XXII. *On the Periods of the Changes of Light in the Star Algol. In a Letter from* John Goodricke, *Efq. to the Rev.* Anthony Shepherd, *D. D. F. R. S. Profeffor of Aftronomy at* Cambridge.

Read April 1, 1784.

S I R,   York, Dec. 8, 1783.

AS I am now able, by collating fome of my late obfervations on Algol with thofe I fent you laft May, to determine with greater precifion the periodical return of its changes, I wifh to add this as a kind of fupplement to that account.

The method I have here purfued is by taking the intervals between accurate obfervations of Algol's leaft brightnefs or greateft diminution of light made at long diftances of time from each other, and dividing thofe intervals by a certain number of revolutions, as will be beft underftood by the table below. The reafon of my chufing long intervals is, that the number of revolutions being greater, the errors of obfervation are thereby diminifhed : all error cannot, however, as yet be excluded, but I think the period is now, by the following calculation, afcertained within ten or fifteen feconds.

3   Mean

Mean times of Algol's
  leaft brightnefs.

1783	h.	'				d.	h.	'	''
Jan. 14	9	25 }	an interval of 99 revolutions, each of			2	20	49	14
Oct. 25	6	39 }							
Jan. 14	9	25 }	Ditto	106	Ditto	2	20	49	10
Nov. 14	8	17 }							
Jan. 14	9	25 }	Ditto	107	Ditto	2	20	49	2
Nov. 17	4	52 }							
Feb. 6	8	15 }	Ditto	91	Ditto	2	20	49	3
Oct. 25	6	39 }							
Feb. 6	8	15 }	Ditto	98	Ditto	2	20	48	59
Nov. 14	8	17 }							
Feb. 6	8	15 }	Ditto	99	Ditto	2	20	48	51
Nov. 17	4	52 }							
Feb. 26	9	43 }	Ditto	84	Ditto	2	20	49	14
Oct. 25	6	39 }							
Feb. 26	9	43 }	Ditto	91	Ditto	2	20	49	9
Nov. 14	8	17 }							
Feb. 26	9	43 }	Ditto	92	Ditto	2	20	49	0
Nov. 17	4	52 }							
Jan. 31	14	29 }	Ditto	100	Ditto	2	20	49	4
Nov. 14	8	17 }							
Mar. 21	8	36 }	Ditto	84	Ditto	2	20	48	46
Nov. 17	4	52 }							
Hence the period of Algol's variation is, on a mean,						2	20	49	3

I could have added feveral more comparifons of the like
kind; but thefe are, I think, fufficient. It is to be remembered,
that all the obfervations contained in the above table are reduced
to mean time.

It appears to me now, that the duration of the variation is
about eight hours; but, as it is difficult to hit exactly the be-
ginning and end of the variation, this may occafion different
obfervers to differ in this refpect. Before I conclude, I beg
leave to mention a circumftance deferving of notice; which is,

that

that FLAMSTEAD has alſo amongſt other ſtars obſerved Algol, and in two places has marked it of leſs magnitude than at other times, *viz.* of the third magnitude, 1696, January 16. 6 h. 24′, and 1711, December 5. 9 h. 13′, both mean time and old ſtile *. Suſpecting theſe might probably be days of Algol's variation, I computed the interval between them, but could not find a period anſwerable to that which I have above determined. Upon examining more cloſely the obſervations, I find, in that of 1696, he marked at the ſame time the mag- nitude of ρ Perſei; which, conſidering eſpecially the nearneſs of ρ Perſei to Algol, makes this obſervation to be relied on for its juſtneſs, and leſs liable to any miſtake of judgement; whereas the other obſervation of December 5, 1711, is more liable to error or doubtfulneſs, becauſe he did not then mark the magnitude of ρ Perſei, or of any ſtar of the ſame magni- tude near enough to Algol. Preſuming, therefore, on the juſt- neſs of FLAMSTEAD's obſervation of 1696, to think that it probably was made at a time when Algol varied, I compared it with one of mine, *viz.* October 25. 6 h. 39′, 1783, and I find there is, in the interval between thoſe obſervations, either 11,176 periods, each of 2 d. 20 h. 49′ 18″; or 11,177, each of 2 d. 20 h. 48′ 56″. The laſt, as it approaches neareſt to the reſults of my beſt obſervations, I think, is the exacteſt de- termination of the period. This, however, all proceeds upon the ſuppoſition that Algol varied at the time of FLAMSTEAD's obſervation, and alſo that the period is regular.

* Hiſtoria Cœleſtis, vol. II, edit 1725, p. 284. and 534.

The following is a fhort abftract of my late obfervations on Algol, when its leaft magnitude was accurately determined.

<div align="center">Auguft 17, 1783.</div>

App. time.

h. '

10 52 About equal to ρ Perfei, though Algol feemed to be rather brighter.

11 7 Evidently lefs than ρ Perfei.

11 22 Ditto; but rather difficult to diftinguifh them from each other.

11 30 Rather brighter than ρ, and not fo bright as δ Perfei.

12 0 About the brightnefs of δ Perfei, and rather lefs than β Trianguli.

12 30 Brighter than δ Perfei, and rather not fo bright as β Trianguli.

From thofe obfervations, by taking a mean between 11 h. 7′ and 11 h. 22′, it appears, that its leaft brightnefs happened at 11 h. 14′; true, I think, to 5′.

<div align="center">October 25.</div>

6 40 It was confiderably lefs than ρ Perfei.

7 5 Ditto.

7 20 Equal to ρ Perfei, though Algol feemed rather lefs.

7 35 About equal to ρ Perfei.

7 50 Brighter than ρ, and alfo than δ Perfei.

8 25 About the third magnitude, and equal to β Trianguli.

9 35 Between the fecond and third magnitude; brighter than β Arietis, and rather lefs than α Pegafi.

10 10 About the fecond magnitude; rather brighter than α Pegafi, rather lefs than β Caffiopeæ, and not fo bright as α and γ Caffiopeæ.

<div align="center">I</div>

<div align="right">Rather</div>

App. time.
h.   ′
10 40 Rather brighter than β Caſſiopeæ, but leſs than α and γ.
11   0 Nearly equal to, if not rather brighter than, γ Caſſio-
          peæ, and leſs than α Caſſiopeæ*.

In 20′ afterwards it was of the ſame brightneſs; hence
we may conclude, that the variation has ended at
11 h. 0′.

Its leaſt brightneſs from the obſervations appears to
have happened at 6 h. 55′; true, I think, to 10′.

November 11.

10   5 Third magnitude; not much different from ε Perſei
          and β Trianguli.
10 45 Between the third and fourth magnitude; believe equal
          to δ Perſei.
11 14 Leſs than ρ Perſei.
11 48 Ditto; but think it rather increaſed.

Its leaſt brightneſs from thoſe obſervations appears to
have happened at 11 h. 31′; true, I believe, to a
quarter of an hour.   The weather was rather hazy.

November 14.

5   0 Between the ſecond and third magnitude, and leſs than
          β Caſſiopeæ.
5 45 A little brighter than β Arietis.
6 50 Not ſo bright as β Arietis, and rather brighter than
          β Trianguli.
8 10 A little brighter than ρ Perſei, and believe equal to
          δ Perſei.

* Algol's uſual and greateſt brightneſs, by my later and more accurate obſer-
vations, is thus: a little leſs than α Caſſiopeæ, brighter than β Caſſiopeæ and
α Pegaſi, and rather a little brighter than γ Caſſiopeæ.

Leſs

App. time.

h.   '

8 25 Lefs than ρ Perfei.

8 40 Ditto.

9   0 Equal to ρ, though Algol appeared rather brighter.

9 15 A little brighter than δ and ρ Perfei.

By taking a mean between 8 h. 25′ and 8 h 40′, it appears, its leaft brightnefs happened at 8 h. 32′; true to 10 minutes. The weather was rather hazy during fome part of this obfervation.

November 17.

4 58 A little lefs than ρ Perfei.

5 15 Ditto.

5 35 Rather brighter than ρ Perfei.

5 50 A little brighter than ρ Perfei, but lefs than δ Perfei.

6   5 Rather brighter than δ Perfei.

6 40 Equal to β Trianguli, and brighter than ε and ζ Perfei.

7 20 A little brighter than β Arietis.

8 30 Between the fecond and third magnitude, and equal to β Caffiopeæ, but lefs than α and γ.

8 50 Second magnitude, and equal to γ Caffiopeæ.

9 25 Nearly the fame, if not rather brighter.

The variation has therefore ended at 9 h. 0′ nearly, and its leaft brightnefs by taking a mean between 4 h. 58′ and 5 h. 15′, happened at 5 h. 7′; true, I believe, to 10 minutes. The weather was fine.

I have feveral more obfervations on Algol, where I have not been able to afcertain its leaft brightnefs, which all happened agreeable to the period as above determined; *viz.* May 20. July 5. and 22. Auguft 14. September 6. 9. 12. and 26. October 2. 5. 19. and 22. and December 7.