A pitfall in reading astronomical daytime arguments before 1925

Historical observations tell a lot about the long time behaviour of variable stars, but old reports must be read properly. In 1925 an unsuccessful regulation tried to change a venerable convention how to communicate astronomical time arguments. Astronomers could not be talked out of this convention and instead only changed their reporting habits. Beginning variable star observers and even some modern professionals get puzzled by the inconsistent remnants of this abortive reform. Even worse, they run great risks to misunderstand papers reporting astronomical time arguments in the old, traditional way. I point out the pitfall.

Astronomers adopted the Julian Day (JD) count before 1700, but until 1925 only reluctantly communicated JD numbers. They regarded the JD count as a technical tool to simplify calculations and did not want to annoy the public with unclear numbers. The instant when the sun crosses the meridian nearer to the zenith could be established easily with the primitive technical equipment of the old times and astronomers thought it convenient to count fractions of a day from mean noon. Consequently they combined both JD numbers and Gregorian calendar day numbers with day fractions counted from mean noon, fractions being reported either in the traditional hour-minute-second pattern or in a decimal pattern. F.W.A. Argelander for example gives an epoch of ETA AQL 1860JAN04 17h13m28s = 1860JAN04,717685 M.Z.Bonn. This is an instant early in the morning Bonn mean time on January 5th (!!) 1860 in the civil understanding of the Gregarian calendar.

With the spread of modern transport and communication techniques since 1850 precise times and clocks increasingly influenced civil life. Contrary to the astronomical tradition, civil clocks started day time count at mean midnight. In 1925 authorities urged astronomers to adopt this civil life practice. Astronomical days also should start at midnight. On one side astronomers wanted to avoid complicated transformations. For scientific purposes they kept the old traditions and combined JD numbers with day fractions counted from mean noon as they had done for centuries. On the other side they would have had to combine a Gregorian day number with a day time argument counted from mean midnight. This dichotomy inevitably would have produced confusion and since 1925 most astronomers therefore stopped to communicate in the Gregorian pattern.

Nevertheless before 1925 reports of astronomical time arguments in the Gregorian pattern are frequent. Modern readers want to reduce such communications to the standard time system, we now are used to, and for this purpose have to assign to reported Gregorian day numbers Julian day numbers subsequently. Usually we nowadays do this with modern computer software and Jean Meeus gave the appropriate algorithm. This algorithm however invariably produces JD numbers with seven digits and a fractional part 0.5, valid for daystart at midnight. Adding the original day time argument given in the historical paper to such a number will **result in a JD number too small by 12 hours or 0.5 days**.

In other words: When working with historical communications before 1925 all JD finding numbers for a day ending with 0.5 have to be increased by 0.5 to the next integer value. These integers are valid for mean noon of the day in question and can be combined with the astronomical day time argument of the paper. If the historical author gives the daytime as a decimal fraction, this fraction should come out of the transforming procedure unchanged as it was before. If the fractional part changed (mostly by 0.5), something went wrong! In the rare cases, when an old astronomer reports a JD number with fractions, we must not change anything and take the number as given.

Reference: MEEUS Jean, Astronomical Algorithms, Willmann-Bell, Richmond, Virginia, 1991, p.59ff.

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