

THE FIRST SUCCESSFUL ATTEMPTS TO DETERMINE STELLAR PARALLAXES
IN THE LIGHT OF THE BESSEL/STRUVE CORRESPONDENCE

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ABSTRACT. Among other items, the Bessel/Struve correspondence reflects the competition between the two astronomers in deriving a value of a stellar parallax significantly differing from zero. This paper summarizes the letters written between 1837 and 1840.

1. THE LETTERS

The complete Bessel/Struve correspondence, stored in the archives of the Academy of Sciences of the GDR, includes 106 letters each written by Friedrich Wilhelm Bessel and Friedrich Georg Wilhelm Struve. Around 1900, Otto Struve presented the Bessel letters to the Prussian Academy at Berlin (Klauss 1986). Among many other items, this correspondence reflects the competition between the two astronomers in deriving a value of a stellar parallax significantly differing from zero.

In the correspondence exchanged before July 1837 and after May 1840 there is no indication of the crucial parallax measurements. Between 1837 and 1840 the following letters were written by Bessel and Struve whose friendly relations dated from their first meeting in 1814. This paper is concerned only with the parts dealing with the parallax measurements.

Struve to Bessel, 1837 July 25

Str. tells B. that he continues his observations of double stars and concentrates on the parallax of Alpha Lyrae, since the measurements contained in his recently published *Mensurae micrometricae* are "by no means complete enough".

Bessel to Struve, 1837 August 26

B. enthusiastically praises Str's. *Mensurae micrometricae* he received two weeks before. He takes great interest in Str's. attempt to measure the parallax of Alpha Lyrae. B. is stimulated to do the same with Alpha Bootis and 61 Cygni. Str. is expected to anticipate B's. parallax measurements since he already has been collecting measurements for one year. "Forever the honour of having tried this method first belongs to you."

Bessel to Struve, 1837 October 11

nothing on parallaxes

Struve to Bessel, 1837 October 18

Str. expresses his delight that B. has again taken up his studies on the parallaxes of stars. Str. expects positive results for the parallaxes during the following years. Str. will not choose any stars other than Alpha Lyrae, since he cannot continue his measurements regularly in the following year. He will have to do some traveling to Petersburg and to Germany.

Bessel to Struve, 1837 October 30

The measurements of 61 Cygni made until then do not show any positive results. However, B. patiently continues measuring it to narrow down the error range.

Struve to Bessel, 1838 ?

B. loses this letter immediatly after receiving it.

Bessel to Struve, 1838 March 25

B. has been patiently observing 61 Cygni during the cold, but clear winter. He believes the result will be positive, but seven months of observations are not sufficient. Observations of Alpha Bootis were not of the same quality. Str. will be the first to learn something about the results, since they were encouraged by his observations of Alpha Lyrae.

Struve to Bessel, 1838 May 7

The measurements of Alpha Lyrae accumulate, but no calculations are made. Observations to be made until coming November will be processed all at once.

Bessel to Struve, 1838 May 14

The measurements of the two reference stars do not agree very well. There is some likelihood that a reasonable assessment will become feasible only next year.

Struve to Bessel, 1838 August 11

Str. is preparing to travel to Germany; he wants to be in Königsberg on August 22 or 23.

Struve to Bessel, 1839 March 5; Bessel to Struve, 1839 June 21

nothing on parallaxes

Bessel to Struve, 1839 October 28

The second year of observations of 61 Cygni has passed. As far as B. can judge the original result will be confirmed.

Struve to Bessel, 1839 November 10

Str. presents the results of the measurements of Alpha Lyrae finished on August 18, 1838. Due to problems with the position angles the parallax is based only on the distances.

Bessel to Struve, 1840 January 29

B. congratulates Str. on the parallax of Alpha Lyrae. He did not expect it to be so large because of the small parallax of 61 Cygni and the relative sizes of the proper motions of the two stars. "But expectations are nothing in comparison with observations."

Bessel to Struve, 1840 May 8

B. presents the new result on 61 Cygni. The observations were finished at the end of March. "We have now definitely disputed the opinion that the parallaxes of fixed stars are imperceptible." Assuming that Alpha

Lyrae has a measurable parallax, many other stars may as well have one. Struve to Bessel, 1840 May 25

Str. appreciates the interesting information on the parallax of 61 Cygni, "the determination of which we have to consider as an essential triumph of recent astronomy". The printing of the paper on the parallax of Alpha Lyrae has nearly been completed. The following ten years will teach us more about parallaxes. The next candidate is 40 Eridani, which might be even nearer than 61 Cygni because of the large apparent separation of its companion.

2. CONCLUSIONS

From this correspondence we may conclude:

Struve did not tell Bessel about his first attempts to determine the parallax of Alpha Lyrae. During that time (around 1836) Struve wrote very rarely to Bessel, which led to some tension between the two. With Struve's letter of July 25, 1837, the last period of their close relationship before Bessel's death began.

Struve himself did not consider the preliminary value of the parallax of Alpha Lyrae published in 1837 to be sufficient. However, Bessel was encouraged by the result and started a new series of observations of 61 Cygni. A year later Bessel succeeded in deriving a statistically significant value of the parallax. Bessel readily ceded to Struve the honour of being the first to use the method of differential parallax measurements. No other discussion on priority occurs in the correspondence.

Struve's travels to Germany from August to November of 1838 and his meeting with Bessel interrupted their correspondence, i.e. we do not know how Struve reacted to Bessel's success of October 1838.

Fernie (1975) is the first who drew attention to Struve's influence on Bessel. He considered it quite likely that it was again Struve's paper of 1837 that finally prompted Henderson to analyze his observations of Alpha Centauri. Neither Bessel nor Struve commented on Henderson's investigations.

REFERENCES

- Fernie, J. D.: 1975, *J. Roy. Astron. Soc. Canada*, 69, 222.
 Klauss, K.: 1986, *Die Sterne*, 62, 35.