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

Project Details	
Project Title	**How 'radio-quiet' quasars contribute to the total radio emission from all faint sources**
Primary Supervisor	**Sarah White**
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Additional Supervisors & Contact Details	Nick Seymour nick.seymour@curtin.edu.au +61 8 9266 3736
Additional Resources Required	None
Student Location for project	Curtin
Project Description	The Square Kilometre Array (SKA) is a next-generation radio telescope that will allow us to detect sources with very faint radio emission. This includes 'radio-quiet' quasars (RQQs), which are supermassive black-holes that accrete material very efficiently and produce low levels of radio emission. These black holes reside in host galaxies, whose star-formation processes are thought to be the origin of this emission. However, black-hole accretion also produces radio emission, and recent work argues that this process actually dominates the emission in RQQs. (See http://arxiv.org/abs/1410.3892 for further information.) In this project we will investigate the significance of this accretion component, in terms of its fraction of the total emission across *all* faint radio sources (i.e. normal star-forming galaxies, without an accreting black-hole at the centre, in addition to RQQs). This is crucial research, as it is currently expected that the *total* radio emission of such sources can be used to determine the star-formation history of the Universe. For this work, Python scripts are already in place but will require some editing before they can be run over a new, deeper radio image. A fairly straightforward paper should result, with the student as a co-author. Please do email if you have any questions.
Student Attributes	
Academic Background	An undergraduate in physics and/or astronomy, preferably with a good understanding of statistical methods.
Computing Skills	Previous programming experience is preferred, with knowledge of Python being highly desirable.
Training Requirement	If you have no experience of Python, you can attend an introductory course at the start of the studentship, run by

	Paul Hancock and Andrew Williams (both at Curtin).
Project Timeline	
Week 1	Become familiar with Python, and especially the PyFITS and matplotlib libraries.
Week 2	Use Python to extract radio flux-densities at specified positions in a radio map.
Week 3	Plot histograms of those flux densities, and carry out a Kolmogorov–Smirnov test.
Week 4	Plot the brightness-weighted number counts of the RQQs, and all sources.
Week 5	Estimate the true number counts of the RQQs, given that the sample is incomplete. Compare this, and the number counts for all sources, to (existing) simulated data.
Week 6	Use the results of previous fitting to obtain estimates of the galaxy's stellar mass. If progressing well, collate far-infrared data for all sources within the field.
Week 7	Calculate two independent estimates of the star-formation rate, and plot them against one another.
Week 8	Determine the total accretion-related radio emission, and what fraction this is of the total radio emission from all sources.
Week 9	Start to work on the presentation and report-writing.
Week 10	Clarify any issues, look for improvements that can be made, and complete the presentation and report.
	Final Presentation