COLUMBUS
WORLD´S FINEST GLOBES AND MAPS

Learn more about:
- Time zones
- Seasons
- Twilight
- Day and Night
- Subsolar area
- and much more

...ABOUT YOUR COLUMBUS GLOBE

Congratulations,

with this globe you have chosen a quality product from COLUMBUS.
Please note the following information and you will have many pleasant years with "your" globe.

The Planet Earth

The earth is in constant motion. Being a planet it travels around the sun in roughly 365 days, turning around itself once every 24 hours during its solar orbit.

These two motions, the orbit of the earth round the sun within the period of one year and its rotation around itself within 24 hours, constitute the basis for the determination of time.

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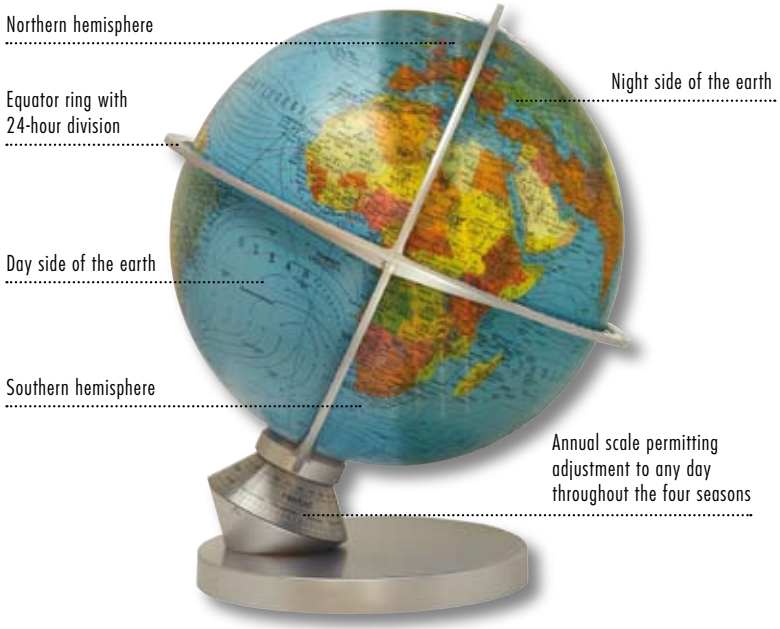

Northern hemisphere
Equator ring with
24-hour division
Day side of the earth
Southern hemisphere
Night side of the earth
Annual scale permitting
adjustment to any day
throughout the four seasons

The Planet Earth illuminated globe

The planet Earth illuminated globe incorporates a number of novel features permitting the two motions of the earth to be demonstrated and distinguishing this globe from any type of globe known up to now. The base of the globe is provided with a scale that adjusts to each day of the year.

The ring surrounding the equator and dividing the globe into the Northern and Southern hemispheres is designed as a dial divided into 24 hours of the day and including quarterhour intermediate divisions.

When the interior light of the globe is switched on, the globe appears divided into two halves: one illuminated, the other not. The illuminated half represents the day side while the non-illuminated half is the night side of the earth.

The changing phenomena of time defy representation in the illustrations and appear only on the globe.

Please note:

The following pictures are only advisable examples for adjusting the Planet Earth iluminated globe.

The annual scale above the index mark is adjustable to each day of the year

Index mark for setting the day

The annual scale

By turning the scale, the globe can be set to each day of the year. The index mark on the non-revolving base shows the day set; in the photograph above it is the 3rd of March.

When slowly turning the annual scale with the light on, the globe shows the movement of the line separating the day side and the night side. This constant movement of the line of light, wich does not repeat itself ubtil after the passing of one year, after one complete revolution of the earth about the sun, corresponds to the actions in nature.

The globe shows the position of the earth in space on its path around the sun. Day by day the earth changes its position with respect to the sun until the cycle is repeated after 365 days.

North Pole

The time of day

While one motion of the earth, its orbit round the sun, is demonstrated by the annual scale of the globe, the second motion, the rotation of the earth around its axis, is shown by the equator ring, with its effect on the time of day appearing directly on the globe.

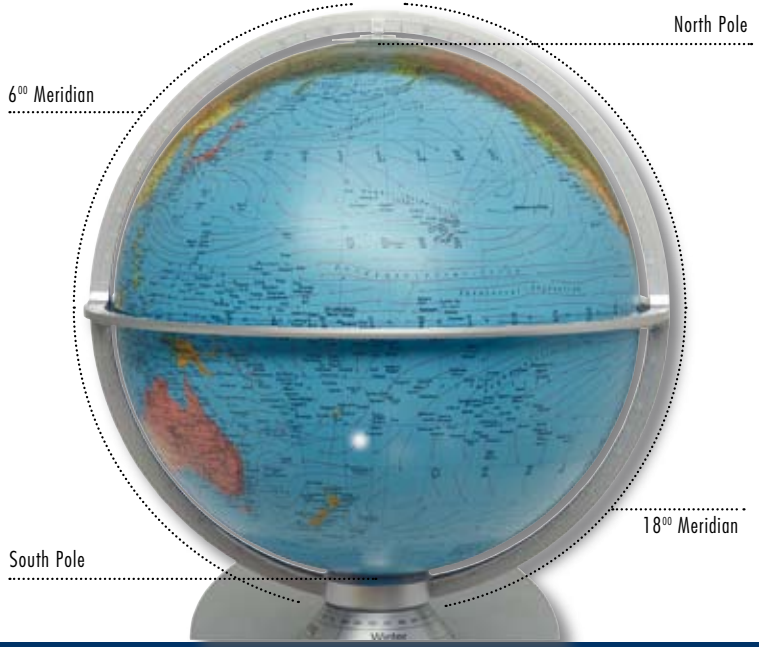
Due to the close relationship between the rotation of the globe and the time of day, there has to be noticed that every turn of the globe means a change in time; a quarter-turn equals 6 hours, a half-turn 12 hours, and a complete turn 24 hours.

As all areas of the earth are situated on the same meridian have the same time of day, this also applies to the globe. The meridians are blue lines on the map and pass from the North Pole to the South Pole; they are drown at intervals of ten degrees and numbered (right below the wide blue line of the equator ring) where the line of that meridian crosses the equator.

Here is an example:

The time of the day in this moment for London.

Find London on the globe. The hatched bold Prime Meridian passing through London leads to the time in London in this moment.


North Pole
6⁰⁰ Meridian
18⁰⁰ Meridian
South Pole

Reading the time of day

First of all please notice that on every day of the year basically all times of day on the earth as well as on the globe are presented "at the same time": When it is midnight in Europe, the sun of high noon is shining "at the same time" over the pacific Ocean, the sun is rising in some areas of Russia and is "at the same time" setting in some areas of the United States of America.

Consequently, any moment of time applies to only a limited area. To read the time of day applying to that limited area at any moment, all you have to do is read the time indicated on the dial of the equator ring for each meridian.

The photograph shows another feature finding and reading the time of day. The ring supporting the equator ring and connecting the North Pole and the South Pole is marked as 6.00 Meridi- and 18.00 Meridian. For all areas on the globe right below the 6.00 meridian it is 6 o'clock; for all areas across from the 18.00 meridian it is 18 o'clock.


The 3 twilight zones
Night side of the earth
Day side of the earth

Twilight

Along the line dividing day and night, the globe with the light on, shows three bright stripes illustrating the zones of dusk and dawn, the twilight before sunrise and after sunset. In nature, the gradual passage between day and night occurs continuously.

However, to identify the different degrees of twilight, the three stripes stand for the following stages:

1st stage: the so called "civil" twilight for wich the name "daylight" after sunset still applies.

2nd stage: the "nautical" twilight which ends when horizon can not be seen anymore.

3rd stage: the "astronomical" twilight calculated to that moment in which no reflections of the sunlight light up the night sky.

For the break of dawn the values apply in reverse order.

Sunrise on June 21

The Prime Meridian, the hatched bold line passing from the North Pole to the South Pole and crossing London is located right below the 6.00 meridian. Europe and Africa are situated in the bright morning light. The morning twilight is visible from a small stripe of Africa's west coast up to the Ivory Coast. The sun is just rising over the Canary Islands. For the North Pole and the region extending as far as the dotted line representing the Arctic Circle, it is polar day. Within the entire Arctic Circle, the sun does not set on 21st June.

Sunrise on December 21

After the expiry of six months, from June 21 to december 21, the illumination has changed that drastically, that neither in Tripoli nor in Moscow the sun rise at 6 o'clock. The area around the North Pole lies in the dark up to the dotted line of the Arctic Circle; it is polar night, the sun does not rise above this area.

Within that period of six months, the earth has covered half the distance of its path around the sun. The inclination of the earth's axis, maintaining the North-South direction during the orbit around the sun is the reason for the change of the illumination. By turning the annual scale this phenomenon can be demonstrated on the globe. After one year - one complete turn around the sun - the change of the illumination starts again recurs year by year.


1 hour

Local Time

As already described in the paragraph "Reading the time of day", the Planet Earth globe permits demonstrating, apart from the course of the year, the course of 24 hours of the day. Each complete rotation of the globe around its axis means the course of 24 hours.

A look at the dial of the equator ring shows that there are 15 meridians situated between two hour indications of the dial which are marked as blue lines in intervals of 10 degrees on the map. The time difference for every ten degrees is 40 minutes.

The time that can be read on the globe for every place on earth along a meridian is called "local time".

In order to be able to read other "standard" times, such as the Central European Time (CET) on the globe, you need some additional explanations.


DÄNEM
Göteborg
Kopenh
Riga
Hamb
Danzig
Königsbg
POLEN
Warschau
Berlin
DEUTSCHLD
Bonn
Leipzig
Frankft
Prag
Breslau
Krakau
Brest
Dublin
Cork
London
Der Kanal
Le Havre
Den Haag
Brüssel
Brest
Nantes
Paris
Golf v. Bordeaux
Biscaya
FRANKREICH
Toulouse
La Coruña
K. Finisterre
Porto
Lissabon
Zaragoza
Madrid
Valencia
Andorra
Barcelona
Marseille
Monaco
Korsika
Balearen
Palma
Sardinien
Cagliari
Murcia
Sevilla
Cadiz
Gibraltar (Br)
Tanger
Rabat
Casablanca
MAROKKO
Atlas
Oran
Algier
Constantine
Annaba
Tunis
Palermo
Messina
Sizilien
Neapel
Rom
Bari
Adria
Tirana
Korfu
GRIECHEN
Patras
Wien
ÖSTERR
UNGARN
Budapest
Zagreb
Cluj
RUMÄNIEN
Bukarest
Belgrad
BULGARIEN
Sofia

Central European Time (CET)

As large, economically interrelated areas require a uniform time for reasons of traffic and combined in time zones. Central Europe is one of these time zones. The official time commonly agreed for this area is the local time of the "15th degree of eastern longitude", wich runs right through the middle of Central Europe. Read the Central European Time (CET) on the dial of the equator ring midway between 10° and 20° meridians. In this context it must be pointed out that all "local times" the globe indicates for the large area of Central Europe remain additionally applicable.

Occasionally, the times of sunrise and sunset published in pocket diaries are indicated in local time as the time differences regarding the standard time cause considerable errors. The difference of the local times between the western and the eastern areas of Central Europe is after all 2 hours.

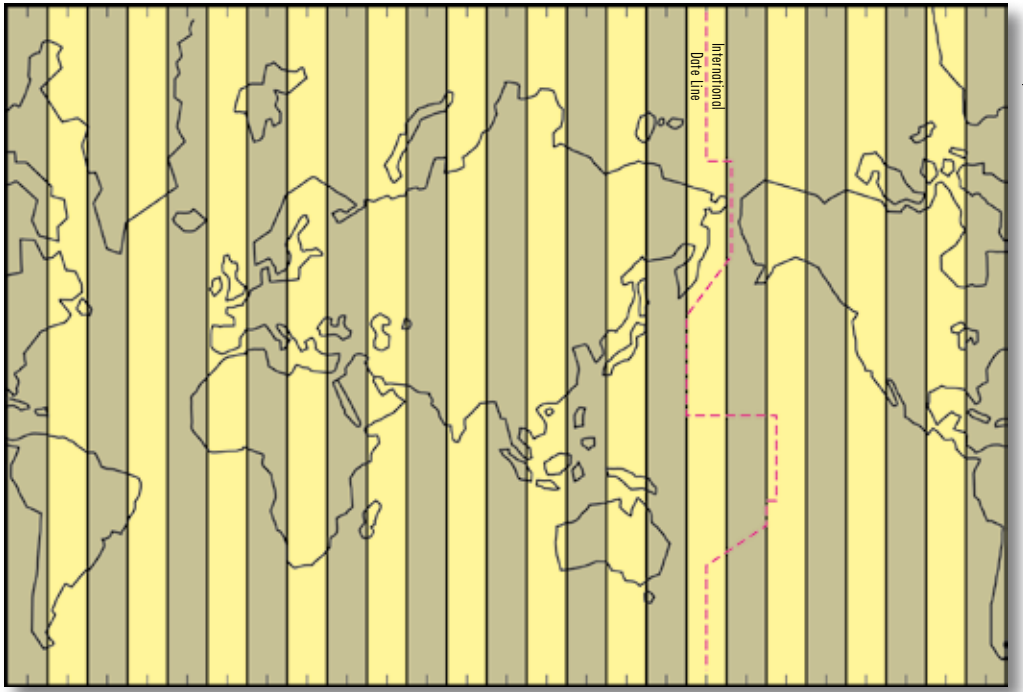

Kandi
Kaduna
Maiduguri
Bautschi
Bagirmi
Schari
NIGERIA
Ogbomoscho
Ibadan
Jola
Sark
Ndélé
Benue
Sklavenküste
Lagos
Enugu
KAMERUN
ZENTRALAFR.
Lomé
Plo. Novo
Fumban
Bangassu
Pt. Harcourt
Sanaga
MEZ
Bangui
Duala
Malabo
Jaunde
Yasanyama
Rioko
PRINCIPE
Bata
Wesso
Kongo
SAO TOME
Libreville
Mouia

Reading the Central European Time

The map-illustration on the left side (part of central Africa) shows unambiguous where to read the Central European Time (short CET). The time, indicated at this point on the dial of the equator ring is the official time for all clocks from Madrid to Warsaw. The Planet Earth globe shows clearly that the local time of many places in western Europe do not accord to the CET.

A hint:

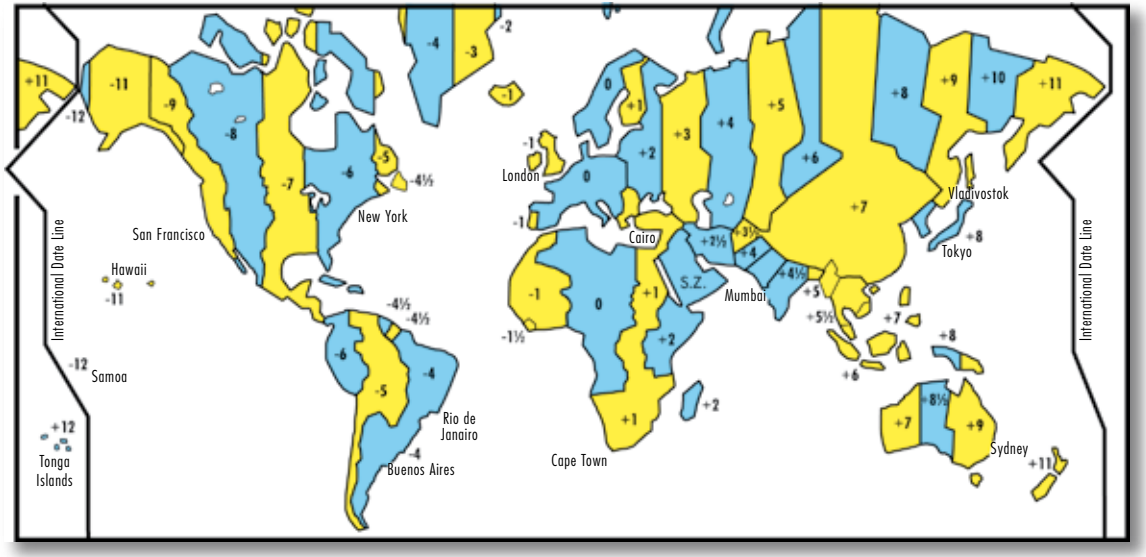
Should it seem to be uncommon using this point in Central Africa as the indication to read the CET, it could be a practical memory hook marked with a small piece of adhesive tape on the globe. As soon as the relationship between CET and the various local times is clear, you will not need the adhesive tape any longer.


International Date Line
75° 60° 45° 30° 15° 0° 15° 30° 45° 60° 75° 90° 105° 120° 135° 150° 165° 180° 165° 150° 135° 120° 105° 90° 75°
west of Greenwich
east of Greenwich
west of Greenwich

Division in time zones

The illustration shows the pattern permitting vast regions with different local times to be combined, in a simple manner, in time zones having the same standard time. For this, the surface of the earth has been divided into 24 zones extending along the meridians, Each zone has a width of 15 degrees, so that the local time within one zone differs by exactly one hour between the two extremes. The time generally applicable within each zone is the local time of the meridian in the middle of each zone. This system assures that the local times within each zone differ by not more than a maximum of thirty minutes from the standard time. Moreover, the change in time when entering the neighbouring time zone is exactly one hour.

However, a look at the CET area, which extends over two "zones", shows that such a system can hardly be reconciled with the practical requirements of the land areas of the world.


International Date Line
San Francisco
New York
Hawaii
Samoa
Tonga Islands
Rio de Janairo
Buenos Aires
London
Cairo
S.Z.
Mumbai
Cape Town
Vladivostok
Tokyo
Sydney
International Date Line

Division of land areas in time zones

As mentioned before, reasons of traffic and communication make it necessary to have a common time for economically and politically interrelated areas. The map shows, based on the schematic division, how the different areas are divided into time zones.

The standard time system has been introduced by almost every country all over the world by appropriate legislation.

A number of countries, especially for economic reasons, have adopted a Summer Time for the summer half-year, with the clocks being advanced by one hour.

Within the various time zones, no reference is made to the "time" used in each time zone, so the addition CET is only made avoiding mistakes.

As in the European countries apart from the CET also the Western European Time, Eastern European Time and Moscow Time are used, the following time zones are applied for North and South America:

- Alaska Standard Time
- Pacific Standard Time
- Mountain Standard Time
- Central Standard Time
- Eastern Standard Time
- Atlantic Standard Time.

More time zones:

- Java Time
- Chinese Coast Time or Celebes Time
- Japanese Time
- Southern Australian Time
- Eastern Australian Time and New Zealand Time

The local time on the Prime m Meridian is called Universal Time or World Time in astronomical use.

18.00 o'clock CET on June 21

The illlustration shows the Planet Earth globe set for 18 o'clock CET the 21st of June.

In this position, the local time for alll areas below the 18 o'clock meridian ring accords to the CET.

The illustration make clear how the CET varies from the local times of the western areas. (i.e. the west coast of France and the area of Spain)

This position also tends to illustrate the effect of twilight.

Turning the globe it shows that i.e. Stockholm remains in twilight during the whole night. The proverbial "light nights of Stockholm" find their explanation here.

18.00 o'clock CET on December 21

The illustration shows clearly how the illumination has changed after six months, after half a turn around the sun. As mentioned before this is due to the fact that the inclination of the axis of the earth did not change during the turn. The Planet Earth globe also help you to understand that the sun rises at 6 o'clock at the equator and sets at 18 o'clock every day of the year: The shericity of the earth causes this effect.

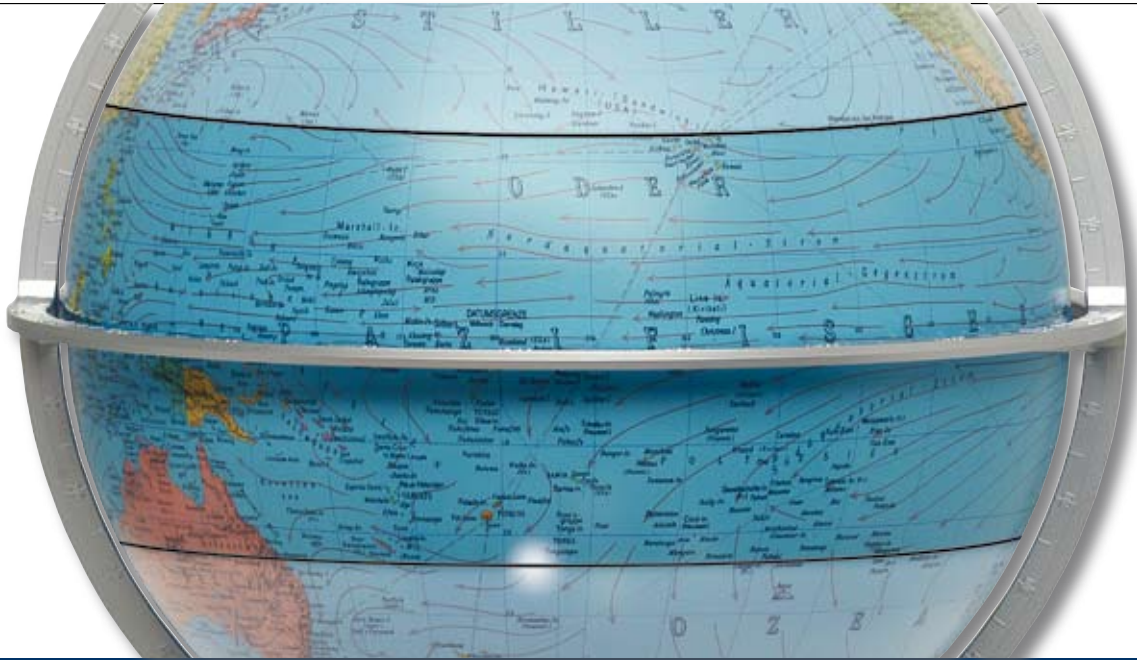

Winter

The subsolar area - I

When the globe is illuminated, a bright dot of light will appear on the globe ball near the 12 o'clock mark on the equator ring. This bright dot of light marks the area in which the sun rays don't cast any shadow on the earth's surface at 12 o'clock: At this time, the sun is directly overhead and the respective area is directly "below the sun". This is why that area is called "subsolar" area.

Turn the globe and you will note that other areas of the earth will reach this bright dot and become subsolar area for a short while.

Since the sun must be considered to be "vertically above the dot of light on the surface of the earth", the observer will (after a little practice) soon be able to estimate the altitude or position of the sun in any region of the earth and on any day of the year.


S T I L L E
O D E R
Äquatorial-Gegenstrom

The subsolar area - II

The two bold lines in the illustration identify the "tropics", which, on the globe, appear as dottet lines: the "tropic of cancer" on the northern hemisphere and the "tropic of capricorn" on the southern hemisphere. The names have been adoptet from olden times; they refer to the path of the sun and stand for the respective signs of the zodiac. However, these zodiacal constellations are no longer correct because the apparent "path of the sun" has changed.

The dot of light of the subsolar area reveals the significance of the tropics. When the annual scale is turnde, the light dot will travel between the tropics and "turn back" after having reached the dottet lines. The annual scale then indicates the time of the "summer solstice" on June 21, or the "winter solstice" on December 21.


Marshall Islands
Hawaii Islands
International Date Line

The International Date Line

To understand the significance and function of the Date Line, find the Date Line on the globe. It is a dottet line leading from the North Pole to the South Pole opposite the Prime Meridian. See the bold line in the illustration.

Whenever the Date Line is crossed, regardless of whether this be from the east to the west or in the opposite direction from the west to the east, the date must be changed. So, for example, when it is Thursday, May 6, on one side of the Date Line, it is Wednesday, May 5, on the other side.

The simultaneous existence of two different dates is absolutely necessary to permit a "uniform date" to be counted for the population of the world. For an explanation of this apparentely paradoxical statement turn the globe to have the Date Line below the 0.00 mark of the equator ring. Now the Prime Meridian has been positioned below the 12.00 o'clock mark. In this position, the same date is used throughout the world, for example Wednesday, May 5. But to keep the date applicable, all areas of the world crossing the 0.00 mark must use the new date beginning on 0.01: Thursday, May 6. As a consequence, the inhabitants of the Hawaii Islands will witness the forthcoming sunrise on Wednesday, May 5, while their neighbours on the Marshall Islands will date the same sunrise as Thursday, May 6. This difference in the date will remain during the revolution of the earth until the Hawaii Islands have reached the new date, Thursday, May 6, at 0.00 o'clock. But shortly thereafter the same process will be repeated: On the Marshall Islands the new date, Friday, May 7 will beginn.

The existence of two different dates at the same time is only significant for someone who crosses the border of the Date Line. And it makes no difference on what day or what time of day the Date Line is crossed.

Travel agencies offer an attractive air travel arrangement: Anyone wanting to celebrate New Year's Eve on the Fiji Islands is offered a flight to the Hawaii Islands in the course of January 1st. Upon arriving on Hawaii the date is still December 31st, and the person has another chance to celebrate the arrival of the new year.

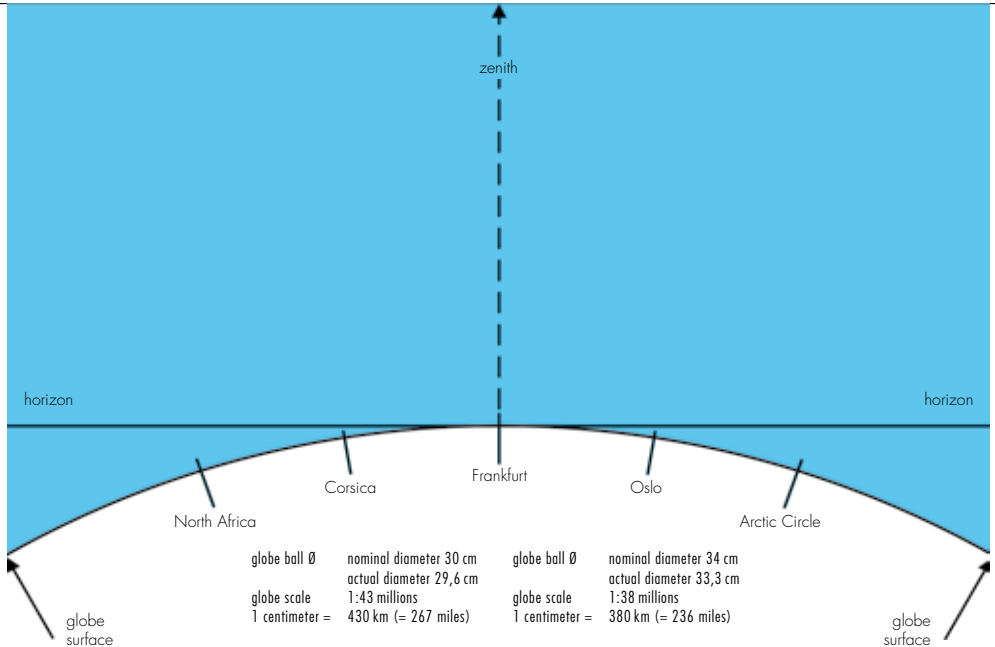
For the passengers of a space station the repeated crossing of the dateline within 24 hours is of no significance. What counts is only the date that has been adoptet at the place of the landing in the course of the flight.

Proportions referred to the globe scale

Since it becomes easier for the observer to understand the natural phenomena and to read the time by assuming an imaginary position on the surface of the earth, it seems advisible to deal in more detail with the actual proportions referred to the globe scale.

The following illustration shows a section of the globe ball in north to south direction and illustrates the proportions of distance. The distance from Oslo to Corsica, from Norway via Denmark, Germany, Switzerland and northern Italy, is close to 2,000 kilometers (1,250 miles). The circumference of the earth, however, is twenty times that distance: 40,000 kilometers (25,000 miles), a distance that is represented on the globe by the actual diameter. Seen from Frankfurt Oslo and Corsica are already far below the horizon. However, the size of the earth makes it almost impossible to have the impression of living on a sphere.

The distances of the illustration are more easily perceived when confronted with some elevations. The highest mountain on the earth, the Mt. Everest with a height of 8,850 meters (29,141 feet) , would have to be represented by an elevation of 0.2 millimeters to agree with the scale of the globe (diameter of 33.3cm). An altitude of 20 kilometers (12.5 miles) above the ground - the layer containing 90% of the atmosphere of vital importance for life on earth - equals an elevation of 0.52 millimeters when represented on the scale of the globe (diameter of 33.3cm). Those 90% of the atmosphere are a layer of not more than one half of a milllimeter



globe ball Ø	nominal diameter 30 cm actual diameter 29,6 cm	globe ball Ø	nominal diameter 34 cm actual diameter 33,3 cm
globe scale 1 centimeter =	1:43 millions 430 km (= 267 miles)	globe scale 1 centimeter =	1:38 millions 380 km (= 236 miles)

on the globe. A satellite circling the earth at an orbital height of 250 kilometers (155 miles) revolves around the globe at a distance of 6.8 millimeters.

More dimensions referred to the scale of the globe (diameter of 33.3cm): The moon corresponds to a ball having a diameter of 9.1 centimeters. It accompanies the globe on its path around the sun at a mean distance of 10 meters (33 ft.). The sun, reduced to the scale of the globe, is at a distance of roughly 4 kilometers (2.5 miles); it has a diameter of 36.6 meters (120 feet). The path of the globe around that imaginary sun has a lenght of roughly 25 kilometers (15.5 miles). On that path of 25 kilometers the globe covers an average distance of 67.75 meters (approx. 222 feet) every day, within 24 hours. If both motions of the earth, its path around the sun and the revolution around its axis, are to be demonstrated by means of the globe, the globe must be carried a distance of about 17 meters (56 feet) for every quarter turn of the globe, within six hours.

The mean speed of the earth on its path round the sun is remarkable in several respects. It is 29.8 kilometers per second (18.5 mps). This figure doesn't become any more meaningful when contrasted with another figure: A bullet fired from a rifle, for instance, has an initial velocity of 900 meters per second (appr. 3,000 fps). But the scale of the globe, the ratio of 1:38 millions affords a better possibility of comparison. The globe must be advanced at a rate of 0.8 millimeter per second to illustrate the high orbital speed of the earth. This example also

shows that even a year consists of seconds and that a mere second is enough to turn 0.8 millimeters into a distance of 25 kilometers (18.5 miles).

The development of precision instruments has made it possible to achieve a high degree of accuracy in the constant observation and measurement of natural phenomena. It is a well-known fact that in recent years a leap second has occasionally been inserted to correct the length of the year. The average length of the year is stated to be 31,556,925.9747 seconds. When indicating seconds, four places after the decimal point are of no importance whatsoever in our daily life; but they are indicative of the measuring accuracy characterizing scientific statements. Without such an accuracy there would exist no exact information on natural phenomena, nor would it, for instance, be possible for man to travel in space.

How to change the light bulb

1. Pull out the plug of the socket.
2. Take a screwdriver for help.
3. Lift the globe with one hand at the top of the annual scale and turn it, so that the base plate faces upwards. (a rattling noise from the inside is normal)
4. With the screwdriver in the other hand, loosen the screw in the middle of the bottom of the base (do not loosen the screw completely). This screw will only be visible when the using manual is taken out of the therefore intended case.
5. Now you can lift the base plate from the globe. (attention: the sphere of the globe must be held upside down)
6. First control if the light bulb is loose. (a turn to the right is enough)
7. If necessary change to an identique light bulb. (230 V, 25 W)
8. Then try the illumination switching it on and off. The globe should not be illuminated when reassembling it.
9. For reassembling the globe, fix the base plate the other way round. Be careful of the correct position of the base plate. (if necessary turn carefully the base for getting the bulb in the inside of the sphere)
10. Tighten the screw and turn the whole globe. A rattling noise from the inside of the sphere is normal. The inner construction is moving in its intended position.

Attention: To avoid danger, a damaged outer flexible line of this globe should only be changed by the producer, his service team members or a comparable qualified person!

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Columbus Verlag Paul Oestergaard GmbH
Kartografisches Institut, Verlag und Export
Am Bahnhof 2
D-72505 Krauchenwies

Telefon: 0049 7576 9603-0
Telefax: 0049 7576 9603-29
Mail: info@columbus-verlag.de
Web: www.columbus-verlag.de