Research Highlights:

1974

Thesis study of velocity field of spiral galaxy M51 with an imaging Fabry-Perot interferometer. At the epoch, the most detailed two-dimensional study of motions in any galaxy and provided evidence favoring model of spiral formation driven by interaction. **1975**

HI study of DDO dwarf galaxies (with J.R. Fisher). This program approximately doubled the number of galaxies observed in HI.

1976

Westerbork 21 cm observations of what became the smallest systems with detailed kinematic information (with L. Bottinelli, J.R. Fisher, L. Gouguenheim, R. Sancisi, and H. van Worden).

1977

Luminosity-line width relation for spirals (with J.R. Fisher). Subsequently referred to as Tully-Fisher relation. Still probably the most accurate way to measure the distances to spiral galaxies beyond a few megaparsecs.

1981

HI observations data paper (with J.R. Fisher). Publication of results of observations of 1200 galaxies, again approximately doubling the number of galaxies observed in HI at the time.

1982

A description of the Local Supercluster.

A color-magnitude relation for spirals (with J.R. Mould and M Aaronson).

Model of galaxy infall toward the Virgo Cluster (with M. Aaronson, J.P. Huchra, J.R. Mould, and P.L. Schechter).

1984

A more elaborate model of galaxy infall toward the Virgo Cluster and on the angular momentum content of galaxies (with E.J. Shaya).

1986

Discovery of structure in the universe on a scale of 0.1c. Observed coincidence of the plane of the Local Supercluster and a plane delineated by Abell and less rich clusters in the Pisces-Cetus region.

1987

Publication of the 'Nearby Galaxies Atlas' (with J.R. Fisher) and the 'Nearby Galaxies Catalog'. Substantially the first attempt to map the structure in the distribution of nearby galaxies.

Compendium of nearby groups of galaxies selected by objective algorithm. Evidence for dark matter on a scale of 100 kpc around galaxies and lower limit for the density of the universe of 0.08 times the critical density.

1988

Distance estimates to galaxies in clusters (with M.J. Pierce) and in the field. Evidence that the Hubble Constant is in the range 85-90 km s^{-1} Mpc^{-1}.

First results with a new imaging Fabry-Perot interferometer (with J. Bland and G. Cecil). Studies of anomalous extended emission regions in nearby galaxies with active nuclei. Bipolar outflow from M82 mapped. Emission-line filaments demonstrated to be on outwardly accelerating surfaces of hot bubbles.

1990

Mapping of biconal outflow from the Seyfert galaxy NGC 1068 and the association with kiloparsec scale high excitation conditions (with G. Cecil and J. Bland).

1991

Dissection of the velocity field of the ultraluminous infrared collision object NGC 6240 into two discrete interacting disk components. A compact center was already known associated with one of these disks, but a 'dark' center with a 700 km s^{-1} velocity gradient was also identified with the second disk (with J. Bland-Hawthorn and A. Wilson).

1992

Linear non-parametric analysis of the velocity field of the Local Supercluster within 3000 km s^{-1} (with E.J. Shaya and M.J. Pierce). A value for the density of matter clumped on 1-10 Mpc scales of only $0.1\Omega_{crit}$ was found.

Further intriguing but inconclusive evidence is presented for coherent structure, possibly cyclic, on scales of 300 Mpc (with R. Scaramella, G. Vettolani, and G. Zamorani).

The velocity field of the galaxy NGC 4258 was mapped (with G. Cecil and A. Wilson). The well-known paired anomalous arms which emanate from the nucleus and are associated with ionized gas, radio non-thermal emission, and X-ray

emission are now shown to consist of braided strands. The phenomenon must be associated with a magnetohydrodynamic instability in the plasma jet outflow.

1994

NGC 3079 contains the most energetic bipolar outflow event seen in nearby galaxies with line-of-sight velocities ranging over 2000 km s^{-1}. A two-dimensional Fabry-Perot velocity field map reveals that, as with M82, the gas radiating visible lines is on a sheath around hot X-ray emitting plasma and the gas is accelerating outward. The stellar wind is driven by a starburst in the galaxy nucleus (with S. Veilleux, G. Cecil, J. Bland- Hawthorn, A. Filippenko, and W. Sargent).

1995

Least Action reenactment of orbits of galaxies in the Local Supercluster provide a plausible history of the formation of the structure that is seen and provides an estimate of the mass distribution. The density of matter distributed like the observed galaxies corresponds to 17% of closure density, with a standard deviation of 10% (with E.J. Shaya and P.J.E. Peebles).

1996

Evidence for bimodality of the surface brightnesses of spiral disks comes from optical–infrared photometry of a complete sample of galaxies in the Ursa Major Cluster. There may be 3 discrete formation states for spirals separated by (angular momentum?) thresholds: low surface brightness systems with exponential disks, high surface brightness systems with exponential disks, and high surface brightness systems with disks plus bulges (with M.A.W Verheijen).

1998

The extragalactic distance scale and expansion rate are reevaluated with an abundance of new data. Distances to individual galaxies are determined using the relation between luminosities and rotation rates. Samples are now much more extensive and complete, and cover more of the sky to greater distances. Photometry at B, R, I, and K' bands allows corrections for obscuration. Accurate distances from the cepheid method are available for 24 calibrator galaxies. It is now found that $H_0 = 77 \pm 8$ km s^{-1} Mpc^{-1} (95% prob.) (with M.J. Pierce).

2001

Observations with the wide field CCD cameras on CFH and Subaru telescopes and complementary HI observations with the VLA reveal significant variations of the faint end of the galaxy luminosity function in different environments. The ratio dwarf-to-giant is high in high density regions with short dynamical collapse

times and low in low density regions with long dynamical times. It is suggested that dwarfs were formed very early in regions with short dynamical times, so early that they formed before the epoch of re-ionization of the universe. In low density regions, dwarf dark halos collapsed after the epoch of re-ionization. The visible manifestations of galaxy formation were squelched in those halos that were so small that the energy in the ionized gas exceeded the gravitational energy associated with the dark halo potential well (with R.S Somerville, N. Trentham, and M.A.W. Verheijen).

2003

There is remarkably strong observational evidence for variations in the amount of blue light associated with dark matter in different environments. The most light (lowest M/L_B values) are found in group halos in the mass range $10^{12} - 10^{13} M_\odot$. Collapsed regions on larger mass scales have increasingly larger M/L_B values. The correlation is enhanced by a second parameter: groups or clusters with shorter dynamical times have larger M/L_B values. These correlations can probably be understood as the consequence of stellar aging, tidal disruptions, and thermalization of gas components. At smaller masses, there is evidently a cutoff in processes that lead to star formation. Groups in the mass range $10^{11} - 10^{12} M_\odot$ have very high M/L_B values, reaching values of several thousand. It is speculated that there may be completely dark halos. There may be astrophysical mechanisms that prevent gas accumulation and star formation in many low mass halos.