

A Brief Column for the Beginning Stargazer Introducing a New Astronomical Term Each Month

Astronomy is rich with terminology. This column will help beginning stargazers ease into the world of astronomy by *briefly introducing* a new but *basic astronomical term* (word, acronym or abbreviation) each month. This list, which began January 1999 with the letter *a*, is alphabetical but uses successive letters for each month's entry. (We will return to the letter *a* after twenty-six months.)

Word of the Month for September 2000

Universal Time (UT and often synonymous with UT1) A measure of time and the basis of all civil timekeeping. UT conforms closely with the mean *diurnal* (daily) rotation of the Sun around the celestial sphere.

UT is determined directly from observations of the diurnal motions of the stars.

(Such observations really determine *sidereal time*, time based on the rotation of the Earth with respect to the stars rather than the Sun. However, UT is then formally defined by a mathematical formula that relates sidereal and solar time.)

Three basic types of Universal Time:

1. **UT0** The time scale determined directly from such observations of the stars. It is slightly dependent on the place of observation.
2. **UT1** (often abbreviated **UT**) UT0 corrected for a shift in longitude caused by *polar motion* (the "Chandler wobble"). See Note A.
3. **UTC (Coordinated Universal Time)** Also called **Greenwich Mean Time** or **GMT**. A modified version of *International Atomic Time* (TAI) and provided by broadcast time signals. See Note B.

UTC is the time transmitted by time services such as radio station WWV.

UTC is kept within 0.90 seconds of UT1 by the occasional introduction of one second steps (*leap seconds*) generally added at the end of June or December as needed. Thus, UTC is atomic time shifted to keep UTC close to time based on the Earth's nonconstant rotation (UT1).

Notes:

A. Chandler wobble An irregular movement of the Earth's *geographical poles* (poles of rotation) over the Earth's surface by about 6 meters (20 ft) during an approximate 433-day cycle (anticlockwise for north pole, clockwise for south). However, the Earth's rotation axis maintains the same orientation in space (it is the Earth that does the shifting.) It is named for the American astronomer Seth Carlo Chandler (1846–1913).

Until now, the cause of the Chandler wobble was unknown. Recently Richard S. Gross at JPL (*Geophysical Research Letters*, Aug. 1, 2000) has attributed most of the polar deviation to variations in pressure at the ocean's bottom. (The ocean's mass shifts in response to changes in temperature, salinity and atmospheric winds.) In addition, variations in atmospheric pressure may also account for about one third of the wobble.

B. International Atomic Time (TAI) A continuous time scale resulting from the analysis of atomic time standards in many countries. This results in the most accurate time scale currently available. UTC differs from TAI by an exact number of seconds due to the introduction of leap seconds to keep UTC within 0.9 seconds of UT1. ☼

References. J. Mitton 1991, *Concise Dictionary of Astronomy* (Oxford Univ. Press); I. Ridpath 1997, *A Dictionary of Astronomy* (Oxford Univ. Press); *Explanatory Supplement to the Astronomical Almanac*, 1992, ed. P.K. Seidelmann.