NOTES FROM OBSERVATORIES

QUEEN'S UNIVERSITY AT KINGSTON, ONTARIO

Personnel. In the past year, G. V. Bicknell (Ph.D., Sydney), K. L. Chan (Ph.D., Princeton) and B. Guindon (Ph.D., Queen's) began terms as Research Associates, Bicknell replacing P. S. Wesson who took up an appointment at the Institute of Theoretical Astrophysics, University of Oslo. M. M. deRobertis (Toronto), R. Hayward (Dalhousie), W. H. R. Morgan and R. Varsava (Queen's), L. Nelson (McGill), B. C. Reed and R. V. Shaver (Waterloo), began M.Sc. programs. The radio astronomers made observations at the Algonquin Radio Observatory (NRC), Green Bank (West Virginia – NRAO), Arecibo (Puerto Rico – NAIC), Westerbork (Holland – ZWO) and the Very Large Array (New Mexico – NRAO). V. A. Hughes received a D.Sc. from the University of Manchester, U.K.

Stellar Systems. R. N. Henriksen and W. Y. Chau calculated exactly the angular momentum lost through neutrinos via the Poynting-Robertson effect from relativistic rotating, collapsing stellar cores and from the early cooling phase of a neutron star. With Chan, their work on gravitational collapse and the resulting gravitational radiation is being extended to include the effects of a magnetic field and non-uniform density.

Chau, Morgan and D. Lauterborn (Hamburg) are studying the effect of gravitational radiation on the evolution of low-mass close binaries using stellar-structure programs at Hamburg and at Queen's. Chau has completed a study of the significance of angular-momentum loss on orbital-period determination in close binaries and, with Nelson, is studying gravitational radiative reaction in close binaries and relativistic clusters.

Hughes and A. W. Woodsworth (NRC) published a summary of "radio stars" detected using the Algonquin telescope; 8 of 166 systems investigated were brighter than 25 mJy at $\lambda 2.8$ cm. Henriksen has estimated the radio emission to be expected in the pulsar far field from helicon low-frequency waves.

Interstellar Matter. Hughes, M. R. Viner, D. C. Gresham and A. Kidd mapped IC 1795 in the continuum at 10.5 GHz, in the 85α recombination lines of hydrogen, helium and carbon and in the 107β and 122γ lines of hydrogen. Hughes and Viner developed a model for IC 1795 wherein a massive H I cloud with early-type stars forming in its outer regions contains older late-type stars nearer its centre; they are making further observations of a narrow recombination line due to H I in the region which may be a

protostar. Hughes and Viner continued to study the unique feature W3(OH), suggesting that it is a runaway object; they also resolved four separate components in the hydrogen recombination lines from W49.

Hughes, J. P. Vallée and Viner are using the Algonquin telescope to make λ2.8 and λ4.6-cm maps of W4 and W5, regions of star formation near IC 1795, and have used the Westerbork array at λ21 cm to map the centre of W4 at 25″ resolution; a source of excess λ100μ radiation has been identified with a feature in the λ21-cm map. They have developed models for recombination-line and continuum emission from inhomogeneous H II regions including non-LTE and Stark-broadening terms, and Vallée has applied these to a "blister" model for W3(OH).

M. J. L. Kesteven, A. Pedlar (Jodrell Bank/DRAO) and Hayward are surveying the H101α recombination line from directions near the Galactic Centre in order to establish the kinematics of this unique region.

Galaxies. A. H. Bridle and E. B. Fomalont (NRAO) have mapped elliptical galaxies with sub-arcsec resolution at 2.7 and 8.1 GHz and have identified two classes of radio core in active galaxies, characterised by their spectra and linear sizes. The more extended (~2 kpc) cores exhibit a radio spectrum – luminosity relation suggesting intimate relationship to the process of energy transport in extragalactic radio doubles. With G. K. Miley (Leiden) they are beginning a survey of such extended cores using the Very Large Array (VLA).

Bridle, Fomalont, M. M. Davis (Arecibo), R. G. Strom (Dwingeloo) and A. G. Willis (Leiden/Brandeis) have mapped the giant galaxy NGC 315 at λ50 and λ21 cm, revealing polarised radio jets linking a source in the galactic nucleus to peaks in the large-scale circumgalactic emission. They are investigating these jets at higher angular resolution using Westerbork and the VLA to elucidate their dynamics.

J. J. Palimaka, Bridle and Fomalont are studying the orientations of double radio sources around elliptical galaxies and R. E. Goodson is completing a thesis on the asymmetries of such doubles. Goodson, Palimaka, Guindon, Shaver, R. W. Scholes and Bridle have determined accurate optical positions for objects in the fields of radio galaxies mapped at NRAO, Westerbork and the VLA, leading to new or improved identifications of over 100 radio systems.

Henriksen, Kesteven and Bridle are developing their rotating-beam model for radio galaxies, and are modelling the radio outbursts in galaxy cores.

Galaxy Clusters. Guindon is determing the spatial and luminosity distributions of galaxies in rich clusters containing "head-tail" radio sources or

powerful X-ray sources, to study models of the distortion of cluster radio sources and of the "virial mass discrepancy". Wesson, A. Lermann (Oslo) and Goodson numerically modelled the effects of subclustering on the virial mass discrepancy.

Vallée published a review article on "head-tail" radio galaxies and, with A. S. Wilson (Sussex) and H. van der Laan (Leiden), mapped the short "head-tail" IC 708 using the Westerbork array at λ6 cm. The radio morphology of IC 708 suggests gravitational focussing of intracluster matter behind the galaxy on its orbit through the cluster.

Bridle, Fomalont, Miley and E. A. Valentijn (Leiden) mapped Abell 2256 at λ21 cm with the Westerbork array, revealing further "head-tail" structures in this strong X-ray emitter, and defining the spectrum and polarisation of its unusually complex extended radio emission; they are using the VLA to map selected features with higher resolution and sensitivity.

Relativity and Cosmology. Bicknell and Henriksen have demonstrated correctly the self-similar growth of primordial black holes in a stiff early Universe, and have calculated the self-similar growth of these and other density inhomogeneities in non-stiff Universes. Henriksen and Wesson are investigating the physical significance of self-similar solutions to the Einstein Equations with nonzero cosmological constant.

Astronomical Signal Processing. G. J. M. Aitken and Kidd are continuing work on a holographic correlator – Fourier transformer to produce real-time visible images of the radio sky from the output of cross-type radio telescopes. Aitken and Varsava are studying an aperture-coded image-enchancement technique for reducing the effects of atmospheric turbulence in optical astronomy. Aitken is also working with Centre d'Etude et des Recherches Geodynamiques et Astronomiques (CERGA), Grasse, France on signal processing for a long-baseline infrared heterodyne-detection interferometer.

Kesteven is investigating a modified form of Maximum Entropy Analysis with a view to improving the speed of the conventional technique and to reducing its susceptibility to distortions due to noise.

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