The HIPASS Bright Galaxy Survey

The HI Parkes All-Sky Survey (HIPASS) has provided the first ever survey of extragalactic neutral hydrogen (H I) over the sky. This survey was completed in March 2000 and the data released in May 2000 (see www.atnf.csiro.au/multibeam/release). An extension into the northern hemisphere to the northern limit of the Parkes telescope is ongoing. Extensive efforts are now underway to mine the rich HIPASS data set. The most important effort is in finding and cataloguing the galaxies, both previously known galaxies and newly discovered galaxies. Considerable effort is being contributed by the teams at the University of Melbourne, the Swinburne Centre for Astrophysics and Supercomputing, and the ATNF. One of the first products is the HIPASS *Bright Galaxy Catalogue*, which is a catalogue of the 1000 apparently brightest H I galaxies in the southern hemisphere.

The HIPASS Bright Galaxy Catalogue represents the first unobscured view of the nearby galaxy distribution in the southern sky. Neutral hydrogen gas in galaxies can be detected easily where optical and infrared surveys are limited by the dust and stars of our own Galaxy. Therefore HIPASS easily fills in large areas of previously 'blank' sky, revealing the overall extent of galaxy large-scale structure.

In Figure 1 we show the spatial distribution of the brightest HIPASS galaxies. Of these, 84 have no counterparts cataloged in the NASA/IPAC Extragalactic Database. Most of the newly discovered galaxies lie in or close to the optical 'Zone-of-Avoidance' (see Figure 2), with 58 at Galactic latitudes less than 10 degrees, 38 galaxies at less than 5 degrees (see also Henning et al. 2000, AJ, 119, 2686). There are 21 new galaxies at latitudes greater than 15 degrees. For 17 galaxies, the HIPASS and optical velocities disagree. ATCA and optical follow-ups of these and many other galaxies are under way to confirm their identification.

The new galaxies found outside the Zone-of-Avoidance can be divided into two groups, those with optical counterparts and those without, the latter being very rare. Figure 3 shows several examples of the first kind: mostly compact, late-type galaxies, some close to nearby stars. We detected HI 1225+01 (the Virgo cloud; Haynes & Giovanelli 1989) and a new tidal cloud, HIPASS J0731-69, well-separated from its apparent host galaxy NGC 2442 (see the article by Stuart Ryder et al.). Also remarkable was the detection of HIPASS J1712–64 (Kilborn et al. 2000, AJ 120, 1342) and later HIPASS J1718–59 (Koribalski et al. 2001, in prep.) plus several others without any obvious optical counterparts. Their striking location along the Supergalactic Plane leads to speculation that they may be the dregs of the galaxy formation process. However, it is also quite possible that they represent a new kind of high-velocity ejecta from the Magellanic system as has been predicted in some simulations.

Figure 4 shows the velocity distribution of the 1000 brightest HIPASS galaxies (orange) compared to the 1000 brightest optical galaxies (selected from the Lyon/Meudon Extragalactic Database using blue magnitude). As the overall H I distribution is dominated by galaxies with systemic velocities between 800 and 2000 km s^{-1} the most outstanding structures in Figure 1 are the Supergalactic Plane and the Local Void. Several new galaxies with velocities above 1000 km s^{-1} have been found which better define the boundaries of the Local Void. Although we know from optical surveys that the galaxy large-scale structure is far from homogeneous, it is important to study the sky uninhibited by obscuration. Many known structures continue into and across the optical Zone-of-Avoidance and create a beautiful network of galaxies, dominated by groups, strings and bubbles.

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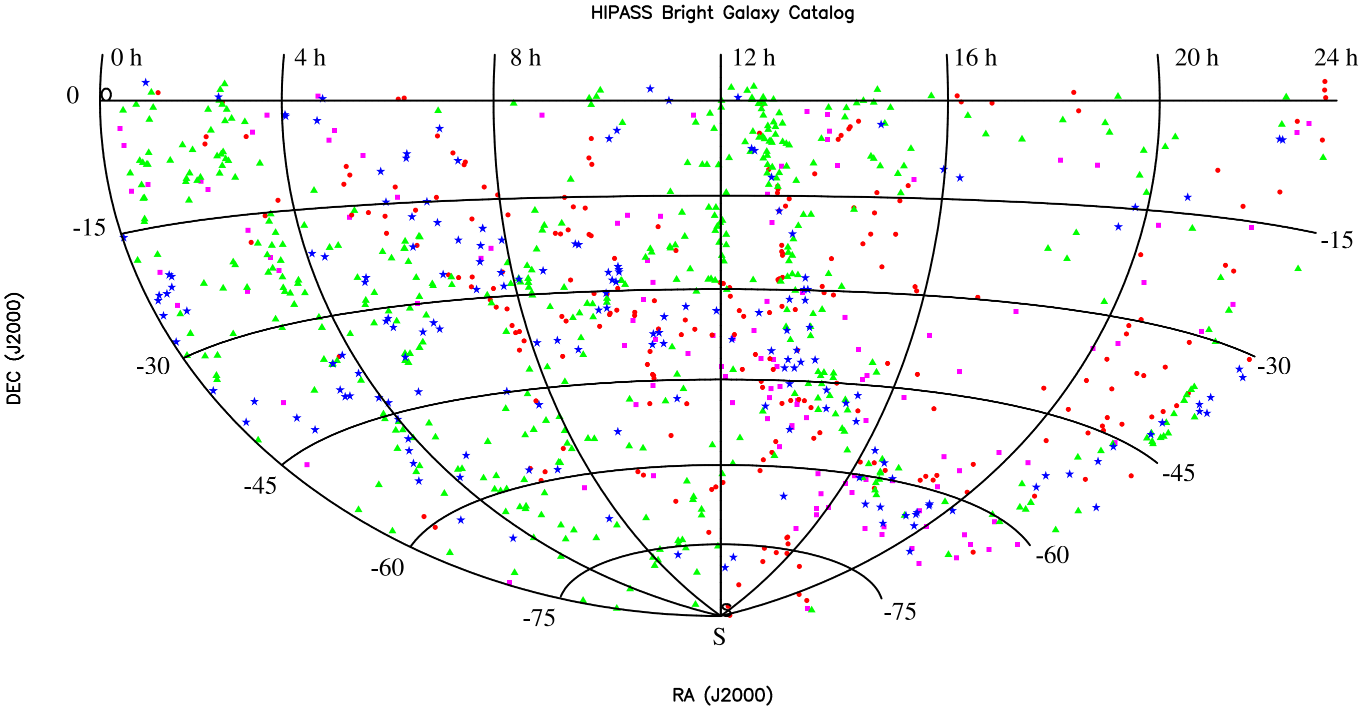

Figure 1: Aitoff projection of the 1000 brightest HIPASS galaxies. — The symbols and colors denote different velocity ranges: $v_{\rm sys} < 1000$ (blue stars), $1000 - 2000$ (green triangles), $2000 - 3000$ (red circles), and > 3000 km s^{-1} (grey squares).

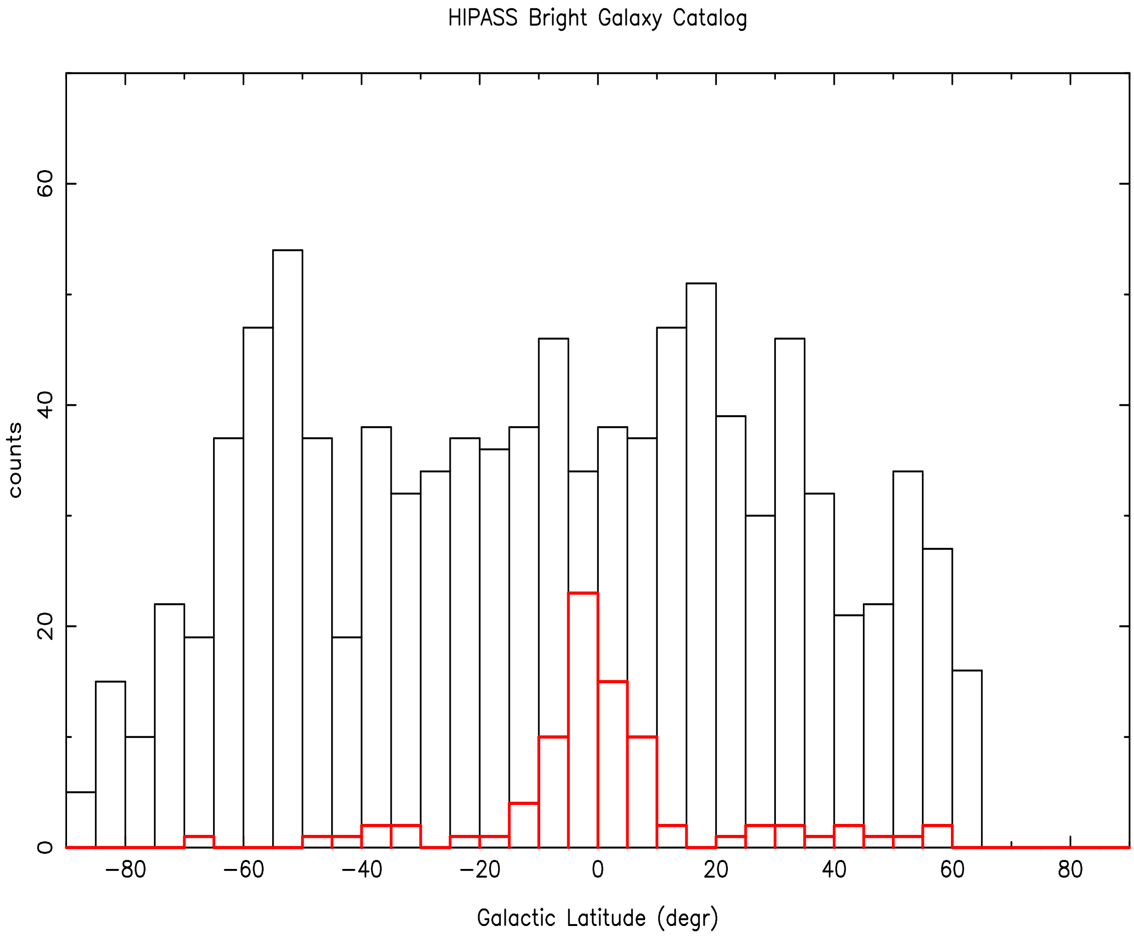

Figure 2: Latitude histogram of the 1000 brightest HIPASS galaxies; new galaxies are marked in red.

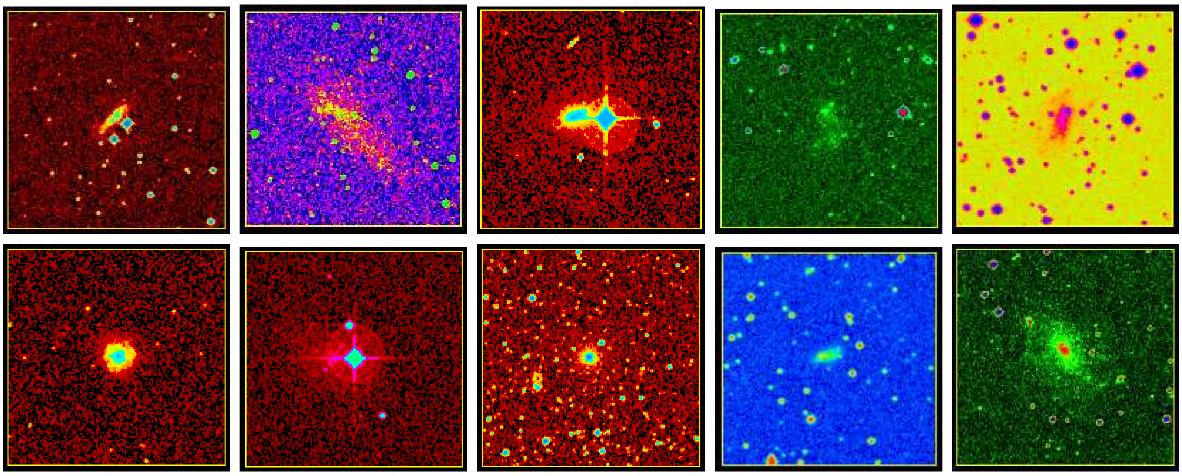

Figure 3: Displayed are optical images (from the the Digitized Sky Survey) of ten new galaxies detected in the HIPASS Bright Galaxies Survey (latitudes $|b| > 15$ degrees).

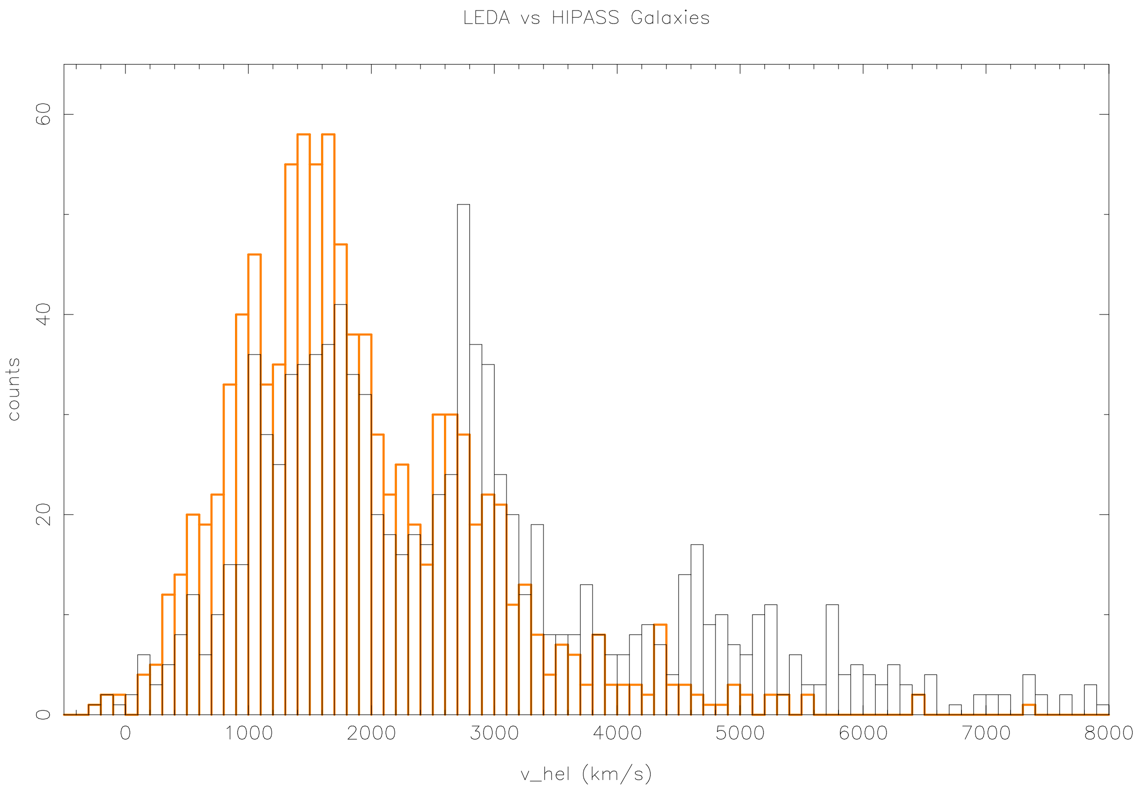

Figure 4: Histogram of the H I systemic velocities of the 1000 brightest HIPASS galaxies (orange). The velocity range from -1300 to $+8000$ km s^{-1} was searched, except for the span from -350 to $+350$ km s^{-1} where only known galaxies with an H I peak flux >120 mJy beam^{-1} were added. For comparison we added the velocity histogram of the 1000 brightest optical galaxies (black).