

ICRAR & ICRAR-Pawsey Summer Studentships 2017-2018 Project Proposal

Project Details	
Project Title	Why does just one star cluster have two different ages, 5 Gyr and 12 Gyr old?
Primary Supervisor	Kenji Bekki
Primary Supervisor Availability	Kenji Bekki will be available from Nov 27 2017-Feb 16 2018.
Contact Details	6488 7730, kenji.bekki@uwa.edu.au
Additional Supervisors & Contact Details	
Additional Resources Required	Access to ICRAR GPU cluster Pleiades.
Pawsey Centre Hardware Use	If necessary, we will use the GPU cluster at the Pawsey center (e.g., if ICRAR GPU cluster is not available).
Software Required	N/A
Student Location for project	ICRAR-UWA
Project Description	<p>Globular clusters (GCs) are very old (12 Gyr) stellar systems consisting of about a million of stars. Terzan 5, which is one of the Galactic GCs, has been recently observed to have two distinct stellar populations with vastly different ages, 4.5 Gyr and 12 Gyr old, and different metallicities. The origin of such two distinct populations in just one GC remains unclear. In this project, students investigate how such an intriguing GC can be formed in the Galaxy using computer simulations of GC formation in the Galaxy. One possible scenario is that this GC was formed from merging between two GCs with different ages. However, it is not clear when and where they met to merge with each other. This project will reveal (i) how such GC merging was possible and (ii) whether or not the physical properties of the merged GCs are consistent with corresponding observations (e.g., mass fraction of younger population and metallicity differences between the two populations).</p>
Student Attributes	
Academic Background	Any students who are interested in either physics/astrophysics or computational science.
Computing Skills	Not necessary. The supervisor will teach this.
Training Requirement	Nothing in particular.

Project Timeline	
Week 1	Pawsey training (or inductions and project introduction)
Week 2	Setting up the initial conditions of numerical simulations for GC formation (i.e, GC merging in dwarf galaxies)
Week 3	Performance of numerical simulations on GPU clusters
Week 4	Continued
Week 5	Analysis of simulations, in particular, the physical conditions of GC merging in dwarf galaxies (that merge with the Galaxy about 5 Gyr ago).
Week 6	Continued
Week 7	Comparison with the simulated GC with the Terzan 5
Week 8	Discussion of the consistency or inconsistency between the observed and simulated GCs
Week 9	If there is inconsistency between observation and simulation in Week9, a solution for the inconsistency will be discussed.
Week 10	Final Presentation and Reporting



The Galactic globular cluster (GC) Terzan 5 (Credit: APOD)

