

Proposal for appointment of a joint Sino–Chile postdoctoral researcher

Title: *A population study of stellar rotation rates*

Abstract:

Old globular clusters (GCs) in the Milky Way often show clear evidence of containing multiple stellar populations. The origin of multiple stellar populations in GCs is still unknown; however, most popular current theories invoke scenarios involving large age spreads within GCs. Additionally, recent observations have shown that intermediate-age (1–3 Gyr-old) star clusters exhibit extended main-sequence turn-offs (eMSTOs). At first sight, eMSTOs suggest that clusters may include stellar populations with age spreads of more than 300 Myr. However, observations of young massive star clusters do not show any hints of such an extended star-formation process. Alternative models have been proposed, including population differences in terms of stellar rotation rates, but definitive tests remain elusive. Here we propose to systematically characterize the distributions of stellar rotation rates in star clusters of different ages, metallicities, and containing a range of stellar masses, using a combination of observational and novel theoretical approaches. A project such as this has never been done before for star clusters, and even for field stars the distribution of rotation rates is still very poorly known. Yet, this project has the potential to answer one of the most important open questions in GC research today: are star clusters born as “simple” stellar populations or do multiple populations develop through a more complex process?

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