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Under the support of this grant, observations were made with the *International Ultraviolet Explorer* of two quite diverse astronomical objects. The first is an extremely ultraviolet-excess star projected near the globular cluster M5; the second is a previously unrecognized but very bright starburst galaxy. We discuss below each of these objects in turn.

I. M5 Star 79

Recently Bohlin *et al.* (1985) have reported ultraviolet imagery of the globular cluster M5, obtained during a sounding rocket flight. The objective of these data was to derive the helium abundance of the cluster via photometry of the horizontal branch stars. They supply carefully calibrated broadband photometry (and positions) for 144 stars at two bandpasses centered at 154 and 236 nm. With one exception, all of the UV-bright objects at these two wavelengths, and the majority of the fainter sources as well, have been identified by Bohlin *et al.* with stars already in the literature due to previous visible light observations. Curiously, Bohlin *et al.* were unable to locate a counterpart for the very brightest object observed on the entire flight, star 79 in their nomenclature. They did supply accurate coordinates for the object, located about 10′ south of the cluster core, and contented themselves with a final comment that the tremendous UV flux implied by their data indicated that the star must surely be well below the main sequence regardless of whether or not it is a cluster member.

We have on hand a variety of direct plates of M5, obtained in several different colors for various programs over many years. We have examined the plates in the vicinity of star 79 and readily found the identification of the intense UV source observed but only briefly

discussed by Bohlin *et al.* It is a (previously anonymous) object of $B \sim 16$, $(B-V) \sim 0$, and $(U-B) \sim -1$. Its tremendous ultraviolet excess makes the identification quite certain: it may well be the most UV object on the entire plate, and is exceeding prominent on all of our U emulsions. The very extreme visible band colors of star 79 have perhaps been overlooked in the past as the object is quite far from the cluster, and there is little motivation to expect membership in this outlying area. The crude color indices available from comparison of the B and rocket ultraviolet magnitudes quite unambiguously show that this object must be highly unusual; no main sequence star has such colors, for example.

The visible spectrum of star 79 has been obtained in 1984 September and again in 1985 June, in collaboration with Dr. R. Downes, using the UCSD/Minnesota 1.5 m reflector on Mt. Lemmon, and Professor J. Liebert, using the MMT, respectively. These data, covering the 390–690 nm range, have approximately 1 nm spectral resolution. The spectrum displays Balmer and possibly He I absorption superposed on an otherwise featureless, extremely ultraviolet continuum. Star 79 is almost surely a very hot subdwarf, drastically foreground to, and unrelated to M5.

An even approximate estimate of the temperature of the object requires ultraviolet data: as is well known, the slope of the optical continuum becomes almost completely insensitive to temperature for these very hot degenerate stars. We obtained both long and short wavelength exposures with the *IUE* as part of this program. The observations were quite difficult, as at $V = 16$ the object is not visible with the *IUE* FES, and careful astrometry followed by blind offsets were necessary.

The resulting long and short wavelength data proved well exposed, and final reductions are now complete. An extremely steep but featureless UV continuum is clearly detected. The flux at the longest wavelengths, 320 nm, nicely matches the required brief extrapolation from the shortest available wavelength of the visible spectrum, 350 nm, thus providing us providing us with a virtually uninterrupted, totally flux calibrated spectrum from Lyα through Hα.

We have modelled this continuum to set limits on the temperature. We are aided in this process by the existence of *IUE* observations of at least one further very hot sdO star, SB 884 (Hunger *et al.* 1981), where a complete model atmosphere analysis from optical data is also extant. Our conclusions are that M5 star 79 is at least as hot as that object, with $T_{eff} \sim 60,000$ K. These data are now in final preparation for publication.

II. A Bright Starburst Nucleus

As part of an unrelated program described by Anderson and Margon (1987*a*, *b*), we have recently discovered a previously uncatalogued yet remarkably bright example of a starburst nucleus, which we designate 0833+652. Starburst nuclei are a recently recognized extragalactic phenomena consisting of otherwise normal galaxies, or regions of galaxies, where a very intense burst of star formation is underway. These interesting regions are characterized optically by strong emission lines superposed on a blue continuum. At $V_{cont} \sim 13$, our newly discovered object is slightly brighter than the object previously thought to be the prototype of the class, NGC 7714 (Weedman *et al.* 1981). This brightness is itself quite important, as it means that our new object is potentially detectable at many wavelengths of the electromagnetic spectrum.

As part of a multi-wavelength analysis, we obtained a long wavelength *IUE* spectrum of 0833 + 652. In collaboration with Dr. P. Massey of the Kitt Peak National Observatory, National Optical Astronomy Observatories, we have also obtained optical spectra of the object. Although the optical spectra alone might leave the nature of the object in doubt, the *IUE* spectrum obtained as part of this work is quite unambiguous. The very narrow Lα emission, coupled with prominent, broad absorption at C IV λ1549, is the unambiguous sign of a starburst nucleus. This spectrum of 0833 + 652 is quite similar to the *IUE* data on NGC 7714 published by Weedman *et al.* (1981).

We have also detected this object at X-ray wavelengths using data fortuitously available

in the postflight data bank of the *Einstein Observatory*, at 6 cm using the VLA, and in the 12–100μ bands with data from the point source catalog of the *Infrared Astronomy Satellite*. We thus have available the integrated spectrum of the object over a range of more than eight decades of frequency. The combination of this wide wavelength range of available data, coupled with the brightness of the object, suggests that this system will become a new prototype for the study of starburst nuclei. These data are now in final preparation for publication.

III. References

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IV. Recent Publications Related to *IUE* Projects

1. An Unsuccessful Search for Very Extended Haloes Around NGC 1300 and M61 (G. D. Bothun, B. Margon, and B. Balick), *P.A.S.P.*, **96**, 583, 1984.
2. KPD 0005 + 5106: A Post-PG 1159 Type Object? (R. A. Downes, J. Liebert, and B. Margon), *Ap. J.*, **290**, 321, 1985.