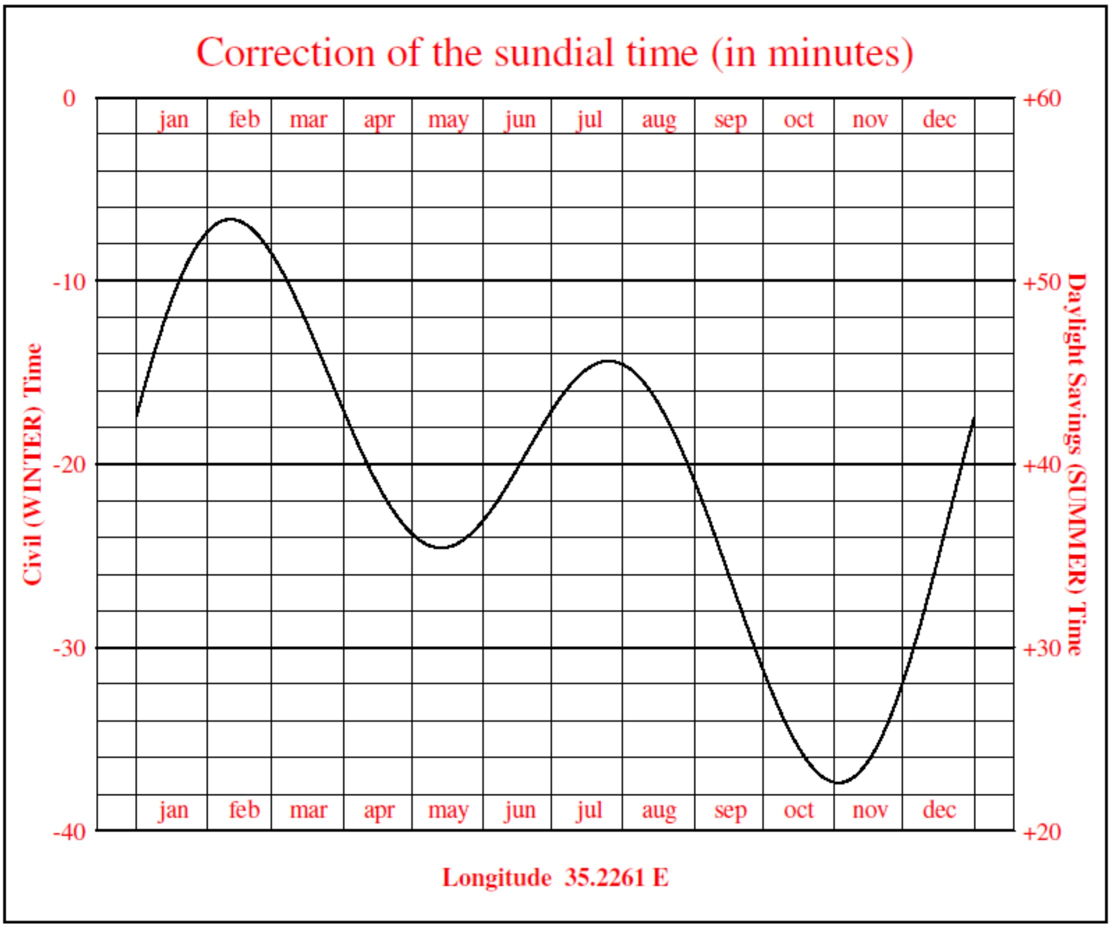
There are four significant dates to note – two in which the length of the day and night are equal, called 'Equinoxes', the third one is when the Sun reaches its lowest (southern) position and the fourth one is when it reaches its highest (northern) position, called 'Solstices'. These special dates occur each year **around** the following dates:

- Vernal (spring) equinox - March 20th or 21st
- Summer solstice - June 21st (in the northern hemisphere; winter in the southern)
- Autumnal (autumn) equinox - September 22nd or 23rd
- Winter solstice - December 21st (in the northern hemisphere; summer in the southern)

This sundial is precisely calibrated to the specific geographical location where it stands. Yet the time we are using in our daily life, called 'Daily Mean Time', is different from the one indicated by the sundial. There are numerous reasons for this:

- Jerusalem is located at longitude **35** degrees, **13** minutes and **34** seconds east of longitude 0 – the Greenwich Meridian, which is about 5 degrees east of the central meridian at longitude 30 degrees of our time zone. The standard time at any place is coordinated by fixed time zones, and does not take into account the specifics of the local coordinates where the sundial is situated. Every 15 degrees in longitude are equal to one hour in time, or one degree corresponds to 4 minutes in time. This means that at Jerusalem's longitude the time indicated by the sundial is in average **ahead** of the time indicated by our wristwatch by about 20 minutes.
- The angle by which the Earth rotation axis is inclined relative to the ecliptic – the plane on which all of the planets revolve around the Sun.
- The fact that the Earth's orbit around the Sun is elliptical and not circular.
- The difference of one hour when Daylight Saving Time is used.

In order to convert the time indicated by the gnomon on the sundial to Daily Mean Time, as indicated by our wristwatch, use the diagram below.



- You have to find the day of the year of interest.
- If Daylight Saving Time **is not used**, you have to **subtract** the corresponding number of minutes indicated by the **left** vertical axis (the Y-axis) from the time indicated by the sundial.
- If Daylight Saving Time **is used**, you can either:

  Use again the **left** axis as above but one hour should be **added**;

  Or:

  You have to **add** the corresponding number of minutes indicated by the **right** vertical axis (the Y-axis) to the time indicated by the sundial.

This sundial was planned and designed by the sculptor Maty Grunberg

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