

A *HST* imaging survey of a sample of 61 Galactic Wolf-Rayet stars — the WC8-9 subsample⁰

Debra J. Wallace¹, Anthony F.J. Moffat², Michael M. Shara³,
Douglas R. Gies¹, Virpi S. Niemela⁴, and Edmund Nelan⁵

¹*Center for High Angular Resolution Astronomy,
Department of Physics and Astronomy, Georgia State University,
Atlanta, GA 30303, USA*

²*Département de Physique, Université de Montréal,
C.P. 6128, Succ. Centre-Ville, Montréal, QC H3C 3J7, Canada*

³*Department of Astrophysics, American Museum of Natural History,
Central Park West at 79th Street, New York, NY 10024, USA*

⁴*Facultad de Ciencias Astronómicas y Geofísicas,
Universidad Nacional de La Plata,
Paseo del Bosque s/n, B1900FWA, La Plata, Argentina.*

⁵*Space Telescope Science Institute,
3700 San Martin Drive, Baltimore, MD 21218, USA*

Abstract. A *HST*-WFPC2 survey of Galactic Wolf-Rayet stars was undertaken over a five year period, in an effort to discover new close visual companions, tight clusters, and/or association memberships. In total, 61 Galactic WR stars were observed, with nine objects being members of the subclasses WC8 and WC9, which are associated with dust production. For these nine, we present images of WR 11, WR 48a, WR 69, WR 70, WR 81, and WR 92. We refer to Wallace *et al.* (2002) for discussion of WR 98a, WR 104, and WR 112. Overall, we find for separations of approximately ≥ 150 mas, that the binary/association properties of the WC8/WC9 sample are statistically indistinguishable from the overall WR population. These statistics are limited, however, by the small numbers of each WR subclass observed.

1. Introduction and observations

Over a five year period, *HST*-WFPC2 images of 61 Galactic WR stars were obtained in an effort to determine new clusters, associations, and/or visual binary companions. Individual targets were selected based on their perceived likelihood of harboring unknown neighbors, but since STScI does not guarantee the execution of SNAP-mode targets, not all of the requested stars were imaged.

The *HST* images were pipeline processed to apply the dark, bias, and flat-field corrections. Images were combined and cosmic rays removed using STSDAS. Photometry was done using DAOPHOT (Stetson 1987).

⁰Based on observations with the NASA/ESA *HST* obtained at the Space Telescope Science Institute, which is operated by AURA, Inc., under NASA contract NAS5-26555.

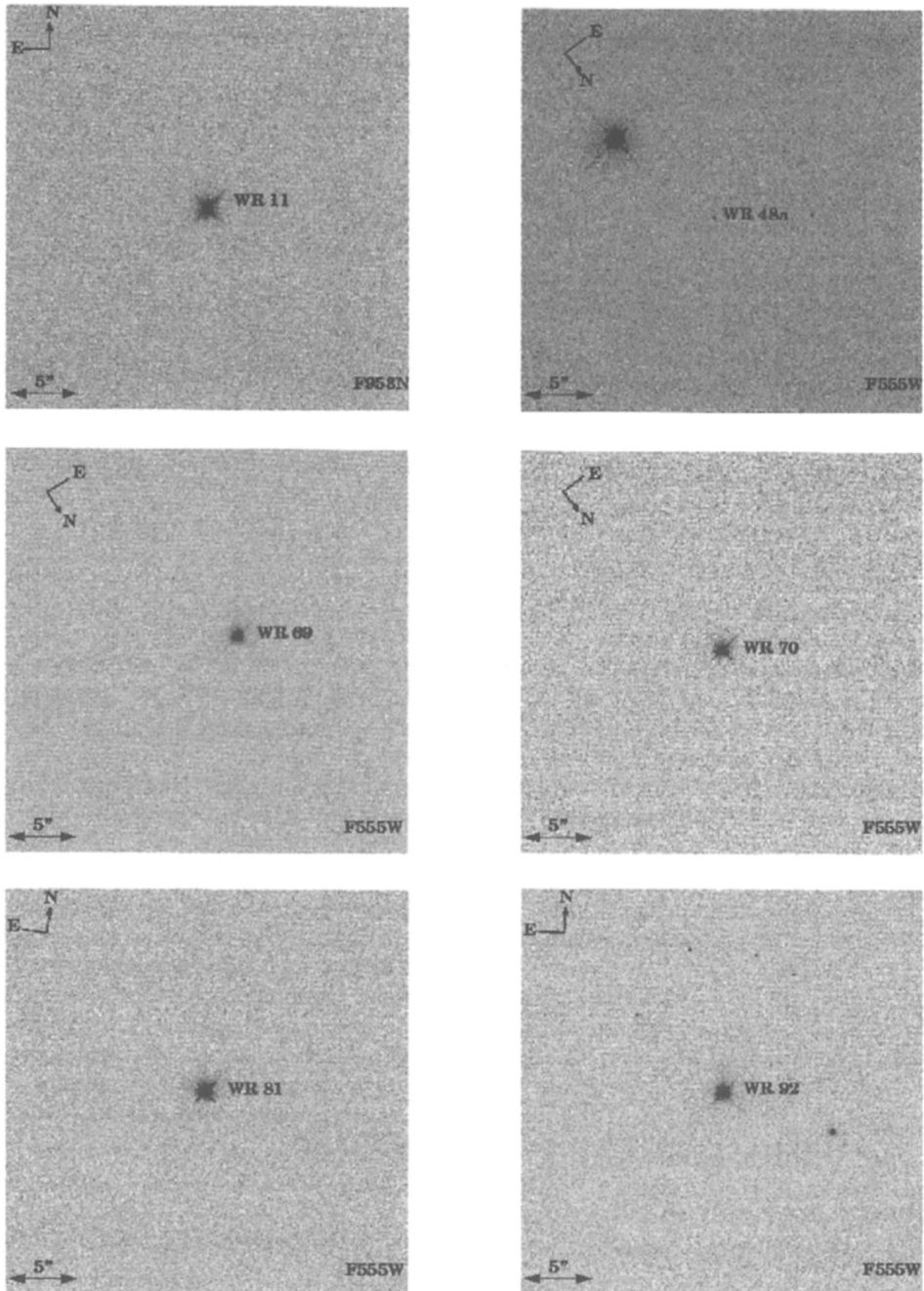


Figure 1. *HST*-WFPC2 PC F555W images of the WC8/WC9 stars WR 11, WR 48a, WR 69, WR 70, WR 81, and WR 92.

Table 1. *HST* derived magnitudes.

WR	<i>HST</i> magnitudes							
	F336W	F375N	F439W	F437N	F555W	F675W	F814W	F953N
WR 11	-	0.72	-	1.41	-	-	-	4.09
WR 48a	19.16	-	19.79	-	17.08	-	-	-
WR 69	9.09	-	9.02	-	9.36	-	-	-
WR 70	11.20	-	10.46	-	9.90	-	-	-
WR 81	14.40	-	13.19	-	12.29	-	-	-
WR 92	10.03	-	9.99	-	10.42	-	-	-
WR 98a A	-	-	-	-	19.44	17.13	15.44	-
WR 98a B	-	-	-	-	17.71	17.26	17.07	-
WR 104 A	16.11	-	15.04	-	13.65	-	-	-
WR 104 B	17.63	-	16.57	-	15.36	-	-	-
WR 112 A	20.25	-	21.99	-	17.77	-	-	-
WR 112 B	20.97	-	19.18	-	18.31	-	-	-

2. Discussion and results

Nine of our 61 targets are listed in the VIIth Galactic Wolf-Rayet Catalogue (van der Hucht 2001) as members of the WC8/WC9 subclasses. Typical of the WC8/WC9 subclass, WR 48a, WR 69, WR 70, WR 98a, WR 104, and WR 112 are known to be sources of dust emission. WR 48a, WR 92, WR 98a, WR 104, and WR 112 were each discovered to have a WFPC2-resolved companion(s). For the remainder of the sample, we find no evidence of a wide (≥ 150 mas) companion associated with the WR star and cannot establish a link between a wide companion and WR dust production.

We present $0''.5$ aperture magnitudes in the *HST* filter system for these objects in Table 1. These magnitudes are uncorrected for geometric distortion, charge transfer efficiency, and filter contamination which will lead to corrections on the order of a few percent each. The WFPC2 images (Figure 1) show each star to be relatively isolated in space. WR 48a is $9''.2$ from its bright companion with a position angle of $194^\circ 2$, and with an additional companion to the northeast. WR 92 is $8''.5$ from the bright companion with a position angle of $254^\circ 3$, with four fainter companions to the north. At separations of $\leq 15'' 0$, we find a companion detection frequency of 56 % for the WC8/WC9 subclass, compared to a frequency of 83 % for the remainder of the sample. It is likely, however, that not all visual companions are physically associated with the WR star.

References

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van der Hucht, K.A. 2001, *New Astron. Reviews* 45, 135
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