PHILOSOPHICAL
TRANSACTIONS:

# Catalogue of Double Stars. By Mr. Herschel, F. R. S. Communicated by Dr. Watson, Jun.

Mr. Herschel and Dr. Watson

*Phil. Trans. R. Soc. Lond.* 1782 **72**, doi: 10.1098/rstl.1782.0014, published online 1 January 1782

# XII. *Catalogue of Double Stars. By Mr.* Herſchel, *F. R. S. communicated by Dr.* Watſon, *Jun.*

Read January 10, 1782.

## INTRODUCTORY REMARKS.

THE following catalogue contains not only double-ſtars, but alſo thoſe that are treble, double-double, quadruple, double-treble, and multiple. The particulars I have given of them are comprehended under the following general heads.

I. The names of the ſtars and number in FLAMSTEAD's Catalogue; or, if not contained therein, ſuch a deſcription of their ſituation as will be found ſufficient to point them out.

II. The comparative ſize of the ſtars. On this occaſion I have uſed the terms equal, a little unequal, pretty unequal, conſiderably unequal, very unequal, extremely unequal, and exceſſively unequal, as expreſſing the different gradations to which I have endeavoured to affix always the ſame meaning.

III. The colours of the ſtars as they appeared to me when I viewed them. Here I muſt remark, that different eyes may perhaps differ a little in their eſtimations. I have, for inſtance, found, that the little ſtar which is near $\alpha$ Herculis, by ſome to whom I have ſhewn it has been called green, and by others blue. Nor will this appear extraordinary when we recollect that there are blues and greens which are very often, particularly by candle-light, miſtaken for each other. The ſituation will alſo affect the

the colour a little, making a white ſtar appear pale red when the altitude is not ſufficient to clear it of the vapours. It is difficult to find a criterion of the colours of ſtars, though I might in general obſerve that Aldebaran appears red, Lyra white, and ſo on; but when I call the ſtars garnet, red, pale red, pale roſe-colour, white inclining to red, white, white inclining to blue, blueiſh white, blue, greeniſh, green, duſky, I wiſh rather to refer to the double ſtars themſelves to explain what is meant by thoſe terms.

IV. The diſtances of the ſtars are given ſeveral different ways. Thoſe that are eſtimated by the diameter can hardly be liable to an error of ſo much as one quarter of a ſecond; but here muſt be remembered what I have before remarked on the comparative appearance of the diameters of ſtars in different inſtruments. Thoſe that are meaſured by the micrometer, I fear, may be liable to an error of almoſt a whole ſecond; and if not meaſured with the utmoſt care, to near 2″. This is, however, to be underſtood only of ſingle meaſures; for the diſtance of many of them that have been meaſured very often in the courſe of two years obſervations can hardly differ ſo much as half a ſecond from truth, when a proper mean of all the meaſures is taken. As I always make the wires of my micrometer outward tangents to the apparent diameter of the ſtars, all the meaſures muſt be underſtood to include both their diameters; ſo that we are to deduct the two ſemi-diameters of the ſtars if we would have the diſtance of their centers. What I have ſaid concerns only the wire micrometers, for my laſt new micrometer is of a ſuch a conſtruction, that it immediately gives the diſtance of the centers and its meaſures (as far as in a few months Ihave been able to find out) may be relied on to about one-tenth of a ſecond, when a mean of three obſervations is taken. When I have

added *inaccurate*, we may ſuſpect an error of 3 or 4″. *Exactly eſtimated* may be taken to be true to about one-eighth part of the whole diſtance; but only *eſtimated*, or *about*, &c. is in ſome reſpect quite undetermined; for it is hardly to be conceived how little we are able to judge of diſtances when, by conſtantly changing the powers of the inſtrument, we are as it were left without any guide at all. I ſhould not forget to add, that the meaſure of ſtars, whereof one is extremely ſmall, muſt claim a greater indulgence than the reſt on account of the difficulty of ſeeing the wires when the field of view cannot be ſufficiently enlightened.

V. The angle of poſition of the ſtars I have only given with regard to the parallel of declination, to be reduced to that with the ecliptic as occaſion may require. The meaſures always ſuppoſe the large ſtar to be the ſtandard, and the ſituation of the ſmall one is deſcribed accordingly. Thus in figure 12. AB repreſents the apparent diurnal motion of a ſtar in the direction of the parellel of declination AB; and the ſmall ſtar is ſaid to be ſouth preceding at *mn*, north preceding at *op*, ſouth following at *qr*, and north following at *st*. The meaſure of theſe angles, I believe, may be relied upon to 2° or at moſt 3°, except when mentioned inaccurate, where an error amounting to 5° may poſſibly take place. In mere eſtimations of the angle, without any wires at all, an error may amount to at leaſt 10°, when the ſtars are near each other.

VI. The dates when I firſt perceived the ſtars to be double, treble, &c. are marked in the margin of each ſtar.

To ſhorten the work as much as poſſible, I have put L. for the large ſtar; S. for the ſmall ſtar; w. for white; r. for red; d. for duſky; n. for north; ſ. for ſouth; and have likewiſe occa-

occaſionally uſed other abbreviations that will be eaſily underſtood.

It may be ſeen, that this catalogue is yet in a very imperfect ſtate, many of the ſtars not having even the principal elements of diſtance and poſition determined with any degree of accuracy; but having already mentioned the reaſon why I give it imperfect as it is, I can only add that my endeavours will not be wanting ſoon to remove thoſe defects. However, ſince this can only be a work of ſome time, we may hope, in the mean while, that many lovers of the ſcience will turn their thoughts upon the ſame ſubject.

## CATALOGUE OF DOUBLE STARS.

### FIRST CLASS.

1. ε Bootis. FLAMST. 36. Ad dextrum femur in perizomate.

Sept. 9. 1779. Double. Very unequal. L. reddiſh; S. blue, or rather a faint lilac. A very beautiful object. The vacancy, or black diviſion between them, with 227 is ¾ diameter of S.; with 460, 1¼ diameter of L.; with 932, near 2 diameters of L.; with 1159, ſtill farther; with 2010 (extremely diſtinct) 2¾ diameters of L. Theſe quantities are a mean of two years obſervation. Poſition 31° 34′ n. preceding.

2. ξ Urſæ majoris. FL. 53. In dextro poſteriore pede.

May 2, 1780. Double. A little unequal. Both w. and very bright. The interval with 222 is ⅔ diameter of L.; with 227, 1 diameter of L.; with 278, near 1½ diameter of L. Poſition 53° 47′ f. following.

3. σ Coronæ borealis, FL. 17.

Aug. 7, 1780. Treble. The two neareſt pretty unequal; the third very faint with powers lower than 460. The two neareſt both w.; the third d. Interval of the two neareſt with 227, full 1¼ diameter of L.; with 460, 2 diameters of L. Poſition 77° 32′ n. preceding. Diſtance of the third from L. 24″ by exact eſtimation. Poſition 25° n. following by eſtimation.

4. In conſtellatione Draconis, FL. 16.

Aug. 8, 1780. Double. It is the ſtar to which a line drawn from ν through μ points, at nearly the ſame diſtance from μ as μ from ν. Conſiderably unequal. L. w.; S. w. inclining to r. With 222, 1 diameter of L.; with 278, 1½ diameter of L. Poſition 24° 0′ f. following. There is a third ſtar, at ſome diſtance, preceding.

5. σ Caſſiopeæ, FL. 8. In dextro cubito.

Aug. 31, 1780. Double. It is the ſtar at the vertex of a teleſcopic iſoſceles triangle turned to the ſouth. Very unequal. L. w. a little inclining to r.; S. d. With 222, near 1 diameter of L.; with 460, 1½ diameter of L. Poſition 60° 28′ n. preceding.

6. Quæ infra oculum Lyncis, FL. 12.

Oct. 3, 1780. A curious treble ſtar. Two neareſt pretty unequal. L. w.; S. w. inclining to roſe colour. With 227, about ½ diameter; with 460, full ¾ diameter of S. Poſition 88° 37′ f. preceding. The firſt and third conſiderably unequal; ſecond and third pretty unequal. The third pale r. Diſtance from the firſt 9″ 23‴; too difficult to be extremely exact. Poſition with regard to the firſt 32° 33′ n. preceding.

7. *b* Draconis,

7. *b* Draconis, FL. 39. Trium in recta, in prima inflectione colli, borea.

Oct. 3. 1780. A minute double ſtar. Extremely unequal, the ſmall ſtar being a fine lucid point. L. w.; S. inclining to r. With 227, ¾ diameter of L.; with 460, full 1½ diameter of L.; with 932 (extremely fine) full 2 diameters of L. Poſition 77° 8′ n. following. A third ſtar at ſome diſtance; duſky r. Poſition 63° 22′ n. following.

8. ε Draconis, FL. 63. In quadrilatero inflexionis primæ.

Oct. 3, 1780. A very minute double ſtar. Exceſſively unequal; the ſmall ſtar can only be ſeen when the air is perfectly clear. L. w.; S. d. With 227, leſs than 1 diameter of L.; with 278, not a diameter of L. Poſition 63° 14′ n. preceding. A pretty large third ſtar at about 3 or 4′. Poſition of this third ſtar with ε 88° 16′ n. following.

9. In cauda Lyncis media, FL. 38.

Nov. 24. 1780. Double. Very unequal. L. w.; S. inclining to r. With 227, extremely cloſe; with 460, at leaſt ½ diameter of S. A very fine object. Poſition 25° 51′ ſ. preceding. A proper motion is ſuſpected in one of the ſtars.

10. In ſiniſtro anteriore pede Monocerotis, FL. 11.

Feb. 15. 1781. A curious treble ſtar; may appear double at firſt ſight; but with ſome attention we ſee that one of them again is double. The firſt, or ſingle ſtar, is the largeſt; the other two are both ſmaller, and almoſt equal, but the preceding of them is rather larger than the following. They are all w. The two neareſt with 227, 1 diameter of the preceding, or nearly

nearly 1 ¼ of the following; with 460, 1 ¼ diameter of the preceding. Poſition of the two neareſt 11° 32′ ſ. following. For an account of the ſingle ſtar, ſee the ſecond claſs. As perfect as I have ſeen this treble ſtar with 460, it is one of the moſt beautiful ſights in the heavens; but requires a very fine evening.

11. In conſtellatione Cancri, FL. 11.

Mar. 13, 1781. Double. Conſiderably unequal. Both pale r. With 227, 1 full diameter of L.; with 460, about 1 ¾ diameter of L. Poſition 85° 10′ n. preceding.

12. *d* Serpentis, FL. 59. In Cauda.

July 17, 1781. Double. Very unequal. L. reddiſh w.; S. fine blue. With 227, 1 full diameter of L.; with 278, 1 ⅓ diameter of L. Poſition 44° 33′ n. preceding.

13. In conſtellatione Aquilæ, near FL. 37.

July 25, 1781. A curious treble ſtar. It is the laſt ſtar of a teleſcopic trifolium n. following *k*, ſimilar to that in the hand of Aquarius. The two neareſt very unequal; the third ſtar exceſſively ſmall, and not viſible with 227. The two neareſt with 460, no more than ½ diameter of L.; the fartheſt about 7 or 8″.

14. In conſtellatione Aquilæ, FL. 24.

July 30, 1781. Double. In HARRIS's maps it is the ſtar in the elbow of Antinous. Exceſſively unequal; the ſmall ſtar is but juſt viſible with 227; but with 460 it is pretty ſtrong. L. pale r.; S. d. With 227, 1 full diameter of L.; with 460, 1 ½ diameter of L. Poſition 72° 0′ ſ. following.

15. *i* Bootis, FL. 44.

Aug. 17, 1781. Double. In HARRIS's maps it is marked *i*, but has no letter in FL. Atlas. Conſiderably unequal. Both

w.

w. With 227 they ſeem almoſt to touch, or at moſt ¼ diameter of S. aſunder; with 460, ½ or ¾ diameter of S. This is a fine object to try a teleſcope, and a miniature of α Geminorum. Poſition 29° 54′ n. following.

16. η Coronæ borealis, FL. 2.

Sept. 9. 1781. Double. A little unequal. They are whitiſh ſtars. They ſeem in contact with 227, and though I can ſee them with this power, I ſhould certainly not have diſcovered them with it; with 460, leſs than ¼ diameter; with 932, fairly ſeparated, and the interval a little larger than with 460. I ſaw them alſo with 2010, but they are ſo cloſe that this power is too much for them, at leaſt when the altitude of the ſtars is not very conſiderable; with 460 they are as fine a miniature of *i* Bootis as that is of α Geminorum. Poſition 59° 19′ n. following.

17. In conſtellatione Bootis, near FL. 51.

Sept. 10. 1781. Double. It is a ſtar near μ not marked in FLAMSTEAD's Catalogue. Conſiderably unequal. Both duſky w. inclined to r. The interval with 460 is ¾ diameter of S. The poſition of the ſmall ſtar is turned towards μ a little following the line which joins L to μ Bootis. See μ Bootis in the ſixth claſs.

18. In conſtellatione Coronæ borealis.

Sept. 10. 1781. Double. It is the ſmalleſt of two teleſcopic ſtars between θ and δ, not contained in FL. Cat. Equal. Both d. With 460, about 1¾ diameters. Poſition 21° 0′ n. following.

19. *h* Draconis, near FL. 19.

Sept. 10. 1781. One of the moſt minute of all the double ſtars I have hitherto found. It is the ſmall teleſcopic ſtar near the preceding *h* Draconis. Conſiderably unequal. Both duſky w. inclining to r. With 460, they ſeem in contact; I have however had a very good view of a ſmall dark diviſion between them. Poſition (by exact eſtimation) 25 or 30° ſ. preceding. They are too minute for any micrometer I have. It is in vain to look for them if every circumſtance is not favourable. The obſerver as well as the inſtrument muſt have been long enough out in the open air to acquire the ſame temperature. In very cold weather, an hour at leaſt will be required; but in a moderate temperature, half an hour will be ſufficient.

20. In dextro humero Orionis, FL. 52.

Oct. 1. 1781. Double. A little unequal. Both w. a little inclining to pale r. With 227, $\frac{1}{4}$ diameter; with 460, $\frac{1}{2}$ diameter. Poſition 69° 41′ ſ. preceding.

21. *c* Trianguli, near FL. 12. and 13.

Oct. 8. 1781. Double. It is the moſt north of a ſmall teleſcopic trapezium of unequal ſtars. Extremely unequal. With 460, $\frac{3}{4}$ diameter of L. Poſition (by eſtimation) 55 or 60° n. preceding.

22. *n* Orionis, FL. 33. Duarum præcedentium $13^{\text{am}}$ ($\omega$) antecedens.

Oct. 22. 1781. Double. Conſiderably unequal. L. w.; S. w.; inclining to blue. With 227, they ſeem almoſt in contact; with 460, $\frac{1}{2}$ diameter of S. Poſition 60° 55′ n. following. A very pleaſing object and eaſily ſeen.

23. In poſterioribus femoribus Canis minoris.

Nov. 21, 1781. A moſt minute double ſtar. It is the ſmall teleſcopic ſtar following Procyon. A little unequal. Both w. With 278, $\frac{1}{8}$ of a diameter of S.; with 460, near $\frac{1}{4}$ of a diameter of S. They are cloſer than $\eta$ Coronæ, becauſe their diameters, by which they are eſtimated, are ſmaller. Poſition 27° 21′ ſ. following. To ſee this very minute double ſtar well, Procyon ſhould be near its meridian altitude. There is a ſmall teleſcopic ſtar preceding the double ſtar. Diſtance 1′ 59″ 39‴ from center to center.

24. $\zeta$ Cancri, FL. 16.

Nov. 21, 1781. A moſt minute treble ſtar. It will at firſt ſight appear as only a double ſtar, but with proper attention, and under favourable circumſtances, the preceding of them will be found to conſiſt of two ſtars, which are conſiderably unequal. The largeſt of theſe is larger than the ſingle ſtar; and the leaſt of the two is leſs than the ſingle ſtar. The firſt and ſecond (in the order of magnitude) pretty unequal. The ſecond and third pretty unequal. The two neareſt both pale r. or r. With 278, but juſt ſeparated; with 460, $\frac{1}{4}$ diameter of S. Poſition 86° 32′ n. following. For meaſures relating to the third or ſingle ſtar ſee $\zeta$ Cancri in the third claſs of double ſtars.

SECOND CLASS OF DOUBLE STARS.

1. † $\alpha$ Geminorum, FL. 66. In capite præcedentis II

April 8, 1778. Double. A little unequal. Both w. The vacancy between the two ſtars, with a power of 146, is 1 diameter of S.; with 222, a little more than 1 diameter of L.; with 227, $1\frac{1}{2}$ diameter of S.; with 460, near 2 diameters of L.; (ſee fig. 6.) with 754, 2 diameters of L.; with 932, full 2 diameters of L.; with 1536 (very fine and diſtinct) 3 diameters of L.; with 3168, the interval extremely large, and ſtill pretty diſtinct. Diſtance by the micrometer 5″,156. Poſition 32° 47′ n. preceding. Theſe are all a mean of the laſt two years obſervations, except the firſt with 146.

2. † $\alpha$ Herculis, FL. 64. In capite.

Aug. 29, 1779. A beautiful double ſtar. Very unequal. L. r.; S. blue inclining to green; the colours with every power the ſame. The interval with 222, $1\frac{3}{4}$ diameter of L.; with 227, above 2 diameters of L.; with 932, above 3 diameters of L. Diſtance 4″966. All a mean of two years obſervations. A ſingle meaſure with my laſt new micrometer, from center to center, 4″ 34‴. Poſition 30° 35′ f. following.

3. * $\rho$ Herculis, FL. 75. Trium in ſiniſtro femore, tertia.

Aug. 29, 1779. Double. Pretty unequal. Both w. With 227, $1\frac{1}{4}$ diameter of L.; with 460, 2 diameters of S. Diſtance 2″,969. Poſition 30° 21′ n. preceding. The meaſures a mean of two years obſervations.

4. * *p* Serpentarii, FL. 70. Tres has ſequitur, quaſi ſupra mediam.

Aug. 29. 1779. Double. Conſiderably unequal. L. w.; S. inclining to r. With 227, $1\frac{2}{3}$ diameter of L.; with 460, much above 2 diameters of L. Poſition 9° 14′ f. following. Mean of two years obſervations.

5. et 6. * ε Lyra, FL. 4. and 5.

Aug. 29. 1779. A very curious double-double ſtar. At firſt ſight it appears double at ſome conſiderable diſtance, and by attending a little we ſee that each of the ſtars is a very delicate double ſtar. The firſt ſet conſiſts of ſtars that are conſiderably unequal. The ſtars of the ſecond ſet are equal, or the preceding of them rather larger than the following. The colour of the ſtars in the firſt ſet L. very w.; S. a little inclining to r. In the ſecond ſet both w. The interval between the ſtars of the unequal ſet, with a power of 227, is full 1 diameter of L.; with 460, near $1\frac{1}{2}$ diameter of L.; with 932, full $1\frac{1}{2}$ diameter; with 2010, $2\frac{1}{3}$ diameters. The interval between the equal ſet with a power of 227 is almoſt $1\frac{1}{2}$ diameter of either; with 460, full $1\frac{3}{4}$ diameter; with 932, 2 diameters; with 2010, $2\frac{1}{2}$ diameters. Theſe eſtimations are a mean of two years obſervations. Poſition of the unequal ſet 56° 0′ n. following. Poſition of the equal ſet 72° 57′ f. following.

7. * ζ Aquarii, FL. 55. Trium in manu dextra præcedens.

Sept. 12. 1779. Double. Equal, or the preceding rather the largeſt. Both w. With 227, $1\frac{1}{4}$ diameter; with 449, $1\frac{1}{3}$ diameter; with 460, 2 diameters; with 910, near 2 diameters; with 932, $2\frac{1}{2}$ diameters;

with 2010, pretty diſtinct; but too tremulous to eſtimate. With my 20 feet reflector, power 600, full 2 diameters, very diſtinct. Poſition, 71° 39′ n. following. Diſtance 4″,56, mean of two years obſervation.

8. ζ Coronæ borealis, FL. 7.

Oct. 1. 1779. Double. Conſiderably unequal. L. fine w. S. w. inclining to r. With 222, almoſt 3 diameters of L. Diſtance 5″,468. Poſition 25° 51′ n. preceding, mean of two years obſervations.

9. λ Orionis, FL. 39. In capite nebuloſa.

Oct. 7. 1779. Quadruple, or rather a double ſtar and two more at a ſmall diſtance. The double ſtar conſiderably unequal. L. w.; S. pale roſe colour. With 222, 1½ diameter of L.; with 449, above two diameters of L. Diſtance 5″,833, a mean of all the meaſures. Poſition 45° 14′ n. following. As every one of the four ſtars is perfectly diſtinct, it is evident, the whole appeared nebulous to FLAMSTEAD for no other reaſon than becauſe his teleſcope had not ſufficient power to diſtinguiſh them.

10. and 11. σ Orionis, FL. 48. Ultimam cinguli præcedit ad auſtrum.

Oct. 7. 1779. A double-treble ſtar, or two ſets of treble ſtars, almoſt ſimilarly ſituated. Preceding ſet. The two neareſt equal; the third larger and, compared with either of the former two, pretty unequal. The two neareſt with 222, about 2 diameters. Poſition of the following ſtar of the two neareſt with the third 66° 35′ ſ. preceding. Poſition of the two neareſt, by exact eſtimation, 2 or 3° n. following or ſ. preceding

ceding the following ſet. The two neareſt very unequal. The largeſt of the two and the fartheſt conſiderably unequal. L. w.; S. blueiſh. The two neareſt with 222, about 2¼ diameters of L.; the two fartheſt 43″ 12‴. Poſition of the two neareſt 5° 5′ n. following. Poſition of the two fartheſt 29° 4′ n. following. A pretty object with 227.

12. α Piſcium, FL. ultima. In nodo duorum linorum.

Oct. 19, 1779. Double. Conſiderably unequal. Both w. With 222, not quite 2 diameters of L.; with 460, about 3 diameters of L. Diſtance 5″,123 mean meaſure. Poſition 67° 23′ n. preceding.

13. μ Draconis, FL. 21. In lingua.

Oct. 19. 1779. Double. Equal. Both w. With 227, 1½ diameter; with 460, 2½ diameters. Diſtance 4″,354 mean meaſure. Poſition 37° 38′ ſ. preceding or n. following.

14. ω Aurigæ, FL. 4.

Oct. 30, 1779. Double. Very unequal. L. w.; S. r. With 227, almoſt 2 diameters of L.; with 460, full 3 diameters of L. Poſition 82° 37′ n. preceding.

15. ψ Cygni, FL. 24. In ala dextra.

Nov. 2, 1779. Double. Extremely unequal; the ſmall ſtar a mere point. L. w.; S. r. With 227, near 1¼ diameter of L; with 278, near 1½ diameter of L.; with 460, 2 diameters of L. Poſition 89° 32′ n. preceding.

16. ξ Cephei, FL. 17. In pectore.

Nov. 7, 1779. A fine double ſtar. Conſiderably unequal. L. w. inclining to r.; S. duſky grey. With 222, nearly 2 diameters of L. Single meaſure 5″,00. Poſition 20° 18′ n. preceding.

17.

17. * In ſiniſtro anteriore pede Monocerotis, FL. 11.

Dec. 5, 1779. Double. With 222, about 1½ diameter. Poſition (taken Oct. 20, 1781) with the fartheſt of the other two ſtars 31° 38′ ſ. following. See the tenth ſtar in the firſt claſs.

18. ξ Bootis, FL. 37.

April 9, 1780. Double. Very unequal. L. pale r. or nearly r. S. garnet, or deeper r. than the other. With 222, 1½ diameter of L, with 460, full 3 diameters of L. Diſtance 3″ 23‴ ſingle meaſure. Poſition 65° 53′ n. following.

19. *g* Serpentarii, FL. 5.

May 2, 1780. Double. It is a ſtar in the body of Cancer, and the double ſtar is at the angular point of the three teleſcopic *g*'s making a rectangle. Pretty unequal. Both w. With 227, 1½ diameter of L. Poſition 82° 10′ ſ. preceding.

20. and 21. ξ Libræ, FL. ultima.

May 23, 1710. Double double. The firſt ſet very unequal. L. fine w. With 227, nearly 2 diameters of L*. By the micrometer 6″ 23‴, but too large a meaſure. Poſition 1° 23″ n. following. The other ſet both ſmall and obſcure. With 227, perhaps 5 or 6 of their diameters aſunder.

22. ε Perſei, FL. 45. In ſiniſtro genu.

Aug. 2, 1780. Double. Extremely unequal. L. w.; S. d. With 222, 2½ diameters of L. Poſition 81° 28′ ſ. following, a little inaccurate. A third ſtar near at about 1½ or 1¾ min.

* In a future collection this ſet will be found as a treble ſtar of the firſt claſs, the large white ſtar, with a power of 460 and 932, appearing to be two ſtars.

23. In

23. In conſtellatione Serpentarii, near FL. 11.

Aug. 7, 1780. Double. It is the ſmalleſt and preceding of two in the finder. Pretty unequal. L. pale r.; S. duſky r. With 222, about 1¼ diameter of L.; with 278, about 1½ diameter of L.; with 460, above 2 diameters of L. Poſition 46° 24′ n. preceding. A little inaccurate.

24. In conſtellatione Aquarii, FL. 108. In ſequenti flexu 5ª ad A.

Aug. 23, 1780. Double. In HARRIS's maps it is marked *i*. Unequal. With 227, 2 diameters; with 460, about 3 diameters.

25. *k* Cygni, FL. 52.

Sept. 8, 1780. Double. Extremely unequal. L. w. inclining to r.; S. d. and extremely faint; with 227, 2½ diameters of L.; with 460, about 4 diameters of L. or more. Poſition 28° 17′ n. following.

26. In conſtellatione Orionis, near FL. 42. In longo enſis.

Oct. 23, 1780. Double. It is the moſt north of three teleſcopic ſtars in a line at the end of a cluſter near *c*. Extremely unequal. L. w.; S. d. With 278, 1¾ diameter of L. Poſition 26° 5′ n. following.

27. *δ* Geminorum, FL. 55. In inguine ſiniſtro ſequentis III.

Mar. 13, 1781. Double. Extremely unequal. L. w. inclining to r.; S. r. With 227, about 2½ full diameters of L.; with 460, 4 or 5 diameters. Poſition 85° 51′ f. preceding.

28. In conſtellatione Aquilæ, near FL. 54.

July 23, 1781. Double. It is a ſtar following *o*. Exceſſively unequal. The ſmall ſtar is not viſible with 227, nor with 278. It is viſible with 460; but not without attention.

attention. Diſtance with 460, about 4 or 5 diameters of L. Poſition, by very exact eſtimation, 36° 28′ n. preceding.

29. In conſtellatione Aquilæ, near FL. 63. In medio capite.

July 31, 1781. Double. It is the ſtar at the vertex of a teleſcopic iſoſceles triangle near τ. Extremely unequal. Both r. With 460, 2 diameters of L. Poſition 75° 48′ n. preceding.

30. ζ Sagittæ, FL. 8. Trium in arundine ſequens.

Aug. 23, 1781. Double. Extremely unequal. The ſmall ſtar brighter with 460 than with 227 or with 278; with 460, between 4 or 5 diameters of L.; with 278, 2½ diameters of L. Diſtance 5″ 27‴ inaccurate. Poſition 34° 10′ n. preceding.

31. In conſtellatione Draconis, FL. 56.

Sept. 6, 1781. Double. A little unequal. Both w. With 460, near 3 diameters. Diſtance 5″ 7‴.

32. In conſtellatione Sagittæ, near FL. 4.

Sept. 7, 1781. Double. It is the ſtar north following ε. L. pale r.; S. d. Diſtance 5″ 3‴ inaccurate.

33. β Orionis, FL. 19. In ſiniſtro pede ſplendida.

Oct. 1, 1781. Double. Extremely unequal. L. w.; S. inclining to r. With 227, 2¼ or 2½ diameters of Rigel. With 460, more than 3 diameters of L. Diſtance 6″ 27‴. Poſition 68° 12′ f. preceding. The ſmall ſtar not wanting apparent magnitude is better to be ſeen with my power of 227 than with 460.

34. ι Trianguli, FL. 6.

Oct. 8, 1781. Double. It is marked *b* in the ſmall triangle of HARRIS's maps. Very unequal. L. pale r. or reddiſh w.; S. blueiſh r. With 227, full 1¼ diameter

of

of L.; with 460, full 1½ diameter of L. Poſition 4° 23′ n. following. A pretty object, ſomewhat reſembling α Herculis, but ſmaller and not ſo bright.

35. In conſtellatione Trianguli, near FL. 6.

Oct. 8, 1781. Double. It is the ſtar following ι. Equal. Both duſky w. With 460, about 2½ diameters.

36. In conſtellatione Eridani, FL. 32.

Oct. 22. 1781. Double. Conſiderably unequal. L. reddiſh w.; S. blue. Diſtance 4″ 19‴. Poſition 73° 23′ n. preceding.

37. In capite Monocerotis.

Oct. 22. 1781. Double. It is one of a cluſter of ſix teleſcopic ſtars, arranged in pairs.

38. In conſtellatione Bootis.

Dec. 24, 1781. Double. It is the moſt north and largeſt of three in a line, ſ. following FL. 15. Conſiderably unequal, L. w.; S. inclining to r. Diſtance 5″ 10‴. Poſition 83° 5′ ſ. preceding.

## THIRD CLASS OF DOUBLE STARS.

1. † θ Orionis, FL. 41. Trium contiguarum in longo enſis media.

Nov. 11. 1776. Quadruple. It is the ſmall teleſcopic Trapezium in the Nebula. Conſiderably unequal. The moſt ſouthern ſtar of the following ſide of the Trapezium is the largeſt; the ſtar in the oppoſite corner is the ſmalleſt; the remaining two are nearly equal. L. pale r.; the ſtar preceding L. inclined to garnet; following L. inclined to garnet; oppoſite to L. d. With 460, the ſtars are all full, round, and well-defined.

The two ſtars in the preceding ſide diſtance 8″,780; in the ſouthern ſide, 12″,812; in the following ſide 15″,208; in the northern ſide, 20″,396.

2. ζ Urſæ majoris, FL. 59. Trium in cauda media.

Aug. 17, 1779. Double. Conſiderably unequal. L. w; S. w; inclining to pale roſe colour. Diſtance 14″,5 by two years obſervation, not a mean but that which I ſuppoſe neareſt the truth. Poſition 56° 46′ f. following.

3. η Caſſiopeæ, FL. 24. In cingulo.

Aug. 17, 1779. Double. Very unequal. L. fine w.; S. fine garnet, both beautiful colours. Diſtance 11″,275 mean meaſure. Poſition 27° 56′ n. following.

4. In extremitate pedis Caſſiopeæ, FL. 55. Ptolemæi.

Aug. 17, 1779. Double. Extremely unequal. L. w.; S. blueiſh r. Diſtance 7″,5 ſingle meaſure. Poſition 10° 37′ f. following ‡.

5. * γ Andromedæ, FL. 57. Supra pedem ſiniſtrum.

Aug. 25, 1779. Double. Very unequal. L. reddiſh w.; S. fine light ſky-blue, inclining to green. Diſtance 9″,254 a mean of two years obſervation. Poſition 19° 37′ n. following. A moſt beautiful object.

6. β Cephei, FL. 8. In cingulo ad dextrum latus.

Aug. 31, 1779. Double. Very unequal. L. blueiſh w.; S. garnet. Diſtance 13″,125. Poſition 15° 28′ f. preceding.

7. * β Scorpii, FL. 8. Trium in fronte, lucidarum, borea.

Sept. 19, 1779. Double. Very unequal. L. whitiſh r; S. r. Diſtance 14″,375. Poſition 64° 51′ n. following.

‡ In a future collection this will be found as a treble ſtar of the firſt claſs; the large ſtar having a ſmall one preceding, eaſily ſeen with 460 and 932.

8. * $\pi$ Bootis, FL 29

Sept.20, 1779. Double. Pretty unequal. L. w.; S. w. inclining to r. Diſtance 6″,171. Poſition 6° 28′ f. following.

9. † $\gamma$ Arietis, FL. 5. Quæ in cornu duarum præcedens.

Sept.27, 1779. Double. Equal, or if any difference the following is the largeſt. Diſtance 10″,172, a mean of two years obſervation. L. w. inclining a little to r.; S. w. Poſition 86° 5′ n. preceding.

10. * $\gamma$ Delphini, FL. 12. Borea ſequentis lateris, quadrilateri.

Sept.27, 1779. Double. Nearly equal, the following a little larger. Both w. Diſtance 11″,822, being a mean of the meaſures taken in Sept. Oct. Nov. and Dec. 1779. As I ſuſpect a motion in one of theſe ſtars, I thought it beſt not to join other obſervations in that meaſure. Poſition 4° 9′ n. preceding.

11. $\kappa$ Bootis, FL. 17. Trium in ſiniſtro manu præcedens.

Sept.27, 1779. Double. Very unequal. L. w.; S. d. Diſtance 12″503, a mean of the obſervations in 1779, 80, 81. Poſition about 30° f. preceding.

12. $\iota$ Orionis, FL. 44. Trium contiguarum in enſe auſtrina.

Oct. 7, 1779. Treble. It is the following or largeſt of the two $\iota$'s. One is L.; the other two are extremely ſmall. L. w.; the other two both duſky r. Diſtance of the neareſt 12″,5. Diſtance of the fartheſt 48″ 31″. Poſition of the neareſt 43° 51′ following. Poſition of the fartheſt 11° 19′ f. following.

13. and 14. $\iota$ Orionis, FL. 44. Trium contiguarum in enſe auſtrina.

Oct. 7, 1779. Double-treble. It is the preceding or ſmalleſt of the two $\iota$'s. The preceding ſet (forming a triangle) conſiſts of three equal ſtars. All duſky r. Diſtance

of the two neareſt, with 227, about 3 diameters. The following ſet (forming an arch) conſiſts of three ſtars of different ſizes. The middle ſtar is the largeſt; that to the ſouth is alſo pretty large; and the third is very ſmall. L. w.; l. w.; S. pale r. Diſtance 36″,25.

15. * $\mu$ Cygni, FL. 78.

Oct. 19, 1779. Double. Conſiderably unequal. L. w.; S. blueiſh. Diſtance 6″,927 mean meaſure. Poſition 20° 15′ f. following.

16. * In conſtellatione Delphini, FL. 1.

Nov. 15, 1779. Double. It is the ſtar ſouth preceding $\epsilon$. A little unequal. Both w. Diſtance 12″,5. Poſition 9° 42′ f. preceding.

17. In extremitate caudæ Lacertæ, FL. 1.

Nov. 20, 1779. Double. Conſiderably unequal. L. w.; S. d. inclining to r. Diſtance 13″ 43‴ inaccurate. Poſition 76° 16′ f. preceding.

18. † $\gamma$ Virginis, FL. 29. De quatuor in ala ſiniſtra, ſequens.

Jan. 21, 1780. Double. Equal. Both w. Diſtance 7″,333 mean meaſure. Poſition 40° 44′ f. following.

19. † $\zeta$ Cancri, FL. 16.

April 5, 1780. Double. Conſiderably unequal. L. pale r.; S. pale r. Diſtance 8″,046 mean meaſure. Poſition 88° 16′ f. preceding. See the 24th in the firſt claſs.

20. In conſtellatione Bootis.

June 25, 1780. Double. Draw a line through $\pi$ and $\zeta$ to the ſmall ſtar under the right foot, and erecting a perpendicular towards the left foot of equal length, the end of it will mark out this double ſtar. Pretty unequal. Both

Both r. Diſtance 7″ 36‴ full meaſure. Poſition 59° 32′ n. preceding.

21. In conſtellatione Equulei, FL 1.

Aug. 2, 1780. Double. Conſiderably unequal. L. w.; S. much inclining to r. Diſtance 9″,375 mean meaſure. Poſition 5° 39′ n. following. A third ſmall ſtar follows at ſome diſtance.

22. Quæ infra oculum Lyncis, FL. 12.

Aug. 7, 1780. Double. With 222, about 3 diameters of L. Conſiderably unequal. L. w.; S. pale r. Diſtance 9″ 23‴, not extremely accurate. Poſition 32° 33′ n. preceding. See the ſixth ſtar in the firſt claſs.

23. In conſtellatione Caſſiopeæ, FL. 34.

Aug. 8, 1780. Double. It is one of two teleſcopic ſtars, and is marked φ in HARRIS's maps. Extremely unequal. L. pale r.; S. d. Diſtance about 12″ or more.

24. θ Sagittæ, FL. 17.

Aug. 8, 1780. Treble. The two neareſt extremely unequal. L. pale r.; S. d. Third ſtar pale r. Diſtance of the two neareſt 11″ 8‴. Diſtance of the two largeſt 1′ 7″ 49‴.

25. In conſtellatione Serpentarii, FL. 39.

Aug. 24, 1780. Double. It is the moſt ſouth and largeſt of two in the finder. Very unequal. L. w.; S. inclining to blue. Diſtance 10″ 2‴, a little inaccurate. Poſition 87° 14′ n. preceding.

26. * In conſtellatione Cerberi 1. HEVELII 1ª. FL. Herculis 95.

Sept. 8, 1780. Double. It is the ſtar in the leaf neareſt to Hercules's face and hand. Equal. Preceding w. Following

lowing blueiſh w. Diſtance 6″ 6‴. Poſition 4° 9′ ſ. preceding or n. following.

27. In conſtellatione Navis, near FL. 3.

Feb. 15, 1781. Double. It is a ſtar between η Canis majoris and ξ Navis. Equal. Diſtance about 15″.

28. In conſtellatione Navis, near FL. 9.

Feb. 15, 1781. Double. It is one of two teleſcopic ſtars under Monoceros. Diſtance about 8″.

29. In naribus Monocerotis, FL. 8. ::

Feb. 15, Double. Diſtance about 12″.

30. * In conſtellatione Leonis, FL. 54. Duarum ſupra dorſum ſequens.

Feb. 21, 1781. Double. Conſiderably unequal. L. brilliant w.; S. aſh-colour, or greyiſh w. Diſtance 7″ 6″ mean meaſure. Poſition 9° 14′ ſ. following.

31. In conſtellatione Herculis.

May 20, 1781. Double. Over ι ::. Equal. Both very ſmall. Diſtance about 10″.

32. In conſtellatione Aquilæ, FL. 11.

July 25, 1781. Double. It is the moſt ſouth of two near ε and ζ. Exceſſively unequal. S. hardly viſible with 227, but pretty ſtrong with 460. Diſtance about 7″.

33. In conſtellatione Aquilæ, near FL. 7. and 8.

July 30, 1781. Double. It is a ſtar preceding the two ſmall ſtars north of *k* and *l*. Unequal. L. w.; S. blueiſh w. Diſtance 11″ 35‴ inaccurate, but not much.

34. In conſtellatione Aquarii, FL 94.

Aug. 20, 1781. Double. Between ψ and ω towards δ. Very unequal. Diſtance 13″ 45‴. L. pale r.; S. d.

35. In conſtellatione Serpentarii, FL. 54.

Aug. 21, Double. It is the preceding of two ſtars in the

1781. head. Exceſſively unequal. L. reddiſh w.; S. d. Diſtance about 8″.

36. In conſtellatione Perſei.

Sept. 14, 1781. Double. A little ſouth of γ. Conſiderably unequal. L. w.; S. w. inclining to r. Diſtance 11″ 53‴, rather full meaſure.

37. and 38. In conſtellatione Perſei, near FL. 38 ‡.

Sept. 24, 1781. Double-double. South preceding the firſt *o*. The equal ſet with 227, about 4 or 5 diameters. The unequal ſet about 5 or 6 diameters. Near this laſt ſet is alſo a third ſtar forming an obtuſe angle with the ſtars of this ſet. Diſtance about 10″.

39. *o* Perſei, FL. 40.

Sept. 24, 1781. Double. It is the ſecond or moſt northern *o*. Extremely unequal. L. w.; S. d. With 227, S. is hardly viſible; with 460, it appears at firſt ſight. Diſtance 14″ 59‴, inaccurate on account of the obſcurity of S.

40. In conſtellatione Herculis, near FL. 87.

Oct. 10, 1781. Double. Of three ſtars, forming an obtuſe angle, whereof FL. 87. (a ſtar ſouth of μ) is at the angular point, that towards Ramus Cereb. Extremely unequal. L. w.: S. d. Diſtance 10″ 20‴. Poſition 19° 37′ f. following.

41. * *i* Herculis, FL. 43.

Oct. 10, 1781. Double. Equal. Preceding ſtar w. A little inclined to r. Following w. Diſtance 11″ 43‴. Poſition 88° 23′ n. following.

42. In conſtellatione Trianguli.

Oct. 10, 1781. Double. It is a ſtar north following δ. Unequal. L. reddiſh. S. blueiſh. Both d. Diſtance about 6 or 7″.

‡ Mr. BRYANT of Bath firſt obſerved theſe ſtars.

43. In ſiniſtro anteriore pede Monocerotis.

Oct. 20, 1781. Double. It is the moſt ſouth of two teleſcopic ſtars preceding the treble ſtar. Extremely unequal. L. w.; S. d. Poſition 23° 39′. n. preceding.

44. In ore Monocerotis.

Oct. 20, 1781. Double. Conſiderably unequal. L. w.; S. r. Diſtance 12″ 30‴. Poſition 60° 14′ n. following.

45. In conſtellatione Tauri, near FL. 10.

Oct. 22, 1781. Double. It is near the ſtar ſub pede et ſcapula dextra. Extremely unequal. L. pale r.; S. d. Poſition 35° 33′ ſ. preceding.

46. In conſtellatione Monocerotis.

Oct. 22, 1781. Double. It is the ſtar following the tip of the ear.

## FOURTH CLASS OF DOUBLE STARS.

1. α Urſæ minoris, FL. 1. Stella Polaris.

Aug. 17, 1779. Double. Extremely unequal. L. w.; S. r. Diſtance 17″ 15‴. Poſition 66° 42′ ſ. preceding.

2. * η Lyræ, FL. 20. Duarum contiguarum ad ortum a teſta, borea.

Aug. 29, 1779. Double. Conſiderably unequal. L. w.; S. r. Diſtance 25″ 42‴. Poſition 31° 51′ ſ. preceding. Three other ſtars in view.

3. ξ Capricorni, FL.

Sept. 19, 1779. Double. It is the preceding ſtar of two. Extremely unequal. Diſtance about 25″.

4. $\eta$ Perſei, I. HEVELII 9. In dextro brachio.

Sept.20, 1779. Double. Very unequal. L. r.; S. blue. Diſtance 26″, very inaccurate. Poſition 20° 5′ n. preceding.

5. In conſtellatione Arietis, FL. 33. Quatuor inform. ſup. dorſ. præc.

Sept.27, 1779. Double. It is the firſt in the head of the fly. L. w.; S. d. Conſiderably unequal. Diſtance 25″ 32‴ inaccurate. Poſition 87° 14′.

6. † $\theta$ Serpentis, FL. 63. In extremitate Caudæ.

Oct. 17. Double. Equal. Both w. Diſtance 19″,375.

7. $\psi$ Draconis, FL. 31. Prima ad $\psi$.

Oct. 19, 1779. Double. Pretty unequal. L. w.; ſ. pale r. Diſtance 28″ 14‴.

8. * $\zeta$ Piſcium, FL. 86. Trium in lino lucidarum ſequens.

Oct. 19, 1779. Double. Pretty unequal. L. w.; S. w. inclining to blue. Diſtance 22″,187, not very accurate. Poſition 22° 37′ n. following.

9. * Prima ad $\psi$ Piſcium, FL. 74. Trium in pinna coſtarum præcedens.

Oct.30, 1779. Double. Diſtance 27″,5. Poſition about 80° ſ. following. An obſcure ſtar alſo within 1½ minute.

10. $\chi$ Tauri, FL. 59. Auſtralis ſequentis lateris quadrilateri, in cervice.

Oct. 30. Double. Diſtance 18″,75, very inaccurate.

11. $\chi$ Cygni, FL. 17.

Nov.20, 1779. Double. Very unequal. L. w.; S. duſky r. Diſtance 24″ 52‴.

12. * $\psi$ Aquarii, FL. 91.

Nov.26, 1779. Double. It is the firſt of three $\psi$'s. Unequal. Diſtance 23″ 5‴, pretty accurate.

13. In conſtellatione Leonis, FL. 83.

April 6, 1780. Double. It is a ſmall ſtar north preceding τ. A little unequal. Both inclining to r. Diſtance 29″ 5‴. Poſition 54° 55′ ſ. following.

14. In conſtellatione Aquilæ, FL. 57.

Aug. 2, 1780. Double. It is the preceding of two, near the ſouth end of Antinous's bow. A little unequal. L. w.; S. w. inclining to r. Diſtance 29″ 28‴, pretty accurate. Poſition 81° 55′ ſ. preceding.

15. In dextra aure Camelopardali. I. HEVELII ultima.

Aug. 2, 1780. Double. A little unequal. L. reddiſh w.; S. reddiſh w. Diſtance 20″ 5‴.

16. In conſtellatione Caſſiopeæ, FL. 31.

Aug. 2, 1780. Double. It is marked with the letter A in HARRIS's maps. Diſtance about 20″ or more.

17. * Cor Caroli, FL. 12. Canum Venaticorum.

Aug. 7, 1780. Double. Very unequal. L. w.; S. inclining to r. Diſtance 20″ 0‴, inaccurate. Poſition 41° 47′ ſ. preceding.

18. * In conſtellatione Cygni, FL. 61.

Sept. 20. 1780. Double. It is a ſtar preceding τ. Pretty unequal. L. pale r.; S. r.; or L. r.; S. garnet. Diſtance 16″ 7‴. Poſition 36° 28′ n. following.

19. In conſtellatione Aurigæ, FL. 14.

Sept. 24, 1780. Double. It is the preceding ſtar of a cluſter of ſtars that precede φ and χ. Very unequal. L. reddiſh w.; S. d. Diſtance 16″ 8‴, a little inaccurate. Poſition 37° 38′ ſ. preceding.

20. *o* Draconis, FL 47.

Oct. 3, 1780. Double. Very unequal. L. pale r.; S. duſky r. Diſtance 26″ 39″. Poſition 90° n. preceding or following, by exact eſtimation.

21.

21. ζ Orionis, FL. 50. Trium in cingulo ſequens.

Oct. 10, 1780. Double. Very unequal. L. w.; S. d. Diſtance about 25″. Poſition 83° 25′ n. following, very inaccurate.

22. *f* Cygni, FL. 63. ::

Oct. 27, 1780. Double. Extremely unequal. L. fine w.; S. d. Diſtance 18″ 11‴.

23. 2 ad ω Cygni, FL. 45. In genu dextro.

Oct. 27, 1780. Double. Conſiderably unequal. L. reddiſh w.; S. d. Diſtance within 30″. Poſition 7° 23′ n. preceding.

24. 3 ad ω Cygni, FL. 46. In genu dextro.

Oct. 27, 1780. Treble. Very unequal, and extremely unequal. L. fine garnet; S. r.; ſmalleſt d. All within 30″. Poſition of the brighteſt of the two ſmall ſtars 44° 19′ n. preceding. Poſition of the fainteſt —— preceding.

25. In conſtellatione Ceti.

Dec. 23, 1780. Double. It is a ſtar near the place of the periodical ſtar *o*. Diſtance 16″,875, a little inaccurate.

26. In conſtellatione Navis, FL. 19. ::

Feb. 15, 1781. Double. It is a ſtar under the ham of Monoceros's right-foot. Diſtance about 25″.

27. In conſtellatione Comæ Berenices, FL. 24.

Feb. 28, 1781. Double. Conſiderably unequal. L. whitiſh r.; S. blueiſh r. Mean diſtance 18″ 24‴. Poſition 3° 28′ n. preceding.

28. In conſtellatione Geminorum.

Mar. 13, 1781. Double. It is near γ towards ζ Tauri. A little unequal. Both r. Diſtance 19″ 41‴. Poſition 57° 0′ f. preceding.

29. *h* Urſæ majoris, FL. 23. Duarum in collo ſequens.

Apr. 25, 1781. Double. Extremely unequal. L. reddiſh w.; S. d. Diſtance with 460, 19″ 14‴. Poſition 3° 14′ n. preceding.

30. In conſtellatione Lyncis, FL. 44.

May 26, 1781. Double. It is the eye or noſe of Leo minor. Unequal. Diſtance 24″ 53‴ inaccurate.

31. In conſtellatione Cephei, near FL. 27.

May 27, 1781. Treble. It is a ſtar near δ. Diſtance of the neareſt about 20″.

32. * In conſtellatione Serpentarii, FL. 61.

July 15, 1781. Double. It is a ſtar near γ. A little unequal. L. w.; S. grey. Diſtance 19″ 4‴, inaccurate. Poſition almoſt directly following.

33. In conſtellatione Aquilæ.

July 19, 1781. Treble. It is the firſt of two ſtars preceding *v*. Diſtance of the two neareſt 21″ 59‴, inaccurate.

34. In conſtellatione Aquilæ, near FL. 64.

July 25, 1781. Double. It is near a ſtar preceding θ. Equal diſtance about 30″.

35. β Delphini, FL. 6. Auſtrina præcedentis lateris quadrilateri.

Aug. 1, 1781. Double. Extremely unequal. Hardly viſible with 227; pretty ſtrong with 460. Diſtance 25″ 54‴, rather narrow meaſure. Poſition 78° n. preceding, by exact eſtimation.

36. β Serpentis, FL. 28. In eductione colli.

Aug. 13, 1781. Double. Extremely unequal. L. w.; S. extremely faint. Diſtance 24″, pretty exactly eſtimated. Poſition 3 or 4° f. preceding, too obſcure for meaſuring.

37. δ Equulei, FL. 7. Duarum in ore ſequens.

Aug. 13, 1781. Double. Exceſſively unequal. S. hardly viſible with 227; but with 460, viſible at firſt ſight. L. w.; S. d. Diſtance 19″ 32‴. S. too obſcure to be very accurate. Poſition 11° 39′ n. following.

38. In conſtellatione Aquarii, FL. 24.

Aug. 14, 1781. Double. It is the ſtar in the cheek or hair of the neck. Very unequal. L. w.; S. d. Diſtance 25″, very inaccurate.

39. In conſtellatione Cygni.

Oct. 1, 1781. Double. It is a ſtar north following σ. Extremely unequal. L. w.; S. d. Diſtance 18″ exact eſtimation. Poſition 30° 28′ f. following.

40. *a* Trianguli, FL. 10.

Oct. 8, 1781. Double. It is the preceding of three teleſcopic ſtars. Unequal. Diſtance 17″ 19‴, pretty accurate.

41. μ Herculis, FL. 86.

Oct. 10, 1781. Double. Exceſſively unequal. The ſmall ſtar is not viſible with 227, nor with 278. I ſaw it very well with 460. L. inclined to pale r.; S. d. Diſtance, by pretty exact eſtimation, 18″. Poſition, by very exact eſtimation, 30° f. preceding.

42. In conſtellatione Herculis.

Oct. 10, 1781. Double. It is a ſtar juſt by ν. Conſiderably unequal. L. inclined to r.; S. inclined to blue. Diſtance 18″ 19‴. Poſition 4° 58′ n. preceding.

43. λ Eridani, FL. ultima. In origine fluvii.

Oct. 22, 1781. Double. It is the middle of three teleſcopic ſtars. Very unequal. L. w.; S. r.

44. In

44. In conſtellatione Tauri, near FL. 4.

Dec. 22, 1781. Double. It is a ſmall teleſcopic ſtar ſouth following *s*. Extremely unequal. L. w.; S. d.

## FIFTH CLASS OF DOUBLE STARS.

1 δ Herculis, FL. 11. In ſiniſtro humero.

Aug. 9, 1779. Double. Extremely unequal. L. w.; S. inclining to r. Diſtance 33″,75. Poſition 72° 28′ f. following.

2. * ζ Lyræ, FL. 6.

Aug. 29, 1779. Double. Pretty unequal. L. w.; S. w. inclining to pale roſe colour. Diſtance 41″ 58‴, perhaps a little inaccurate. Poſition 62° 18′ f. following, a little inaccurate.

3. * β Lyræ, FL. 10. Duarum in jugimento borea.

Aug. 29, 1779. Quadruple. All w. Firſt and ſecond conſiderably unequal. Firſt and third very unequal. Firſt and fourth very unequal. The ſecond a little inclining to r. The third and fourth more inclining to r. Diſtance of the firſt and ſecond 43″ 57‴. Poſition 60° 28′ f. following, a little inaccurate.

4. δ Cephei, FL. 27. Sequitur tiaram.

Aug. 31, 1779. Double. Conſiderably unequal. L. reddiſh w.; S. blueiſh w. Diſtance 38″ 18‴, a bright object.

5. † β Cygni, FL. 6. In ore.

Sept. 12, 1779. Double. Conſiderably unequal. L. pale r.; S. a beautiful blue. The eſtimation of the colours the ſame

ſame with 227 and 460. Diſtance 39″ 32‴, pretty accurate. Poſition 36° 28′ n. following.

6. * ν Scorpii, FL. 14. Duarum adjacentium boreæ frontis, borea.

Sept. 19, 1779. Double. Very unequal. Both w. Diſtance 38″ 20‴, pretty accurate. Poſition 69° 28′ n. preceding.

7. μ Sagittarii, FL. 13. In ſummo arcu, borealis.

Sept. 19, 1779. Treble. Two ſmall ſtars near on each ſide. L. w.; S. both r. Diſtance of the neareſt about 30″. Poſition — preceding, the other — following.

8. κ Herculis, FL. 7. In dextri brachii ancone.

Sept. 20, 1779. Double. A little unequal. L. r.; S. garnet; or L. pale r.; S. r. (when the ſtars are low the firſt eſtimation of the colours will take place). Diſtance 39″ 59‴. Poſition 79° 37′ n. following. Has alſo a third ſtar.

9. ι Bootis, FL. 21. Trium in ſiniſtra manu, media.

Sept. 27, 1779. Double. Very unequal. L. w.; S. d. Diſtance 37″,56. This is not a mean of the meaſures; for I ſuſpect a motion in one of the ſtars, which another year or two may ſhew. Poſition 52° 51′ n. following.

10. * δ Orionis, FL. 34. Trium in cingulo præcedens.

Oct. 6, 1779. Double. Conſiderably unequal. L. w.; S. blueiſh r. Diſtance 52″,968 full meaſure. Poſition 88° 10′ n. preceding.

11. † γ Draconis, FL. 24. and 25, In ore duplex.

Oct. 19, 1779. Double. A little unequal. L. pale r.; S. pale r. Diſtance 54″ 48‴. Poſition 44° 19′ n. preceding.

From the right aſcenſion and declination of theſe ſtars in FLAMSTEAD's catalogue we gather, that in his

his time their diſtance was 1′ 11″,418; their poſition 44° 23′ n. preceding; their magnitude equal or nearly ſo. The difference in the diſtance of the two ſtars is ſo conſiderable, that we can hardly account for it otherwiſe than by admitting a proper motion in either one or the other of the ſtars, or in our ſolar ſyſtem; moſt probably neither of the three is at reſt.

12. * λ Arietis, FL. 9. In vertice.

Oct. 30, 1779. Double. Conſiderably unequal. L. pale r.; S. duſky garnet. Diſtance 36″ 44‴, a little inaccurate. Poſition 42° 0′ n. following.

13. φ Tauri, FL. 52. Borea ſequentis lateris quadrilateri in Cervice.

Oct. 30. Double. Diſtance 55″,625, inaccurate.

14. In conſtellatione Monocerotis.

Dec. 5, 1779. Multiple. It is a ſpot over the right fore-foot; 4 or 5 ſmall ſtars within one minute.

15. *c* Urſæ majoris, FL. 16.

May 2, 1780. Double. Very unequal. L. whitiſh r.; S. d. Diſtance with 460, 48″ 59‴. Poſition 80° 47′ f. preceding.

16. σ Piſcium, FL. 76. Duarum in ore piſcis ſequentis borealior.

Aug. 3, 1780. Double. Extremely unequal. L. pale r.; S. duſky r. Diſtance 48″,125, pretty accurate. Poſition 15° 28′ n. preceding.

17. π Andromedæ, FL. 29. In dextro humero.

Aug 25, 1780. Double. Extremely unequal. L. w.; S. blueiſh. Diſtance 34″ 12‴, inaccurate.

18. $\alpha$ Caſſiopeæ, FL. 18. In pectore.

Aug. 31, 1780. Double. Extremely unequal. L. pale r.; S. d. Diſtance 52″,812. Poſition 40° 58′ n. preceding.

19. $\gamma$ Herculis, FL. 20. In dextro brachio.

Sept. 4, 1780. Double. Extremely unequal. L. reddiſh w.; S. r. Diſtance 41″ 49‴, a little inaccurate. Poſition 19° 30′ ſ. preceding.

20. *e* Pegaſi, FL. 1.

Sept. 8, 1780. Double. Very unequal. L pale r.; S. d.; Diſtance 37″ 5‴, pretty accurate. Poſition 38° 19′ n. preceding.

21. $\tau$ Aurigæ, FL. 29.

Sept. 26, Double, about 30″.

22. $\lambda$ Aurigæ, FL. 15.

Sept. 30. Multiple. Two are within about 30″.

23. In conſtellatione Orionis.

Oct. 10, 1780. Double. It is a ſtar following *f*. Diſtance about 40″

24. In conſtellatione Ceti, FL. 37

Oct. 12. 1780. Double. It is a ſtar between $\eta$ and $\theta$ towards the north. Diſtance 42″,812, inaccurate.

25. $\tau$ Orionis, FL. 20. ſupra talum in tibia.

Oct. 23, Double. Very unequal. Diſtance about 30″

26. *h* Leonis, FL. 6.

Feb. 21, 1781. Double. Very unequal. L. r.; S. d. Diſtance 35″ 48‴. Poſition 12° 55′ n. following.

27. In conſtellatione Libræ, near FL. 31.

May. 24, 1781. Double. The moſt ſouth of three ſmall ſtars in the finder. Equal, or the preceding rather the largeſt. Both w. inclining to pale r. Diſtance 44″ 12‴, a little inaccurate. Poſition 40° 17′ ſ. following.

28. In conſtellatione Cephei.

May. 27, 1781. Double. It is a ſtar near $\beta$. Extremely unequal. Diſtance about $30''$.

29. $\nu$ Serpentis, FL. 53. Poſt dextrum femur Serpentarii.

July 16. Double. Unequal. Diſtance about $35''$.

30. In conſtellatione Serpentarii, FL. 53.

July 19, 1781. Double. It is a ſtar between $\alpha$ and $\beta$ one-third of the way from $\alpha$. Very unequal. L. w.; S. inclining to r. Diſtance $32'' 21'''$, narrow meaſure.

31. In conſtellatione Aquilæ.

July 19, 1781. Double. It is the ſtar next but one preceding $\delta$. Very unequal. L. r.; S. d. Diſtance about $30''$.

32. $\alpha$ Andromedæ.

July 21, 1781. Double. Extremely unequal. The ſmall ſtar better with 460 than with 227. L. w.; S. d. Diſtance $55'' 32'''$, rather narrow meaſure. Poſition $10° 37'$ f. preceding.

33. $h$ Aquilæ, FL. 15.

July. 25, 1781. Double. Unequal. Both pale r. Diſtance $33'' 53'''$, inaccurate.

34. In conſtellatione Aquilæ, near FL. 28.

July 25, 1781. Double. It is one of two ſtars near A. Diſtance about $35''$.

35. In conſtellatione Aquilæ.

July 25. 1781. Double. It is a ſtar near that which follows $\theta$. Very unequal. Diſtance about $40''$.

36. $o$ Scuti, FL. 2. in conſtellatione Aquilæ.

July 30, 1781. Double. Very unequal. L. pale r.; S. d. Diſtance $42'' 44'''$, a little inaccurate.

37. υ Coronæ, FL. 18.

Sept. 21, 1781. Treble. Very unequal. L. w.; S. both r. Diſtance of the neareſt about 50″; the 1½ min. ‡

38. In conſtellatione Herculis, FL. 23.

Sept. 21, 1781. Double. It is the ſtar between ν and ξ Coronæ, the largeſt of a teleſcopic triangle. Diſtance 36″ 27‴, rather narrow meaſure. L. w.; S. w. inclining to r.

39. α Lyræ, FL. 3. In teſta fulgida.

Sept. 24. 1781. Double. Exceſſively unequal. By moon-light I could not ſee the ſmall ſtar with 278, and ſaw it with great difficulty with 460; but in the abſence of the moon I have ſeen it very well with 227. L fine brilliant w.; S. duſky. Diſtance 37″ 13‴. Poſition 26° 46′ f. following.

Oct. 22, 1781. Having often meaſured the diameters of many of the principal fixed ſtars, and having always found that they meaſured leſs and leſs the more I magnified, I fixed upon this fine ſtar for taking a meaſure with the higheſt power I have yet been able to apply, and upon the largeſt ſcale of my new micrometer I could conveniently uſe. With a power of 6450 (determined by experiments upon a known object at a known diſtance) I looked at this ſtar for at leaſt a quarter of an hour, that the eye might adapt itſelf to the object; having experimentally found, that the aberration by this means will appear leſs and leſs, and, in the teleſcope I uſed upon this occaſion with powers from 460 to 1500, will often quite vaniſh, and

‡ In a future collection the ſmall ſtar at the obtuſe angular point will be found as a double ſtar of the ſecond or third claſs.

leave a very well-defined circular diſk for the apparent diameter of the ſtars. The diameter of α Lyræ, by this attention, appeared perfectly round, and occaſionally ſeparated from rays that were flaſhing about it. From the very brilliant appearance of the ſtar with this great power, and a pretty accurate rough calculation founded on its apparent brightneſs, when obſerved with the naked eye with 227, with 460, with 6450, I ſurmiſe, that it has light enough to bear being magnified at leaſt a hundred thouſand times with no more than ſix inches of aperture, provided we could have ſuch a power, and other conſiderations would allow us to apply it. When I had as good a view as I expected to have, I took its diameter with my new micrometer upon a ſcale of eight inches and 4428 ten thouſandth to 1″ of a degree, and found it ſubtended an angle of 0″,3553. I had no perſon at the clock; but ſuppoſe the time of its paſſing through the field of my teleſcope (which in this great power is purpoſely left undefined, and as large as poſſible) was leſs than three ſeconds.

40. ν Lyræ, FL. 8.

Sept.24, 1781. Treble. Extremely unequal. L. w.; S. both d. One n. preceding, the other ſ. following. Diſtance of the following ſtar 56″ 47‴, a little inaccurate. Poſition of the ſame 28° 27′ ſ. following.

41. A Perſei, FL. 43.

Sept.24. Double. Unequal. L. w. Diſtance about 50″.

42. In conſtellatione Lyræ.

Sept.25, Double. It is a ſmall ſtar juſt by η. A little unequal

1781. equal. Both r. Diſtance 38″ 8‴. Poſition 26° 18′ n. following.

43. In conſtellatione Cygni, FL. 76.

Oct. 1, 1781. Double. It is the third ſtar from ρ towards υ. Unequal. Diſtance 48″ by exact eſtimation. Poſition —— preceding.

44. In conſtellatione Cygni, FL. 69.

Oct. 1, 1781. Treble. Very unequal. L. w.; S. both reddiſh. Poſition both —— preceding.

45. In conſtellatione Cygni.

Oct. 1, 1781. Double. It is the moſt ſouth of two teleſcopic ſtars following τ. Very unequal. L. w.; S. d. Diſtance 44″ by exact eſtimation. Poſition —— following.

46. *c* Cygni, FL. 16. 1ª ad *c*.

Oct. 5, 1781. Double. It is the ſtar next following θ. Almoſt equal. Both pale r. Diſtance 30″ by pretty exact eſtimation.

47. *c* Cygni, FL. 26. 2ª ad *c*.

Oct. 8, 1781. Double. Very unequal. L. reddiſh w.; S. duſky r. Diſtance 39″ by pretty exact eſtimation.

48. * In conſtellatione Piſcium.

Oct. 8, 1781. Double. It is a teleſcopic ſtar juſt by θ northwards. Both d. Diſtance about 45″.

49. * In conſtellatione Arietis, FL. 30.

Oct. 15, 1781. Double. It is a ſmall ſtar over the Ram's back. Nearly equal. Diſtance 31″ 6‴, inaccurate.

50. γ Leporis, FL. 13. In poſterioribus pedibus auſtrina.

Oct. 22, Double. Conſiderably unequal. Diſtance about 40′.

51. In conſtellatione Sagittæ.

Nov. 23, 1781. Double. It is a ſtar north following ε. Extremely unequal. Diſtance 32″ 48‴. L. r.; S. blue.

## SIXTH CLASS OF DOUBLE STARS.

1. *o* Ceti, FL. 68. In pectore nova.

Oct. 20. Double. Very unequal. L. garnet. S. duſky.

1777. Diſt. { mean of ſome very accurate meaſures 1′44″,218
mean of other very accurate meaſures 1′53″,032.

As I can hardly doubt the motion of this ſtar, I have given the mean of the moſt accurate meaſures ſeparately; and hope in a few years time to be able to give a better account of it.

2. *o* Serpentarii, FL. 67.

Aug. 29, 1779. Double. Diſtance about 1¼ min.

3. *δ* Lyræ, FL. 11.

Aug. 29, 1779. Double. Extremely unequal. L. w.; S. d. Diſtance about 4′, pretty exact eſtimation.

4. *α* Capricorni, FL. 5.

Sept. 19, 1779. Double. Very unequal. L. r.; S. d. Diſtance about 1¼ min. Poſition —— f. preceding.

5. In conſtellatione Arietis, FL. 35. ſupra dorſum.

Sept. 27, 1779. Double. It is the ſtar in the body of the fly. Diſtance 2′ 5″ 35‴.

6. *ε* Capricorni, FL. 39. Duarum in eductione caudæ præced.

Sept. 27, 1779. Double. Unequal. L. pale r. Diſtance about 1¼ min.

7. * *τ* Tauri, FL. 94. In eductione cornu borei.

Oct. 6. Double. Diſtance 1′ 11″,25‴, pretty accurate.

8. *κ* Tauri, FL. 59.

Oct. 6. Double. At a conſiderable diſtance.

9. * ζ Geminorum, FL. 43. In ſiniſtro genu ſequentis II$^{i}$.

Oct. 7, 1779. Double. Very unequal. L. reddiſh w.; S. duſky r. Diſtance 1′ 31″ 52‴, rather full meaſure. Poſition 81° 14′ n. preceding.

10. *o* Cygni, FL. 31. Duarum in dextro pede ſequens.

Nov. 2, 1779. Double. Conſiderably unequal. L. pale r. S. blue. It is the following ſtar of the two *o*'s that are cloſe together. Diſtance 1′ 39″ 57‴. Poſition 87° 14′ f. preceding.

11. * α Leonis, FL. 32. In corde.

Nov. 14, 1779. Double. Very unequal. L. w.; S. d. Diſtance 2′ 48″ 20‴. Poſition 30° 5′ n. preceding.

12. * τ Leonis, FL. 84. Quaſi in cubito.

April 6, 1780. Double. Conſiderably unequal. L. r.; S. inclining to blue. Diſtance 1′ 22″ 42‴. Poſition 73° 29′ f. following.

13. *o* Leonis, FL. 95. In extremitate caudæ.

April 6, 1780. Double. Extremely unequal. L. reddiſh w.; S. d. Diſtance about 1½ min. Poſition about 80° n. following.

14. η Serpentis, FL. 58. In cauda.

June 19, 1780. Double. Extremely unequal. L. pale r.; S. d. Diſtance 1′ 21″ 2‴. Poſition 9° 7′ f. following.

15. In conſtellatione Bootis, near FL. 6.

June 25, 1780. Double. It is a teleſcopic ſtar near that which forms a rectangle with α and η. Diſtance about 2′.

16. δ Bootis, FL. 49. In dextro humero.

July 23, 1780. Double. Conſiderably unequal. Diſtance about 2¼ min. L. reddiſh w.; S. w. Poſition 5° 46′ n. following.

17. $\mu$ Bootis, FL. 51. In baculo recurvo.

July 30, 1780. Double. Unequal. Diſtance 2′ 8″, exact eſtimation. Poſition 80° 25′ ſ. following. L. reddiſh w. S. pale r. See the 17th ſtar of the firſt claſs.

18. $\nu$ Coronæ, FL. 21.

July 30, 1780. Double. Very unequal. L. r.; S. garnet. At ſome conſiderable diſtance. Poſition about 80° n. following.

19. $\chi$ Perſei.

Aug 2, 1780. Multiple. An aſtoniſhing number of ſmall ſtars all within the ſpace of a few minutes. I counted not leſs than 40 within my ſmall field of view.

20. $\mu$ Perſei, FL. 51. Duarum in dextro poplite ſequens.

Aug. 2, Double. Very unequal. L. w. Diſtance about 1′½.

21. $\eta$ Pegaſi, FL. 44.

Aug. 23. Double. Diſtance about 2¼ min.

22. In conſtellatione Draconis, I. HEVELII 69.

Aug. 7, 1780. Double. It is the ſtar between $\alpha$ Draconis and the tail of Urſa major. Diſtance about 3½ min.

23. In naribus Lyncis.

Aug. 7. Double. Diſtance about 2′.

24. *d* Caſſiopeæ, FL. 4.

Aug. 12, 1780. Treble. Two are large. Diſtance about 2′. A third is obſcure. Diſtance about 1¾ min. They form almoſt a rectangle.

25. In conſtellatione Caſſiopeæ, FL. 3.

Aug. 18. Double. Diſtance about 2¼ min.

26. $\varepsilon$ Sagittæ, FL. 11.

Aug. 19, 1780, Double. Very unequal. L. r.; S. r. inclining to blue. Diſtance 1′ 31″ 53‴. Poſition 8° 32′ ſ. following.

27. In conſtellatione Aquilæ.

Aug. 24. Double. It is a ſtar north of $\theta$. Diſtance about 1′.

28. $\beta$ Capricorni, FL. 9. Trium in ſequente cornu auſtrina.

Aug. 26, 1780. Double. Conſiderably unequal. Diſtance about 3′. Poſition —— preceding.

29. $\pi$ Capricorni, FL. 10. Trium in roſtro præcedens.

Aug. 26. Double. Diſtance about 2½ min.

30. $\alpha$ Aurigæ, FL. 13. In humero ſiniſtro.

Sept. 8, 1780. Double. Extremely unequal. L. w.; S. d. Diſtance 2′ 49″ 8‴. Poſition 33° 42′ f. following. With a power of 227, and my common micrometer, the diameter of this ſtar meaſured 2″,5. The circumference was remarkably well defined.

31. *d* Tauri, FL. 88. In ſiniſtro cubito.

Sept. 24, 1780. Double. Diſtance 1′ 10″,625. A little inaccurate.

32. $\lambda$ Cygni, FL. 54.

Sept. 20, 1780. Double. Extremely unequal. L. blueiſh w.; S. d. Diſtance about 1 min. Poſition 12° 42′ f. following.

33. In conſtellatione Cygni, FL. 32.

Sept. 20. Double. Diſtance about 2 min.

34. $\theta$ Aurigæ, FL. 37. In dextro carpo.

Sept. 26. Double. Diſtance about 2½ min.

35. In conſtellatione Camelopardali, FL. 13.

Sept. 26, 1780. Double. It is the ſtar over the goat's head. Diſtance about 2′.

36. In conſtellatione Camelopardali, FL. 10.

Sept. 30. Double. Diſtance about 1½ min.

37. *c* Draconis, FL. 46. In flexura colli.

Oct. 3. Double. Diſtance 3 or 4′. A rich ſpot.

38. *c* Draconis, FL. 64 or 65.

Oct. 3. Double. Diſtance about 2′.

39. *α* Orionis, FL. 58. In dextro humero lucida rutilans.

Oct. 10, 1780. Double. Extremely unequal. L. r. but not deep; S. d. Diſtance 2′ 6″ 2‴. Poſition 62° 18′ f. following.

40. *γ* Leporis, FF. 13.

Feb. 21, 1781. Double. Diſtance about 2½ min.

41. *ρ* Cancri 5 ad *ρ*, FL. 67.

Feb. 21, 1781. Double. Very unequal. L. reddiſh w.; S. d. Diſtance 1′ 35″ 59‴. Poſition 50° 33′ n. preceding.

42. *β* Geminorum, FL. 78. In capite ſequentis Π.

Mar. 13, 1781. Multiple. Extremely unequal. The neareſt diſtance 1′ 56″ 45‴, rather full meaſure. Poſition 24° 28′ n. following, not extremely accurate. This is the ſmalleſt. The next diſtance 3′ 17″ 19‴, pretty accurate. Poſition 15° 56′ n. following. A third I did not meaſure.

43. *θ* Virginis, FL. 51. De quatuor ultima et ſequens.

May 14, 1781. Double. Extremely unequal. L. w.; S. d. Diſtance 1′ 3″ 53‴, inaccurate. Poſition 24° 55′ n. preceding.

44. *ι* Libræ, FL. 24.

May 24, 1781. Double. Very unequal. L. w.; S. duſky r. Diſtance 1′ 5″ 10‴, not accurate. Poſition 22° 31′ f. following.

45. In conſtellatione Andromedæ.

July 21, 1781. Double. It is a ſtar near *ι* towards *o*. L. r. Diſtance about 1½ min.

46.

46. $\alpha$ Aquilæ, FL. 53.

July 23, 1781. Double. Extremely unequal. L. w.; S. d. Diſtance 2′ 23″ 18‴. Poſition 64° 44′ n. preceding.

47. In conſtellatione Aquilæ, near FL. 35.

July 25, 1781. Double. It is one of the preceding ſtars of a ſmall quartile near *c*, not very near.

48. In conſtellatione Aquilæ, near FL. 35.

July 25, 1781. Double. It is alſo one of the preceding ſtars of a ſmall quartile near *c*, not very near.

49. In conſtellatione Aquilæ.

July 26. Double. The following ſtar of a trapezium near l.

50. In conſtellatione Aquilæ.

July 26, 1781, Double. The following ſtar of a trapezium near l. not near.

51. In monte Mænali Heveliana.

Aug. 5, 1781. Double. It is a ſtar near the middle. The following of two, not very near.

52. In conſtellatione Bootis.

Aug. 17, 1781. Double. It is a ſtar between $\varepsilon$ and *f*. Diſtance above 1′. Unequal.

53. In conſtellatione Bootis.

Aug. 17, 1781. Double. It is a ſtar more ſouth than *i*. Diſtance above 1′.

54. In conſtellatione Serpentarii.

Aug. 21, 1781. Double. It is a ſtar more ſouth than *o*. Diſtance 75″, exact eſtimation.

55. In conſtellatione Caſſiopeæ, FL. 2.

Sept. 6. Double. It is a ſtar near *e*. L. r. Diſt. within $2'\frac{1}{2}$.

56. $\theta$ Lyræ, FL. ultima.

Sept. 25, 1781. Double. Very unequal. L. w.; S. inclining to r. Diſtance about $1\frac{1}{2}$ min. Poſition —— n. following.

57. In conſtellatione Cygni, FL. 79.

Oct. 1, 1781. Double. It is the fifth ſtar from ρ to υ. Unequal. L. w.; S. pale r. Diſtance 1′ 40″ eſtimation.

58. In conſtellatione Aquarii, FL. 5.

Oct. 5, 1781. Double. It is the moſt ſouth of two in the arrow of Antinous. Diſtance above 1′.

59. In conſtellatione Cygni, near FL. 28.

Oct. 5, 1781. Double. It is a ſtar near *b*. Diſtance 73″, exact eſtimation.

60. In conſtellatione Cygni.

Oct. 8, 1781. Double. It is a ſtar near the ſecond *c*. Conſiderably unequal. L. w.; S. d. Diſtance 88″, exact eſtimation.

61. In conſtellatione Piſcium, near FL. 7.

Oct. 8, 1781. Treble. It is a ſtar preceding *b*. They form a triangle, each ſide of which is about 1′.

62. κ Piſcium, FL. 8. In ventre.

Oct. 8. Double. Diſtance near 2′.

63. In conſtellatione Sagittæ.

Oct. 12, 1781. Double. It is near the ſtar north following ε. Extremely unequal. L. w. inclining to r.; S. d. Diſtance 1′ 30″ 56‴. Poſition 4° 9′ ſ. preceding. A third ſtar in the ſame direction, at a little more than twice the diſtance. A fourth ſtar in view.

64. In conſtellatione Eridani.

Oct. 22, 1781. Double. It is the ſmall ſtar near ν. Diſtance about 1 ¾ min.

65. In capite Monocerotis.

Oct. 22, 1781. Multiple. It is one ſtar with at leaſt 12 around it, all within the field of my teleſcope.

66. $\alpha$ Tauri, FL. 87. Splendida in auſtrina oculo.

Dec. 19, 1781. Double. Extremely unequal. L. r.; S. d. Diſtance 1′ 27″ 45‴. Poſition 52° 58′ n. following. With 460, the apparent diameter of this ſtar, when on the meridian, meaſured 1″ 46‴, a mean of two very compleat obſervations, they agreed to 6‴; with 932, it meaſured 1″ 12‴, alſo a mean of two excellent obſervations; they agreed to 8‴. The apparent diſk was perfectly well defined with both powers.

---

## POSTSCRIPT TO THE CATALOGUE OF DOUBLE STARS.

SINCE my having delivered my paper on the Parallax of the Fixed Stars, in which I refer to the above Catalogue of Double Stars, I have received, by the favour of our Preſident Sir JOSEPH BANKS, the fourth volume of the Acta Academiæ Theodoro Palatinæ, which contains a moſt excellent Memoir of Mr. MAYER's, "De novis in Cœlo ſidereo Phænomenis;" wherein I ſee that the idea of aſcertaining the proper motion of the ſtars by means of ſmall ſtars that are ſituated at no great diſtance from large ones, has induced that gentleman before me to look out for ſuch ſmall ſtars. In the courſe of that undertaking he has diſcovered a good many double ſtars, of which he has given us a pretty large liſt, ſome of them the ſame with thoſe in my catalogue. My view being the annual parallax required ſtars much nearer than thoſe that would do for Mr.

MAYER's

MAYER's purpoſe; therefore I examined the heavens with much higher powers, and looked out chiefly for ſuch as were exceedingly cloſe.

The above catalogue contains 269 double ſtars, 227 of which, to my preſent knowledge, have not been noticed by any perſon. I hope they will prove no inconſiderable addition to the general ſtock, eſpecially as in that number there are a great many which are out of the reach of Mr. MAYER's and other mural quadrant or tranſit inſtruments. It can hardly be expected, that a power of 70 or 80 would be ſufficient to diſcover thoſe curious ſtars that are contained in the firſt claſs of my catalogue; ſo that it is not ſtrange they ſhould have intirely eſcaped Mr. MAYER's notice. We ſee that it is not for want of his looking at thoſe ſtars; for we find he has frequently obſerved $\zeta$ Cancri, the ſtar near Procyon, and the ſtar in Monoceros, without perceiving the ſmall ſtars near them, which I have pointed out. Nor is it only in the firſt claſs that his teleſcope wanted power, light, and diſtinctneſs; for the ſmall ſtars that are near $\beta$ Orionis, $\beta$ Serpentis, $\zeta$ Orionis, $e$ Pegaſi, $\alpha$ Lyræ, $\alpha$ Andromedæ, $\mu$ Sagittarii, $\alpha$ Aquilæ, $\eta$ Pegaſi, $\delta$ Lyræ, $\iota$ Libræ, $\varkappa$ Piſcium, $\alpha$ Tauri, and many more, have eſcaped his diſcovery, though he has given us the places of other more diſtant ſmall ſtars not far from them, and therefore muſt have had them frequently in the field of view of his teleſcope. In ſettling the relative ſituations of very cloſe double ſtars, neither Mr. MAYER's inſtruments, nor his method, were adequate to the purpoſe. It is well known, that whenever we employ time as a meaſure, the reſults cannot be very accurate; becauſe a miſtake of no more than a tenth part of a ſecond in time will produce an error of a whole ſecond and an half in meaſure, ſo that his $\mathcal{A}\mathrm{R}$ muſt be

be extremely defective. Nor could his micrometer give the declination much better unleſs the teleſcope had bore a power of at leaſt 4 or 500. When the angle of poſition is but ſmall, ſuch as 3, 4, 5, or 6 degrees, and the diſtance of the ſtars not above a few ſeconds, it is evident, that a micrometer muſt be able to meaſure tenths of a ſecond at leaſt to give even a tolerable exactneſs of poſition. On the contrary, the poſition being meaſured with ſuch a micrometer as I have conſtructed for the purpoſe, we may from thence deduce the declination, with great confidence, true to a quarter of a tenth of a ſecond for every ſecond of the diſtance of the ſtars.

Mr. MAYER's account of $\alpha$ Geminorum, for inſtance, gives a difference of $0''{,}7$ of time in $\mathcal{R}$, of $3''{,}8$ in declination, and of 1 to 6 in magnitude or degree of light of the ſtars. Theſe quantities reduced to my notation, and compared with my meaſures of the ſame ſtar, give

| | | | |
|---|---|---|---|
| Mr. MAYER's | Diſtance $9''{,}635$ from center to center | Mine | $5''{,}156$ diameters included. |
| | Poſition 23° 14′ n. preceding | | 32° 47′ n. preceding. |
| | Magnitude extremely unequal | | A little unequal. |

To account for this difference I aſcribe Mr. MAYER's error in diſtance to his method of meaſuring by time. The error of poſition follows always from an obſervation of the declination taken with the common micrometer, when it is deduced from an erroneous $\mathcal{R}$. In my meaſures the diſtance and poſition are independent of each other, which I look upon as no ſmall advantage of my croſs-hair micrometer. The error in the magnitudes of the ſtars I aſcribe to the want of power in Mr. MAYER's teleſcope, which did not ſeparate the ſtars far enough for him to judge accurately of their ſize, otherwiſe he would ſoon have found, that inſtead of five there is hardly ſo much as

one

one ſingle degree of difference in their magnitudes. See fig. 6. for a repreſentation of thoſe ſtars with my power of 460.

I do not mean to depreciate Mr. MAYER's method, the excellence of which is well known; and with ſome ſtars of my third, all thoſe of the fourth, fifth, and ſixth claſſes, as well as with thoſe ſtill farther diſtant, to which he has applied it with admirable ſkill, and "magno labore, multiſque "nocturnis vigillis" (as he very juſtly expreſſes himſelf) a better can hardly be wiſhed for; but with ſtars of the ſecond claſs which generally differ no more than one, two or three-tenths of a ſecond of time in $\mathcal{R}$, and can never differ more than four tenths, the inſufficiency of meaſuring by time is obvious. In regard to the declination, it is alſo no leſs evident, that it is much more accurate to take an angle, which may be had true to 2 or 3° at moſt, than to meaſure its tangent, which in ſtars of the ſecond claſs is generally no more than 2, 3, or 4″ of a degree, and can never exceed five. I do not ſo much as mention the ſtars of the firſt claſs: they muſt certainly, as to ſenſe, paſs the meridian at the ſame inſtant of time. Their diſtance has even eluded the attacks of my ſmalleſt ſilk-thread micrometer armed with an excellent power of 460; but I ſhall ſoon apply my laſt new inſtrument to them *, not without hopes of ſucceſs. Now, though I have hitherto not been able to expreſs the diſtance of the ſtars of the firſt claſs, otherwiſe than by the proportion it bears to their apparent diameters, I think it a very great point gained, that one of my inſtruments at leaſt (*viz.* the croſs-hair micrometer) has laid hold of them: for their angle of poſition, I think, is within a very ſmall quantity as well determined as it is in thoſe of the ſecond claſs. This ſimple but moſt uſeful inſtrument can, by actual meaſure,

* For a deſcription of which ſee p. 163.

diſcover

diſcover beyond a doubt a motion in two ſtars that are very cloſe together, though it ſhould amount to no more than a tenth part of a ſecond of a degree, provided that motion be in ſuch a direction that the effect of it be thrown upon the angle of poſition; wherein, with ſome of the ſtars of the firſt claſs, it would occaſion an alteration of 10, 20, 30, or more degrees.

I have marked all thoſe ſtars in my catalogue which have been obſerved by Mr. MAYER and other aſtronomers with an aſteriſk (*) affixed to the number that they may be known; thoſe with the mark of a dagger (†) have been obſerved by different aſtronomers before Mr. MAYER. Among the ſtars which are not marked, will be found ſeveral that have been obſerved by Mr. MAYER; but, on comparing them together, it will be ſeen, that they are obſervations of different ſmall ſtars; for inſtance, Mr. MAYER (Act. Acad. vol. IV. p. 296.) obſerved a ſmall ſtar near Rigel at the diſtance of $1'\,0'',5$ $\mathfrak{R}$ in time, and $2'\,55'',2$ in difference of declination north preceding Rigel. In my ſecond claſs (the 34th ſtar) we alſo find Rigel; but the ſmall ſtar I have obſerved is one which has not been ſeen by Mr. MAYER, and is at a diſtance of no more than $6'\,27''$. Poſition $68°\,12'$ ſouth preceding; and ſo on with other ſtars.

I have uſed the expreſſion *double-ſtar* in a few inſtances of the ſixth claſs in rather an extended ſignification: the example of FLAMSTEAD, however, will ſufficiently authorize my application of the term. I preferred that expreſſion to any other, ſuch as Comes, Companion, or Satellite; becauſe, in my opinion, it is much too ſoon to form any theories of ſmall ſtars revolving round large ones, and therefore I thought it adviſeable carefully to avoid any expreſſion that might convey that idea. I am

very well perſuaded, FLAMSTEAD, who firſt uſed the word Comes, meant it only in a figurative ſenſe.

I ſhall not fail to take the firſt opportunity of looking out for thoſe of Mr. MAYER's double-ſtars which I have not in my catalogue, amounting to 31; and alſo for one I find mentioned in *La Connoiſſance des Temps* for 1783, diſcovered by Mr. MESSIER.