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THE VARIABILITY OF PQ NORMAE = BV 1556 = HD 148013

The variability of PQ Nor = BV 1556 has been discovered by Strohmeier and Knigge (1973). They claimed a period of 0.931 days and EW light curve with amplitude of  $0^m.3$  in the photographic region.

The star has been observed photoelectrically in UBV with the 50 cm photometric telescope at the European Southern Observatory (ESO) on La Silla/Chile in May-June 1974. The results are given in the Table. Corrections for extinction have been applied.

The primary comparison star was HD 147670 ( $V = 7^m.84$ ,  $B-V = ^m.00$ ,  $U-B = ^m.44$ ; B5), check star was HD 148028 ( $V = 8^m.76$ ,  $B-V = ^m.09$ ,  $U-B = ^m.26$ ; B5). No variability of these two stars larger than the observing errors was found.

The period and the type of variability given by Strohmeier and Knigge could not be confirmed, and the amplitude was found considerably smaller than  $0^m.3$ . Best fit of the data is obtained with a period of 5.58 days. The light curve is shown in the Figure, JD 2442180.0000 was chosen arbitrarily as starting epoch. The amplitude in V is found as  $0^m.045$ , the amplitude in B is about  $0^m.065$ . The light curve seems slightly asymmetric with a steeper increasing branch.

J.M.Vreux very kindly has taken a spectrogram of the star with dispersion 12.3 Å/mm at the 1.5 m spectrographic telescope of the European Southern Observatory. The spectrogram shows only strong Balmer lines and a sharp but weak Calcium K line. The latter very probably is of interstellar origin since its radial velocity differs by about 35 km/s from the radial velocities derived from the Balmer lines. From the appearance of the spectrum the star is classified as A0. No metal lines are discernible.

The colour index  $B-V = +.26$  for mean light is considerably redder than for normal A0 stars, indicating an interstellar reddening of about  $E_{B-V} = 0.^m25$ . Since  $E_{U-B} = E_{B-V} \cdot (.72 + .05 \cdot E_{B-V})$  the unreddened U-B colour index must be close to  $(U-B)_0 = -.35$ . The reddening is in agreement with the galactic position at (1950)  $l = 329.^o13$ ,  $b = -5.^o83$ . Since the total interstellar absorption  $A_V$  in visual is about three times as large as the selective reddening in B-V we have  $A_V = 0.^m8$ . The corrected visual apparent brightness is therefore  $m_0 = 6.^m9$ .

Since the spectrum shows no metal lines the variability probably is not connected with the observed A0 star. The simplest explanation is the assumption of a possibly physical companion which exhibits a normal Cepheid light curve of period 5.58 days. Assuming a visual amplitude of about  $0.^m8$  this Cepheid must be fainter than the A0 star by about  $2.^m8$ . The period-luminosity relation of Cepheids gives an absolute visual magnitude of  $M_{CV} = -3.^m6$ . If the two stars are at the same distance the absolute visual magnitude of the A0 star is  $M_{AV} = -6.^m4$  according to luminosity class I<sub>ab</sub> which also would be in good agreement with the unreddened ultraviolet colour index  $(U-B)_0 = -.35$ . The distance of the two stars is then about 4.5 kpc.

Further observations of the object, especially the determination of radial velocities, are needed to confirm the proposed nature of the variability of PQ Nor = BV 1556.

The author wishes to express his sincere thanks to J.M.Vreux who very kindly took the spectrogram of PQ Nor. Gratefully acknowledged is the allocation of observing time by the European Southern Observatory.

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References:

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Bd X, Nr. 106 (1973)

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Photoelectric observations of BV 1556 = PQ Normae

Jul.date	V	B-V	U-B	Jul.date	V	B-V	U-B
2442000+				2442000+			
185.7541	7.682	.253	-.134	188.9229	7.738	.258	-.161
185.7568	7.685	.256	-.139	188.9257	7.728	.271	-.158
185.7594	7.692	.255	-.140	189.8052	7.729	.270	-.145
185.7618	7.694	.252	-.141	189.8085	7.733	.267	-.143
185.7652	7.703	.248	-.146	189.8127	7.730	.265	-.136
185.7677	7.697	.254	-.145	189.8154	7.732	.262	-.129
185.7702	7.693	.263	-.147	189.8175	7.730	.265	-.137
185.7729	7.688	.249	-.160	189.8206	7.729	.265	-.141
185.7754	7.690	.245	-.156	189.8238	7.727	.261	-.131
185.7782	7.694	.248	-.142	189.8261	7.722	.270	-.133
185.7837	7.697	.248	-.147	189.8300	7.725	.269	-.134
185.7860	7.694	.255	-.149	189.8323	7.722	.270	-.138
185.7953	7.701	.248	-.143	189.8396	7.732	.264	-.139
185.7982	7.678	.256	-.138	189.8423	7.728	.261	-.136
185.8009	7.675	.254	-.141	189.8445	7.735	.257	-.140
185.8037	7.696	.245	-.142	189.8485	7.728	.265	-.136
185.8037	7.696	.245	-.142	189.8512	7.726	.267	-.131
185.8062	7.695	.251	-.150	189.8544	7.728	.269	-.143
185.8087	7.697	.248	-.144	189.8577	7.734	.264	-.142
185.8145	7.701	.244	-.146	189.8615	7.727	.265	-.133
185.8196	7.696	.250	-.151	189.8649	7.728	.262	-.145
185.8221	7.692	.251	-.142	189.8713	7.732	.258	-.135
185.8247	7.699	.247	-.148	189.8753	7.735	.258	-.136
185.8309	7.704	.243	-.144	189.8780	7.737	.256	-.137
185.8333	7.706	.249	-.150	189.8832	7.732	.257	-.146
185.8361	7.700	.255	-.158	189.8866	7.731	.260	-.143
185.8422	7.693	.243	-.132	189.8902	7.741	.253	-.138
185.8448	7.694	.242	-.136	189.8949	7.734	.257	-.136
185.8474	7.696	.240	-.138	189.8984	7.735	.259	-.141
185.8501	7.697	.243	-.139	189.9019	7.727	.268	-.155
185.8527	7.698	.254	-.155	189.9073	7.728	.258	-.136
188.7973	7.731	.262	-.130	191.7951	7.686	.254	-.146
188.8010	7.731	.264	-.133	191.7972	7.690	.244	-.142
188.8044	7.734	.274	-.137	191.8007	7.691	.246	-.142
188.8258	7.728	.272	-.141	191.8028	7.686	.245	-.143
188.8304	7.742	.263	-.144	191.8063	7.686	.245	-.143
188.8331	7.736	.261	-.139	191.8104	7.685	.250	-.147
188.8358	7.728	.268	-.141	191.8125	7.682	.253	-.149
188.8385	7.717	.275	-.146	191.8146	7.689	.247	-.151
188.8413	7.729	.271	-.157	191.8198	7.687	.244	-.136
188.8441	7.729	.264	-.158	191.8219	7.692	.245	-.141
188.8565	7.737	.270	-.145	191.8260	7.684	.250	-.143
188.8608	7.734	.270	-.145	191.8285	7.686	.255	-.151
188.8658	7.740	.257	-.140	191.8305	7.691	.244	-.147
188.9028	7.737	.263	-.145	191.8330	7.690	.241	-.139
188.9069	7.728	.260	-.147	191.8349	7.690	.244	-.141
188.9094	7.733	.249	-.156	191.8372	7.687	.247	-.151
188.9151	7.721	.263	-.156	191.8410	7.685	.253	-.147
188.9176	7.717	.272	-.170	191.8438	7.691	.249	-.147
188.9203	7.738	.247	-.152	191.8460	7.682	.246	-.142

Jul.date	V	B-V	U-B	Jul.date	V	B-V	U-B
2442000+				2442000+			
193.5895	7.714	.283	-.142	194.8443	7.736	.267	-.138
193.6005	7.732	.267	-.137	194.8574	7.744	.263	-.144
193.6029	7.729	.271	-.131	194.8612	7.729	.277	-.148
193.7811	7.734	.261	-.127	195.4755	7.730	.275	-.151
193.7833	7.731	.269	-.141	195.4792	7.730	.265	-.133
193.7854	7.731	.265	-.137	195.6258	7.724	.257	-.128
193.7895	7.731	.265	-.142	195.6281	7.729	.255	-.129
193.7917	7.730	.265	-.133	195.7682	7.719	.259	-.133
193.7944	7.730	.268	-.144	195.8391	7.717	.256	-.141
193.7968	7.729	.265	-.143	195.8414	7.716	.256	-.137
193.8005	7.724	.272	-.140	195.9017	7.720	.256	-.151
193.8038	7.728	.274	-.138	196.4615	7.706	.243	-.156
193.8059	7.729	.269	-.145	196.6777	7.697	.249	-.139
193.8083	7.725	.273	-.148	196.6799	7.695	.250	-.143
193.8125	7.730	.265	-.133	196.7988	7.695	.245	-.136
193.8149	7.735	.257	-.133	196.8010	7.702	.238	-.144
193.8173	7.735	.258	-.142	196.8823	7.696	.241	-.160
193.8248	7.728	.262	-.137	196.8848	7.691	.246	-.153
193.8270	7.724	.270	-.139	197.4958	7.708	.233	-.146
193.8295	7.734	.258	-.142	197.4986	7.701	.244	-.163
193.8317	7.738	.268	-.151	197.7766	7.698	.244	-.145
193.8343	7.720	.273	-.137	198.7273	7.725	.266	-.121
193.8372	7.725	.264	-.130	198.7297	7.722	.258	-.131
193.8396	7.729	.260	-.141	199.6790	7.728	.259	-.126
193.8438	7.735	.259	-.150	199.7550	7.732	.272	-.145
193.8461	7.735	.261	-.144	199.7595	7.717	.279	-.142
193.8483	7.739	.257	-.141	199.7618	7.731	.267	-.132
193.8577	7.735	.260	-.146	199.7640	7.733	.262	-.141
193.8603	7.738	.262	-.147	199.7775	7.730	.269	-.138
193.8644	7.735	.256	-.134	199.7953	7.734	.265	-.146
193.8668	7.729	.264	-.142	199.8325	7.725	.274	-.146
193.8697	7.732	.263	-.149	200.4681	7.739	.267	-.145
193.8722	7.726	.271	-.150	200.4705	7.745	.270	-.154
193.8832	7.736	.263	-.155	200.4997	7.731	.278	-.143
193.8870	7.734	.268	-.156	200.5836	7.745	.260	-.135
193.9020	7.724	.269	-.158	200.5864	7.733	.274	-.141
194.7730	7.736	.269	-.134	200.7889	7.739	.271	-.154
194.7754	7.738	.268	-.139	201.4772	7.714	.259	-.143
194.7792	7.731	.274	-.138	201.4798	7.714	.254	-.135
194.7816	7.732	.275	-.142	201.7555	7.703	.249	-.140
194.7868	7.731	.274	-.137	201.7578	7.701	.250	-.138
194.7900	7.734	.271	-.134	201.7948	7.695	.256	-.146
194.7923	7.736	.269	-.131	201.7970	7.700	.248	-.139
194.7950	7.728	.274	-.134	201.7994	7.698	.253	-.142
194.7976	7.731	.273	-.137	201.8031	7.696	.257	-.147
194.8007	7.733	.268	-.134	201.8052	7.698	.253	-.147
194.8254	7.737	.265	-.134	201.8078	7.697	.256	-.148
194.8287	7.735	.266	-.138	201.8308	7.703	.246	-.153
194.8376	7.737	.270	-.143	201.8480	7.704	.250	-.150
194.8408	7.730	.275	-.138	201.8503	7.703	.255	-.153

Jul.date	V	B-V	U-B	Jul.date	V	B-V	U-B
2442000+				2442000+			
201.8815	7.695	.257	-.162	204.8956	7.742	.256	-.161
201.8838	7.697	.256	-.162	204.8999	7.749	.250	-.158
202.4652	7.697	.240	-.134	204.9028	7.748	.253	-.174
202.4675	7.692	.247	-.141	204.9072	7.748	.250	-.172
202.7384	7.692	.246	-.148	204.9096	7.742	.249	-.171
202.7409	7.689	.246	-.150	205.5386	7.737	.260	-.128
202.8036	7.695	.243	-.155	205.6326	7.731	.269	-.134
202.8058	7.687	.248	-.145	205.6349	7.733	.270	-.135
202.8270	7.687	.251	-.154	205.7449	7.730	.271	-.136
202.8295	7.693	.245	-.148	205.7472	7.728	.273	-.137
202.8429	7.686	.251	-.151	205.9161	7.752	.267	-.180
203.4707	7.709	.254	-.146	205.9183	7.716	.284	-.159
203.7388	7.716	.248	-.135	206.4643	7.733	.257	-.140
204.4707	7.731	.267	-.156	206.4765	7.736	.254	-.141
204.7526	7.735	.264	-.145	208.4727	7.708	.241	-.152
204.7550	7.733	.266	-.146	208.4742	7.706	.246	-.154
204.8471	7.731	.262	-.152	208.4764	7.703	.240	-.148
204.8879	7.746	.254	-.168	209.4758	7.726	.251	-.139
204.8908	7.738	.265	-.166	210.4927	7.731	.266	-.131
204.8935	7.741	.260	-.163	210.4950	7.725	.272	-.132

