

## **THE STAR FORMATION HISTORY OF THE MILKY WAY OVER THE PAST 5 GYR**

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This project aims to use Kepler to perform the first statistically valid determination of the Milky Way's star formation rate history in the Solar vicinity over the past 5 Gyr, and to identify possible individual star formation episodes in the Cygnus-Lyra direction probed by Kepler. This is a long-standing problem in Galactic astronomy, and one that can now be addressed because of Kepler's unprecedented precision and the development of the technique of gyrochronology. Ground-based observations are insensitive to the small photometric modulations routinely observed by Kepler for very old stars, the latter allowing their rotation periods and thus gyro-ages to be determined. From the ground, it is thus impossible to probe lookback times greater than Hyades age (600 Myr). Furthermore, ground-based surveys do not allow the control and understanding of the data, including selection effects, possible with Kepler. Uncertainties in commonly used isochrone ages are too large to be useful, and asteroseismology is unfeasible for the large sample including the fainter and unevolved star required for this project. Kepler will be used to measure the rotation periods for a large sample of single main-sequence stars for which our team has already performed extensive time-series ground-based spectroscopy using the Hectochelle spectrograph on the MMT. This preparatory work is providing an exceptional target list for the proposed study. These rotation periods will be transformed into precise ages for the stars using gyrochronology, a new distant-independent method for determining the age of a field star from its rotation period. That age precision, far better than that of isochrone ages, enables this project. Variations in the numbers of stars as a function of age provide the star formation history. A proof-of-concept study is included in the proposal to demonstrate feasibility.