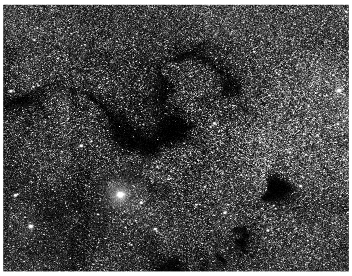
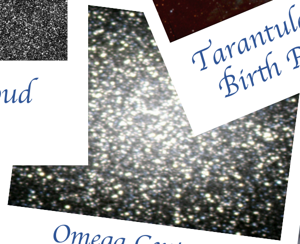
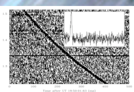


The Snake Dark Cloud

Tarantula Star Birth Region

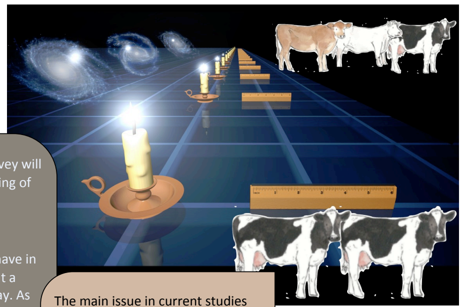


Omega Centauri Star Cluster



ASKAP - Australian Square Kilometre Array Pathfinder

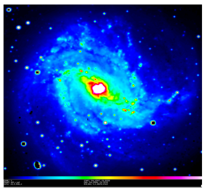
CAASTRO helped a unique collaboration to arise, which may reveal for the first time optical light from the enigmatic **"Fast Radio Bursts"** that were first found at the Parkes Telescope. The **Australian SKA Pathfinder (ASKAP)** will shadow the SkyMapper Telescope from 2018 as it completes its sky survey. ASKAP can pinpoint radio bursts with enough precision to highlight which pixel in SkyMapper images may show optical light at the same time. Any light other than radio waves helps to reveal more about these completely unexplained radio bursts, which for the duration of a millisecond outshine entire galaxies in their radio emission.



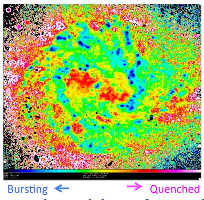
The **SkyMapper** Transient Survey will provide unprecedented understanding of **Dark Energy** through detailed observations of distant **Type Ia supernovae**. They tend to behave in a similar way, shining very brightly at a known luminosity before fading away. As with street lamps we can judge their distance from how bright they appear. Together with their redshift we map the expansion history of the Universe.

The main issue in current studies of Dark Energy is that populations of nearby and distant supernovae are different. Known nearby supernovae were collected in a selective process, while distant supernovae are more diverse, causing subtle inconsistencies when measuring Dark Energy.

SkyMapper is designed to find nearby supernovae with equal diversity, so that we can compare apples with apples when measuring the expansion history of the Universe. As a result we will characterise the mysterious Dark Energy to a new level. Will that reveal its nature?



Messier 83 Galaxy false-colour image of brightness



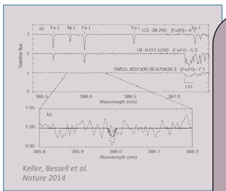
Colour-coded map of temporal changes in star formation

Originally tailored to characterise stars in our Milky Way with high precision, **SkyMapper** introduces a new diagnostic tool to the study of other galaxies: its colours reveal how much the level of star formation in other galaxies has changed over the last 200 million years. The galaxy shown here is Messier 83 at a distance of 16 million light-years and the map on the right reveals regions where the level of star formation is rising or fading.

SPACE & COSMOS

The Archaeology of the Stars

The New York Times

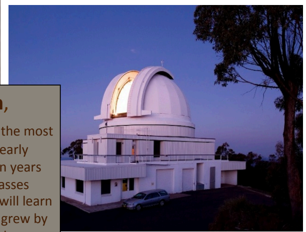


Keller, Bessell et al. Nature 2014

The Oldest Star...

SkyMapper has already found the most chemically pristine star known in our Galaxy. It formed 13 billion years ago in the primordial gas cloud of the Milky Way. SkyMapper will find many such stars and provide deep insights into how galaxies form.

With the help of **Taipan, SkyMapper** will find the most massive black holes in the early Universe. Less than a billion years after the Big Bang, their masses reach ten billion suns. We will learn whether these black holes grew by rapidly accreting matter or have a mysterious primordial origin. Taipan will also reveal the largest super-structures in the Universe and test its homogeneity.



TAIPAN Spectrograph UK Schmidt Telescope

The Taipan survey will measure redshifts for twomillion **SkyMapper galaxies**. This will test our understanding of the standard cosmological model and give precise answers to three fundamental questions:

1. What is the expansion rate of the universe (the Hubble constant)?
2. What are the density and velocity fields in the local universe?
3. What is the correct theory of gravity?

The 1.3m SkyMapper Telescope

The SkyMapper 1.3m Telescope is situated at Siding Spring Observatory (NSW) near the Warrumbungle National Park, Australia's first Dark Sky Park. Owned and operated by ANU, its observations started in the year 2014 and will run until 2020. The resulting image of the sky will have one trillion (1,000,000,000,000) pixels and record billions of stars and galaxies with their locations, shapes and luminosities in six optical colours. These colours are crucial to differentiate stars of different mass, size and chemical composition, galaxies at different distance and with different levels of star formation, as well as actively growing supermassive black holes. All processed imagery will be freely accessible to the public at http://skymapper.anu.edu.au

Using repeat observations SkyMapper reveals transient phenomena from nearby pulsating stars to distant supernovae and new unknowns.

CAASTRO ALL-SKY ASTROPHYSICS
Astronomy Australia Ltd.
NCI
Australian National University
Australian Government Australian Research Council
NCRIS National Research Infrastructure for Australia
ASVO