SLIT SPECTRA OF SOME PECULIAR AND METALLIC-LINE A STARS

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Recently Bidelman has given a list of new peculiar stars found on 10° objective-prism plates taken with the Curtis-Schmidt telescope at the University of Michigan.[1] In this note we discuss only the peculiar and metallic-line A stars.

Because of difficulties with overlapping images and definition, normal stars frequently appear to have spectral peculiarities on objective-prism plates. Since the statistical data on normal and peculiar A stars may lead to important information about differing kinematical and evolutionary properties, the writers felt confirmation of Bidelman's stars by slit spectrograms would be valuable.

All spectra have been obtained with the Morgan classification spectrograph on the 40-inch refractor at Yerkes and have been exposed to include the K line of Ca II. A few of the stars (indicated by a dashed line in the tables) have not yet been observed either because of their faintness or position in the sky.

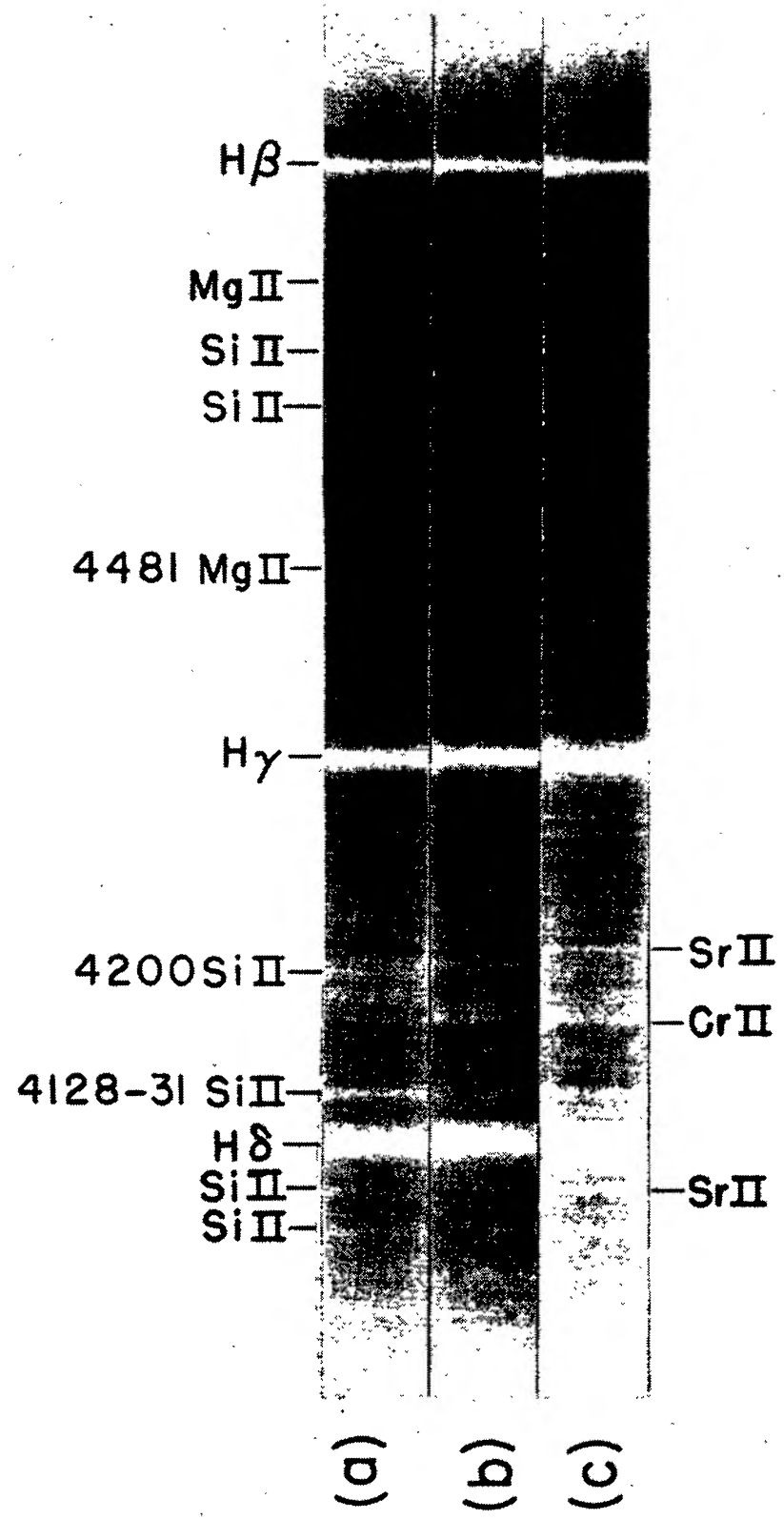
Table I lists the stars designated as peculiar by Bidelman. A

TABLE I

BIDELMAN'S "NEW PECULIAR A STARS" AND SLIT SPECTRAL CLASSIFICATIONS

Designation HD	Classification		Remarks
	Bidelman	Cowley	
573	Cr-Eu	F0 III	
2852	Sr-Eu	Sr	
2887	Sr-Cr	Sr-Cr	
3200	Si	.....	
3473	Si-Mg	Si-Mg	
7341	Si	Si	
8892	Si	Si	
10320	Si	Si	
11140	Si	Si	
18410	Si	variable	Cr, Eu both strong on one plate; Si strong on second

PLATE I



An intercomparison of the spectra of *(a)* HD 3473 (Aug. 14, 1964), *(b)* HD 39658 (Oct. 27, 1964), and *(c)* HD 204117 (July 30, 1964) from plates obtained at Yerkes Observatory. Of all the peculiar A stars observed by the writers, the line spectra of HD 39658 and HD 204117 between λ 4481 and Hβ most closely resemble the spectrum of HD 3473. Tentative identifications of some of the features marked Si II and Mg II are described in another paper.[2]

TABLE I *(Continued)*

Designation HD	Classification		Remarks
	Bidelman	Cowley	
20662	Si	A0 V	Cr may be slightly enhanced
22316	Cr:	B9 V	
25215	Si	Si	
26792	Sr	Sr	
29371	Si	B9 V	
29762	Si	Sr	Cr also present
38129	Cr-Sr	A7 V	
39658	Cr	Cr	Eu also present but weaker
39724	Sr-Eu	Si-Sr-Eu	Possibly variable
40142	Sr-Eu	Sr	
52628	Cr-Eu	Cr-Eu-Sr	
+53°1183	Cr-Eu-Sr	Sr-Cr	
119213	Sr	Sr-Cr	
169887	Si	Si	
+26°3347	Sr	.....	
178308	Cr	.....	
184383	Si	.....	
193948	Si	Si	May be composite; hint of a G band
194132	Si	Si	
194210	Si	B9 III	
+25°4289	Sr-Cr-Eu	.....	
201834	Si	B9 IV	
+27°4042	Sr-Eu	.....	
203786	Si	Si	
204117	Sr-Cr-Eu	Sr-Cr-Eu	
204905	Si	.....	
205795	Cr-Eu	Cr-Eu	
205950	Si	Cr-Eu	
206028	Si	Si	
208525	Sr	Sr	Eu and Cr also present but weaker than Sr
209059	Si	B9 V	Si may be very slightly enhanced
+51°3356	Si	Si	
216754	Si	Si	
+59°2602	Si	.....	
220846	Sr-Eu	Sr-Eu	
222672	Si	Si	

few seem to us to have normal spectra. In other cases, differences may be due to real variability of the spectrum. Several stars are listed as possible spectrum variables on the basis of more than one Yerkes spectrogram.

Plate I illustrates the spectral peculiarities of three stars of this survey. One of the most interesting is HD 3473. Its exceptionally strong Si II λλ 4128-30, Mg II λ 4481, and numerous fainter lines between λ 4500 and Hβ distinguish it from any other known peculiar A star. Many of these features have recently been identified as high-excitation lines of Si II and Mg II.[2]

Table II contains those stars which Bidelman called either metallic-line or δ Delphini stars. We find that some of these would be classified as normal stars on the MK system.

TABLE II

BIDELMAN'S "NEW METALLIC-LINE STARS" AND SLIT SPECTRAL CLASSIFICATIONS

Designation HD	Classification		Remarks
	Bidelman	Cowley	
3448	δ Del	F3 V	Metallic lines slightly enhanced
3777	Am	Am	
7119	Am	δ Del	
16641	Am	Am	
16932	Am	A7 V	
18460	δ Del	F3 V	
21769	Am	Am	
25021	Am	A3 V	Metallic lines weakly enhanced?
25305	Am	Am	
25515	δ Del	F3 III	
28617	Am	A5 V	
30110	δ Del	δ Del	
+57°911	Am	Am	
39390	δ Del	δ Del	
42083	Am	A5 III	
43508	Am	Am	
45798	Am	A5 V	
47606	Am	δ Del	
50130	Am	Am	
53227	Am	Am	

TABLE II *(Continued)*

Designation HD	Classification Bidelman	Classification Cowley	Remarks
62257	Am	Am:	
66068-9	Am	Am	
66297	Am	Am	
67317	Am	Am	
69682	δ Del	F0 IV	
72459	Am	A5 V	
72792	δ Del	δ Del	
74502	Am	Am	Sr strong
76310	Am	Am	
76364	Am	.....	
78388	δ Del	F0 III	
81772	δ Del	F0 IV	
82861	Am	Am	
97811	Am	Am	
99620	Am	Am	
99859	Am	A5 V	
100992	Am	.....	
108346	Am	Am:	
108844	Am	F0 IV	
109495	Am	A7 V	
172743	δ Del	F0 V	
179461	δ Del	F0 IV	
185983	Am	.....	
+26°3658	Am	.....	
192680	Am	Am:	
192849	Am	A5 V	
192893	Am	Am	
193646	Am	Am	
195692-3	Am	Am	
195726	Am	.....	
196022	Am	Am	
200223	Am	Am	
204541	Am	Am	
207561	Am	F0 III	
212595	Am	Am	

TABLE II *(Continued)*

Designation HD	Classification Bidelman	Classification Cowley	Remarks
213143	δ Del	Fm	K line indicates an F star, but metals strong
213634	δ Del	F0 V	
218067	Am	Am	
218574	Am	Am	
220317	Am	.....	
222770	Am	Am	
223247	δ Del	F0 IV	
223461	Am	Am	
223531	Am	Am	
224002	Am	Am	
224657	Am	F2 V	

Note: "Am:" indicates an A star in which the metallic lines are only slightly enhanced.

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[1] W. P. Bidelman, ONR symposium held at Flagstaff, Arizona, June 1964.

[2] A. P. Cowley, *Ap. J.*, **141**, 1288, 1965.