

## **Mining Galaxies from the ATLAS database**

The 4-telescope ATLAS-network<sup>1</sup> (Tonry et al. 2018) is an asteroid impact early warning system developed by the University of Hawaii and funded by NASA. One of the 4 telescopes has been installed and operational in Sutherland, South African since late 2022. The network is designed to discover near-Earth Asteroids (NEAs) by surveying the entire sky every night. This all-sky survey-mode of course means that ATLAS has serendipitously observed many astronomical objects thousands of times (~4 visits each night for several years) and is therefore a rich dataset for various non-asteroid related studies too.

Although each telescope is relatively modest (0.5m primary mirror), one potential aspect of the data that is currently unexploited is to investigate relatively faint and diffused extended objects (e.g., galaxies or nebulae) by stacking the thousands of visits to increase the SNR. The ATLAS survey is also performed in two broad filters so a single colour of this diffused material should also be obtainable by separately stacking the different filtered images. The aim of this honours project would be to identify a list of an interesting class of galaxies (e.g., ring galaxies or interacting galaxies, but to be determined after discussion with a prospective student), extract cut-out images using the publicly available "ATLAS Forced photometry server"<sup>2</sup> and to perform proper WCS-aligned median stacking. Once the stacked images are produced for the respective list of objects further analysis can be performed (e.g. colour determination, morphology etc.).

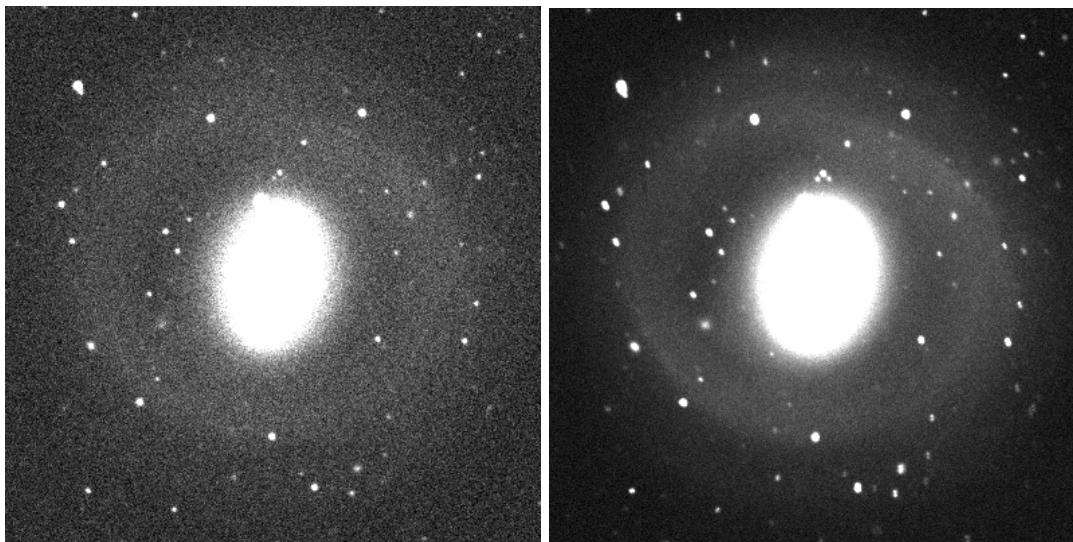


Figure 1: (left) A single-visit 30-second image from the ATLAS survey of the ring galaxy NGC 1291. (right) a non-wcs aligned (i.e., crude) median stack of only 12 30-second visits. The fainter diffused features are already clearly more visible after the crude and relatively moderate 12-visit stack.

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<sup>1</sup> <https://www.fallingstar.com/home.php>

<sup>2</sup> <https://fallingstar-data.com/forcedphot/>