

ICRAR & ICRAR-Pawsey Summer Studentships 2018-2019

Project Proposal

Project Details	
Project Title	Finding Massive Clusters in the Early Universe with the MWA
Primary Supervisor	Nicholas Seymour
Primary Supervisor Availability	Off a few weeks in January (dates TBD) but in Perth so can come in to meet with Student
Contact Details	nick.seymour@curtin.edu.au
Additional Supervisors & Contact Details	Guillaume Drouart
Additional Resources Required	none
Pawsey Centre Hardware Use	no use of Pawsey
Software Required	List all software requirements here. Student Desktop Requirements: • a programming language like python or perl. Those two are preferred but others possible • topcat, but use of this is can be taught Pawsey Centre software installations required: • n/a
Student Location for project	ICRAR-Curtin
Project Description	Clusters of galaxies are the most massive bound structures in the Universe lying at the crossroads of the large-scale structure. In the nearby Universe they are dominated by massive galaxies with very low star formation rates, but in past they must have been forming stars at a prodigious rate. However, finding young proto-clusters in the distant Universe is difficult as typical search methods (e.g. X-ray surveys, Sunyaev-Zel'dovich effect) become much less sensitive. High redshift radio galaxies are known to lie in overdense, proto-cluster environments and to be beacons regions of extreme star formation. Scaling relations suggest that the most massive black holes (powering this radio emission) will be found in the most massive dark matter haloes. This project will take advantage of low-frequency radio surveys with the Murchison Widefield Array (MWA) and combine it with NASA's mid-infrared WISE mission to find and characterise new distant, massive proto-clusters.
Student Attributes	

Academic Background	General astrophysics and/or computing background. Some understanding or keen interest to learn about galaxy evolutions welcome.
Computing Skills	Proficiency in one common language used in astrophysics (e.g. Python or Perl).
Training Requirement	Nothing specific, but increasing
Project Timeline	
Week 1	Project introduction. Familiarisation with data (MWA and WISE) and software (e.g topcat).
Week 2	Develop script to query the WISE survey data base to obtain data at a given position
Week 3	Develop script to analyse the WISE survey data and measure over-density of sources.
Week 4	Run these scripts on catalogues of known clusters (found from X-ray, millimetre surveys)
Week 5	Analyse output of these scripts. How well does WISE find the higher redshift clusters?
Week 6	Search for trends in the observed data. Can we see the build up of massive galaxies statistically from this large sample.
Week 7	compare output of scripts for clusters found from different methods.
Week 8	Run scripts on selected MWA sources to search for new clusters in the early Universe.
Week 9	Analyse new high redshift candidate clusters
Week 10	Final Presentation and Reporting