Remarks on Three Stars - RR Scl, RS Scl and S Tel.

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Introduction.

The three named variables, RR and RS Sculptoris, and S Telescopii are currently known only from the information gleaned from the GCVS. The observations used to classify these stars are very old, and more modern material is now available to assist in clarifying the nature of these stars.

Basic Data..

Star	GCVS Type	GCVS Range	DM No.	Discoverer	Year	RASNZ Chart Nos.
0024-38b	RR Scl	Cst 12.9v	CoD-38 142	Innes	1897	76,77
0122-33	RS Scl	? 9.8 - (15p		Innes	1897	70
1958-55	S Tel	Cst? 11.9 - 13.1v	CPD-55 9313	Kapteyn	1896	209,210

Firstly, it must be appreciated that at the time (pre-1900) of these old observations the magnitude scales were poorly fixed and astronomical photometry was rather crude. If one is to evaluate the magnitudes reported by Innnes one must somehow convert his magnitude scale to the modern equivalent - standard V. Preferably one should have a sequence localized for each of the above variables. Fortunately, for RR Scl, Innes gives a local sequence, that adopted for T Scl, a Mira variable located 10.5' north.
(Cape Ann. 9, 2, p23B (1902)). His sequence is given below, together with BV from Tycho-2 and ASAS-3 catalogues.

Innes comp. star	CoD no.	CoD mag.	V	B-V	V_err	Source
8.0v	-38 149	8.0	8.40	1.19		Tycho-2
8.9v	-38 141	8.9	9.83	1.18		Tycho-2
10.0v	-38 140	10	11.89		0.04	ASAS-3
11.0v	[GSC 7525.316]		13.01		0.09	ASAS-3

Clearly, Innes has adopted the Cordoba magnitude scale, and his sequence is much too bright at the faint end. I expect that most of Innes' visual estimates will usually be found to be too bright whenever his observations are tied to the CoD scale. His estimates are apparently also influenced by the CoD scale in observations of far southern variables not yet covered by the CoD.(Innes, Cape Annals 9,2,15B....1902). Anyway, one should not take "10" in the CoD as literally mag. 10.0. It covers a whole class of stars at the faint end of the CoD magnitude scale.

RR Sculptoris = CoD-38 142 (9.6).

This star was first recorded by Thome for the CoD. Observations at Cordoba are :
1889 Nov.25 10m
1890 Oct. 14 9.0m

Thome listed this star (among many others) as a suspected variable. In the light of later knowledge one would query the 1890 observation. Was it just a slip of the pen, or an erroneous estimate?

Innes states (Cape Ann. 9,2,25B,1902)

At the Cape, this star has never been brighter than 10.5v (=12.5V). The observations are given .....but it must be remembered that my estimates of so faint a star in a sparse field are not very reliable. The Cape observations by themselves do not indicate variability.

Using a 7-inch Merz equatorial refractor (f.o.v. 35'), Innes made 35 positive estimates between 1897 Jan. 25 and 1900 Dec. 16. Most estimates are between 10.5 and 11.5v, average value being 11.0v (Cape Ann. 9,2,25B,1902)..This is equivalent to 13.0V on the modern scale. This is in fair agreement with the ASAS-3 value, V =12.73 (err +/-0.07). S.. Gaposchkin (Harvard Ann. 115, No.2, p227, 1950) looked for RR Scl on the Milton Bureau plates, but could not find it and dropped it from his program.

Conclusion : RR Scl is constant. ASAS-3 data does not suggest variability.

Modern Position : (J2000) 00h29m31.92s -38°04'16.7"

RS Scl = Var 23.1903 Sculptoris.

Very few positive visual observations reported, and these are of uncertain reliability. The field of view through the Cape 7-inch refractor would have been even sparser than than of RR Scl (q.v.), with only one star as bright as 11.0V. No chart or sequence published. Published position for 1875 is

01h21m22s -33°33.4' AN 162,205 (1903) and

01 21 23 -33 33.7 Cape Ann 9, 161B

RS Scl was announced as variable by W. de Sitter (AN 162,205, 1903), who published the following list of observations to support the claim of variability.

1. Var. 23.1903 Sculptoris
Anon. 1h21m22s -33°33.4'

P	1893 Dec. 28	10.70
	1894 Jan. 8	9.76
S	1899 Sept. 14	10.30
I	1900 Jan. 23	10.97
	" " 24	10.41
P	1902 Jan. 26	no star; limit 11.0+/-

where P = photographic [CPD scale, where 11.0 is equivalent to 11.75B. MM].
S = Zollner photometric obs,. with 6" equatorial tel. of Cape Observatory.
I = visual observation by R.T.A. Innes.

However, I am not convinced by the three visual observations. They seem to be isolated observations made at random in a sparse field. It is not clear to which magnitude scale they conform - de Sitter refers to the Cordoba scale, corrected to the Harvard scale. These visual estimates could just as well refer to the star CoD-33°524 (11.00V) about 8.5' south. Moreover, Innes (Cape Ann.9, 161B, 1902) did report a short series of observations made on a more regular basis. He observed RS Scl on

1897 Dec. 18, 21 and 28	always invisible
1898 Jan. 4 and 15	invisible
Feb. 8 and 20	invisible
Mar. 16	invisible

His limit appears to have been around 12.5 -13.0v. However, significantly, Innes prefaces his observations with this comment :

The existence of a star here was suspected from a photo-plate.

Presumably the two photographic observations mentioned by de Sitter (1893 Dec. 28 and 1894 Jan. 8) contain the suspected images.

RS Scl was examined at Harvard, but results were negative (Harvard Ann. 115, No. 2 (1950) p228). They state the following about RS Scl :

Miss Leavitt (unpublished record) states that "no object at or near position shows variability." We have concluded that RS Sculptoris does not exist, this view being strengenthed by Innes' statement that the original discovery images were only suspected.

It is curious that de Sitter announced RS Scl as a new variable in 1903, despite Innes having, in 1902, failed to verify it and having cast doubt on its reality.

F.M. Bateson attempted to observe RS Scl from 1953-56 without success.

RS Scl is shown on chart 70 of the VSS,RASNZ, published in 1966, and this has allowed other observers to follow RS Scl. The results are generally negative or inconclusive. The DSS prints of the field show nothing at the position of RS Scl, certainly no variable of large range.

Conclusion: RS Sculptoris does not exist.

S Telescopii = CPD-55°9313 (9.0)

This star was announced as variable by J.C. Kapteyn (Astr. Nach. 3389 of 1896 Nov. 30), on the following evidence.

CPD Plate No.	776	1887	Sept. 17	JD 2410532	9.0
"	780	1887	" 20	0535	9.0
"	2749	1890	July 9	1558	<10.4
"	2894	"	Oct. 22	1663	<10.4
"	2919	"	Nov.4	1676	<10.1

All the plates were carefully inspected and nowhere could any defect in the film be detected.

Innes (Cape Ann 9,2,142B, 1902) reports an extensive series of visual observations between 1897 Aug 8 and 1900 Oct. 2, all of them negative. It apears that Innes' magnitude scale is too bright by 1-2 magnitudes, consistent with his observations of other fields. He does not provide a chart or sequence. His limit with the 7-inch Merz equatorial would be about 13.0v Even at the time of discovery an immediate question arose : Is this star a Nova? This matter was then referred to Prof. E.C Pickering at Harvard, who collected observations of a star at or near the position of CPD-55°9313. On 24th Sept 1901 he reported nine observations, stating that the star was variable between 11.5 and 13.0p.

It is questionable, however, whether the Harvard workers examined the correct star. There is a nearby star, GSC 8780-1530 at (J2000) 20:06:16.23 -55:34:21.3, V =13.05 from ASAS-3, but not obviously variable. Innes does not mention this star, either not seeing it or disregarding it. At Harvard the GSC star seems to have become permanently linked to S Tel. AAVSO and RASNZ charts for RR Tel incorrectly identify S Tel with GSC 8780-1530 since 1951, possibly stemming from Harvard observations of the field. S Tel is not in the GSC or other modern catalogue, that we know of, and is yet to be recovered.

S Tel as a possible nova or other eruptive variable.

I think it wiser to stick with the CPD position and identifier. There are three faint 19mag stars near the position of CPD-55°9313. One star, at (J2000) 20:06:21.18 - 55:32:53.3, R=18.1, B=19.1 has the same Right Ascension and is about 13" north. Naturally such faint stars were beyond the reach of early 20th Century technology.

Conclusion :

S Tel = CPD-55°9313; appears to be a transient object captured on two CPD plates. It is near GSC 8780-1530, but is not the same. S Tel may repay close watching, as an unrecognized nova or eruptive variable. .
Approx. position: (J2000) 20h06m21.1s -55°33'06".

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