

Resolving the Smallest Galaxies

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Scientific Category: RESOLVED STELLAR POPULATIONS

Scientific Keywords: DWARF GALAXIES, GROUPS OF GALAXIES, RESOLVED STELLAR POPULATIONS, STELLAR POPULATIONS IN EXTERNAL GALAXIES, GALAXY FORMATION AND EVOLUTION

Instruments: WFPC2

Proprietary Period: 12

Orbit Request	Prime	Parallel
Cycle 16	15	0

Abstract

An order of magnitude more dwarf galaxies are expected to inhabit the Local Group, based on currently accepted galaxy formation models, than have been observed. This discrepancy has been noted in environments ranging from the field to rich clusters, with evidence emerging that lower density regions contain fewer dwarfs per giant than higher density regions, in further contrast to model predictions. One possible explanation for this involves the effects of reionization on the forming galaxies and naturally explains both the dearth of dwarf galaxies and the apparent environmental dependence. However, before such theories can be fully tested, we require a better understanding of the distribution of dwarf galaxies. Currently, there is no complete census of the faintest dwarf galaxies in any environment. The discovery of the smallest and faintest dwarfs is hampered by the limitations in detecting such faint and low surface brightness galaxies, and this is compounded by the great difficulty in determining accurate distances to, or ascertaining group membership for, such faint objects. The M81 group provides a unique means for establishing membership for galaxies in a low density region complete to magnitudes as faint as $M_R \sim -7$. With a distance modulus of 27.8, the tip of the red giant branch (TRGB) appears at $I \sim 24$, just within the reach of ground based surveys. We currently have surveyed a 30 square degree region around M81 with the CFHT/Megacam. From these images we have detected 15 new candidate dwarf galaxies. We propose to use the HST with WFPC2 to image these 15 galaxies in F606W and F814W bands in order to construct a color-magnitude diagram down to $I = 25.5$ from which to measure accurate TRGB distances to these candidate galaxies and determine star formation and metallicity histories. The overall project will provide a survey of the dwarf galaxies in the M81 group environment with unprecedented completeness to a limit of $M_R < -7$.

Investigators:

	Investigator	Institution	Country
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CoI	Prof. Igor D. Karachentsev	Russian Academy of Sciences, Special Astrophysical Obs.	Russia
CoI	Dr. R. Brent Tully	University of Hawaii	USA/HI
CoI	Dr. Luca Rizzi	University of Hawaii	USA/HI

Number of investigators: 4

Target Summary:

Target	RA	Dec	Magnitude
D0926+70	09 26 27.9000	+70 30 24.00	
D0944+69	09 44 22.5000	+69 12 40.00	
D0955+70	09 55 13.6000	+70 24 29.00	
D0958+66	09 58 48.5000	+66 50 59.00	
D0959+68	09 59 33.1000	+68 39 25.00	
D1014+68	10 14 55.8000	+68 45 27.00	
D1016+69	10 16 18.3000	+69 29 45.00	
D1028+70	10 28 39.7000	+70 14 1.00	
D1041+70	10 41 16.8000	+70 09 3.00	
D1006+67	10 06 46.2000	+67 12 4.00	
D0934+70	09 34 3.7000	+70 12 57.00	
D1009+70	10 09 34.9000	+70 32 55.00	
D0946+68	09 46 13.0000	+68 42 55.00	
D0957+70	09 57 12.4000	+70 12 35.00	
D1048+70	10 48 57.0000	+70 25 38.00	

Observing Summary:

Target	Config Mode and Spectral Elements	Flags	Orbits
D0926+70	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		
D0944+69	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		
D0955+70	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		
D0958+66	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		
D0959+68	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		
D1014+68	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		
D1016+69	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		
D1028+70	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		
D1041+70	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		
D1006+67	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		
D0934+70	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		
D1009+70	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		
D0946+68	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		
D0957+70	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		
D1048+70	WFPC2 Imaging F606W		1
	WFPC2 Imaging F814W		

Total prime orbits: 15