letters to nature

Is HD26676 an unusual radio star?

STROM AND HARRIS[1] have detected a faint radio source (4 mJy at 6 cm) whose position is coincident, to within an error region of 3×18 arc s, with the 6 mag late B star HD26676 (=HR1307). Although a prominent reflection nebula surrounds this star[2], they argue convincingly[1] that the nonthermal nature of the radio spectrum suggests identification with the star itself. As Strom and Harris stress, this association would be remarkable, as all previously identified radio stars are radio and optical variables and/or binaries. We report here that no such evidence exists for HD26676 or the radio source.

HD26676 has been classified as B8V by Cowley[3] and B7V by Racine[2]. The main sequence assignment by Racine is based on the equivalent widths of Balmer lines. *U*, *B*, *V* colours by Crawford[4] and Cousins[5] more closely correspond to B7V with a colour excess E_{B-V} of about 0.15 mag. The distance to HD26676 is ~125 pc as given by Racine[2] who assigns the star to the association Taurus R2. Among known radio stars the eclipsing binary β Per has the spectral type, B8V, most similar to that of HD26676. The orbital period of β Per is 2.9 d, and its distance about 30 pc. Its radioflux is highly variable, from less than a few mJy to 1 Jy (refs 6, 7).

We do not know of any detailed, high dispersion search for radial velocity variations in HD26676. Such observations are reported here which demonstrate that this star is almost certainly not a close binary. The data are based on plates obtained with the Coude spectrograph of the 3 m Shane reflector of the Lick Observatory on five nights in 1977–78. One spectrogram, covering the wavelength range λλ 3,500–4,800 with dispersion 16 Å mm^{-1}, was obtained on each of these nights. Our estimate of the spectral type from these plates is B8V. The confluence of the Balmer lines at about $n = 16$ confirms that the surface gravity is that of a main sequence star.

Table 1 Radial velocities of HD26676

Heliocentric julian date	Radial velocity (km s^{-1})
2443470.824	+20±2(m.e.)
529.699	+26±4
558.659	+20±2
559.602	+21±5
560.601	+21±2
Weighted mean	+22±1

The spectrograms were measured with a Grant-type engine and velocities derived from eight Balmer lines between Hγ and H14 on each plate. Shallow lines of HeI and MgII provide velocities consistent with but more uncertain than the Balmer series, and these were not used in the final analysis. A list of the observations and resulting mean velocity for each plate are given in Table 1. These data indicate that the velocity is constant to within the uncertainties. A weak interstellar K line gives a velocity of +20±3 km s^{-1}. Four radial velocity measures of this star from two series of spectrograms have also been reported by Hube[8]. Their weighted mean, +5±8 km s^{-1}, does not agree particularly well with our result, either as to constancy or mean velocity. However, our data are of substantially higher dispersion, on well-widened spectrograms (0.9 mm), and we do not regard this discrepancy as significant.

From the results of Table 1, we tentatively exclude systematic radial velocity variation of amplitude greater than a few km s^{-1} on timescales of 1 day to several weeks, periods relevant for other known binary radio stars. Even a severely undermassive companion would be expected to cause variations exceeding this limit unless the system is accidentally seen nearly pole-on. The rotational broadening, estimated very roughly as 250 km s^{-1} from the weaker lines on our spectrograms, argues strongly against this possibility. This line width corresponds to a rotational period of about 0.6 d. In most close binaries, including β Per, rotational and orbital periods are about equal. We conclude that HD26676 is unlikely to be a close binary.

This constraint make the result of Strom and Harris[1] more intriguing. Either the positional association of HD26676 and the radio source is accidental, despite the probability of order 10^{-6} quoted for such a coincidence[1], or this object may represent a new class of radio star. A radio error box with an order of magnitude less area will help greatly to resolve this question. Instrumentation currently available is capable of such an observation.

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Relative abundance of antiprotons and antihelium in the primary cosmic radiation

THE importance of determining the abundance of antiparticles in the primary cosmic rays has already been discussed[1]: for example, Steigman has considered the value of $\bar{p}$ as a probe in distinguishing various propagation models. We report here on the measurement of $\bar{p}/p$ and $\bar{He}/He$ in the 4–100 GeV/c range made from a balloon flight in May 1976 of a superconducting magnet spectrometer from Palestine, Texas, under 5.8 g cm^{-2} of residual atmosphere. The upper limits derived are the most stringent to date.

We have previously reported on the $\bar{p}/p$ in the 4.2–12.5 GeV/c range from an earlier (September 1975) balloon

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