

# CASTLE: the Calar Alto SchmidT-Lemaître Explorer

## Towards science preparation and exploitation

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**Subject's title:**

CASTLE: the Calar Alto SchmidT-Lemaître Explorer:  
Towards science preparation and exploitation

**Subject description:**

### Context

CASTLE is a 35-cm – F/2.5 robotic telescope to be installed at the Calar Alto Observatory by spring 2022. Its original design makes it suited for two cutting-edge science cases. This telescope benefits from a set of new technologies combining a **freeform entrance mirror**, a **folded design** allowing to get rid of the holding spider's obscuration and a **curved convex focal CMOS 64MPix** sensor suppressing flattening optics and polluting ghosts. It results in a very low diffraction effect in the image plane, as well as a high PSF stability across the wide field of view (3.6deg<sup>2</sup>).

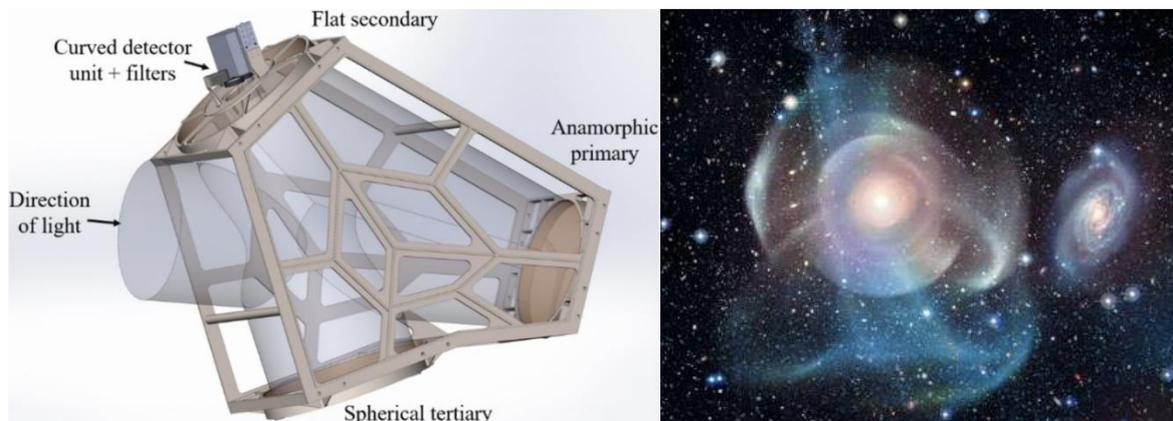


Figure 1. (Left): CASTLE layout. This 3-mirrors design works as a Schmidt camera, the anamorphic freeform primary acting as a Schmidt correcting plate. The folding of the beam makes it possible to place the detectors block behind the flat secondary, thus avoiding the use of spiders creating diffraction effects and PSF inhomogeneity and degradation. The tertiary mirror is the classical spherical Schmidt collimator, focusing the beam behind the flat secondary, on a curved convex focal surface. (Right): A network of shells of various colors and thus stellar populations around the ETG NGC0474. True color (combination of g

*and r bands) image obtained with the MegaCam camera at CFHT as part of the Atlas3D project, and processed by Coleum Duc/Cuillandre/CFHT/Coleum (2012)*

This combination of innovations makes it a facility perfectly suited to **observe the Low Surface Brightness Universe (LSB)**. CASTLE has also been made robotic and can serve as **a transient follow-up facility** in the visible. Part of its observation time is dedicated to this science case, in an alert mode. Additionally, CASTLE will serve, once a month, as an educational tool, targeting scholars, college and grad students willing to discover or enrich their knowledge about what an observation program and a telescope operation are.

## PhD workplan

The PhD work will cover several of the aspects involved in the construction of a new telescope. The student will be in charge of preparing and executing tests for a sub-module of the telescope, he/she will participate to the integration and commissioning phase on site, and be involved in the science exploitation.

Tasks to be undertaken are to develop the automatic data pre-processing which includes applying dark, bias and flat field correction. The possibilities of preparing simulations of realistic observations, starting from observations made by other surveys (e.g. CFHT), will be considered depending on the status of the project. This action will be focused on providing: (i) initial target selections, (ii) assessment of observing strategy (exposure time, dithering pattern).

Once an initial observing campaign will start, the student will be part of the science exploitation phase, for which data will be collected and analyzed to better understand galaxy formation and evolution.