ICRAR & ICRAR-Pawsey Summer Studentships 2016 - 2017
Project Proposal

Project Details	
Project Title	**Observing Synthetic Galaxy Clusters**
Primary Supervisor	Pascal Elahi
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Additional Supervisors & Contact Details	Chris Power, chris.power@uwa.edu.au, Claudia Lagos, claudia.lagos@uwa.edu.au
Additional Resources Required	Programming (C/C++, Python, R) programming experience
Student Location for project	**UWA** / Curtin / Other
Project Description	Galaxy clusters are the largest gravitationally bound structures in the Universe, containing hundreds to thousands of galaxies. This complex environment can be used to study the cosmology of the Universe and probes galaxy formation across cosmic time. They are effectively astronomical laboratories that can be used to study the cosmology of the Universe or the processes that govern the formation and evolution of galaxies. However, the difficulty is understanding the complex physical information stored in images of galaxy clusters. Thus, astronomers turn to numerical simulations of galaxy clusters. The student will be involved in using synthetic clusters produced by state-of-the-art Hydrodynamical N-Body simulations. The student will write software to produce virtual observations of these simulated clusters using the information contained in the hydrodynamic simulations. These mock images can be directly compared with real observations, from X-ray maps of the hot gas that envelops clusters to images of individual galaxies themselves. By examining the properties of the clusters we will be able to identify signatures of galaxy cluster mergers and the dynamical state present in the mock images. This will be of great use to the astronomical community.
Student Attributes	
Academic Background	Physics, Mathematics, Computational Sciences or Engineering
Computing Skills	Programming (C/C++, Python, or R), knowledge of Linux Environment
Training Requirement	2nd year Physics and/or 2nd year Comp. Sci.

Project Timeline	
Week 1	Introduction to N-body simulations
Week 2	Learning to use data produced from N-Body data
Week 3	Learning to use data produced from N-Body data
Week 4	Introduction to observations of galaxy clusters
Week 5	Learning to produce simple toy observations from N-body data
Week 6	Writing/further developing existing software to produce synthetic observations
Week 7	Writing/further developing existing software to produce synthetic observations
Week 8	Produce mock X-ray & optical maps
Week 9	Write report and presentation
Week 10	Write report and presentation
	Final Presentation