CTA-Australia Workshop #4 - Talk Abstracts

Nigel Maxted

Talk details: Gas Towards Gamma-Ray-Emitting Supernova Remnants

The Mopra radio telescope is ideal for probing the interstellar environments of gamma-ray sources through large-scale molecular line surveys. The Mopra Galactic Plane CO Survey can resolve gas involved in gamma-ray generation at a scale comparable and better than the resolution of the CTA, while giving insights into gas dynamics. Dense gas tracers such as CS and NH3 have proven to be useful probes of gamma-bright regions, while SiO emission can directly highlight shock-disrupted gas. I present the results of molecular spectral line observations towards supernova remnants at various stages of evolution, focusing on SNR HESS J1731-347, with reference to SNRs RXJ1713.7-3946, CTB37A and W28.

Catherine Braiding

Talk details: The Mopra Southern Galactic Plane CO Survey

Now in its seventh year, the Mopra CO Survey has observed more than 100 square degrees of the Galactic Plane, and is now being expanded outwards to cover a higher range of latitudes to include the vast majority of HESS (and expected CTA) sources. I'll present our current coverage maps and astonish the viewer with gorgeous imagery of the deep complexity of the interstellar medium in our Milky Way. We'll also discuss our plans for 2017, in order to ensure that all remaining high-priority sources are observed in what may be our last year of telescope availability.

John Dickey

Talk details: CTA, HI, and Molecular gas in the Interstellar Medium

One of the most valuable results of a CTA survey of the Galactic Plane will be as a reference for spectroscopic tracers of the interstellar medium. Gamma ray observations have already shown that there is a gap in the physical parameters of the gas traced by conventional radio and mm-wave surveys. To achieve better precision in the gas column density measurements derived from the gamma ray data may require improvement in the models of cosmic ray density and propagation. This will bring together theory and observation of cosmic rays and magnetic fields, as well as atomic and molecular line data, to answer some long-standing questions in Galactic astrophysics.

Denis Leahy

Talk details: Title: Properties of the Supernova Remnant Population in the Large Magellanic Cloud

A number of Galactic supernova remnants have been studied in great detail, but the properties of the whole population are poorly understood. The Large Magellanic Cloud has a well determined distance and an observed supernova remnant sample that is nearly complete up to intermediate ages. Thus it is currently the best sample for studies of supernova remnant population properties. A new set of models has been applied to this sample, to measure the distribution of supernova remnant characteristics, including explosion energies, ages, and circum-stellar medium densities.

Ivo Seitenzahl

Talk details: Title: "PWNe in young oxygen-rich supernova remnants as TeV sources for CTA"

Abstract: As a member that only very recently joined the CTA consortium, I would like to present a talk on possible intersections of my research on supernovae and supernova remnants with CTA science, in particular cosmic rays accelerated in pulsar wind nebulae and supernova remnants. Specifically, I will present progress and preliminary results from our ongoing optical integral field spectroscopic observations of young, oxygen-rich supernova remnants 1E0102.2-7219, G292.0+1.8, and B0540-69.3 and discuss how these observations at optical wavelengths could be relevant for CTA related TeV gamma-ray science.

Fabien Voisin

Title: Modelling the TeV gamma-ray emission from the propagation of high energy protons/electrons in an inhomogeneous ISM.

Abstract : In this talk, I will discuss about the numerical code I have built which outputs FITS cubes (l,b,Energy) of the gamma-ray energy distribution from the propagation of high energy protons/electrons as they escape from high energy sources (e.g SNRs, PWNe), accounting for all radiation losses. We first create a template density distribution based on CS and CO column density maps obtained from Mopra and Nanten observations. From this template, we then study the effects of this inhomogeneous ISM on the morphology of the gamma-ray emission, and look for key features, which could be resolved by CTA, that would help distinguish hadronic from leptonic gamma-ray emission. Finally, I will discuss the potential upgrades which will be implemented in the future (X-ray modelling, numerical algorithm).

Troy Porter

Title: The GALPROP cosmic ray propagation code and its relevance to CTA

Abstract: GALPROP is the de-facto standard code for modelling cosmic ray propagation and the production of associated non-thermal interstellar emissions in the Milky Way. It has been developed since the mid-90s and is freely available for download, and can be run online via a dedicated website (http://galprop.stanford.edu). I will describe the developments that are leading to the forthcoming next public release. These advances enable improved modelling of the high-quality data that are now available. The Fermi-LAT dramatically improved the sensitivity over the earlier generation space-borne instrument EGRET on the CGRO CTA will make comparable gains over the previous generation Cherenkov detectors, and hence understanding the fore/background from the Milky Way will be critical for simulating the detector performance and analysis of the data. I will describe the relevance of the GALPROP code for enabling future studies with the CTA.

Ray Norris

Talk: CTA and ASKAP-EMU synergy

Abstract: The Australian SKA Pathfinder telescope is approaching completion in Western Australia, and soon we will be starting the EMU project, detecting about 70 million radio sources. Most (and possibly all) CTA sources will be EMU sources, so the science from the two projects will be maximised by ensuring maximum coordination between them. In this talk I will discuss the science driving this synergy, and what we might hope to get out of it.

Shivani Bhandari

Title: Fast Radio Bursts

Abstract: Fast Radio Bursts (FRBs), exotic millisecond duration bursts which are now established as a bona fide astrophysical phenomenon are currently the hottest topic in the field of transient astronomy. The discovery of FRBs has stimulated a range of theoretical investigations to understand their origin and physics as well as observational efforts around the world to search for more such bursts. New instrumentation capable of real-time detection at the Parkes radio telescope has enabled prompt multi-wavelength follow-ups upon detection. The ongoing SUPERB project at Parkes is discovering FRBs in real time and effecting rapid multi-wavelength follow-ups which are a key to determining FRB progenitors. In this talk, I will present latest SUPERB FRB discoveries and the results of their radio, optical and X-ray follow-ups. I will also summarise what is happening around the world for follow-up of FRBs at all wavelengths to motivate further discussion. There is no more exciting time to be involved in the field!

Jo Dawson

Title: A tale of two surveys: Improving our census of transition-state gas with GASKAP and SPLASH

Abstract: I will provide a brief overview and status update on two complementary radio spectral line surveys, GASKAP and SPLASH, with a focus on how they will provide an improved census of the Galactic ISM via recovery and characterisation of its elusive “dark” component. GASKAP (the Galactic ASKAP survey) will map the Galactic Plane and Magellanic system in HI and OH with a resolution as high as 10”, providing a powerful, high-sensitivity dataset well matched to the CTAs resolution. SPLASH (the Southern Parkes Large-Area Survey in Hydroxyl) is the most sensitive large-scale survey of OH ever performed, and promises a new probe of CO-dark molecular gas in the Milky Way. Together these projects will provide a new view of the transition-state gas bridging the classic regimes traced by HI and CO emission – the so-called “dark ISM”

Nick Tothill

Talk details: Cosmic Ray Ionisation in Molecular Gas

Abstract: Can we estimate the ionisation state of molecular gas well enough to use it to understand cosmic ray interaction with clouds and cores, and hence e.g. magnetic fields?