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DETECTION OF CIRCULAR POLARIZATION IN A SECOND WHITE DWARF

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ABSTRACT

The continuum radiation in a band from 3800 to 6000 Å from the white dwarf G195−19 is found to have circular polarization of 0.42 ± 0.04 percent.

Since the discovery of circular polarization in the white dwarf Grw+70°8247 (Kemp *et al.* 1970) we have searched for the same effect in other stars, mostly DC white dwarfs. The first eight studied did not reveal any polarization to a precision of 0.1 percent or better (Angel and Landstreet 1970*b*). A continuation of this search carried out at the 60-inch C telescope at the Catalina Station of the University of Arizona has revealed polarization in the dwarf G195−19 = GR 250. This star is classified as a DC dwarf by Greenstein (1969), with the notation that there may be shallow hydrogen lines.

Measurements of circular polarization, mostly of a broad band from 3800 to 6000 Å, were made using the electro-optically switched polarimeter described in an earlier paper (Angel and Landstreet 1970*a*), and the data obtained over a period of 5 days are summarized in Table 1. No significant variation from night to night is seen, the average circular polarization in the above band being 0.42 ± 0.04 percent with the same sense of rotation as Grw+70°8247. Because the polarization is an order of magnitude weaker than that of Grw+70°8247 and because the star is somewhat fainter (V = 13.79), measurement of the wavelength dependence of the polarization will require long integration times. Preliminary results obtained by selecting broad bands below and above 4500 Å are given in Table 1, and suggest that the polarization is increasing quite sharply in the region from 4000 to 5000 Å. The mean values of the three bands measured are plotted in Figure 1.

Further observations are planned for the near future to determine accurately the time and wavelength dependence of the effect and to search for a linear component of polarization. A comparison of these and other properties with those of Grw+70°8247 should be of great value in determining the polarization mechanism in these dwarfs. If a magnetic field is responsible for the polarization in G195−19, its magnitude would be of order a few million gauss according to Kemp's magnetoemission theory (Kemp 1970). In such a field, which is substantially less than that of Grw+70°8247, one would expect that some absorption lines, particularly the lower Balmer lines, would not be broadened to the point of invisibility by the magnetic field. Thus in this star there may be an opportunity to obtain a direct measure of the mean surface field through the Zeeman effect.

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TABLE 1

SUMMARY OF DATA

Date (1970)	Wavelength Band (Å)	Circular Polarization (%)
November 21.....	3800–6000	+0.37±0.13
November 23.....	3800–6000	+0.52±0.08
November 24.....	3800–6000	+0.39±0.05
November 25.....	4500–6000	+0.60±0.16
November 25.....	3400–4500	−0.16±0.11

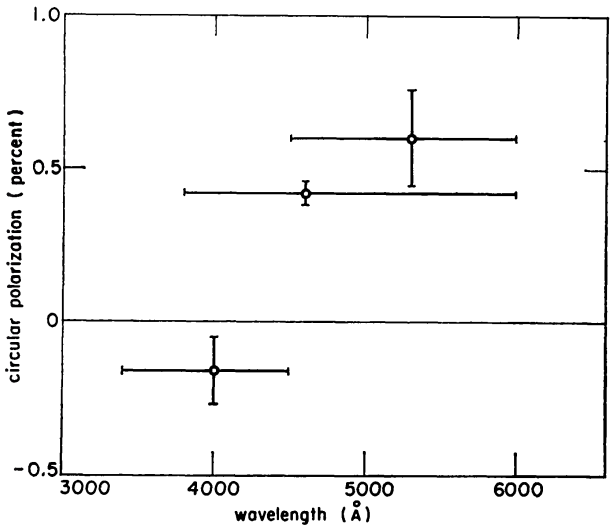

FIG. 1.—Measured circular polarization of G195−19 as a function of wavelength. Horizontal bars give the half-power points of the sensitivity curve; vertical error bars give the standard deviation arising from counting statistics.

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