# UQ Summer or Winter Research Project Description

Please use this template to create a description of each research project, eligibility requirements and expected deliverables. Project details can then be uploaded to each faculty, school, institute, and centre webpage prior to the launch of the program.

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| **Project title:** | T**racing the Solar Magnetic Cycle Two Thousand Years with Tree Rings** |
| **Hours of engagement & delivery mode** | On-site, remote possibilities. 24 June – 19 July . |
| **Description:** | Radiocarbon dating is used by archaeologists to determine the ages of wooden artefacts and remains of living things, by measuring how much carbon-13 has decayed to carbon-12 since the material last took in fresh carbon from the air. The amount of carbon-13 in the atmosphere has slowly varied over time due to solar activity and volcanic eruptions, so to calibrate their radiocarbon dates, archaeologists use precise measurements of tree rings of known age. With alternating patterns of slow and fast growth, tree rings form a barcode pattern that can be matched to libraries stretching back millennia, giving us precise radiocarbon references for almost any year since the last Ice Age.The influence of the solar magnetic cycle can be clearly seen in some of these data: when the solar field is strong it shields the Earth from cosmic rays and suppresses radiocarbon production, and vice versa. These data clearly show Grand Solar Minima like the Maunder Minimum as prolonged periods of low radiocarbon production, and show weak evidence of the 11-year solar cycle. Many previous studies have tried to use these data estimate the period, phase, and any unusual properties of the solar cycle going back thousands of years, for example to forecast oncoming Grand Solar Minima or solar flares; but these have not necessarily been conducted with accurate statistics, and previous results are suspect. In this project, we will analyse the new IntCal24 major release of radiocarbon data and infer the amplitude, phase, and period of the solar cycle going back thousands of years, *and* ensure that we avoid false confidence where the data are weak. |
| **Expected learning outcomes and deliverables:** | Scholars will use modern statistical methods (resampling, power spectral estimators) in Python. |
| **Suitable for:** | This project is open to applications from students with a good background in scientific computing in Python. |
| **Primary Supervisor:** | Benjamin Pope |
| **Further info:** | Please contact Benjamin Pope at b.pope@uq.edu.au prior to submitting an application. |