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[S0002-7537(93)02051-7]

This report covers the period September 30, 2000 to October 1, 2002.

1. STAFF

The members of the Physics Department involved in astronomical research include the following: Ralph A. Alpher, Distinguished Research Professor, A. G. Davis Philip, Research Professor, Jonathon Marr, Associate Professor, and Assistant Professors Rebecca Koopmann and Rebecca Surman. M. Colleen Gino joined the department in March, 2002 as Observatory Manager. In October, 2002 she became the Executive Director of Dudley Observatory. She is a member of the Physics Dept. as an adjunct instructor.

Philip continued as Director of the Shapley Visiting Lecturerships Program and Co-editor of *Baltic Astronomy*. He continues as a trustee of the Fund for Astrophysical Research and serves on its Theodore Dunham, Jr. Grant Program Committee. He resigned as Secretary and Treasurer of the New York Astronomical Corporation in 2001 after 33 years in those positions. He is President and Treasurer of the Institute for Space Observations. Koopmann is a Research Consultant at the Institute for Space Observations. She replaced Philip as Secretary of the New York Astronomical Corporation.

2. INSTRUMENTATION

The new observatory 20-inch, Ritchey-Chrétien Cassegrain telescope is being used by students in training for optical observations by laboratories in several physics and astronomy courses at Union, and for independent research studies by several Union students. More information on the observatory and recent images can be found at <http://www.physics.union.edu/PUBLIC/PHYDEPT/observatory.htm>.

A small radio telescope, 2.3 meters, operating at 1.42 Ghz, purchased from Haystack Observatory, has been assembled next to the optical observatory.

3. RESEARCH

3.1 Astrophysics

Rebecca Surman continued her work investigating aspects of heavy element synthesis by rapid neutron capture (the r process). In collaboration with Jonathan Engel of the University of North Carolina, Chapel Hill, she studied the influence of neutron capture rates on the r process at late times. They found that changing these rates in simulations of the r process can radically alter the abundances of elements produced in the r process. These changes can be used to put bounds on both the nuclear models used to calculate neutron capture rates and the astrophysical conditions under which the r process takes place. She is currently working with Bradley Meyer of Clemson University and Gail McLaughlin of North Carolina State University on looking at the influence of neutrino oscillations on r-process nucleosynthesis.

3.2 Cosmology

The book, *Genesis of the Big Bang*, by Alpher and Herman, was published by the Oxford University Press, in 2001.

3.3 Galaxies

Koopmann continued work on the effects of cluster environment on the massive star formation properties and morphology of spiral galaxies in the Virgo Cluster, in collaboration with Kenney at Yale University. Results of an examination of the spatial distributions of R and H α emission in 63 Virgo Cluster and 30 nearby isolated spirals of Hubble types S0-Sd (Koopmann & Kenney 1998, Koopmann *et al.* 2001) strongly indicate that galaxies in the Virgo Cluster environment experience accelerated morphological and structural evolution of at least their outer disks due to environmental processes. In a paper submitted to the *Astrophysical Journal* in 2002, Koopmann & Kenney show that global star formation has been reduced in the Virgo Cluster by factors up to 2.5 in the median; compared to isolated galaxies of similar Hubble type or central R light concentration. Galaxies with reduced global star formation tend to have normal to enhanced inner disk star formation and severely reduced outer disk star formation (factors up to seven in the median). Thus the reduction in global star formation in the Virgo Cluster is caused mainly by the truncation of the star-forming disks rather than an overall reduction in star formation across the disk. These results were discussed at an invited talk at the Ringberg Workshop on the Virgo Cluster in Ringberg, Germany, April 14 - 17, 2002. The presentation may be downloaded from http://www.Mpifr-bonn.mpg.de/staff/bvollmer/virgo_web/ringberg_conf.html.

Koopman has begun work on an H α and broadband R survey of about 1000 nearby galaxies, collaborating with Barry Madore (IPAC & Carnegie). The survey will provide a database of local massive star formation morphologies as a function of stellar morphology and local environment, as well as a comparison, public database for comparison to observations of distant galaxies.

Holly Burnside, Union 01, completed a senior thesis project with Koopmann in 2001, studying BVR and H α images of the peculiar Virgo Cluster spiral galaxy NGC 4383. Results show that the peculiarities in this galaxy are consistent with a recent minor merger. Krishnan Shammuganandham, Union 06, completed a summer project with Koopmann in 2002 based on a comparison of rotation curves and R and H α images of 15 isolated spiral galaxies. He found that the central R light concentration is not correlated with several quantitative parameters measured from the rotation curve shape, suggesting that there is a poor correlation between the light and mass distributions in spiral galaxies.

Koopmann made Shapley Program visits to the Jamestown Community College in 2000 and Georgian Court College in 2001.

3.4 Radio Astronomy

Marr continued work on a VLBI study of gigahertz-peaked spectrum sources.

3.5 Stellar Astronomy

V. Straizys (ITPA, Lithuania), Philip and R. Boyle (Vatican Observatory Group) continue in their program setting up the new Strömvil system (a combination of filters from the Vilnius and Strömgren photometric systems). Lithuanian astronomers have been observing on University of Arizona telescopes setting up standards in selected regions. Philip and Boyle have been making Strömvil observations of stars in open and globular clusters with the Vatican Advanced Technology Telescope on Mt. Graham, Arizona. Observations continue in Argentina with Dr. Olga Pintado using the 2.2-m telescope at Casleo. However in 2002 no trips were made to Argentina.

4. MEETINGS

On October 26 - 27, 2000 a meeting was held at the Harvard-Smithsonian Center for Astrophysics to commemorate the Centenary of Cecilia Payne-Gaposchkin. Philip and Koopmann attended the meeting and were the editors of the proceedings, *The Starry Universe* which was published by the L. Davis Press in 2001. In June, 2001, Philip, Richard Boyle (Vatican Observatory) and Saul Adelman (The Citadel) spent a week in Antalya, Turkey as part of a summer school for Turkish graduate students in Astronomy. We covered CCD photometry and spectroscopy and then held practice sessions in a special area set up with some 50 computers. Boyle and Philip then went to Castel Gandolfo, Italy where they gave some of the same lectures to students at the Vatican Summer School in Astronomy.

Philip attended the meeting in Tucson honoring Robert Garrison in June, 02. Richard Gray (Appalachian State), Chris Corbally (Vatican Observatory) and he are editing the proceedings which are being published by the L. Davis Press. In June Philip also attended the Scientific Detectors for Astronomy Workshop in Waimea, Hawaii.

PUBLICATIONS

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A. G. Davis Philip