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19. ABSTRACT (Continue on reverse if necessary and identify by block number) The contracts research objective was to understand the infrared sources discovered by the AFGL, FIRRS and IRAS Infrared Surveys. Work has continued on young stellar objects with a variety of collaborators. In particular, extensive infrared and radio observations have yielded new information on the true nature of this highly energetic outflow object. Particular results are the lack of a disk and the resolution of accelerated shells. High resolution maps have been made of several other young stellar objects in an effort to understand the energetics and nature of the objects. The group has continued its investigation of comets. Comets investigated include Giacobini-Zinner and Halley. Emphasis has been on understanding the emission from the dust in these objects. Because of the changing illumination of these dust grains, and the well understood geometry of comets, these objects provide unique information on interstellar dust.						
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June 30, 1988

Dr. Henry R. Radoski  
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AFOSR/PKO  
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Washington, D.C. 20332

Dear Dr. Radoski:

This is the Final Technical Report on AFOSR contract 85-0058. Progress in the last year of the contract is emphasized. Since annual technical reports have summarized earlier years, overall project results are briefly summarized.

In the last year, work has concentrated on star formation, comets, and galaxies which were bright in the IRAS catalog.

G. Grasdalen has continued his work on young stellar objects with a variety of collaborators. In particular, extensive observations have been performed of Lynds 1551. A combination of infrared and radio observations have yielded new information on the true nature of this highly energetic outflow object. Particular results are the lack of a disk and the resolution of accelerated shells (refs. 1,2). Additional high resolution observations by the post-doctoral fellow, C. Woodward, have added information on the circumstellar envelope (ref. 3).

High resolution maps have been made of several other young stellar objects in an effort to understand the energetics and nature of the objects. These include W51 (ref. 4) and the bi-polar outflow of OH0739-14 (ref. 5).

Extensive observations of the W3 region have been obtained by T. Hayward. These cover the wavelengths and 2-20 microns and include InSb measurements at H,K, and with the CVF, Bolometer measurements at 10 and 20 microns, and L' observations with the Rochester InSb CCD. Results are in preparation (ref. 6). The Trapezium has also been mapped, and results are expected this winter.

The group has continued its investigation of comets. Comets investigated include Giacobini-Zinner (ref. 7) and Halley (ref. 8,9). Emphasis has been on understanding the emission from the dust in these objects. Because of the changing illumination of these

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dust grains, and the well understood geometry of comets, these objects provide unique information on interstellar dust.

Observations at Kitt Peak of giants near the galactic center to measure the mass of the supposed Black Hole in the center of the galaxy have been hampered by bad weather. Analysis of the data already obtained and further observations are under way.

Work on extragalactic observations has continued, including more observations of M82 by R. Dietz and G. Grasdalen and more observations of the brightest galaxies in the IRAS catalogue by E. Spillar, N. Silbermann and C. Woodward. In addition to preparing a catalogue of the Morphologies of the nuclear regions of starburst galaxies (ref. 10), C. Woodward and Spillar are comparing U. of Rochester CCD images of NGC600 with WIRO maps both to investigate the nature of this galaxy (ref. 11).

The contracts research objective was to understand the infrared sources discovered by the AFGL, FIRRSE and IRAS Infrared Surveys. In keeping with this broad charge, a number of problems were addressed, which we simply summarize here (citations are recorded in earlier reports):

- \* the morphology and energetics of star formation regions,
- \* dust in star formation regions,
- \* monitored supernovae in M82,
- \* the structure of Arp 220,
- \* dust in comets,
- \* nuclear structure of infrared bright galaxies,
- \* spectra and energetics of novae,
- \* the poorly understood emission line regions in NGC 7027 and NGC 7023 have been studied.

Moreover analysis of the data obtained during the contract is continuing, and will undoubtedly continue for another year.

Sincerely,

*G. Grasdalen*  
G. Grasdalen

*E. J. Spillar*  
E. J. Spillar

EJS:kba

Enclosure

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