GALAXY AND MATTER ASSEMBLY (GAMA)

Simon P. Driver

Scottish Universities Physics Alliance

University of St Andrews

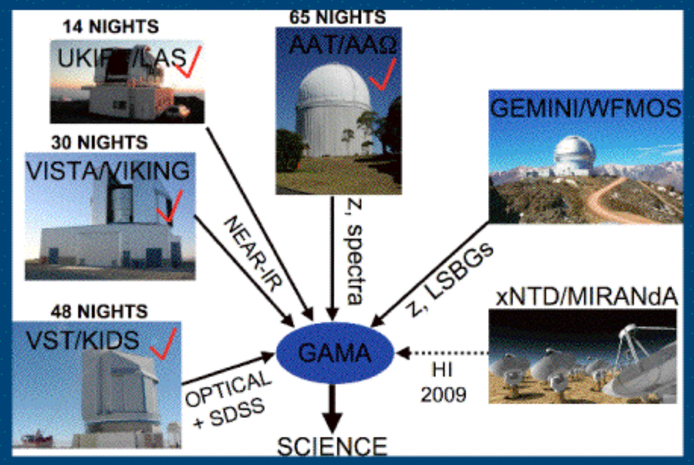

Figure 1. Facilities contributing to the GAMA database.

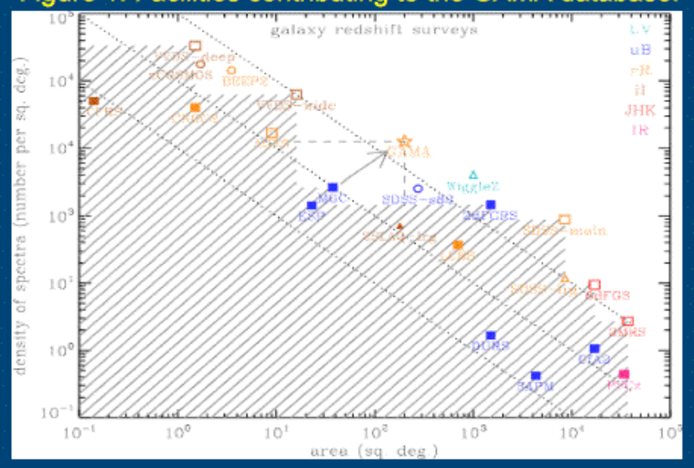

Figure 2. A compendium of ongoing and planned galaxy Surveys. GAMA will explore the intermediate scales between the shallow all sky surveys and the very deep pencil beam surveys (see Fig.5).

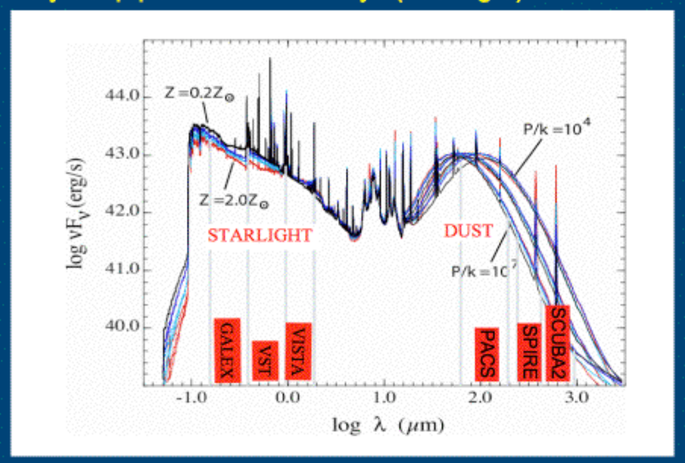

Figure 3. Galaxies emit radiation over a broad wavelength range making multi-wavelength observations essential.

Our understanding of galaxy formation and evolution is predominantly driven by breakthrough observations which in turn are driven by technological advancements. The UK leads the world in wide field astronomy and has recently invested significant funds in the construction of a remarkable suite of new facilities (UKIRT, VST, VISTA, AAT, SCUBA II, HERSCHEL, Figs 1 & 2).

GAMA is a collaboration of 17 institutions across the UK, continental Europe, and Australia, which aims to combine data from all of these major STFC/ESO observatories. The consortium has to date been allocated 157 nights of telescope time over the next three years on four facilities and is led by a seven member Executive including 3 SUPA reps. (Driver, Peacock, Norberg).

The main aim is to test the Cold Dark Matter paradigm for galaxy and structure formation over 1kpc to 1Mpc scales. This is the scale over which the models struggle to match the available observations. Our tests focus on three areas:
1) The dark matter halo mass function from cluster to galaxy mass scales (Fig.6)
2) The galaxy stellar mass function to constrain baryonic feedback (Fig.7)
3) The recent galaxy merger rates & timescales via pair and Asymmetry studies

The broader (Legacy) objective is to construct a comprehensive and complete galaxy database that will contain measurements of the structural properties, stellar distributions, stellar populations, gas & dust content, and dynamical masses for around 250,000 nearby (z<0.6) galaxies. This database will provide the definitive description of the nearby galaxy population and represents a vital compliment to the upcoming deep sky surveys with the James Webb Space Telescope, Atacama Large Millimeter Array and Square Kilometer Array.

A key feature of our survey is the focus on a truly multi-wavelength approach to obtain the full spectral-energy distributions from ultra-violet through near-IR to far-IR and HI to trace the individual matter states (stars, neutral gas and dust).

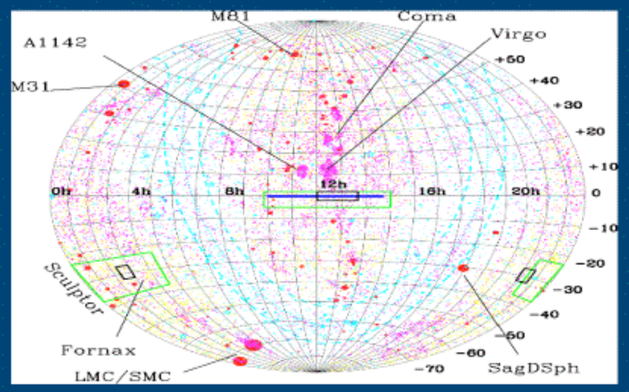

Figure 4. An Aitoff projection of the whole sky with various survey regions marked (blue box GAMA, green box 2dFGRS, black line MGC). The location of the Galactic Plane and the Bright Star Catalogue in cyan, galaxies within 10Mpc in red, the NGC catalogue in magenta, and the Abell cluster catalogue in yellow.

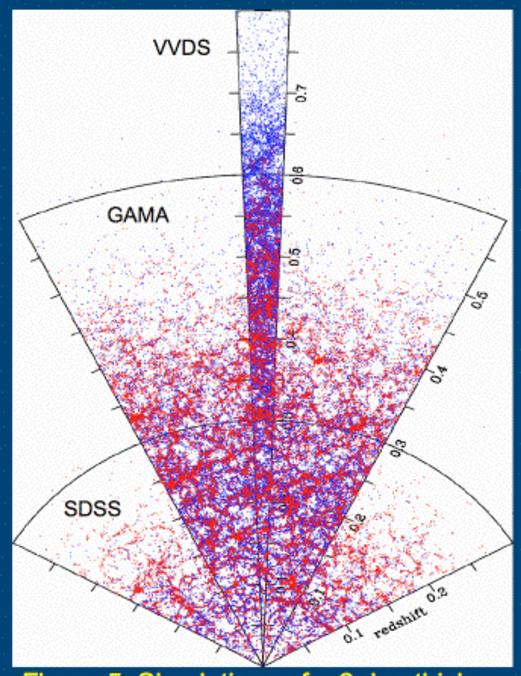

Figure 5. Simulations of a 2 deg thick survey section for 3% of SDSS, 50% of GAMA and 50% of VVDS.

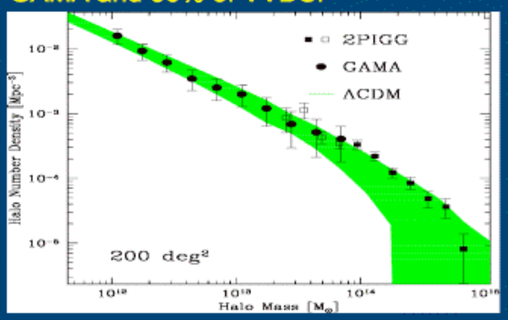

Figure 6. The predicted Cold Dark Matter halo mass function (green), existing constraints (boxes), and our projection of the final GAMA survey (discs).

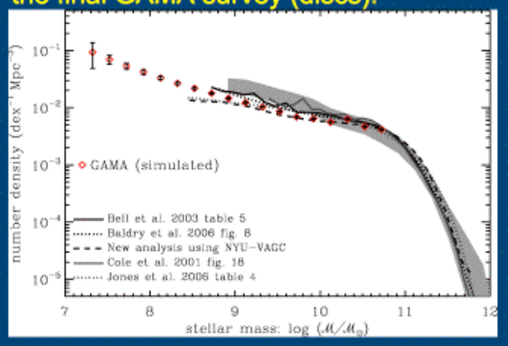

Figure 7. The projected GAMA stellar mass function compared to other recent studies.