PULSARS IN GLOBULAR CLUSTERS

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Abstract.

Since the discovery of the first globular cluster pulsar in M28 (Lyne et al. 1987) a total of 33 pulsars have been found to reside within 13 seperate clusters. Many (but not all) of the cluster pulsars have properties similar to the millisecond pulsars in the disk: short period, binarity and low magnetic field strength. The common understanding is that these pulsars are primordial neutron stars (i.e. the remnants of massive stars in clusters) which have been spun up by accretion of matter from a companion. Therefore, in this framework, the cluster pulsars are descendents of Low Mass X-ray Binaries (LMXBs) (Alpar et al. 1982). This hypothesis is by no means accepted by all workers (e.g. Michel 1987, Ray & Kluzniak 1990, Romani 1990, Bailyn & Grindlay 1993). These workers have argued that at least some (if not all) cluster pulsars could be formed by accretion induced collapse of massive white dwarfs. In either case, it is clear from the sensitivity limits of current cluster searches, and the luminosity of field pulsars, that there are currently $\mathcal{O}(10^3)$ extant radio pulsars in the Galactic globular cluster system.

In this review, specifically targeted for astronomers working in the field of globular clusters, not pulsar astronomers, we argue that cluster pulsars have provided us with a new window into the population of long-dead massive stars and the physics of tidal capture. The precision with which pulsars can be timed has created new diagnostics: measurement of the mass distribution in the dense cores, measurement of orbital evolution on short timescales and precise determination of orbital characteristics. It is fair to say that all these diagnostics are unique, and not obtainable by other observations. Despite this, it is our assessment that the typical astronomer who works in the field of globular clusters is apparently unaware of these relevant contributions. Hopefully this review will bridge this gap. A complete copy of the review article may be found at http://astro.caltech.edu/~srk.

P. Hut and J. Makino (eds.), Dynamical Evolution of Star Clusters, 181–182.

1. References

- Alpar, M. A., Cheng, A. F. Ruderman, M. A., & Shaham, J., Nature, 300, 728 (1982)
- Bailyn, C. D. & Grindlay, J. E., ApJ, 353, 159 (1990)
- Lyne, A. G., Brinklow, A., Middleditch, J., Kulkarni, S. R., Backer, D. C. , & Clifton, T. R., Nature, 328, 399 (1987)
- Michel, F. C., Nature, 329, 310 (1987)
item Ray, A. & Kluzniak, W., Nature, 344, 415 (1990)
- Romani, R. W., ApJ, 357, 493 (1990)

https://doi.org/10.1017/S0074180900001510 Published online by Cambridge University Press