of solid oxygen in the production of the spectrum is not sufficiently complete nor are the wave length coincidences exact enough to warrant identification of the three interstellar lines with solid oxygen, but neither is the possible identification ruled out. Further experimental work on low-temperature solids is advocated; particularly on a material recently discovered by Giguere and thought to be HO_2 .

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Markowitz, Wm. The annual variation in the rotation of the earth, 1951-54.

Variations in the rate of rotation of the earth with periods of a year or less can be determined with the aid of quartz-crystal clocks. Solutions were made for each of the three years from September 1951 to October 1954.

The astronomical observations were made with the photographic zenith tubes at Washington, D. C., and Richmond, Florida, on a total of over 1500 nights. Two resonator clocks of the National Bureau of Standards, R2 and R3, which had uninterrupted runs, were used. These clocks are of remarkably high precision, and separate solutions were made for each clock. The deviation of either clock from the mean was less than 2 milliseconds for the entire three years.

The variation in rotation of the earth was fairly regular from year to year. The earth was about 35 ms fast on October 1 and about 35 ms slow on June 1. Harmonic analysis gives a 1-year term of 30 ms amplitude and a 0.5-year term of 10 ms amplitude. There were also found two new terms of about 1 ms each, which had been predicted. The periods are 13.6 days and 27.6 days, respectively.

Values for these four terms were computed by Y. Mintz and W. Munk from meteorological and tidal considerations. The agreement with those given by observation is so good that we may consider the causes of the annual variation to be known. The 1-year term, apparently, is due principally to meteorological causes. The 0.5-year term is due principally to the solar tide Ssa and the other two terms are due to the lunar tides Mf and Mm, respectively. Tides affect the moment of inertia of the earth and, hence, its rate of rotation.

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Markowitz, Wm., Hall, R. G. and Edelson, S. Ephemeris time from photographic positions of the moon.

The program for the photographic determination of the position of the moon was started at the U. S. Naval Observatory in June 1952. The principal aim of the program is the determination of uniform time and uniform frequency. Enough of the plates taken have been reduced to provide preliminary values of Ephemeris Time.

The photographic observation gives the position of the moon at a known Universal Time, which is non-uniform. The Improved Lunar Ephemeris gives the position of the moon as a function of Ephemeris Time, which is uniform. The Improved Lunar Ephemeris is entered with the observed position and the Ephemeris Time is taken out. The difference in the two kinds of time is

$$\Delta T = \text{E.T.} - \text{U.T.}$$

A value of $\Delta T = 30^s.0$ for 1955.0 was obtained from the plates measured.

Limb corrections have not yet been applied, but two provisional corrections were applied: $+0^s.60$ to the observed latitude of the moon to reduce from the center of figure to the center of gravity, and $+0^s.27 \cos l$ to the tabular longitude, where l is the mean anomaly of the moon.

The position of the center of the moon derived from the west limb averages $1^s.2$ greater in longitude than that from the east limb. Equal weight was given to the mean value of ΔT obtained before and after full moon for each lunation.

If an atomic standard capable of furnishing measurable frequency were constructed it would be possible to test the equivalence of two measures of uniform time, gravitational and atomic.

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Menzel, Donald H., Layzer, David and Krook, Max. The origin and evolution of sunspots.

A star with differential rotation and a permanent magnetic field will in general not be in a steady state. It performs torsional oscillations in which during successive stages of a single cycle azimuthal fields are first built up in one sense, decay, build up in the opposite sense, then decay again. With even moderately small basic poloidal fields, the lines of force may "wind round" many times and thus provide comparatively strong azimuthal fields. Parts of these azimuthal fields