EXTRAGALACTIC ASTRONOMY

# Unveiling a new galaxy

*David Burstein*

ON a clear, dark, moonless summer (or winter) night, look at the sky around midnight. You will see myriads of stars pasted on the dome of the sky, bisected by a fuzzy arc that is an amalgam of dark and light diffuse patches. This arc was called the 'Milky Way' by the Greeks. We know today that the Milky Way is the disk of our Galaxy, seen edge-on by us, residents of that disk. Yet what is beautiful to the eye on a dark night is the bane of extragalactic astronomers, as the dust and stars within the disk of our Galaxy veil the rest of the Universe from our sight. Extragalactic astronomers have long called the Milky Way the 'zone of avoidance' for the fact that galaxies appear to avoid that region of the sky. This is an illusion, of course. Only this summer, we first realised that the Milky Way had an attendant dwarf galaxy so close that it was in danger of being pulled apart[1]; and now, on page 77 of this issue, R. C. Kraan-Korteweg *et al.*[2] describe their discovery of a nearby spiral galaxy hidden by the murk.

If we are truly going to understand the structure of the Universe, we must be able to study the 15 per cent or so that is obscured by our own Milky Way. The trick is to search the region at a wavelength that is not badly obscured by dust, and the Dwingeloo telescope in The Netherlands is, for the time being, entirely dedicated to doing just that. A systematic survey of the zone of avoidance (ZOA) region is being made at a wavelength of 21 cm (the emission comes from atomic hydrogen, H I). Analysis of the results is only just beginning, and the first fruits of the survey include the new spiral galaxy. More can surely be expected to emerge as the survey continues.

The new galaxy, seen glimmering faintly behind the foreground stars in the photograph, lies about 0.1° below the Galactic plane and has an angular size of about 3 arcminutes as imaged by the discoverers. As far as Kraan-Korteweg *et al.* can guess, it is about 3 megaparsec away (about $10^7$ light years), too distant to be a member of our Local Group of galaxies. It therefore is not likely to share the fate of the dwarf galaxy discovered earlier this year, which is a mere 24 kiloparsec away and is apparently being pulled apart by the Milky Way.

It is indicative of the importance placed on understanding the Universe beyond the ZOA that the Dwingeloo survey is but one of several being done by astronomers, as a meeting earlier this year[3] discussed. Surveys in the optical, infrared and radio regions of the spectrum are being done in various directions within the ZOA by various groups. Indeed, the paper on page 77 draws together workers from several groups; Lahav and Lynden-Bell have had a long-standing cosmological interest in what lies behind the ZOA, Henning was earlier involved in a more limited H I survey aimed at detecting nearby galaxies, and to the best of my knowledge, Kraan-Korteweg herself was the first to start systematically examining optical images for galaxies within the ZOA, some six or seven years ago.

R. C. Kraan-Korteweg

A galaxy on our doorstep — image of Dwingeloo 1 taken by the Isaac Newton Telescope.

Why this flurry of interest? After all, astronomers have known about the obscuration of the disk of the Milky Way for nearly a century. Speaking for myself, my attention was first drawn to the ZOA seven years ago, when it became apparent that one of the largest components of the motion of our Galaxy, relative to the expansion of the Universe, is due to the gravitational attraction of mass that lies behind the ZOA. Moreover, the largest nearby concentration of visible mass that we do know exists (called variously the Great Attractor or the Hydra–Centaurus–Pavo–Indus–Telescopium collection of galaxy clusters) is squarely bisected by the ZOA, leaving us to speculate on how many galaxies are really in this region.

Whereas the disk of the Milky Way is the zone of avoidance to those who study other galaxies, it is a subject in its own right to those who study our Galaxy. Over the past 10 years, the advent of near-infrared and infrared detectors with high quantum efficiency that can pierce the dust have made observational study of the disk plausible. Inevitably, such studies are bound to uncover extragalactic objects lying behind the ZOA; for example, Ibata and colleagues[1] discovered the Sagittarius dwarf galaxy during a survey that was designed to study stars within the disk and bulge of our Galaxy.

Study of the stars and dust in the disk of our own Galaxy is important for other cosmological reasons as well. The discovery of the faint lumps and bumps of the early Universe by the COBE satellite first required careful removal of the much brighter foreground infrared emission from both stars and dust in the disk of our Galaxy (the newly discovered galaxies, on the other hand, are far too faint to affect the COBE results). COBE, indeed, contributes considerably to our knowledge of the Galactic disk[4]. Separately, large-scale surveys that are designed to find the dark-matter candidates known as MACHOs (massive compact halo objects; really, very low-mass star-like objects) must observe as many stars as possible in order to have a reasonable probability of detecting the light variation caused by passage of one MACHO along our line of sight to one star. So MACHO surveys place high priority on relatively dust-free paths within the disk and bulge of our Galaxy.

Until 10 years ago, most maps of galaxies on the sky placed a veritable 'celestial incognito' on the ZOA; this region was simply kept blank. Ten years ago our understanding of the distribution of stars in the disk more than 2 kpc from us was limited to a very few lines of sight and to studies of only the brightest stars. It is encouraging to see the veil of the Milky Way being slowly lifted; and we await with anticipation the full unveiling. □

*David Burstein is in the Department of Physics and Astronomy, Arizona State University, Tempe, Arizona 85287, USA.*


1. Ibata, R. A., Gilmore, G. & Irwin, M. J. *Nature* **370**, 194–196 (1994).
2. Kraan-Korteweg, R. C. *et al.* *Nature* **372**, 77–79 (1994).
3. *Unveiling Large-Scale Structures behind the Milky Way* (eds Balkowski, C. & Kraan-Korteweg, R. C.) (Astr. Soc. Pacif. Conf. Series **67**, 1994).
4. Arendt, R. *et al.* *Astrophys. J.* **425**, L85–88 (1994).