Contributed Talk

Splinter Education

The Pitfalls of Determining Time and Location

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One major task of astronomical observatories during the height of the classical astronomy was to provide the local time as well as to assist in land surveying by providing precisely measured reference sites. In addition to classical astronomical methods, sufficiently robust and mobile chronometers permitted an independent checking of the longitude differences by the end of the 18th century.

For this purpose, numerous chronometers – by sea– and land-transport – were repeatedly exchanged between the chief observatories and reference points and compared with the respective stationary pendulum clocks. The implementation of such comparative measurements involved several practical difficulties and also one fundamental problem. Since the time of Friedrich Wilhelm Bessel (1784–1846), transit observations revealed that time differences within a few tenths of a second between different observers could not be prevented in principle. The need to take account of these time lags and to correct them through personal equation was already common at that time and appropriate procedures were established. However, these procedures couldn't be directly applied for the purpose of comparing longitudes.

This article describes the historical and technical circumstances and the need for taking into account physiological effects. Based on a historical example, it will be shown that the processes of determining time and location are necessarily intertwined. Learners should be given an understanding of these fundamental issues – together with the historical context – in the course of their schooling. Especially due to the fact that precise location and timing information are readily but seemingly unconditionally available nowadays.