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SPECTRA OF BRIGHT SOUTHERN STARS

PHOTOGRAPHED WITH THE 13-INCH BOYDEN TELESCOPE

AS A PART OF

THE HENRY DRAPER MEMORIAL

AND DISCUSSED BY

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UNDER THE DIRECTION OF

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INTRODUCTORY NOTE.

THE first general classification of photographic spectra was made by Mrs. Fleming in the Draper Catalogue contained in Volume XXVII of these Annals. A detailed study of the photographic spectra of the bright stars visible in Cambridge has been made by Miss Maury, and is contained in Part I of the present volume. A similar discussion of the southern stars has been made by Miss Annie J. Cannon and is given below. In all three cases, it was deemed best that the observer should place together all stars having similar spectra and thus form an arbitrary classification rather than be hampered by any preconceived theoretical ideas, or by the previous study of visual spectra by other astronomers. If spectra which are absolutely identical can be placed together it makes but little difference what name is assigned to them, since in any future classification it is only necessary to take one star of each class and arrange them in any order, or give to them any nomenclature that may be desired. In forming the Draper Catalogue, the dispersion was small and but few divisions could be made, as slight differences could not be distinguished, although in the extension of this work to the South Pole, and the revision of the northern regions, several subdivisions of these classes were introduced. With the larger dispersion used in the later work, however, many differences became perceptible, and the northern stars were divided by Miss Maury into twenty-two classes, which were closely connected with one another, so that almost all the stars could be arranged in a single sequence with nearly imperceptible gradations. Miss Cannon, however, when studying the southern stars with a large dispersion found that they could be more conveniently designated according to the notation of the Draper Catalogue, modifying it so that intermediate classes of spectra could be indicated. The comparison made on page 145 shows how easy it is to pass from one system of notation to the other, and that so long as we have an accurate classification, the nomenclature is of little importance. It is believed that the present volume will furnish the principal facts regarding the spectra of all the brighter stars from the North to the South Pole, so that

the reader can classify them according to any system he may choose, without the necessity of referring to the spectra themselves in each particular case. This is well shown by the comparisons made on pages 10 and 145. In the preparation of the present volume for the printer and in seeing it through the press, important aid has been rendered by Mrs. Fleming.

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Director of the Observatory of Harvard College.

CAMBRIDGE, U. S., *April 12, 1900.*

CONTENTS OF PART II.

SPECTRA OF BRIGHT SOUTHERN STARS.

CHAPTER X.

Outline of Classification.

The following pages contain a classification of 1,122 stars by means of their photographic spectra. These spectra have been examined on 5,961 plates photographed at Arequipa, Peru, with the Boyden telescope of this Observatory. The first plate was taken on November 29, 1891, the last on December 6, 1899. The telescope has an aperture of 13 inches (33 cm.), and a focal length of 16 feet (192 cm.). The photographs of the spectra were made by placing one, two, or three prisms in front of the object glass. The dispersion of the prisms is such that the spectra measure from Hϵ to Hβ, 2.24, 4.86, and 7.43 cm., for one, two, and three prisms, respectively. An appreciable width, generally not less than 0.5 cm. but varying according to the magnitude of the star, was given to the spectra by attaching different weights to the pendulum of the clock controlling the motion of the telescope. The time of exposure was generally about one hour. The stars classified include, first, all those south of —30° in declination whose photometric magnitude is 5.00 or brighter; second, numerous fainter stars south of —30° in declination; third, numerous stars whose declinations are included between 0° and —30°; fourth, a few northern stars.

The series of plates taken with the 13-inch Boyden telescope is designated by the letter X. All photographs of stellar spectra were taken from this series, and arranged in boxes according to the type of each spectrum following the classification of the Draper Catalogue. In cases where a plate showed more than one spectrum, the brightest only was considered in this preliminary examination. Thus, all plates on which the spectrum, or the brightest spectrum, was of the first type with the Orion lines present, were placed together and marked "B." In like manner those whose spectra were of the first type without Orion lines were marked "A"; those whose spectra appeared intermediate between the first and the second types were marked "F"; those whose spectra were of the second type were marked "G"; those whose spectra were of the third type showing sudden changes in intensity at the end of greater wave length were marked "M"; and, lastly, all those having bright lines were marked "Bright Line Stars."

The detailed study of spectra of the second type was first undertaken. The spectra of α Aurigæ, α Boötis, and α Tauri were assumed as examples of the subdivisions of this type. These three spectra were carefully studied and their differences noted. The plates marked "G" were then examined one by one. Each plate was placed on a stand and inclined at an angle of 45°. The light of the sky was reflected through it by means of a horizontal mirror. The spectrum was compared with the three typical spectra, and the plate was then superposed film to film on that which it most nearly resembled, so that the ends of the lines coincided. A positive eye-piece having a focal length of two inches was used in this examination. A record was made of the number and quality of the plate, the number of prisms used, the name or catalogue number of the star, the name of the typical star it resembled, and remarks were recorded concerning peculiarities, in cases where the spectrum differed from that of the typical star of the class. The same method of examination was later extended to the other spectra in the following order: "M," "F," "A," "B," "Bright Line Stars." After the general classification was outlined, a detailed study of the lines of each typical star and of each peculiar star was made.

It may be well at this point to describe the terms here used in referring to lines, or series of lines. The term "hydrogen lines" is used to designate the well known series of lines due to hydrogen, and designated Hα, Hβ, Hγ, Hδ, Hε, Hζ, Hη, Hθ, Hι, Hκ, Hλ, Hμ, Hν, Hξ, Ho, Hπ, Hρ, Hσ, Hτ, and Hυ. Any one of these lines is referred to as Hβ, Hγ, etc. The term "additional hydrogen lines" is used to designate the secondary series of lines due to hydrogen, first identified in the spectrum of ζ Puppis. In the following tables these lines are called Hβ′, Hγ′, Hδ′, Hε′, Hζ′, Hη′, and Hθ′. The term "Orion lines" is used to designate all the dark lines, except those due to hydrogen and calcium, in the spectra of classes Oe, Oe 5 B, B, B 1 A, B 2 A, B 3 A, and B 5 A. A list of these lines, as well as those due to hydrogen and calcium, is given in Table XXIII. Three of the lines included in this table, besides those of hydrogen and calcium, are common to the spectra of Class A. These are the double line, 4128.5 and 4131.4, due to silicon, and the magnesium line 4481.4. The Orion lines may be divided into two general classes, — first, those due to helium and parhelium; and, second, those due to other gases or substances. The term "helium lines" is used to refer to those lines which have been identified with helium or parhelium, a list of which is published on page 123 of this volume. Some of the Orion lines not due to helium or parhelium have recently been identified with oxygen and nitrogen. The triplet 4069.4, 4072.0, and 4075.9 is the most conspicuous of the lines due to oxygen

seen in the photographic spectra of the stars. Lines 3994.9 and 4630.6 have been identified with nitrogen. The most intense Orion lines, not due to helium or parhelium, have not yet been certainly identified with any terrestrial element. Among them may be mentioned 4096.9, conspicuous in the spectra of Class Oe, and 4089.2, 4116.2, and 4649.2 conspicuous in the spectra of Class B. The term "solar lines" is used to designate the lines found in the spectrum of the Sun, excepting those due to hydrogen and calcium. Some of the solar lines are found in all the spectra from Class B 8 A to Class Mb. The term "calcium lines" is used to designate the lines or bands at wave lengths 3933.8 and 3968.6. The first of these lines is often called K, the second H. The term "band G" is sometimes used to denote the solar lines from wave length 4299.2 to 4315.2.

The identification of the lines forms an important part of a detailed classification of stars by means of their spectra. The hydrogen lines can be readily selected on plates of all dispersions in spectra of Class A. By superposing spectra of this type on spectra of other types taken with the same dispersion, the hydrogen lines, however faint, can be identified. The Orion lines were identified by means of Table IV, page 53, of this volume. The more intense lines, as those at wave lengths 3819.2, 4026.4, 4089.2, 4116.2, 4120.5, 4144.0, 4471.8, and 4649.2, were found by their relative positions with respect to the lines of hydrogen. The faint lines also could sometimes be identified from estimates of their position, with the aid of the wave lengths and intensities given in Table IV. This method could be employed for faint lines lying close to known intense lines, or situated in small spaces between two well marked lines. Frequently, however, measures were necessary to identify the faint lines. A scale divided into half millimetres was used, and small sections of the spectrum were measured at a time, — as, for instance, the portion of the spectrum between the Orion lines, 4387.8 and 4471.8. With the zero of the scale on the line 4387.8, measures of all the lines were made as far as 4471.8, inclusive, and their intensities estimated. Approximate wave lengths were obtained from these measures by interpolation or graphically. From these wave lengths it was generally easy to determine whether the lines measured corresponded with given lines in Table IV.

It was more difficult to identify the solar lines on any plate with those in Tables V and VI of Part I, than to identify the Orion lines with those in Table IV. For many parts of the spectrum, it was necessary first to identify the lines on a plate of the solar spectrum by a comparison with Rowland's map. No photograph of the solar spectrum having been taken with the Boyden telescope, a plate taken with the 11-inch Draper telescope with four prisms as described on

page 2, was used. The solar lines in any portion of the spectrum on this plate were identified by a careful comparison of the corresponding region on Rowland's map, with the aid of the intensities given in Tables V and VI. The spectrum of α Aurigæ so nearly resembles that of the Sun, that by superposing the plate of the solar spectrum on one of α Aurigæ taken with three prisms, the lines in that star could be readily identified with the solar lines, allowance being made for the slightly different dispersions of the two plates. Lines once identified in the spectrum of α Aurigæ were easily found in other spectra by superposing plates of similar dispersion. Since the objective prism was used in photographing these spectra, and the field of view of the telescope is 8 inches in diameter, many of the plates show the spectra of several stars distinctly enough to permit them to be classified. These additional stars represent various types of spectra and therefore could not be classified until the systematic study of the brighter stars was completed. All these additional spectra were therefore identified and reserved for classification later.

When the spectrum of only one star appeared on a plate it was identified by the hour angle and setting in declination of the telescope, making a proper allowance for the deviations of the prisms used. In cases of doubt, a comparison was made with photographs of the same region taken with the Bache telescope. These photographs were also used to identify the fainter spectra when several appeared upon a plate. This work was facilitated by a series of manuscript charts on the scale of 2 cm. to 1°, and extending from declination —20° to the south pole. On these charts the positions for 1900 had been entered of all stars of the magnitude 7.0 and brighter in the Uranometria Argentina. Each spectrum was identified twice independently, once by Miss L. D. Wells and once by the writer.

Of the 1,122 stars classified from these plates, 41 have been photographed with three prisms, 268 with two prisms, and 813 with one only. The plates taken with one prism were found most useful in making the general classification, those with two or three prisms were found necessary for detailed study of peculiarities and intensities of lines.

Partly from the fact that so small a proportion of the total number of stars classified has been photographed with more than one prism, it was found inexpedient to make the divisions "a," "b," and "c" as given in Part I of this volume. There are doubtless great differences in the width and sharpness of the spectral lines. α Eridani of the Orion type, and α Aquilæ of the later first type, may be mentioned as having broad and hazy lines, while β Orionis of the Orion type and l Puppis of the first type have unusually well defined lines. The facts relating

to the width of the lines are given in the remarks following Table XVI, and great care has been exercised to determine whether such variations from the normal are due to the star or to instrumental conditions. In cases where the lines of any spectrum appeared hazy, plates taken just before and after, on the same evening were examined to see if the lines on them were well defined at that time. If this was the case, and the lines were well defined on other plates of the same star taken on earlier dates, the star was regarded as an object of interest, and, as soon as practicable, a request was sent to Peru to have other photographs of it taken. It is well known that a poor adjustment of the focus will sometimes give lines that are distinctly double. For instance, in the spectrum of α Carinæ on Plate X 7897, all the lines are double. The spectrum of α Carinæ usually shows well defined lines, and the doubling of the lines on this plate would be remarkable except that on the preceding plate taken the same evening the lines are also double. The latter plate shows the spectrum of β Orionis. It is interesting to note in this connection that two stars which, from earlier plates, were classed among the spectra showing hazy lines, are proved by later plates to be spectroscopic binaries. These stars are π Scorpii and ζ Centauri.

The letters of the Draper Catalogue are used in the following discussion to denote the various classes of spectra. The relation between the letters of the Draper Catalogue and the five types in ordinary use for visual spectra is as follows: —

Type.	Letter.	Type.	Letter.
I	A, B	III	M
I–II	F	IV	N
II	G	V	O
II–III	K		

When the letters of the Draper Catalogue were adopted as the symbols of classification in this discussion, it was soon found that many subdivisions must be made to suit the varieties of spectra seen on plates of greater dispersion. Thus, the letter B is used in the Draper Catalogue to represent all the spectra showing the dark hydrogen lines together with the Orion lines, those at wave lengths 4026.4 and 4471.8 being, it is stated, the only lines commonly seen with the small dispersion employed. It is obvious, however, that the letter B can not represent all the varieties of spectra photographed with a dispersion which shows eighty or more Orion lines with many combinations of intensities, as on plates taken with three prisms. It was therefore decided that the letter B should be used to indicate stars of the Orion type in which some of the Orion lines are as intense as the

hydrogen lines. The gradual decrease in the intensities of the Orion lines and the increase in the hydrogen lines were next made the basis of a series of subdivisions of Orion stars in which the interval between Class B and Class A is estimated in tenths. Thus the spectra of Class B 1 A are very nearly like those of Class B, while those called Class B 9 A show only slight differences from those of Class A. Those of Class B 5 A appear to be about midway between the two classes. The evidence that the Orion spectra precede the Sirian is as good as that the Sirian precede the solar. The gradual decrease in the intensities of the Orion lines is accompanied by gradual increase in the hydrogen lines, and by the incoming of faint solar lines, so that in spectra of Classes B 8 A and B 9 A, solar and Orion lines are commingled. Hence, it was necessary either to interchange the letters B and A of the Draper Catalogue or to place the letter B before the letter A. The first alternative would prove confusing. The second presents no real difficulties since the letters are merely symbols to express an observed condition.

The letter A in this classification represents spectra of the Sirian type, of which α Canis Majoris and α Lyræ are examples. These spectra may be defined as those in which the Orion lines in general are absent, the line K and the solar lines are faint, and the hydrogen lines are of great intensity.

The letter F represents spectra in which the wide bands of calcium, K and H, are the most conspicuous features, while the hydrogen lines are still more intense than any solar lines. The gradations of spectra found between Classes A and F are indicated by the combinations A 2 F, A 3 F, and A 5 F.

The letter G represents spectra of the characteristic solar type, of which α Aurigæ has been used as the best example. The spectra of Class G may be defined as those in which the lines K and H of calcium and the band G are the most conspicuous features, while the hydrogen lines are still as intense as any of the solar lines. Spectra intermediate between Classes F and G are indicated as F 2 G, F 5 G, and F 8 G. The letter K represents spectra of the later second type, or intermediate between the second and third types. The letter K may be briefly described as representing those spectra in which the bands K and H, the band G, and the line 4227.0 are the most conspicuous features, and in which the end of shorter wave length is faint, and the distribution of light is not uniform in different parts of the spectrum. The hydrogen lines in this class are fainter than numerous solar lines. Spectra intermediate between Classes G and K are designated by the letters G 5 K. The letter M represents, in general, the spectra which differ from those of Class K mainly in showing sudden diminutions in

intensity as the wave length increases, at 4762, 4954, 5168, and 5445. Spectra coming between Classes K and M are indicated as K 2 M and K 5 M. Since no spectra were found which followed those of Class M, and into which this type of spectrum appeared to merge, the variations of these spectra could not be expressed in intervals between M and any other letter. The two divisions of stars of Class M are therefore indicated by the letters Ma and Mb. With the spectra of Class Mb, the series in which the various spectra merge almost insensibly from one type to another is concluded as far as it has been observed on these plates. The letters Md represent spectra of the third type showing one or more bright hydrogen lines. Spectra of the fourth type, for which the letter N is used in the Draper Catalogue, do not appear on any plates in the series examined for this classification. Thus, with the symbols B, A, F, G, K, Ma, and Mb, or with combinations of these symbols, and by the aid of remarks to explain the peculiarities of those spectra that vary slightly from the typical stars, all spectra with wholly dark lines can be provided for with one exception.

A few spectra of the Orion type were found which clearly precede those of the class called B. These spectra might have been called by the letter B, and those now called B passed on to B 1 A, and so on. But when it was found that these spectra were intermediate between a class of spectra showing bright lines and those of Class B, it was deemed advisable to express that fact in the symbol used to designate them. Stars of the fifth type are those whose spectra consist mainly of bright lines. The spectra of these stars are characterized by the bright bands at wave lengths 4633 and 4688, and the line at 5007 characteristic of gaseous nebulæ, is sometimes present. Stars whose spectra are of the fifth type are called O in the Draper Catalogue. In the present classification five subdivisions of Class O are represented by the letters Oa, Ob, Oc, Od, and Oe. These subdivisions depend upon the varying intensities of the bright bands named above, and the various combinations of these bands with other lines and bands, bright or dark. It is between spectra of Class Oe and Class B that the few spectra with wholly dark lines above referred to as falling outside of the series from B to Mb appear to belong. They are therefore designated by the symbol Oe 5 B. Spectra of Class Oe 5 B differ mainly from spectra of Class Oe in having line 4685.4 dark, and in the presence of the dark line 4649.2 instead of the bright band 4633; they also differ mainly from spectra of Class B in the greater intensities of the additional hydrogen lines, and of line 4685.4. These spectra, in combination with those of Class Oe, appear to establish the position of spectra of the fifth type as preceding those of the Orion type. The letter O has been placed, therefore, in

this classification, before the letter B instead of after the letter M. The letter P represents the spectra of planetary nebulæ. The letter Q represents peculiar spectra having bright lines.

One other class of spectrum remains unprovided for, namely, the spectra of the Orion type with one or more bright hydrogen lines. The Orion lines in these spectra are found to conform more or less closely to one of the systems of Orion lines in the typical Orion spectra. Hence, in the absence of any connection between these spectra and others having bright lines, these spectra are regarded as peculiar objects, and are given in Table XVI under the class of stars which they would resemble were all the lines dark. A list of these stars in the order of right ascension is given in Table XIX. A few spectra were found which presented the combination of two distinct types so completely superposed that no separation either in right ascension or declination could be detected. These spectra are called composite. Five spectra showing lines periodically double were found in this series. Stars whose spectra show this peculiarity are called spectroscopic binaries. Lists of the stars having the above-named peculiarities of spectra are given in Tables XX and XXI.

As a result of this classification it is found that most of these 1,122 spectra can be arranged in a sequence. The spectra of Class Oe, or possibly those of Class Ob, are at one end of the sequence, while the spectra of Class Mb are at the other end. The order of the development is not indicated, and the series might proceed from Class Mb to Class Oe, instead of from Class Oe to Class Mb. The latter seems more probable, perhaps owing to its agreement with Laplace's theory of stellar development. The progressive changes in the spectra are at times so slight as to be almost imperceptible, and so gradual as to make exact differentiation difficult, while again the changes are somewhat abrupt, and it appears as if intermediate forms as yet undiscovered might exist. Commencing with Class Ob, the course of the development may be traced briefly as follows. Wide, hazy, bright bands that correspond to both series of hydrogen lines and two bright bands at wave lengths 4606 and 4688 are present. The hydrogen lines, and band 4688, become narrower, and band 4606 is replaced by a band having wave length 4633. The two series of hydrogen lines next appear dark, while the bands 4633 and 4688 are still bright, though of less width and intensity. As these two bands decrease in brightness, the helium and other Orion lines appear. Two well marked dark lines, 4649.2 and 4685.4, are present when the bright bands disappear. Line 4685.4 appears to be the reversal of at least a part of the bright band 4688. Lines 4649.2 and 4685.4, together with 4089.2, and 4116.2, none of which are due

to helium or parhelium, become the most characteristic Orion lines, being as a whole more conspicuous than the helium lines. The additional hydrogen lines decrease in intensity until they become invisible when the helium lines are at their maximum intensity. Lines 4089.2, 4116.2, and 4649.2, decrease rapidly so that they are absent or inconspicuous when the helium lines are most intense. The helium lines remain visible longer than the other Orion lines and some of them are present in spectra showing also faint solar lines. The loss of the helium lines occurs when the hydrogen lines are at their maximum intensity. The solar lines and the calcium lines now increase rapidly, while there is a corresponding decrease in the hydrogen lines. The band G becomes conspicuous. The distribution of light is now unequal in different portions of the spectrum. Two distinct bright bands appear between Hγ and Hβ, and the spectrum towards the end of shorter wave length becomes so faint that the bands K and H are barely seen on plates of normal exposure. The calcium line 4227.0 becomes more conspicuous than band G. The spectrum becomes banded at the end of greater wave length, sudden changes in intensity taking place at wave lengths 4762, 4954, 5168 and 5445. These changes are at first only slightly marked, but later they become so abrupt as to be the most distinguishing feature of the spectrum.

The typical stars of each class have been selected so as to show as nearly as possible the continuous development of the series. Stars that differ from the typical stars are marked peculiar and discussed in the remarks. Peculiarities manifest themselves in five different ways. First, the width of the lines may be greater or less than in the typical star. Spectra having lines more or less broad and hazy were found in nearly all the classes of first type stars, and may be selected from Tables XVI or XVII by means of the common remark, number 18. Some spectra are also found in which the lines are narrow with sharp edges, often appearing peculiarly intense. These spectra may be distinguished by means of the remark common to all, number 40.

Second, the intensities of lines, or sets of lines, may differ from those in the typical star. A peculiar intensity of a certain line may appear in one spectrum only, but more generally, there are small groups of stars in which the same line or lines vary from the normal. These peculiarities may be found in several spectra of the same class, or may appear in peculiar spectra of several successive classes. A group of peculiar spectra of Class A, for instance, has the double line 4128.5 and 4131.4 especially well marked. These stars are υ Fornacis, τ^9 Eridani, α Doradus, L^1 Puppis and θ^2 Microscopii. Again, the peculiar spectra of θ^1 Microscopii, and ι Phœnicis of Class A 2 F, of δ Normæ of Class A 3 F, of ξ Phœnicis

of Class F, and of ζ Capricorni of Class G, have the line 4077.9 unusually intense.

Third, certain lines may be reversed, partly reversed, or doubly reversed. In the first case, the line appears bright, as, for instance, Hδ or Hγ in Class Md. In the second case, the lines may be bright, and be superposed on dark bands as in the Orion spectra, having bright hydrogen lines; or Hβ may appear dark, superposed on a bright band, as in the spectrum of γ Velorum. In the third case, the line may appear as a dark band on which is superposed a bright line which itself has a dark thread centrally superposed, as Hγ or Hβ in the spectrum of α Aræ.

Fourth, the lines may be periodically double as in the case of the spectroscopic binaries.

Fifth, the spectrum may consist of two spectra of different classes completely superposed, as in ϵ Carinæ and other stars of the composite type.

Table XV shows the relation between the symbols employed to designate the spectra classified in Part I of this volume, and those employed in Part II. The first four columns give the group number, the division letter, the constellation, and designation of the typical star of each group of Part I, as taken from Table IX. The first star named in that table after each division letter of each group is considered a typical star. Stars of intermediate groups, but not those of intermediate divisions, are included. The typical star of group VIc is H. P. 551, of group XXII is H. P. 1311. The fifth column gives the class to which the spectrum belongs, according to the classification of Part II. The sixth column gives numbers referring to the remarks following Table XVI. In order to classify these spectra according to the system adopted in the following discussion, several plates of each typical star taken with the 11-inch Draper telescope were examined. They were the same plates that had previously been used for classifying these spectra in Part I. To make the classification independent of any knowledge of certain spectra, the plates were removed from the covers, the covers were laid aside, and the plates were then thoroughly intermingled. Since 21 of these typical stars are common to Parts I and II of this volume, this method gave a perfectly independent classification of these 21 stars, photographed at different times with different instrumental and atmospheric conditions. The classification was made by comparison with typical stars of Table XVI, allowance being made for the difference in dispersion. It will be seen that remark 18 of Part II corresponds generally to division "b" of Part I, and remark 40 corresponds to division "c." Slight differences may be accounted for by the quality of the photographs. For instance,

the lines in the spectrum of ζ Canis Majoris are somewhat broad on the only photograph taken with the Draper telescope, but they are well defined on three plates taken in Peru with the Boyden telescope. Hence, remark 18 appears after the star in Table XV, but not in tables XVI and XVII.

TABLE XV.

SPECTRA OF TYPICAL STARS IN PART I.

Group.	Div.	Constellation.	Desig.	Class.	Remarks.	Group.	Div.	Constellation.	Desig.	Class.	Remarks.
I	*b*	Monoceros ..	S	Oe 5 B	18	VIII	*c*	Cygnus	*a*	A 2 F Pec.	40, 154
II	*a*	Orion	ε	B		IX	*b*	Ursa Major..	δ	A 2 F	18
"	*b*	Orion	δ	"	18	X	*a*	Triangulum .	β	A 5 F	
III	*a*	Canis Major .	β	B 1 A		"	*b*	Aquila	*a*	"	18
"	*b*	Virgo	*a*	B 2 A	18	XI	*a*, *b*	Aquila	δ	F	
"	*c*	Orion	χ^2	"	40	XII	*a*	Canis Minor .	*a*	F 5 G	
IV	*a*	Orion	γ	"		"	*c*	Auriga	ε	" Pec.	40, 182
"	*b*	Ursa Major..	η	B 3 A	18	*XII*	*c*	Cygnus	35	"	180
IV	*a*	Orion	π^4	"		XIII	*a*	Orion	χ^1	F 8 G	
"	*b*	Canis Major .	ζ	"	18	"	*c*	Canis Major .	δ	" Pec.	40, 185
V	*a*	Taurus	η	B 5 A		*XIII*	*a*	Perseus.....	θ	G	
"	*b*	Orion	τ	"		XIV	*a*	Auriga	*a*	"	
"	*c*	Canis Major .	η	" Pec.	40, 96	*XIV*	*a*	Gemini	κ	G 5 K	
VI	*a*	Perseus.....	β	B 8 A		XV	*a*	Boötes	*a*	K	
"	*b*	Leo	*a*	"	18	*XV*	*a*	Cancer	β	K 2 M	
"	*c*	Orion	β	" Pec.	40, 112	XVI	*a*	Taurus	*a*	K 5 M	
VI	*b*	Aquarius....	η	"	18	XVII	*a*	Andromeda..	β	Ma	
"	*c*	Camelop. ...	—	B 9 A	40	XVIII	*a*	Orion	*a*	"	211
VII	*a*	Canis Major .	*a*	A		XIX	*a*	Perseus.....	ρ	Mb	
"	*b*	Hercules	o	"	18	*XIX*	*a*	Hercules	*a*	"	214
"	*c*	Leo	η	" Pec.	40	XX	*a*	Cetus	o	Md	
VIII	*a*	Gemini	*a*	"		XXI	—	Pisces	19	N	
"	*b*	Ursa Major..	γ	"	18	XXII	—	Canis Major .	—	Ob	

CHAPTER XI.

Detailed Description of the Classification.

The following pages contain a more detailed description of the classes into which the spectra are divided, than is given in the preceding chapter. The spectrum of a typical star of each class is described, with the exception of Classes P, Q, and Md. Since the spectrum of only one gaseous nebula appears in this series of plates, it was deemed best to describe its spectrum in a remark rather than assume it to be typical of the class for which the letter P is used. The letter Q is used to designate peculiar spectra having bright lines. Since no spectrum of this class can be called typical, a description of each one is given in the remarks following Table XVI. Classes P and Q are placed first in the Table, because they appear to be more nearly related to the spectra of Class O than to those of any other class. Spectra of Class Md, or those of the third type having bright hydrogen lines, are regarded as peculiar, and a description of each of those photographed in this series, is given in the remarks.

Class Oa.

Typical star, — Carinæ, A. G. C. 15305.

The spectrum consists of bright bands on a faint continuous background.

Faint, indistinct, bright bands are present at 4101.8 and 4340.7, the wave lengths of the hydrogen lines Hδ and Hγ. The additional hydrogen lines, first found in ζ Puppis, are suspected to be present and bright, but they are not clearly seen in any photograph of the spectrum in this series. A faint bright band appears to coincide with the helium line, 4471.8.

A broad bright band whose centre is at the wave length 4633 is the most conspicuous feature of this spectrum. On the side of shorter wave length, the edge of this band is well defined and resembles a dark line; on the side of greater wave length, the brightness fades off into a fainter band of nearly equal width, which may coincide with band 4688 seen in Classes Ob, Oc, Od, and Oe. On X 4065, the brighter and fainter portions of the band are separated by a dark space, and resemble in position and relative intensity the bright bands in

γ Velorum. A bright band is faintly seen at wave length 4059. The photographs of A. G. C. 22827, Z. C. 8^h 4141, and Z. C. 10^h 2684, show no bright bands except that at wave length 4633, but this is probably due to insufficient exposure, or faintness of the stars.

Class Ob.

Typical star, — Canis Majoris, A. G. C. 8631, H. P. 1311.

The image consists wholly of wide bright bands on a continuous spectrum, but differs essentially from the spectra of Class Oa in the intensities and positions of these bands. With the exception of 4633 in Class Oa, the width of the bands in A. G. C. 8631 exceeds that of any other bands, bright or dark, in any spectrum examined for this classification. The hydrogen lines Hϵ, Hδ, Hγ and Hβ are bright. The additional hydrogen lines at wave lengths 4026.0, 4200.7, and 4542.4 are also bright. No lines due to helium are seen.

The spectrum is especially characterized by the intensely bright band whose centre is at wave length 4688 approximately. On X 4115, taken June 1, 1892, with an exposure of 61^m, this band shows a narrow line, nearly central, which is brighter than the other portion of the band, and which appears to coincide in position with the dark line 4685.4 in the spectra of τ Canis Majoris and ϵ Orionis of Classes Oe 5 B and B. On X 4512, taken December 18, 1892, with an exposure of 64^m, the band 4688 shows a dark division, but having greater wave length than the line 4685.4, mentioned above. The other bands on X 4512 have the appearance of being double, except Hδ' and Hγ, which are narrower and better defined than on the other plates. The next band of shorter wave length than 4688 has a centre at 4606, and does not coincide with the bright band 4633 of Classes Oc, Od, and Oe. A bright band at wave length 4059 is well marked. The wave lengths of the lines measured in this spectrum will be found in Table XXVIII.

No other spectrum like that of A. G. C. 8631 appears on the plates of this series, probably because these stars are too faint to be photographed with the dispersion here employed.

Class Oc.

Typical star, — Scorpii, A. G. C. 22763.

The spectrum resembles that of Class Ob in showing only bright lines or bands. The bands, however, are much narrower than in the former class, and there are important differences in the portion of the spectrum between Hγ and Hβ. The spectrum is photographed from about wave length 4027 to Hβ.

The hydrogen lines Hδ, Hγ, and Hβ are bright. They are not quite 0.5 as wide as in the spectrum of A. G. C. 8631, of Class Ob. The additional hydrogen lines having wave lengths 4026.0, 4200.7 and 4542.4 are bright.

A bright band, faintly seen, coincides with the helium line 4471.8. The helium line 4026.4, if present, is superposed on the additional hydrogen line 4026.0.

The bright band 4688, though not more than 0.3 as wide as in the spectrum of A. G. C. 8631, is still the most conspicuous feature of the image. The adjacent bright band has its centre at wave length 4633, and the two bands 4633 and 4688 resemble those of ζ Puppis, of Class Od, in position and relative intensity. A bright band between that at 4471.8 and the additional hydrogen line 4542.4 coincides with the line 4514.5, which is dark and well marked in Classes Oe and Oe 5 B. The line 4059 is bright, and more sharply defined than the other lines.

Class Od.

Typical star, ζ Puppis, A. G. C. 10691.

All lines are dark except the bands 4633 and 4688 which are bright. The dark lines are narrow and well defined and very few faint lines are present.

The hydrogen series is seen from Hλ to Hβ, and is wholly dark. The additional lines of hydrogen are also dark and more intense than in any spectrum so far photographed. Eight lines belonging to this new hydrogen series have been measured, and their wave lengths may be found in Circular No. 55. The helium line 4471.8 is present and dark, but faint. The presence of line 4026.4 is undetermined, owing to its proximity to the additional hydrogen line 4026.0.

The two bright bands 4633 and 4688 are less intense than in Class Oc. On plates taken with two prisms, the band 4688 is separated into two bright lines, of which that having greater wave length is four or five times as intense as that of shorter wave length. The band 4633 is not double. The calcium line, K, is dark and faint. On isochromatic plates no lines are seen of greater wave length than Hβ, except the additional hydrogen line 5414, and a faint line at wave length 5202.2. No other star has yet been found whose spectrum is exactly like that of ζ Puppis. It is considered a typical star because its spectrum comes between those of Classes Oc and Oe.

Class Oe.

Typical star, 29 Canis Majoris, A. G. C. 9311.

All lines are dark except the two bands 4633 and 4688 which are bright as in ζ Puppis, but unlike the spectrum of ζ Puppis in which only four dark lines

were found besides those due to hydrogen, this spectrum shows numerous well marked dark lines.

The hydrogen lines are seen from Hθ to Hβ inclusive. Hβ is only 0.5 as intense as Hδ or Hγ, and is bright on the edge of greater wave length. The additional lines of hydrogen are present, but less intense than in ζ Puppis. The magnitude of this star is 4.77, and owing to its faintness, only the four additional hydrogen lines at wave lengths 3924.0, 4026.0, 4200.7, and 4542.4, have so far been photographed. The line 4542.4 is bright on the edge of greater wave length. The lines due to helium are nearly as numerous and well marked in spectra of this class as in the typical Orion stars. Table XIV, on page 123 of this volume, gives the wave lengths of the helium lines as published by Runge and Paschen, and their identification with Orion lines. According to the series explained on page 122, the following helium lines are contained in this spectrum between the limits 3798 and 4925. In series b, 3819.2, 4026.4, 4471.8; in series c, 4120.5, 4712.8; and in series e, 4144.0, 4387.8, and 4922.1. The helium line 4026.4 is not separated from the additional hydrogen line 4026.0, but the presence of the helium line is assured by the increased intensity of the line 4026.4 over the other additional hydrogen lines, as may be noted from the intensities given in the seventh column of Table XXII. The helium line 3867.6 may be present, although not detected on account of imperfect focus in that part of the spectrum. With the dispersion used, the helium line 3926.8, if present, is not separated from the additional hydrogen line 3924.0. The only line of the principal series of helium within the limits of the photographic spectrum has the wave length 3888.78. If present, it would be superposed upon the hydrogen line Hζ, wave length 3889.1. Since, however, no unusual intensity is observed in this hydrogen line, it cannot be assumed that the helium line is present.

While the helium lines in this spectrum connect it with the stars of Class B, the bright bands 4633 and 4688, although less intense, are present, as in ζ Puppis. The bright band 4633 is resolved into two faint lines of equal intensity, of which the one towards Hβ shows a dark edge on the side of greater wave length. This dark edge appears to coincide with the line 4649.2 in Classes Oe 5 B, B, B 1 A, and B 2 A. A dark line at wave length 4059 appears to be the reversal of the bright line or band seen in Classes Oa, Ob, and Oc.

In addition to the above named lines, the dark lines 4089.2, 4096.9, 4116.2, and 4514.5 are also present. 4089.2 is slightly bright on the edge of greater wave length. 4096.9 is so near Hδ, wave length 4101.8, that it gives the hydrogen line the appearance of being double, or of having a bright central line

superposed on a broad dark line. By superposing this spectrum upon that of another star, it is easily seen that Hδ is not double. It then appears that Hδ of the superposed image matches the line of greater wave length in this spectrum, and the line 4096.9 is well separated from the hydrogen line. 4096.9 has not been seen in the preceding classes of spectra, and is strongest in spectra of this class, declining in intensity in succeeding classes until B 2 A is reached, when it is not present. The line 4514.5, which is dark in spectra of this class, is bright in Class Oc.

Class Oe 5 B.

Typical star, τ Canis Majoris, A. G. C. 9313.

All lines are dark. The bright bands 4633 and 4688 are not present. The spectrum resembles that of Class Oe in the intensities of the additional hydrogen lines, but is nearly like ε Orionis of Class B in the intensities of the helium lines. It thus appears to be intermediate between the spectra of stars showing the bright bands 4633 and 4688, and stars of the marked Orion type.

The hydrogen series is seen from Hμ to Hβ inclusive. Four lines of the additional hydrogen series are present, as in A. G. C. 9311 of Class Oe. The additional hydrogen line 3860.8 is suspected.

The lines due to helium which are present in Class Oe are also seen in this class of spectra, and several fainter lines, especially 3964.6 and 4009.5, are present, as in ε Orionis. The well marked dark line 4685.4 appears to be the reversal of a part at least of the bright band 4688. This line is seen only in this class, and in Classes B and B 1 A. The dark line 4649.2 is well marked. It appears at the extreme edge of greater wave length of the bright band 4633, present in Classes Oc, Od, and Oe. Lines 4089.2 and 4116.2 are more intense, while lines 4096.9 and 4514.5 are less intense than in Class Oe, thus showing an advance towards Class B. The calcium line K is sharply defined and more intense than in Class Oe or Class B.

Class B.

Typical star, ε Orionis, A. G. C. 6501.

All lines are dark. As seen with the dispersion of one prism, the spectrum differs from that of τ Canis Majoris of the preceding class, mainly in the diminished intensity of the additional hydrogen lines. An excellent plate, taken with three prisms, shows many fainter lines whose wave lengths and intensities are given in Table XXIII. This spectrum is specially characterized by the great

intensity of several of the Orion lines, some of them being so well marked that the hydrogen series is not readily detected at first glance, as may be done in all the following classes of Orion stars.

The lines of hydrogen are nearly 0.3 as intense as in the spectrum of α Canis Majoris. The system is seen from Ho to Hβ. Hξ is more intense than Hν, but Ho is very faint. The additional hydrogen lines 4200.7, 4542.4, and 5414 are present. The presence of 3924.0 is undetermined, owing to haziness of the image in that region, and 4026.0, if present, is superposed on the helium line 4026.4. Line 5414 as photographed on the isochromatic plate X 8119, is more intense than 4200.7 or 4542.4. This plate also shows a dark line of intensity 2, on the scale of the intensities in Table XXIII, and having greater wave length than 5414. This line has been photographed only in the spectra of ϵ, ζ, and δ Orionis. By superposing the spectrum of ϵ Orionis on X 8109, α Aurigæ, this Orion line falls upon the solar band 5587.0 to 5589.6. Its approximate wave length is therefore 5588.

A table of the helium lines seen in this spectrum is given on page 123 of this volume. It is noted that all helium lines whose intensity is greater than 1, between the wave lengths 3584 and 5045, are found in this spectrum with the exception of lines 3705.15 and 3888.78, which, if present, are superposed on the hydrogen lines Hξ, 3704.0, and Hζ, 3889.1, respectively. Their presence, therefore, could not be detected save by unusual intensity of those two hydrogen lines. The line Hξ is more intense than Hν, as has been stated above, but Hζ shows no unusual intensity. The lines 3819.2, 4026.4, and 4471.8, belonging to the first subordinate series of helium, are the most intense lines due to this gas.

The most characteristic dark lines in this spectrum are at wave lengths 4089.2, 4116.2, and 4649.2. These lines reach a maximum in spectra of this class, and are considerably fainter in spectra of Class B 1 A. 4649.2 is more intense than the helium line 4471.8; 4089.2 is as intense as the helium line 4026.4; and 4116.2 is 2.0 as intense as line 4120.5, or 4144.0. The line 4096.9 is fainter than in spectra of Class Oe 5 B. The triplet, 4069.4, 4072.0, and 4075.9, recently identified with oxygen, forms a conspicuous group near Hδ. The calcium line, K, is better defined than other faint lines. The calcium line, H, appears also to be present, although not distinctly separated from the adjacent hydrogen line, Hϵ. Spectra of faint stars which are photographed with one prism and do not show the less intense lines clearly, are recognized as belonging to this class by the presence of the well marked lines 4089.2, 4116.2, and 4649.2.

Class B 1 A.

Typical star, β Centauri, A. G. C. 19043.

All lines are dark. The number of faint lines is greater than in spectra of Class B, but none of the Orion lines have as great intensity with respect to the hydrogen lines as in that class. By the diminished intensity of lines 4089.2 and 4116.2, the region of Hδ has a slightly different aspect from the same region in spectra of Class B.

The hydrogen system includes Ho, as in Class B, and Hπ is faintly seen on a plate of long exposure. The additional lines of hydrogen are not seen in this or any following class of spectrum.

The lines of helium are more intense than in spectra of Class B. 4471.8 now exceeds 4649.2, and 4120.5 exceeds 4116.2, in intensity. 4120.5 and 4144.0 are equally intense. The helium line D_3, wave length 5875.9, is present, with an intensity 0.5 as great as Hβ, and is photographed on the isochromatic plate X 9199, exposure 62^m. This line is slightly bright on the edge of greater wave length. 4089.2, 4116.2, and 4649.2 are much less intense than in spectra of Class B. The calcium line, K, is faint. The calcium line, H, is not seen, and is perhaps concealed by the hydrogen line, Hϵ.

Class B 2 A.

Typical stars, γ Orionis, H. P. 979, and α Lupi, A. G. C. 19873.

These spectra differ from that of β Centauri of Class B 1 A principally in the greater intensity of the lines due to helium, in the diminished intensity of lines 4089.2 and 4649.2, and in the absence of line 4116.2.

The hydrogen lines are seen from Hξ to Hβ inclusive, and are about 0.4 as intense as in α Canis Majoris.

The lines due to helium and parhelium appear to reach their maximum intensity in spectra of this class. Those having the greatest intensities are at wave lengths 3819.2, 4009.5, 4026.4, 4144.0, 4387.8, 4471.8, and 4922.1, all of which belong to the first subordinate series of either helium or parhelium. The line 3964.6, of the principal series of parhelium, is well marked, as are also the lines of the second subordinate series of helium.

The characteristic lines of spectra of Classes B and B 1 A which are not due to helium are faint. 4089.2 and 4649.2 are about 0.5 as intense as in Class B 1 A, and 4116.2 is not seen. Among the fainter lines, 4267.4 and 4481.4 are noticeable. The line, K, is 2.0 as intense as in Class B 1 A.

Class B 3 A.

Typical star, α Pavonis, A. G. C. 27918.

A marked diminution in the number of Orion lines is noticed. Almost all of the fainter lines of the spectra of Class B 2 A have disappeared, and on plates taken with one prism, few dark lines are seen, except those due to hydrogen, or helium. The hydrogen lines are seen, from Hξ to Hβ inclusive, and are about 0.5 as intense as in α Canis Majoris.

The helium lines, while of about the same intensity as in spectra of Class B 2 A, are more prominent in this spectrum, on account of the faintness, or absence of many other lines. 4649.2 is extremely faint, and is not seen on plates taken with one prism. 4089.2 is not present. 4128.5, 4131.4, and 4481.4 are more intense than in spectra of Class B 2 A. 3926.8 is more intense than the line K.

Class B 5 A.

Typical star, ϕ Velorum, A. G. C. 13593.

The spectrum shows a decided advance towards spectra of Class A, in the increased intensity of the four lines, K, 4128.5, 4131.4, and 4481.4.

The lines of hydrogen are 0.6 as intense as in α Canis Majoris, and are seen from Hπ to Hβ, inclusive.

The lines of helium are the same as in spectra of Class B 3 A, but they are less intense.

Almost all the fainter lines characteristic of the spectra of Classes B, B 1 A, and B 2 A, are absent. It is interesting to note that, of the three intense lines 4089.2, 4116.2, and 4649.2, characteristic of Class B, 4116.2 disappears in Class B 2 A, 4089.2 in Class B 3 A, and 4649.2 in Class B 5 A. They all become very faint in the class preceding the one in which they are invisible.

The line K is more intense than the helium line 3926.8. 4481.4 is 0.7 as intense as the helium line 4471.8.

The double line, 4128.5 and 4131.4, is intermediate in intensity between that of the two helium lines 4120.5 and 4144.0. In stars of this class in which the lines are broad, the line K is fainter than in the typical star.

Class B 8 A.

Typical star, γ Gruis, A. G. C. 29935.

Several of the solar lines visible in stars of Class A are first seen in spectra of Class B 8 A. The lines of hydrogen are 0.8 as intense as in α Canis Majoris, and

are seen from Hκ to Hβ, inclusive. The hydrogen lines show haziness as in stars of Class A. Twelve Orion lines are certainly seen, eight of which are due to helium. All of these are faint, except 4026.4 and 4471.8. 4922.1, which is barely seen in the typical star, is more intense in several stars of this class. The combined intensity of the helium lines is much less than in Class B 5 A.

The line K is less intense than 4026.4. The adjacent lines, 4128.5 and 4131.4, when taken together, are more intense than 4144.0; when seen separately, each line is about as intense as 4144.0.

4481.4 in the typical star, is slightly more intense than 4471.8. In general, in stars of this class, these two lines are approximately equal, although in a few cases the helium line 4471.8 is a little more intense than the line 4481.4. The solar line 4233.6 is present, and 4173.6, 4179.5, 4383.7, and 4385.2 are faintly seen. The presence of these characteristic solar lines is interesting in establishing the connection between this class of spectra and those of the Sirian type, from whence the sequence can be traced as far as, and including, Class Mb.

Class B 9 A.

Typical star, λ Centauri, A. G. C. 15848.

The spectrum resembles that of α Canis Majoris, Class A, except that the helium lines 4026.4 and 4471.8 are present on plates of all dispersions. The hydrogen lines are 0.9 as intense as in α Canis Majoris.

The helium lines 4026.4 and 4471.8 are fairly well marked. The line 4026.4 is about 0.5 as intense as the line K; 4471.8 is about 0.5 as intense as 4481.4. It may be noted that of the two helium lines 4026.4 and 4471.8, which thus remain visible in the last Class of Orion stars, 4471.8 is also the first to be seen in this series, being present and bright in Class Oc. A bright band also appears to coincide with the helium line 4471.8 in Class Oa. The presence of 4026.4 is undetermined in the spectra of the bright line stars, owing to its proximity to the additional hydrogen line 4026.0.

Class A.

Typical star, α Canis Majoris, A. G. C. 8348.

This class of spectrum is characterized by the great intensity of the hydrogen lines. They are seen from Ho to Hβ inclusive, and attain their maximum intensity in this and the following Class, A 2 F. Their intensity, as compared with the solar lines, attains a maximum in Class A. No lines due to helium are seen in the typical star.

The line K is about 0.1 as intense as Hδ, but varies in different stars from 0.1 to 0.2 of the intensity of Hδ. On plates taken with three prisms, the calcium line H is separated from the hydrogen line Hϵ, and is nearly as intense as the line K. Excepting the hydrogen lines and the line K, 4481.4 is the most intense line present. On plate X 7946 taken with three prisms, 88 solar lines are measured between Hθ and Hβ, and 5 of greater wave length than Hβ, making a total of 93 solar lines. The solar lines 4128.5, 4131.4, 4173.6, 4179.5, 4233.6, 4383.7, and 4385.2 are the most conspicuous, but no one of them is more than 0.2 as intense as the line K.

Class A 2 F.

Typical star, ι Centauri, A. G. C. 18149.

The spectrum is like that of α Canis Majoris, except that the line K is more intense, and the solar lines are more numerous and more intense. The lines of hydrogen are as intense as in α Canis Majoris.

In the typical star, the line K is about 0.4 as intense as Hδ, but in different stars of the class it varies from 0.3 to 0.5 of the intensity of Hδ. The calcium line H is not seen apart from Hϵ in any star of this class except α Cygni. The lines in that star are very narrow, and on plates taken with two prisms, H and Hϵ are well separated. The hydrogen line, Hϵ, however, in all the stars of this class, is 0.3 or 0.4 more intense than lines Hδ, Hγ, or Hβ. This is doubtless due to the presence of the calcium component. No helium lines are seen in this or any following class of stars. The solar lines are distinctly seen even on plates taken with one prism. 4481.4 is still the most conspicuous solar line, and is often sharply defined when all the other solar lines are indistinct. 4227.0, which is about 2.0 as intense as in Class A, and 4233.6 make a nearly equal pair.

Class A 3 F.

Typical star, τ^3 Eridani, A. G. C. 3284.

The spectrum resembles that of Class A 2 F, except that the line K is more intense, and the solar lines are more numerous and more intense.

The lines of hydrogen are nearly if not quite as intense as in α Canis Majoris.

The line K is more than 0.5 as intense as the compound line H and Hϵ, but in no star of this class does the line K equal this compound line. The line K is also 0.8 or 0.9 as intense as Hδ, but never exceeds Hδ in intensity.

The calcium line H is not separated from the hydrogen line Hϵ, but this compound line is fully 1.5 as intense as Hδ, Hγ, or Hβ.

The solar lines are more prominent than in Class A 2 F. 4227.0 and 4233.6 are often as intense as 4481.4.

The divisions between successive classes of spectra are perhaps more difficult to define in the classes ranging from A to F than in any others. The steady increase in intensity of the line K and the solar lines, together with an equally steady decrease in the intensity of the hydrogen lines, constitute all the changes observed except in a few peculiar stars. It is thus manifest that all subdivisions must be necessarily arbitrary, and that in each class, spectra will be found which vary slightly from that of the typical star.

Class A 5 F.

Typical star, α Pictoris, A. G. C. 8570.

The lines of hydrogen, seen from Hι to Hβ inclusive, are fainter than in α Canis Majoris, and are estimated as about 0.7 as intense as in stars of Class A.

The line K is 0.9 as intense as the compound line H and Hϵ, and has been estimated in various stars of this class to be from 1.1 to 1.5 as intense as Hδ.

The solar lines resemble those of α Carinæ, Class F, although the fainter lines of α Carinæ are not seen in this spectrum.

4481.4 is no longer conspicuous among the solar lines, many others being equally intense. The lines 4299.2, 4300.8, and 4302.6 are more intense than in Class A 3 F, but the lines 4305.8, 4308.0, and 4309.5, of the band G are not distinctly seen. 4326.0 is very faint. All the lines in this spectrum are somewhat hazy, and no star in this class has very sharp lines.

Class F.

Typical star, α Carinæ, A. G. C. 7843.

This spectrum is intermediate between Secchi's first and second types.

The lines of hydrogen are 0.5 as intense as in α Canis Majoris. The ultra violet portion of the spectrum is photographed with unusual clearness. Nineteen hydrogen lines are seen from Hυ to Hβ inclusive. Hυ is very faint, and the lines Hτ and Hξ appear double. The line K is equal in intensity to the compound line H and Hϵ, and nearly 3.0 as intense as Hδ.

There is no appearance of continuity in the band G. 4305.8, 4308.0, 4309.5, and 4313.0 are distinctly seen on plates taken with three prisms, but they are so faint that they do not form a continuous band between the well marked lines 4302.6 and 4315.2, as they do in the solar spectrum.

On X 8114, an isochromatic plate, taken with three prisms, 326 solar lines have been measured, 74 of which have greater wave length than Hβ.

Many of these lines are faint, and none of them has an intensity of more than 0.3 or 0.4 that of Hδ. Several bright bands of short wave length are seen, the most marked being nearly midway between Hζ and K and about as wide as Hζ. Fainter bands appear between Hη and Hζ, and between K and Hϵ.

The solar line 3727.5, between Hμ and Hλ, is well marked. Another well marked line at about 3714 is seen.

Class F 2 G.

Typical star, π Sagittarii, A. G. C. 26225.

This spectrum resembles that of α Carinæ, except that the lines 4308.0 and 4309.5 are more intense and are seen even on spectra photographed with one prism, when together they appear 0.7 as intense as 4315.2. The increased intensity of the two lines, 4308.0 and 4309.5, gives a slight appearance of continuity to the band G, although less marked than in spectra of Class F 5 G, while the hydrogen lines are as intense as in α Carinæ of Class F.

Class F 5 G.

Typical stars, α Canis Minoris, H. P. 1442, and ρ Puppis, A. G. C. 10763.

These spectra have many points of resemblance to that of the Sun, but the hydrogen lines are 2.0 or 3.0 as intense as in the solar spectrum, and the solar lines are fainter and less numerous.

The hydrogen lines are about 0.4 as intense as in the spectrum of α Canis Majoris. The line Hϵ is united with the wide band H of calcium. The line K is 1.1 as intense as the compound line H and Hϵ.

4326.0, although distinctly visible even on plates taken with one prism, is not more than 0.1 as intense as Hγ. 4227.0 is 0.8 as intense as in the spectrum of α Aurigae of Class G, and 3.0 as intense as in the spectrum of α Carinæ of Class F. On plates taken with one prism, the band G appears to be nearly continuous from 4299.2 to 4315.2. On plates taken with three prisms, the band G consists of four well marked lines, 4299.2 to 4300.8, 4302.6, 4308.0 to 4309.5, and 4315.2, with 4305.8 and 4313.0 very indistinctly seen. The double line 4308.0 and 4309.5, which increases steadily in intensity from the spectra of Class F to those of Class Ma, is more intense in the spectrum of α Canis Minoris than 4315.2, and nearly as intense as the double line 4299.2, and 4300.8.

Class F 8 G.

Typical star, α Fornacis, A. G. C. 3462.

The spectrum resembles that of α Aurigæ as far as a comparison can be made with plates taken with two prisms, except that the lines of hydrogen are nearly 2.0 as intense as in the spectrum of α Aurigæ.

Class G.

Typical star, α Aurigæ, H. P. 932.

The spectrum closely resembles that of the Sun. The hydrogen lines are 0.2 as intense as in the spectrum of α Canis Majoris. The line Hγ is 1.5 as intense as 4326.0. When separated from the adjacent line, 4337.6, Hγ is fully 3.0 as intense as that line. The lines 4076.8 to 4077.9, Hδ, and 4227.0, are about equally intense. The lines H and K of calcium, and the band G, are the most conspicuous features of the spectrum. The line K in this spectrum is 2.0 as intense as Hδ in the spectrum of α Canis Majoris. The band G is continuous on plates taken with one or two prisms, but with greater dispersion, spaces are seen between 4302.6 and 4305.8, and between 4305.8 and 4308.0.

An isochromatic plate, X 8109, shows the region of greater wave length, as far as the D lines. The wave lengths and intensities of the lines from Hβ to the D lines agree closely with those in the solar spectrum, and thus confirm the general resemblance of this spectrum to that of the Sun.

Class G 5 K.

Typical star, α Reticuli, A. G. C. 4812.

This spectrum differs from that of α Aurigæ in the diminished intensity of the hydrogen lines, and in the absorption of light towards the end of shorter wave length. The line Hγ when combined with line 4337.6 is equal in intensity to 4326.0; when separated from 4337.6, Hγ is about 0.9 as intense as 4326.0.

The region of shorter wave length than Hδ is fainter than in α Aurigæ, and the region of shorter wave length than the line K is barely seen on plates having a normal exposure. On plates taken with one prism, some spaces between dark lines are brighter than others, and at least two wide bands brighter than the adjacent portions of the spectrum are noticed extending from about wave lengths 4470 to 4525, and from 4614 to 4648. The space between lines 4077.9 and Hδ also appears like a bright band.

Class K.

Typical stars, α Phœnicis, A. G. C. 355, and ϵ Scorpii, A. G. C. 22731.

These spectra are intermediate between Secchi's second and third types.

The lines of hydrogen are not more than 0.08 as intense as in the spectrum of α Canis Majoris. The line Hγ is less than 0.5 as intense as 4326.0. The line K attains its maximum intensity in the spectra of this and the two following classes. It is 1.2, or 1.3, as intense as the compound line H and Hϵ. It is also 3.0, or 4.0, as intense as Hδ in the spectrum of α Canis Majoris. 4227.0 is 0.3 as intense as Hδ in the spectrum of α Canis Majoris, but not more than 0.5 as intense as the same line in the spectrum of α Tauri of Class K 5 M. The band G is continuous as in the spectrum of α Aurigæ. The two bright bands 4470 to 4525, and 4614 to 4648 are more intense than in spectra of Class G 5 K, and are bright enough to be seen on plates taken with two or three prisms. The portion of the spectrum from the line K to band G is fainter than the portion of greater wave length except the spaces between 4077.9 and Hδ, and between 4215.7 and 4227.0, which appear like bright bands.

The numerous stars of this class show no peculiarities or variations from the typical stars, except in the amount of absorption of light in the region extending from the line K to the band G, and in the relative brightness of the bands 4470 to 4525, and 4614 to 4648. These effects were found to vary so much in different photographs of the same star taken under different conditions, that they have been assumed to be photographic effects, rather than real.

Class K 2 M.

Typical star, υ Libræ, A. G. C. 21146.

This spectrum resembles that of α Tauri, Class K 5 M, in the intensities of the solar lines, and in the faintness of the image towards the end of shorter wave length. The band G, however, is still continuous, as in the spectra of Class K, and no traces of the sudden breaks in light at wave lengths 4762 and 4954 are seen. 4227.0 is 0.7 as intense as in the spectrum of α Tauri.

Class K 5 M.

Typical star, α Tauri, H. P. 797.

The spectrum shows a decided resemblance to stars of the well marked third type. The lines of hydrogen are about 0.05 as intense as in α Canis Majoris, and are inconspicuous among the numerous solar lines. Owing to the red color of this

star, the spectrum in the region of shorter wave length than the line K is too faint to appear on the photographs. The bands K and H, and the line 4227.0, are the most conspicuous characteristics of the spectrum. The bands K and H are of the same width and intensity as in α Phœnicis, and 4227.0 is fully 0.6 as intense as Hδ in α Canis Majoris.

The band G is not continuous. On plates taken with one prism, a wide central line is seen, which comprises lines 4305.8, 4308.0, and 4309.5. The lines 4314.3 and 4315.2, seen as one, are almost entirely disconnected on the side of greater wave length. The lines 4299.2 and 4300.8, also seen together, are disconnected on the side of shorter wave length. On plates taken with three prisms, the band G is resolved into lines, and no part of it is as conspicuous as 4227.0. The lines 4383.7 to 4385.2, and 4405.0 to 4408.5 form a conspicuous pair on plates of all dispersions. 4405.0, when separated from 4408.5, is about 0.7 as intense as lines 4383.7 to 4385.2. The absorption bands, whose edges are at wave lengths 4762, 4954, and 5168, are present and, although faint, are clearly seen on plates taken with one prism. There is also a sudden diminution in intensity at Hβ, which is nearly as conspicuous as the similar changes at 4762 and 4954. Between the bright bands 4470 to 4525, and 4614 to 4648, a third but fainter bright band having the wave length 4556 to 4586 is present.

Class Ma.

Typical star, γ Hydri, A. G. C. 4353.

The spectrum is banded, and belongs to Secchi's third type. The two bands, faintly seen in the spectra of Class K 5 M, extending from 4762 to 4954, and from 4954 to 5168, are now well marked. The edges 4762, 4954, and 5168, are brighter than the adjacent continuous spectrum, and the change in intensity from these edges towards the end of greater wave length is abrupt. The diminution in light at Hβ is now much less conspicuous than the similar changes at 4762 and 4954. The bright band 4556 to 4586 is more conspicuous than in the spectrum of α Tauri, and nearly as intense as band 4470 to 4525. The space between 4657.0 and 4668.0 is bright. The lines of hydrogen are of about the same intensity as in the spectrum of α Tauri. 4227.0 is 1.2 as intense as in the spectrum of α Tauri. The part of the spectrum of shorter wave length than 4307 is faint, except between the line 4077.9 and Hδ, and the bands K and H are barely seen on plates having a normal exposure. The lines that formed the band G in classes G to K are now well separated. 4315.2 is very faint.

Class Mb.

Typical star, γ Crucis, A. G. C. 17048.

The edges of four absorption bands at wave lengths 4762, 4954, 5168, and 5445, are distinctly bright, and the abrupt change in light from these edges towards the end of greater wave length of the spectrum is more marked than in Class Ma. The bands fade gradually in light from these edges towards the end of shorter wave length. Numerous bands brighter than adjacent portions of the spectrum are present. Two of these bands are very conspicuous. One extends from 4556 to 4586, as in Class Ma, but is more intense than in that class. The other extends from 4614 to 4626, being narrower, with more sharply defined edges than in classes K 5 M and Ma. These two bands are of equal intensity in Class Mb. Band 4470 to 4525 is fainter than in Class Ma, and generally does not have the appearance of a distinct band. The space between lines 4657.0 and 4668.0 forms a narrow bright band which is as intense as band 4614 to 4626.

The lines of hydrogen are even fainter than in Class Ma, and are not more than 0.03 or 0.04 as intense as in the spectrum of α Canis Majoris. Line 4227.0 reaches its greatest intensity in spectra of this class, and is as intense as Hδ in the spectrum of α Canis Majoris. 4299.2 and 4300.8, and the compound lines 4305.8, 4308.0, and 4309.5, are the only conspicuous lines remaining of the band G. On the isochromatic plate, X 9180, three absorption bands are seen at the extreme end of greater wave length. The edges of these bands are at 5763, 5816, and 5857, approximately. These edges are less intense than those at 4762, 4954, 5168, and 5445.

CHAPTER XII.

Classification of Spectra.

Table XVI gives the classification of 1122 stars by means of their photographic spectra, arranged in the order of classes as described in Chapter X. The first column contains the letter, or letters, designating the class of spectrum, according to the notation explained in the outline of this classification. The first star following the designation of the class, is considered a typical star, or the first two stars in cases where two typical stars have been used. A detailed description of each typical spectrum is to be found in Chapter XI. The letters Pec., placed after the designation of a class, indicate that the spectrum differs essentially from that of the typical star. The peculiarities are then described in the remarks following the table. The letters Comp. are added after the name of the class of spectrum to signify that the spectrum is composite. When the name of the class is printed in Italics, as in classes B 1 A, B 2 A, B 3 A, B 5 A, and B 8 A, it indicates the presence of one or more bright hydrogen lines.

In the general arrangement of the stars of each class, the aim has been to place first the best examples of spectra similar to that of the typical star. Fainter stars, whose spectra cannot be compared so minutely with the typical spectrum, but which show the same general characteristics, are placed towards the end of each class. For convenience of reference, groups of stars showing similar peculiarities are arranged together. Stars marked Pec., Comp., and those of the Orion type having bright hydrogen lines, are placed at the end of each class in which they occur.

The second column gives the number of each star in the Argentine General Catalogue, if the star is contained in that catalogue. Otherwise, except in five cases, the number of the star in the Harvard Photometry is used, and the letters H. P. are then placed before the number. Five stars, whose spectra were photographed, are not contained in either of the catalogues named above. Three of these stars are in the Durchmusterung, and are indicated by the zone and number in that catalogue. The other two are in the Cordoba Zone Catalogue, and are indicated by the hour and number of the star in that catalogue. The numbers

in the second column are italicized when the star is double and the fainter spectrum is not classified, or, when two spectra are superposed, only one being classified, while the lines of the other are referred to in the remarks.

The third and fourth columns give the constellation and designation.

The fifth column gives a number, which refers to the remarks on individual spectra, following the table. In the remarks, the name or catalogue number of each star is repeated after the number of the remark, except in cases where the remark is general and applies to more than one star.

The sixth column gives the greatest number of prisms with which each spectrum has been photographed.

TABLE XVI.

CLASSIFICATION OF SPECTRA.

Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.	Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.
P	14204	Hydra	—	1	1	B	6501	Orion	ϵ	—	3
Q	14720	Carina	η	2	1	"	10268	Puppis	P	—	1
"	14965	Carina	—	3	1	"	12035	Vela	f	—	2
"	14971	Carina	—	4	1	"	6614	Orion	ζ	18, 19	3
Oa	15305	Carina	—	—	1	"	6401	Orion	δ	18, 19	3
"	22827	Scorpius	—	—	2	"	24850	Sagittarius	—	—	1
"	−21°4864	Sagittarius	—	—	1	"	22626	Ara	—	20	2
"	10^h 2684	Carina	—	—	1	"	21685	Scorpius	δ	18, 21	2
"	8^h 4141	Vela	—	—	1	"	22451	Scorpius	τ	22	2
" Pec.	10863	Vela	γ	5	2	"	14667	Carina	θ	23	2
" Pec.	*17840*	Musca	θ	6	1	"	14489	Carina	—	24	1
Ob	8631	Canis Major	—	7	1	"	*14483*	Carina	—	24, 230	1
Oc	22763	Scorpius	—	—	2	"	6481	Orion	—	25	1
"	14691	Carina	—	8	1	"	6482	Orion	—	25	1
" Pec.	14684	Carina	—	9	1	"	15175	Carina	—	—	1
" Pec.	14626	Carina	—	10	1	"	22814	Scorpius	—	26, 27	2
Od	10691	Puppis	ζ	11	2	"	*22824*	Scorpius	—	28	1
Oe	9311	Canis Major	—	—	1	"	22845	Scorpius	—	29	1
"	22748	Scorpius	—	12	2	"	14698	Carina	—	27	1
"	22843	Scorpius	—	13	2	B 1 A	19043	Centaurus	β	—	3
Oe 5 B	9313	Canis Major	τ	—	1	"	22158	Scorpius	σ	30	2
"	20649	Circinus	δ	—	1	"	17411	Crux	β	30, 31	2
"	20695	Circinus	—	—	1	"	7989	Canis Major	ξ^1	—	1
"	17572	Crux	—	14	1	"	18559	Centaurus	ϵ	—	2
"	6486	Orion	ι	15	1	"	*16942*	Crux	α^1	18, 32	2
"	6478	Orion	θ^1	16	1	"	23515	Ara	γ	18, 33	2
"	14811	Carina	—	17	1	"	10392	Puppis	J	18, 34	1

Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.	Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.
B 1 A	7467	Pictor	δ	18	1	B 3 A	25105	Telescopium	α	—	2
"	*21805*	Scorpius	β	35	1	"	10507	Carina	χ	—	2
"	24854	Sagittarius	—	—	1	"	23698	Scorpius	υ	—	3
"	14903	Carina	—	—	1	"	20806	Lupus	ϵ	—	2
"	8602	Canis Major	—	—	1	"	23500	Ophiuchus	θ	—	2
"	16704	Crux	—	29	1	"	19107	Centaurus	χ	—	1
"	6542	Orion	—	—	1	"	21095	Lupus	d	—	1
"	6533	Orion	—	36	1	"	17826	Centaurus	ξ^2	—	1
"	6484	Orion	θ^2	37	1	"	18968	Centaurus	υ^1	—	1
"	—5° 1320	Orion	—	37	1	"	27344	Sagittarius	θ^1	—	1
"	6469	Orion	—	38	1	"	16778	Crux	ζ	—	1
"	6471	Orion	—	38	1	"	10350	Puppis	b	—	1
"	20640	Circinus	—	—	1	"	9338	Puppis	v^2	—	2
"	24574	Ara	θ	39, 40	2	"	7064	Columba	γ	—	1
"	8752	Canis Major	ϵ	39, 40	2	"	22347	Scorpius	N	—	1
" Pec.	10534	Puppis	V	41	2	"	20514	Lupus	λ	—	1
" Pec.	23098	Scorpius	k	42	1	"	10188	Puppis	—	—	1
" Pec.	22297	Norma	—	42	1	"	H.P. 845	Orion	π^4	—	1
B 1 A Pec.	22812	Scorpius	ζ^1	40, 43	2	"	16652	Centaurus	ρ	—	1
B 2 A	H.P. 979	Orion	γ	—	3	"	5106	Cælum	δ	—	1
"	19873	Lupus	α	—	2	"	14829	Chamæleon	δ^2	—	1
"	11806	Pyxis	α	—	2	"	21084	Lupus	γ	18	2
"	22778	Scorpius	μ^2	—	3	"	25874	Sagittarius	σ	18	3
"	18772	Centaurus	ν	—	2	"	*21653*	Lupus	η	18, 51	2
"	11790	Carina	d	—	1	"	17374	Musca	β	18	2
"	23966	Scorpius	κ	18	2	"	19354	Lupus	ι	18	2
"	23778	Scorpius	λ	18	3	"	20825	Lupus	ϕ^2	18	2
"	18262	Virgo	α	18	1	"	16726	Crux	δ	18	2
"	25692	Pavo	λ	18	1	"	21186	Libra	τ	—	2
"	20779	Lupus	δ	18	2	"	*11760*	Vela	o	52	2
"	11248	Vela	B	18	1	"	17541	Crux	μ	53	1
"	21841	Scorpius	ω^1	—	1	"	21469	Scorpius	b	—	2
"	19661	Lupus	σ	—	1	"	21521	Scorpius	A	—	2
"	10269	Puppis	—	—	1	"	16976	Centaurus	σ	—	1
"	10211	Puppis	—	—	1	"	21810	Lupus	θ	—	1
"	7697	Columba	—	—	1	"	20591	Lupus	e	—	1
" Pec.	20263	Lupus	β	44	2	"	19514	Lupus	τ^1	54	1
" Pec.	18897	Centaurus	ζ	45	2	"	10678	Carina	D	—	1
" Pec.	21638	Scorpius	π	46	2	"	12557	Carina	i	—	1
B 2 A	18773	Centaurus	μ	47	2	"	11956	Carina	f	—	1
"	8518	Canis Major	κ	18, 48	2	"	19890	Centaurus	b	—	1
"	10182	Puppis	o	18, 49	2	"	21592	Scorpius	ρ	55	1
B 3 A	27918	Pavo	α	—	3	"	16479	Crux	θ^2	—	1
"	7681	Canis Major	ζ	—	2	"	*12221*	Carina	b^1	56	2
"	17156	Musca	α	—	2	"	16946	Centaurus	G	57, 58	1
"	12535	Carina	a	—	2	"	9060	Puppis	A	58	1
"	12788	Vela	κ	—	2	"	17540	Crux	λ	59	2
"	20286	Centaurus	κ	50	2	"	17811	Centaurus	f	60	1
"	10390	Puppis	—	50	2	"	11622	Carina	e^1	61	1
"	18960	Centaurus	ϕ	—	2	"	17390	Crux	—	—	1

Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.
B 3 A	9881	Puppis	—	62	1
"	25565	Sagittarius	—	—	1
"	10331	Puppis	—	—	1
"	11797	Vela	—	—	2
"	13964	Carina	—	—	1
"	22613	Ara	—	—	2
"	15152	Carina	—	—	1
"	15204	Carina	—	—	1
"	20463	Lupus	—	—	1
"	10558	Puppis	—	—	1
"	10055	Puppis	—	—	2
"	9276	Puppis	—	—	2
"	12149	Carina	—	—	2
"	12370	Vela	—	—	1
"	12593	Vela	z	—	1
"	10779	Carina	—	—	1
"	9165	Canis Major	—	—	1
"	8671	Canis Major	—	—	1
"	9123	Canis Major	—	—	1
"	9121	Canis Major	—	—	1
"	9168	Canis Major	—	—	1
"	9374	Canis Major	—	—	1
"	13077	Vela	—	—	1
"	10861	Vela	—	63	2
"	14902	Carina	—	—	1
"	15377	Carina	—	—	1
"	10873	Vela	—	—	2
"	14653	Carina	—	—	1
"	14692	Carina	—	—	1
"	14702	Carina	—	—	1
"	14583	Carina	—	—	1
"	7914	Canis Major	—	—	1
"	24156	Sagittarius	—	—	1
"	10109	Puppis	—	—	1
"	8815	Canis Major	—	—	1
"	12298	Vela	—	—	1
"	11194	Puppis	—	—	1
"	15862	Centaurus	—	—	1
"	14571	Vela	—	29, 58	1
"	*8017*	Canis Major	—	—	1
"	10646	Puppis	—	—	1
"	14536	Carina	—	—	1
"	10693	Puppis	—	—	1
"	20450	Lupus	—	—	1
"	10920	Vela	—	—	1
"	10856	Vela	—	—	1
"	10781	Vela	—	—	1
"	18135	Musca	—	—	1
"	18819	Centaurus	—	—	1
"	9334	Canis Major	—	64	1
B 3 A	10568	Puppis	—	65	1
"	10566	Puppis	—	65	1
"	*10973*	Puppis	—	66	1
"	*10986*	Vela	—	220	1
"	*24839*	Sagittarius	—	67	1
"	9031	Canis Major	—	68	1
"	9621	Puppis	—	68	1
"	9940	Puppis	—	68	1
"	10145	Puppis	—	68	1
"	10613	Carina	—	—	1
"	10953	Vela	—	—	1
"	10989	Vela	—	—	1
"	14623	Carina	—	68	1
"	8742	Canis Major	—	68	1
"	10430	Puppis	—	29	1
"	10387	Puppis	—	29	1
"	9902	Puppis	—	69	1
"	14663	Carina	—	58	1
"	18172	Centaurus	—	70	1
"	6616	Orion	—	—	1
"	8520	Canis Major	—	29	1
"	6483	Orion	c	68	1
"	6512	Orion	—	68	1
"	6535	Orion	—	68	1
"	6503	Orion	—	68	1
"	11024	Vela	—	71	1
" Pec.	14656	Carina	—	40, 72	1
" Pec.	22761	Scorpius	μ^1	73	3
B 3 A	16572	Centaurus	δ	18, 74	2
"	23694	Ara	α	18, 75	2
"	9198	Canis Major	ω	76	2
"	9326	Puppis	ν^1	18, 77	2
"	10963	Puppis	r	78	1
"	12465	Carina	E	18, 79	2
"	17717	Musca	—	18, 80	2
"	19273	Centaurus	—	18, 81	1
"	17542	Crux	—	53	1
"	18859	Centaurus	—	81	1
"	8991	Canis Major	—	82	1
B 3 A Comp.	19737	Centaurus	η	83	2
B 5 A	13593	Vela	ϕ	—	2
"	25255	Telescopium	δ^2	—	2
"	13112	Carina	h	—	1
"	19358	Centaurus	v	—	1
"	6972	Dorado	ϵ	—	1
"	2556	Eridanus	κ	84	1
"	902	Sculptor	α	—	1
"	1594	Eridanus	α	18, 85	3
"	17072	Musca	γ	18	2
"	19785	Lupus	ρ	18	1

Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.	Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.
B 5 A	16766	Chamæleon	β	18	1	B 5 A	12809	Vela	—	—	1
"	16151	Centaurus	j	18	1	"	25886	Corona Aust.	—	—	1
"	15539	Centaurus	π	18	1	"	11917	Vela	—	91	1
"	*18855*	Centaurus	h	223	1	"	*16566*	Centaurus	—	92	2
"	*18833*	Centaurus	k	224	1	"	6182	Columba	—	93	1
"	20109	Lupus	o	—	1	"	12723	Vela	—	29	1
"	7904	Canis Major	λ	—	1	"	10053	Puppis	—	68	1
"	6937	Columba	λ	—	1	"	7321	Columba	—	57	1
"	20428	Lupus	π	—	1	"	16329	Crux	—	—	1
"	32389	Sculptor	ζ	—	1	"	6487	Orion	—	68	1
"	4101	Fornax	δ	—	1	"	19445	Centaurus	a	94	1
"	32130	Phœnix	σ	—	1	" Pec.	29598	Capricornus	ϵ	95	1
"	21274	Lupus	ψ^2	—	1	" Pec.	8873	Canis Major	o^2	40, 96	2
"	4336	Eridanus	τ^8	—	1	" Pec.	9476	Canis Major	η	40, 96	2
"	30241	Grus	α	18, 86	3	*B 5 A*	6633	Columba	α	18, 97	2
"	H.P. 618	Taurus	η	86	2	"	14392	Carina	p	18, 98	2
"	H.P. 615	Taurus	—	86	2	" Pec.	14145	Vela	J	99	1
"	H.P. 610	Taurus	q	86	2	" Pec.	20878	Apus	κ^1	100	1
"	H.P. 613	Taurus	—	86	2	" Pec.	9181	Canis Major	—	101	2
"	H.P. 608	Taurus	—	86	2	B 5 A Comp.	20785	Circinus	γ	102	1
"	*22246*	Norma	ϵ	87	1	B 8 A	29935	Grus	γ	—	2
"	18174	Centaurus	J	70	1	"	25614	Sagittarius	ϕ	—	2
"	*10923*	Volans	ϵ	88, 89	1	"	25243	Telescopium	δ^1	—	2
"	9935	Puppis	d^3	—	1	"	*26485*	Sagittarius	β^1	103	2
"	12180	Vela	H	—	1	"	26527	Sagittarius	α	—	2
"	20909	Lupus	—	—	2	"	12175	Carina	c	—	2
"	22147	Norma	—	—	1	"	25153	Pavo	ν	—	1
"	14846	Carina	—	—	1	"	*20713*	Lupus	μ	226	1
"	9287	Canis Major	—	—	1	"	23636	Ara	δ	18	2
"	10510	Puppis	—	—	1	"	2339	Eridanus	ϕ	18	2
"	21728	Lupus	—	—	1	"	14008	Carina	ω	18	2
"	26198	Corona Aust.	—	—	1	"	H.P. 1797	Leo	α	18	1
"	14775	Carina	—	—	1	"	8181	Puppis	ν	18, 104	2
"	12638	Carina	—	—	2	"	H.P. 625	Taurus	—	105	2
"	14764	Carina	—	68	1	"	30889	Piscis Aust.	ϵ	—	1
"	11786	Vela	—	—	1	"	15950	Hydra	o	—	1
"	12297	Vela	—	—	1	"	19577	Hydra	l	—	1
"	10999	Puppis	—	—	1	"	9850	Puppis	f	—	1
"	11424	Vela	A	—	1	"	15183	Hydra	χ^2	106	1
"	14664	Carina	—	—	1	"	17234	Centaurus	l	107	1
"	11733	Vela	—	68	2	"	4242	Eridanus	f	108	1
"	11751	Vela	—	—	2	"	*1069*	Phœnix	ζ	218	1
"	18929	Centaurus	—	57	1	"	15825	Centaurus	A	—	1
"	11817	Vela	—	—	2	"	3897	Eridanus	τ^5	—	1
"	14788	Carina	—	—	1	"	9880	Puppis	k	62	1
"	16939	Crux	—	90	1	"	21078	Apus	κ^2	—	1
"	12759	Carina	—	89	1	"	20731	Lupus	—	—	2
"	14730	Chamæleon	—	89	1	"	9244	Puppis	—	—	1
"	12515	Vela	—	—	2	"	21360	Lupus	—	—	1
"	20670	Lupus	—	—	1	"	25020	Sagittarius	—	—	1

Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.
B 8 A	30057	Indus	—	—	1
"	24169	Scorpius	—	—	1
"	10088	Puppis	—	—	1
"	17489	Centaurus	—	—	1
"	24630	Ara	—	106	1
"	17936	Centaurus	—	—	1
"	17989	Musca	η	—	1
"	23522	Scorpius	—	—	1
"	16959	Crux	—	—	1
"	17270	Crux	—	—	1
"	25895	Sagittarius	—	—	1
"	7164	Columba	—	—	1
"	7672	Columba	—	—	1
"	23656	Ara	—	—	1
"	14573	Vela	—	—	1
"	14417	Carina	—	—	1
"	15318	Carina	—	—	1
"	13453	Vela	—	109	1
"	16080	Centaurus	—	57	1
"	25182	Sagittarius	—	—	1
"	23472	Ara	—	—	1
"	9978	Puppis	—	—	1
"	9900	Puppis	—	69	1
"	10565	Carina	—	68	1
"	14349	Vela	—	110	1
"	14769	Carina	—	68	1
"	8109	Canis Major	—	68	1
"	30762	Piscis Aust.	—	68	1
"	28539	Capricornus	—	68	1
"	19271	Apus	—	68	1
"	10897	Carina	—	111	1
"	13417	Vela	u	111	1
"	4225	Eridanus	—	111	1
"	26229	Sagittarius	—	111	1
"	10639	Carina	—	111	1
" Pec.	6004	Orion	β	40, 112	3
" Pec.	24812	Sagittarius	μ	40, 113	2
B 8 A	+23°558	Taurus	—	105	2
B 9 A	15848	Centaurus	λ	—	2
"	28259	Pavo	υ	—	2
"	4821	Eridanus	X	114	2
"	31859	Sculptor	β	—	1
"	21454	Lupus	χ	—	1
"	11293	Volans	κ^1	115	1
"	*2693*	Fornax	ω	116	1
"	2887	Hydrus	ϵ	—	1
"	16217	Hydra	β	—	1
"	16382	Chamæleon	ϵ	—	1
"	32347	Tucana	ϵ	—	1
"	30594	Tucana	δ	—	1

Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.
B 9 A	7513	Dorado	ν	—	1
"	451	Tucana	β^1	117	1
"	20570	Lupus	κ	118	2
"	25897	Telescopium	λ	119	1
"	14319	Antlia	δ	—	1
"	13217	Carina	m	—	1
"	26843	Sagittarius	h^2	120	1
"	12330	Vela	—	—	1
"	11814	Vela	—	—	2
"	20048	Hydra	—	—	1
"	1871	Phœnix	ϕ	121	1
"	19598	Lupus	—	122	1
"	19930	Libra	—	122	1
"	4286	Eridanus	—	122	1
"	9589	Puppis	—	123	1
"	23633	Ophiuchus	—	—	1
A	8348	Canis Major	α	—	3
"	H.P. 3147	Lyra	α	—	3
"	17269	Centaurus	γ	124	2
"	12636	Carina	β	124	2
"	11887	Vela	δ	124	2
"	11900	Vela	a	—	2
"	29200	Microscop.	ϵ	125	2
"	25919	Sagittarius	ξ^1	125	2
"	27225	Pavo	ϵ	125	2
"	8133	Carina	N	126	1
"	6141	Lepus	—	127	1
"	8065	Canis Major	ξ^2	—	1
"	19387	Centaurus	ψ	128	1
"	H.P. *1423*	Gemini	α	18, 129	3
"	25060	Sagittarius	ϵ	18	3
"	20657	Triang. Aust.	γ	18	2
"	2838	Eridanus	s	18	2
"	31869	Aquarius	b^3	18	1
"	19958	Centaurus	c^2	18	1
"	662	Phœnix	η	18	2
"	29737	Piscis Aust.	ι	18, 130	1
"	23739	Ophiuchus	c	—	1
"	20861	Lupus	k	—	1
"	*30704*	Piscis Aust.	β	228	1
"	31123	Piscis Aust.	γ	—	1
"	32161	Sculptor	δ	—	1
"	26027	Corona Aust.	ζ	—	1
"	4241	Eridanus	f	108	1
"	1421	Cetus	—	—	1
"	21586	Lupus	ξ	131	1
"	21587	Lupus	—	131	1
"	17747	Centaurus	ξ^1	124	1
"	23805	Ara	σ	—	1
"	15901	Centaurus	—	—	1

Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.
A	6404	Lepus	—	—	1
"	14827	Carina	—	—	1
"	26084	Sagittarius	—	—	1
"	17149	Centaurus	—	—	1
"	27237	Pavo	—	—	1
"	26000	Corona Aust.	—	—	1
"	8624	Canis Major	—	—	1
"	8500	Canis Major	—	—	1
"	17939	Musca	—	—	1
"	24765	Telescopium	—	—	1
"	20571	Lupus	—	118	1
"	2919	Fornax	—	132	1
"	9752	Puppis	—	133	1
"	21827	Norma	ι^2	133	1
"	9226	Canis Major	—	133	1
"	8495	Canis Major	—	133	1
"	17460	Centaurus	—	133	1
"	17488	Centaurus	—	133	1
"	16978	Crux	—	133	1
"	*25197*	Sagittarius	—	133, 231	1
"	14624	Vela	—	133	1
"	14754	Carina	—	133	1
"	9243	Puppis	—	134	1
"	17504	Crux	—	135	1
"	*21206*	Lupus	—	136	1
"	20847	Lupus	υ	137	1
"	14935	Vela	—	137	1
"	18646	Centaurus	—	137	1
"	10618	Puppis	—	137	1
"	19057	Centaurus	—	137	1
"	11297	Volans	κ^2	138	1
"	14606	Carina	—	138	1
"	20787	Lupus	—	138	1
"	19867	Centaurus	—	139	1
"	20035	Hydra	—	140	1
"	15269	Carina	—	140	1
" Pec.	H.P. 5	Andromeda	α	141	3
" Pec.	H.P. 1100	Auriga	β	142	2
" Pec.	2065	Fornax	ν	143	2
" Pec.	4447	Eridanus	τ^9	144	1
" Pec.	5198	Dorado	α	145	2
" Pec.	9194	Puppis	L^1	146	2
" Pec.	29314	Microscop.	θ^2	147	1
A 2 F	18149	Centaurus	ι	—	2
"	26041	Sagittarius	ζ	—	2
"	2498	Hydrus	δ	—	2
"	13968	Vela	η	—	2
"	26189	Corona Aust.	α	—	2
"	31044	Grus	ϵ	—	2
"	14383	Carina	K	—	2
A 2 F	*3223*	Eridanus	θ	148	2
"	4208	Eridanus	τ^7	—	2
"	28597	Microscop.	β	—	1
"	3003	Hydrus	ζ	—	1
"	17180	Centaurus	τ	—	2
"	30260	Piscis Aust.	μ	149	1
"	2565	Fornax	ϕ	—	1
"	31955	Phœnix	—	—	1
"	443	Phœnix	λ^1	—	1
"	15317	Crater	β	—	1
"	15048	Vela	i	—	1
"	32311	Tucana	η	—	1
"	29795	Piscis Aust.	θ	—	2
"	12013	Vela	g	57	1
"	14283	Carina	—	—	1
"	467	Tucana	—	—	1
"	8646	Canis Major	—	—	1
"	15253	Hydra	—	—	1
"	16634	Corvus	—	—	1
"	10482	Puppis	—	—	1
"	10605	Puppis	—	—	1
"	21694	Norma	ι^1	18	1
"	30268	Piscis Aust.	—	—	1
"	20655	Lupus	—	—	1
"	8594	Canis Major	—	150	1
"	27100	Pavo	—	—	1
"	19597	Lupus	—	—	1
"	30814	Grus	—	68	1
"	25500	Pavo	—	—	1
"	25944	Sagittarius	—	—	1
"	8607	Canis Major	—	—	1
"	18995	Centaurus	—	68	1
"	22949	Ara	—	68	1
"	30604	Tucana	—	68	1
"	20801	Lupus	—	133	1
"	9787	Puppis	—	133	1
"	6062	Columba	—	133	1
"	*32414*	Sculptor	—	133, 151	1
"	32324	Tucana	—	133	1
"	23589	Ophiuchus	—	133	1
"	30805	Grus	—	133	1
"	31853	Phœnix	—	133	1
"	20782	Lupus	—	133	1
"	15779	Centaurus	—	133	1
"	7274	Columba	—	133	1
"	19473	Hydra	—	133	1
"	22165	Triang.Aust.	—	133	1
"	12785	Vela	—	133	1
"	6458	Orion	—	133	1
"	9131	Canis Major	—	133	1

Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.	Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.
A 2 F	17472	Crux	—	152	1	A 5 F	491	Tucana	θ	68	1
"	14404	Carina	—	153	1	"	17320	Centaurus	—	—	1
"	14528	Carina	—	153	1	"	5244	Cælum	—	—	1
"	16263	Centaurus	—	153	1	"	29117	Indus	—	—	1
"	16359	Centaurus	—	153	1	"	25233	Corona Aust.	—	—	1
"	14797	Carina	—	40	1	"	20716	Lupus	—	—	2
"	452	Tucana	β^2	40, 117	1	"	31083	Piscis Aust.	—	—	1
" Pec.	H.P. 3631	Cygnus	α	40, 154	2	"	30290	Piscis Aust.	—	132	1
" Pec.	10033	Puppis	1	40, 155	1	"	20376	Hydra	—	68	1
" Pec.	24182	Scorpius	ι^2	40, 156	1	"	20295	Hydra	—	68	1
" Pec.	15756	Centaurus	o^2	40,156,157	1	"	31934	Phœnix	—	133	1
" Pec.	29248	Microscop.	θ^1	158	1	"	31975	Phœnix	—	133	1
" Pec.	31906	Phœnix	ι	159	1	"	25160	Sagittarius	—	133	1
A 3 F	3284	Eridanus	τ^3	—	2	"	20959	Lupus	—	133	1
"	31213	Piscis Aust.	α	160	3	"	26977	Sagittarius	—	133	1
"	20668	Circinus	β	—	1	"	7034	Pictor	—	165	1
"	6848	Pictor	β	18	2	F	7843	Carina	α	—	3
"	351	Phœnix	κ	18	2	"	12672	Carina	ι	—	2
"	11770	Vela	n	—	2	"	*13389*	Carina	υ	221	2
"	27346	Sagittarius	θ^2	—	1	"	23849	Scorpius	θ	—	2
"	28879	Capricornus	η	—	1	"	1981	Hydrus	α	18	3
"	22146	Scorpius	o	—	1	"	21484	Triang. Aust.	β	—	2
"	419	Cetus	—	—	1	"	28140	Pavo	ϕ^1	—	1
"	10913	Puppis	—	—	1	"	9176	Puppis	I	—	1
"	26980	Pavo	—	—	1	"	19849	Circinus	α	166	2
"	9632	Puppis	—	—	1	"	22374	Ophiuchus	ω	167	1
"	18716	Centaurus	—	—	1	"	23614	Ophiuchus	b	168	1
"	25574	Pavo	θ	—	1	"	26500	Sagittarius	β^2	—	2
"	2024	Fornax	—	—	1	"	16541	Crux	η	—	1
"	25172	Sagittarius	—	—	1	"	28363	Indus	η	—	1
"	28595	Microscop.	—	161	1	"	29999	Indus	δ	—	1
"	19540	Lupus	—	161	1	"	30879	Octans	β	—	1
"	29717	Capricornus	—	162	1	"	4686	Horologium	δ	—	2
"	26827	Sagittarius	h^1	162	1	"	14304	Carina	s	—	1
" Pec.	21792	Norma	δ	163	1	"	12286	Carina	b^2	132	1
A 5 F	8570	Pictor	α	—	2	"	19379	Lupus	—	—	2
"	16085	Musca	λ	—	2	"	15004	Carina	—	—	1
"	H.P. 3429	Aquila	α	18	3	"	10689	Puppis	—	—	1
"	28338	Pavo	β	—	2	"	9250	Canis Major	—	169	1
"	24559	Pavo	π	—	1	"	6158	Columba	—	—	1
"	*29216*	Indus	θ	227	2	"	12235	Vela	—	—	1
"	16451	Crux	θ^1	—	1	"	14244	Carina	—	—	1
"	3279	Horologium	β	—	1	"	8592	Canis Major	—	150	1
"	12378	Volans	α	—	1	"	21828	Lupus	—	—	1
"	11111	Puppis	q	164	1	"	10546	Puppis	—	132	1
"	13145	Vela	M	164	1	"	9364	Canis Major	—	—	1
"	6852	Dorado	δ	—	1	"	*21767*	Lupus	—	170	1
"	17521	Centaurus	n	—	1	"	5810	Cælum	—	171	1
"	11653	Vela	e	—	1	"	6493	Orion	—	—	1
"	16845	Musca	ζ^2	—	1	"	13135	Vela	—	172	1

Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.
F	27438	Sagittarius	—	172	1
" Pec.	633	Phœnix	ξ	173	2
F 2 G	26225	Sagittarius	π	—	2
"	23250	Scorpius	η	—	2
"	5295	Cælum	α	—	1
"	16576	Corvus	α	—	1
"	31563	Tucana	γ	—	2
"	14517	Vela	p	174	2
F 5 G	H.P. 1442	Canis Minor	α	—	3
"	10763	Puppis	ρ	—	2
"	4811	Dorado	γ	—	1
"	23629	Ophiuchus	d	—	2
"	21226	Lupus	g	—	1
"	14276	Carina	I	—	1
"	18696	Centaurus	i	—	1
"	5313	Cælum	β	—	1
"	12989	Vela	ψ	—	2
"	23481	Ophiuchus	ξ	—	1
"	*19997*	Hydra	m	175	1
"	24577	Sagittarius	W	—	2
"	15166	Hydra	χ^1	—	1
"	28179	Pavo	ρ	—	1
"	31380	Grus	θ	—	1
"	12620	Vela	k	—	1
"	3879	Reticulum	κ	—	1
"	11334	Chamæleon	α	—	1
"	12472	Carina	G	176	1
"	8658	Canis Major	π	—	1
"	25928	Corona Aust.	ϵ	—	2
"	427	Phœnix	—	—	1
"	27292	Sagittarius	—	—	1
"	29544	Capricornus	—	—	1
"	10904	Carina	B	—	1
"	22829	Scorpius	—	—	1
"	5798	Pictor	η^1	—	1
"	8724	Canis Major	—	—	1
"	769	Phœnix	ρ	—	1
"	18031	Musca	—	—	1
"	23888	Ara	λ	68	1
"	28516	Capricornus	—	—	1
"	20775	Circinus	—	—	1
"	28651	Capricornus	—	177	1
"	18232	Centaurus	—	—	1
"	H.P. 541	Perseus	α	178	3
"	6561	Dorado	β	179	2
"	25786	Pavo	κ	180	2
"	19027	Centaurus	υ^2	180	1
"	9407	Volans	δ	181	2
" Pec.	24107	Scorpius	ι^1	40, 182	2
" Pec.	11755	Vela	b	40, 182	2
F 5 G Pec.	15356	Carina	y	40, 182	1
" Pec.	14295	Carina	—	40, 182	1
F 8 G	3462	Fornax	α	—	2
"	233	Tucana	ζ	—	2
"	6733	Lepus	γ	—	2
"	26123	Corona Aust.	γ	—	2
"	4191	Eridanus	τ^6	183	2
"	28455	Capricornus	ψ	183	1
"	30294	Piscis Aust.	τ	—	1
"	10450	Puppis	j	—	1
"	29309	Pavo	γ	—	1
"	23018	Ara	ϵ^2	—	1
"	519	Phœnix	λ^2	—	1
"	5893	Dorado	ζ	—	1
"	28236	Pavo	ϕ^2	—	1
"	10120	Puppis	—	—	1
"	19515	Lupus	τ^2	54	1
"	20786	Lupus	ν^1	—	1
"	*1210*	Tucana	κ	219	1
"	12253	Vela	w	—	1
"	17977	Centaurus	—	—	1
"	9733	Puppis	—	—	1
"	14083	Vela	—	—	1
"	25032	Telescopium	—	—	1
"	31437	Grus	—	—	1
"	24925	Telescopium	—	—	1
"	2965	Horologium	—	—	1
"	14743	Carina	—	—	1
"	24897	Sagittarius	—	—	1
"	8161	Canis Major	—	—	1
"	18839	Centaurus	—	—	1
"	8034	Carina	—	—	1
"	4974	Cælum	—	—	1
"	1932	Eridanus	—	—	1
"	28702	Capricornus	—	—	1
"	24650	Telescopium	—	68	1
"	28593	Capricornus	—	68	1
"	32240	Tucana	—	—	1
"	30830	Grus	—	132	1
"	7817	Dorado	—	132	1
"	8808	Canis Major	—	—	1
"	19593	Hydra	—	68	1
"	24120	Sagittarius	X	184	1
"	22012	Norma	γ^1	184	1
"	15293	Carina	—	184	1
" Pec.	9021	Canis Major	δ	40, 185	2
" Pec.	15266	Carina	x	40, 186	1
" Pec.	15755	Centaurus	o^1	40,157,187	1
" Pec.	16039	Centaurus	—	40, 187	1
G	H.P. 932	Auriga	α	—	3

Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.	Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.
G	336	Hydrus	β	—	3	G 5 K	11714	Pyxis	β	—	1
"	19825	Centaurus	α^1	188	3	"	25297	Corona Aust.	θ	—	1
"	13336	Carina	l	—	2	"	28782	Microscop.	γ	—	1
"	6344	Lepus	β	—	2	"	25108	Sagittarius	—	198	1
"	10225	Puppis	ξ	189	2	"	10343	Puppis	a	—	1
"	30395	Grus	μ^1	—	1	"	3623	Eridanus	e	—	1
"	21849	Scorpius	ω^2	190	1	"	1998	Fornax	π	—	2
"	21939	Triang.Aust.	δ	—	1	"	1931	Phœnix	—	—	1
"	9199	Volans	γ^1	191	1	"	16162	Musca	—	—	1
"	14569	Vela	x	189, 192	1	"	21630	Lupus	—	—	1
"	18202	Centaurus	m	—	1	"	23206	Scorpius	—	—	1
"	20783	Lupus	ν^2	—	1	"	17949	Centaurus	—	—	1
"	1174	Phœnix	ν	—	1	"	10512	Puppis	—	—	1
"	16100	Centaurus	—	—	1	"	9697	Carina	—	—	1
"	22185	Triang.Aust.	ζ	—	1	"	12590	Carina	—	—	2
"	9664	Puppis	—	—	1	"	27380	Pavo	—	68	2
"	30425	Grus	—	—	1	"	20044	Hydra	—	—	1
"	30133	Indus	—	—	1	"	30557	Tucana	—	—	1
"	12600	Vela	—	—	1	"	26134	Corona Aust.	—	165	1
"	*19406*	Centaurus	—	225	1	K	355	Phœnix	α	—	3
"	9323	Canis Major	—	—	1	"	22731	Scorpius	ϵ	—	3
"	30378	Grus	—	—	1	"	H.P. 2400	Boötes	α	—	3
"	15975	Centaurus	—	—	1	"	24596	Sagittarius	γ	—	2
"	32359	Phœnix	—	—	1	"	H.P. 1459	Gemini	β	—	3
"	10215	Puppis	—	—	2	"	6884	Lepus	δ	—	2
"	27452	Sagittarius	—	—	1	"	19129	Centaurus	θ	199	2
"	24848	Pavo	—	132	1	"	1024	Phœnix	β	199	2
" Pec.	29382	Capricornus	ζ	193	2	"	1462	Phœnix	δ	199	2
G Comp.	31442	Aquarius	ϵ^3	194	2	"	28213	Indus	α	199	2
G 5 K	4812	Reticulum	α	—	2	"	31445	Grus	ι	199	2
"	27468	Pavo	δ	—	2	"	22170	Apus	γ	199	2
"	17129	Corvus	β	—	2	"	20572	Lupus	ζ	199	2
"	14751	Vela	μ	—	2	"	*14910*	Carina	u	199, 222	2
"	18121	Hydra	γ	—	2	"	5187	Eridanus	υ^2	199	2
"	15786	Hydra	ξ	—	2	"	4006	Eridanus	y	199	1
"	29426	Capricornus	b	—	2	"	1924	Hydrus	η^2	199	1
"	7731	Columba	δ	—	2	"	18376	Centaurus	d	199	1
"	31263	Grus	ζ	—	2	"	18700	Centaurus	M	199	1
"	1905	Eridanus	χ	—	1	"	21207	Lupus	ψ^1	199	1
"	31385	Aquarius	ϵ^1	—	1	"	24703	Telescopium	ϵ	199	2
"	11852	Vela	d	—	1	"	28544	Microscop.	α	199	1
"	13455	Vela	m	109	1	"	626	Phœnix	μ	199	1
"	26206	Corona Aust.	β	—	2	"	31184	Piscis Aust.	δ	199	1
"	27272	Sagittarius	ω	195	1	"	3034	Eridanus	τ^2	199	1
"	27332	Sagittarius	A	—	1	"	20721	Lupus	f	199	1
"	25853	Sagittarius	ν^1	196, 197	1	"	14955	Carina	T	199	1
"	30405	Grus	μ^2	—	1	"	10203	Volans	ζ	—	1
"	21710	Norma	η	—	1	"	31431	Aquarius	ϵ^2	—	2
"	8573	Carina	A	196	1	"	26102	Sagittarius	o	—	2
"	30647	Grus	δ^1	—	1	"	26149	Sagittarius	τ	—	2

Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.	Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.
K	57	Phœnix	ϵ	—	2	K	24818	Corona Aust.	—	—	1
"	26162	Corona Aust.	δ	—	1	"	16847	Musca	ζ^1	—	1
"	4256	Eridanus	g	—	2	"	14817	Chamæleon	δ^1	—	1
"	25140	Telescopium	ζ	—	1	"	20034	Octans	π^1	—	1
"	2851	Eridanus	ι	—	1	"	17300	Centaurus	w	—	1
"	22393	Apus	β	—	1	"	27273	Pavo	μ^1	—	2
"	6915	Pictor	γ	—	1	"	27298	Pavo	μ^2	—	2
"	27239	Sagittarius	ι	—	1	"	14504	Carina	t^1	—	1
"	4757	Horologium	α	—	2	"	12782	Carina	k	199	1
"	25383	Pavo	ζ	—	1	"	2824	Hydrus	μ	—	1
"	3009	Fornax	β	—	1	"	12617	Vela	l	—	1
"	25927	Sagittarius	ξ^2	—	2	"	11624	Carina	e^2	61	1
"	9206	Volans	γ^2	191	1	"	11583	Vela	C	—	1
"	6427	Columba	ϵ	—	2	"	15222	Carina	z	—	1
"	8568	Puppis	τ	—	2	"	17366	Crux	ι	—	1
"	25171	Sagittarius	λ	—	2	"	18192	Musca	ι^1	—	1
"	6896	Columba	β	—	2	"	18920	Centaurus	—	—	1
"	31676	Aquarius	b^1	—	2	"	19179	Centaurus	—	—	1
"	7120	Columba	η	—	2	"	7011	Columba	ξ	—	1
"	6098	Columba	o	—	1	"	20654	Circinus	ϵ	—	1
"	7586	Columba	κ	—	1	"	6925	Pictor	—	—	1
"	14963	Antlia	ι	—	1	"	20948	Lupus	—	—	1
"	28615	Indus	β	—	2	"	28918	Microscop.	—	—	1
"	29533	Octans	ν	—	2	"	26780	Telescopium	ι	—	1
"	21051	Triang.Aust.	ϵ	—	1	"	18268	Centaurus	—	—	1
"	10984	Puppis	h^2	—	1	"	32376	Octans	θ	—	1
"	5807	Cælum	γ	171	1	"	15877	Centaurus	—	—	1
"	5137	Eridanus	υ^1	—	2	"	25257	Sagittarius	—	—	1
"	30930	Grus	ρ	—	1	"	10001	Puppis	—	—	1
"	22075	Norma	γ^2	—	1	"	11201	Volans	—	—	2
"	12372	Vela	c	—	1	"	22293	Apus	—	68	1
"	27075	Sagittarius	f	—	1	"	2016	Phœnix	χ	68	1
"	31591	Sculptor	γ	—	1	"	24745	Pavo	—	—	1
"	32333	Phœnix	π	—	1	"	18918	Centaurus	—	—	1
"	24987	Sagittarius	δ	—	2	"	13028	Vela	—	—	1
"	19931	Centaurus	c^1	—	1	"	17061	Musca	—	—	1
"	23841	Scorpius	Q	—	1	"	23835	Ara	—	—	1
"	19128	Hydra	π	—	2	"	24649	Sagittarius	—	—	1
"	7066	Dorado	—	—	1	"	15215	Carina	—	—	1
"	12868	Hydra	G	—	1	"	965	Phœnix	—	—	1
"	6119	Dorado	θ	—	1	"	25037	Sagittarius	—	—	1
"	4211	Reticulum	β	—	2	"	14105	Vela	—	—	1
"	16615	Corvus	ϵ	—	2	"	27354	Sagittarius	—	—	1
"	16179	Centaurus	B	—	1	"	31826	Phœnix	—	—	1
"	11405	Chamæleon	θ	—	1	"	15619	Centaurus	—	—	1
"	10249	Puppis	Q	—	1	"	544	Cetus	—	—	1
"	23958	Pavo	η	—	2	"	608	Cetus	—	—	1
"	30968	Grus	η	—	1	"	2853	Hydrus	—	—	1
"	25876	Sagittarius	ν^2	—	1	"	3116	Hydrus	—	—	1
"	11407	Volans	β	—	2	"	3588	Eridanus	—	—	2

Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.	Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.
K	20181	Hydra	—	—	1	K 2 M	20100	Hydra	E	—	1
"	6466	Columba	—	—	1	"	24958	Pavo	ξ	—	1
"	*8227*	Puppis	—	229	1	"	H.P. 333	Aries	a	—	3
"	9755	Puppis	—	—	1	"	17506	Centaurus	e	—	1
"	10705	Puppis	—	—	1	"	12006	Pyxis	γ	—	1
"	13440	Vela	—	—	1	"	8629	Canis Major	o^1	203	2
"	7410	Pictor	—	—	1	"	12930	Antlia	ϵ	—	1
"	20686	Lupus	—	—	1	"	19284	Octans	δ	—	1
"	24321	Scorpius	—	—	1	"	19455	Hydra	k	—	1
"	16878	Musca	—	—	1	"	16835	Crux	ϵ	—	2
"	19007	Octans	—	132	1	"	30209	Grus	λ	—	1
"	20478	Lupus	—	—	1	"	22941	Ara	ϵ^1	—	1
"	*20566*	Lupus	—	200	1	"	3171	Hydrus	ν	—	1
"	23459	Ara	—	—	1	"	9135	Puppis	—	—	1
"	23577	Ophiuchus	—	—	1	"	23378	Apus	ζ	—	1
"	25560	Sagittarius	—	—	1	K 5 M	H.P. 797	Taurus	a	—	3
"	25587	Sagittarius	—	—	1	"	30105	Indus	ϵ	—	1
"	25869	Pavo	—	165	2	"	10113	Puppis	c	—	2
"	26119	Corona Aust.	—	—	1	"	13030	Vela	N	—	2
"	26191	Corona Aust.	—	165	1	"	22832	Scorpius	ζ^2	—	2
"	6931	Columba	—	—	1	"	22916	Ara	ζ	—	2
"	27442	Sagittarius	—	—	1	"	4550	Reticulum	ι	—	1
"	28557	Capricornus	—	—	1	"	21886	Apus	δ^2	204	2
"	11191	Puppis	w	—	1	"	22672	Ara	η	—	2
"	18039	Musca	—	—	1	"	20793	Lupus	ϕ^1	—	2
"	8551	Puppis	—	—	1	"	14673	Carina	w	—	1
"	23603	Ara	—	—	1	"	19826	Centaurus	a^2	188	2
"	25454	Pavo	—	—	1	"	8839	Canis Major	σ	—	2
"	12613	Vela	—	132	1	"	*9288*	Puppis	π	205, 232	2
"	20184	Libra	—	—	1	"	12438	Vela	λ	205	2
"	30810	Piscis Aust.	—	132	1	"	14054	Carina	q	205	2
"	10769	Vela	—	201	1	"	10901	Puppis	h^1	205	1
"	28648	Capricornus	—	—	1	"	4940	Eridanus	d	205	2
"	1973	Phœnix	—	—	1	"	5816	Lepus	ϵ	—	2
"	26557	Sagittarius	—	—	1	"	19851	Apus	a	206	2
"	18720	Centaurus	—	—	1	"	21153	Lupus	ω	206	1
"	21090	Libra	—	—	1	"	14266	Antlia	a	206	1
"	31012	Grus	—	68	1	"	24919	Sagittarius	—	206	1
"	6674	Mensa	γ	68	1	"	31734	Aquarius	b^2	—	2
"	13451	Vela	—	—	1	"	1411	Phœnix	γ	207	2
K Comp.	11285	Carina	ϵ	202	2	"	9652	Puppis	σ	—	2
K 2 M	21146	Libra	υ	—	2	"	30261	Piscis Aust.	υ	—	1
"	22607	Triang. Aust.	a	—	2	"	16133	Musca	μ	—	1
"	30422	Tucana	a	—	2	"	762	Hydrus	λ	—	1
"	24179	Scorpius	G	—	2	"	10025	Puppis	—	—	1
"	17693	Musca	δ	—	2	"	27440	Sagittarius	—	—	1
"	23516	Ara	β	—	2	"	5850	Pictor	η^2	—	1
"	4121	Eridanus	h	—	1	"	14156	Vela	r	—	2
"	27289	Sagittarius	b	—	1	"	15571	Centaurus	—	—	1
"	4840	Reticulum	ϵ	—	1	"	9845	Carina	Q	—	1

Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.	Class.	Cat. No.	Constellation.	Des.	Remarks.	Prs.
K 5 M	*14558*	Carina	t^2	208	1	Ma	17843	Musca	—	—	1
"	9247	Canis Major	—	169	1	"	24218	Scorpius	—	—	1
"	1895	Cetus	—	206	1	"	10641	Carina	—	—	1
"	32337	Sculptor	—	—	1	"	26532	Sagittarius	—	—	1
"	21102	Lupus	—	—	1	"	6358	Orion	—	—	1
"	14478	Carina	r	—	1	"	1962	Cetus	—	—	1
"	*15986*	Hydra	—	209	1	Ma Comp.	22314	Scorpius	α	212	3
"	16484	Chamæleon	κ	68	1	Mb	17048	Crux	γ	—	2
"	28510	Indus	ζ	—	1	"	20431	Libra	σ	—	2
"	14405	Carina	—	—	1	"	377	Sculptor	η	—	1
"	12635	Vela	—	210	1	"	4545	Reticulum	γ	—	1
"	9205	Canis Major	—	—	1	"	27430	Sagittarius	c	—	1
"	10316	Puppis	—	132	1	"	30657	Grus	δ^2	—	1
"	9283	Puppis	—	132	1	"	21881	Apus	δ^1	204	2
"	5351	Cælum	—	—	1	"	24888	Sagittarius	η	—	2
"	30468	Tucana	—	68	1	"	3607	Eridanus	τ^4	—	2
Ma	4353	Hydrus	γ	—	3	"	1864	Phœnix	ψ	—	1
"	H.P. 482	Cetus	a	—	3	"	15344	Carina	—	—	1
"	1965	Cetus	υ	—	2	"	28656	Microscop.	—	—	1
"	H.P. 1091	Orion	α	211	3	"	30709	Tucana	ν	—	1
"	4487	Reticulum	δ	—	1	"	18566	Centaurus	—	—	1
"	14557	Chamæleon	γ	—	1	"	7557	Dorado	η^2	—	1
"	28951	Capricornus	A	—	1	"	9255	Canis Major	—	—	1
"	28598	Capricornus	ω	—	1	"	27330	Pavo	—	—	1
"	12728	Pyxis	θ	—	1	"	16139	Hydra	—	—	1
"	22454	Scorpius	H	—	1	"	14566	Carina	—	68	1
"	12652	Carina	g	—	2	"	30913	Grus	β	213	3
"	16793	Centaurus	F	—	1	"	18779	Centaurus	g	214	1
"	24348	Scorpius	—	—	1	"	16761	Musca	ϵ	214	1
"	27496	Telescopium	ξ	—	1	"	19014	Apus	θ	214	1
"	13506	Hydra	—	—	1	Md	9197	Puppis	L^2	215	2
"	15962	Centaurus	—	—	1	"	13073	Carina	R	216	2
"	8739	Puppis	—	—	1	"	13882	Carina	S	217	1
"	15777	Hydra	—	—	1						

REMARKS.

1. A. G. C. 14204. This object is a gaseous nebula. The only photograph taken, X 4087, is poor. The image consists of a well marked bright band, wave length 5007.0, and a faint bright band, Hγ, 4340.7.
2. η Carinæ. This spectrum is very peculiar. It presents a combination of dark lines and bright bands such as has not been found in any other spectrum examined in this series. The combination is such that a composite type of spectrum is suggested. Taking only the dark lines into consideration, the spectrum would be classed F 5 G, Remark 40. Considering only the bright lines, there is a marked resemblance to the spectrum of Nova Aurigæ, as photographed on X 3929, taken February 17, 1892. Different aspects appear on different plates. On the best plates, the system of dark lines is well defined and the bright bands are not numerous. On some plates, the dark lines appear inconspicuous, and nearly the whole spectrum is crossed by bright bands. On other plates, dark lines are distinctly seen on the edges of shorter wave length of the bright bands. The dark lines as seen on X 4709 resemble very nearly in wave lengths and intensities those in ι^1 Scorpii, and similar spectra, of Class F 5 G. A list of these lines as found in ε Aurigæ, is given in the seventh column of Table VII. Lines in η Carinæ near 4227.0 appear to differ slightly from those in ι^1 Scorpii and ε Aurigæ, but the faintness of η Carinæ at the present time renders an exact comparison of all the lines difficult. On the plates showing the dark lines clearly, bright bands are seen on the edges of greater wave length of the hydrogen lines Hδ, Hγ, and Hβ. The line Hβ is not seen as a distinct dark line, and the bright band extends from 4861.5 to a dark line which appears to be the solar line 4871.8. This band is brightest and most sharply defined on the edge of greater wave length. In all the images of this spectrum, the band Hβ is more intense than any other bright band. The lines Hδ and Hγ are distinctly dark and well defined. The bright band in the region of Hγ extends from Hγ, 4340.7, to the double dark line 4370.0 and 4371.5, and is crossed by the dark line 4352.0. This band is about 0.6 as intense as the band Hβ. The bright band in the region of Hδ extends from Hδ, 4101.8, to the dark line 4110.4, and is 0.8 as intense as the band Hβ. The lines K and Hε are broad and dark as in Class F 5 G. The space between two well defined dark lines is also frequently brighter than the continuous spectrum. Several photographs of this spectrum show very narrow images. On these plates, as many as 20 bright bands of various intensities are seen in the region extending from Hε to 4922. These bands bear a striking resemblance, as has been stated, in intensity and wave length, to the bright bands in Nova Aurigæ. The hydrogen lines Hε, Hδ, and Hγ also resemble the same lines in Nova Aurigæ, in being dark with bright bands on the edges of greater wave length.
3. A. G. C. 14965. The image is narrow. Hγ and Hβ are bright. No dark lines are seen.
4. A. G. C. 14971. The image examined is narrow. Hδ, Hγ, and Hβ are bright, with no appearance of dark edges. The lines 4026.4 and 4471.8 appear to be bright.
5. γ Velorum. See p. 243.
6. θ Muscæ. The bright band 4633 is present as in Class Oa. The lines Hε, Hδ, Hγ, and Hβ are dark. The more intense Orion lines of Class B are present and dark, except 4649.2, which, if present, would be concealed by the bright band 4633. The spectrum, therefore, appears to resemble that of ε Orionis of Class B, except for the presence of the bright band 4633. The lines are hazy. The spectrum of A. G. C. 17839, magnitude 8¼, which precedes $0^s.14$, and is south $6''.6$, is not seen.
7. A. G. C. 8631. See pp. 147 and 248.
8. A. G. C. 14691. A bright band, which appears to be 4688, is seen on a faint continuous spectrum.
9. A. G. C. 14684. This spectrum differs in several particulars from that of A. G. C. 22763, the typical star. The lines K and Hε are dark, of nearly equal intensity, and narrow as in spectra like those of l Puppis and α Cygni of Class A 2 F. The lines Hδ and Hγ appear to be slightly dark, and both have a bright line or band on the side of greater wave length. Hβ is bright, but, as in the spectrum of η Carinæ (See Remark 2), it is shifted towards the edge of greater wave length, so that when the dark lines K and Hε are superposed on the same lines in any other spectrum, the bright Hβ in this star has greater wave length than Hβ in the superposed star. The brightness of the hydrogen lines is not more than 0.1 as intense as the bright band 4688. The line 4059 is nearly 2.0 as intense as in A. G. C. 22763, the typical star. The additional hydrogen lines 4200.7 and 4542.4 are not distinctly seen, but their presence is suspected. The line 4089.2 is present, and bright on the edge of greater wave length.
10. A. G. C. 14626. This spectrum is very nearly like that of A. G. C. 14684 (See Remark 9). Faint bright bands are, however, certainly present at 4514.5 and 4542.4, as in A. G. C. 22763, the typical star. The line 4116.2 is bright, or bright-edged on the side of greater wave length.
11. ζ Puppis. See pp. 148 and 233.
12. A. G. C. 22748. The bright band 4688 is about 0.5 as wide, and 0.5 as intense, as in A. G. C. 9311, the typical star. The line Hβ is not clearly seen in any photograph, so far obtained, of this spectrum, but it appears to be a very faint dark line, which is slightly bright on the edge of greater wave length. The image of this spectrum

from Hδ to the end of greater wave length appears on X 8476 taken with two prisms for ζ^2 Scorpii. The line 4514.5 is here bright on the edge of shorter wave length, and a bright line at about 4490 is present. Band 4633 is widely double.

13. A. G. C. 22843. The line Hβ is distinctly bright and is shifted towards the end of greater wave length, as in the spectrum of A. G. C. 14684 (See Remark 9). If the edge of shorter wave length of this bright Hβ is dark, it is not distinguishable from the continuous spectrum. The lines Hδ and Hγ are dark with bright edges on the side of greater wave length. The separation of band 4633 into two bright lines, as in the typical star, is well seen on Plate X 8476. The appearance is that of a double reversal, the bright band being divided into two portions by a dark line which is superposed. On this plate, lines 4471.8 and 4514.5 are distinctly bright on the edge of greater wave length.
14. A. G. C. 17572. Line 4685.4 is faint, and 4514.5 is 1.5 as intense as in τ Canis Majoris, the typical star.
15. ι Orionis. The Orion lines appear fainter than in the typical star, but the plate is not of the best quality.
16. θ^1 Orionis. The two series of hydrogen lines are seen in this image, but other lines, if present, are lost in the spectrum of the nebula, which is superposed. The spectrum of the nebula consists of bright bands, the most intense of which is at 5007.0. This band seems to extend to the hydrogen line Hβ, and bright bands of less intensity appear to coincide with Hε, Hδ, and Hγ.
17. A. G. C. 14811. The image is narrow, and the Orion lines of Class Oe 5 B are not seen.
18. The lines are broad and ill defined.
19. ζ and δ Orionis. The principal Orion lines have the same intensities as in ε Orionis, but many of the fainter lines are less intense or absent. 29 Orion lines are counted in ζ Orionis between the lines K and Hβ, while the same region of ε Orionis shows 61 lines. The additional hydrogen lines, 4200.7, 4542.4, 5414, and line 4685.4, are twice as intense in these spectra as in that of ε Orionis. Two lines of greater wave length than 5414 are present in both of these spectra, and are photographed on the isochromatic plates X 8119 of δ Orionis and X 8115 of ζ Orionis. Approximate wave lengths were found for these lines by estimating their position with regard to adjacent solar lines in the spectrum of α Aurigæ, on X 8109, upon which the above-named plates were superposed. One of these lines is dark, with intensity 2, and has the approximate wave length 5588. The other is a faint bright line, intensity *1*, and has the approximate wave length 5695.
20. A. G. C. 22626. Line 4116.2 is about 0.7 as intense as in ε Orionis, the typical star.
21. δ Scorpii. The additional hydrogen line 5414 is photographed in this spectrum on Plate X 8743. Lines 4200.7, 4542.4, 4685.4, and 5414 have the same intensities as in ε Orionis, the typical star. This spectrum, however, resembles that of β Centauri, Class B 1 A, in the intensities of 4089.2, 4116.2, and 4649.2. Several plates show hazy lines, and this star is perhaps a spectroscopic binary.
22. τ Scorpii. Line 4685.4 is nearly as intense as in the spectrum of τ Canis Majoris of Class Oe 5 B. 4649.2 is no more intense than in β Centauri of Class B 1 A. The intensities of 4089.2 and 4116.2 are intermediate between the same lines in ε Orionis and β Centauri.
23. θ Carinæ. Line 4685.4 is approximately as intense as in τ Canis Majoris of Class Oe 5 B. 4649.2 is unusually faint. It is not more than 0.2 as intense as in ε Orionis, the typical star, and is even less intense than 4641.1 in θ Carinæ. The additional hydrogen line 5414 is photographed on the isochromatic plate, X 9184.
24. The image is neither distinct nor bright enough to show the faint Orion lines. 4089.2, 4116.2, and 4649.2 have, however, the same intensities as in ε Orionis.
25. A. G. C. 6481 and 6482. These spectra are superposed. Owing, however, to their difference in declination, the hydrogen and Orion lines of the two stars are well separated. When two spectra of nearly equal brightness are superposed, it is difficult to detect the relative intensities of the fainter lines so as to decide the exact class to which each spectrum belongs. While, therefore, both these spectra are of the Orion type, and are probably in this class, one or both may belong to Class B 1 A.
26. A. G. C. 22814. On X 6598 the line 4649.2 appears to be slightly bright on the edge of greater wave length.
27. The line K is twice as intense as in ε Orionis, the typical star
28. A. G. C. 22824. The spectrum of A. G. C. 22822, magnitude $7\frac{1}{2}$, which precedes $1^s.49$ and is north $1'27''.4$, is superposed, and appears also to belong to Class B.
29. The image is faint, and Hβ is not clearly seen.
30. The lines are slightly narrower than in β Centauri, the typical star. 4641.1 is double.
31. β Crucis. Lines 4089.2 and 4116.2 are a little more intense than in the spectrum of β Centauri, the typical star. On X 3976, 4387.8 and 4471.8 appear to be slightly bright on the edge of greater wave length.
32. α Crucis. The spectra of α^1 and α^2 Crucis are superposed. The magnitudes, according to the Argentine General Catalogue, are $1\frac{1}{2}$ and $1\frac{3}{4}$ respectively, and the separation is $0^s.78$ in right ascension and $3''.4$ in declination. There is no evidence on the plates examined that the spectrum is that of a double star, except that the lines are somewhat wide and hazy. It appears that both stars have similar spectra.
33. γ Araæ. Line 4089.2 is less intense, and 4649.2 more intense, than in β Centauri, the typical star. The faint lines are as numerous as in the typical star, in which respect this spectrum differs from those of Class B, which have wide lines, and in which few faint lines are seen (See Remark 19). The lines are very wide on some plates, and at times they appear double. This star may be a spectroscopic binary.
34. J Puppis. The end of shorter wave length of this spectrum appears on X 8039 and X 8174, taken with two prisms, for A. G. C. 10534. On these plates the lines in J Puppis appear double. Accordingly, additional photographs were secured in Peru. Two of these plates show indistinct doubling of the lines, but the evidence

is not yet conclusive as to whether this is due to focus or to a binary system.

35. β Scorpii. This spectrum appears on the edge of Plate X 5921, taken for ω^1 Scorpii. To confirm the classification, plates taken with the 11-inch Draper telescope in Cambridge were examined. On Plate C 2702, taken with 3 prisms, May 20, 1890, exposure 125^m, lines 4026.4, Hδ, 4144.0, Hγ, 4387.8 and 4471.8 are double, the fainter components being of shorter wave length than the more intense components. On C 6779, taken with 2 prisms, May 10, 1894, exposure 123^m, the spectrum of β Scorpii appears from line 4144.0 to the end of greater wave length. On this plate, lines 4387.8 and 4471.8 appear double, the fainter components being of greater wave length than the corresponding more intense components. On other plates, the lines are hazy. This star may be a spectroscopic binary. The spectrum of the adjacent star, A. G. C. 21806, magnitude $7\frac{1}{2}$, which follows $0^s.40$ and is north $13''.8$, is not seen, and is probably too faint to affect the spectrum of β Scorpii on plates taken with two or three prisms. Additional photographs of this spectrum are being secured.

36. A. G. C. 6533. The image is poor and the spectrum may belong to Class B 2 A.

37. The image is rendered indistinct by the nebula of Orion.

38. A. G. C. 6469 and 6471. These spectra are superposed. Both spectra are probably of Class B 1 A, although they may be of Class B 2 A.

39. θ Aræ and ϵ Canis Majoris. Lines K, 3994.9, 4531.4, and 4603.7 are 2.0 as intense, 4415.1, 4417.5, 4619.8, 4630.6, and 4641.1 are 1.3 as intense, 4237.4, 4242.6, 4254.1, 4267.4, and 4350.1 are 1.2 as intense as in β Centauri.

40. The lines are narrow with sharp edges. The intensities of some lines differ from those in the typical star.

41. A. G. C. 10534. This star, which is the Algol variable, V Puppis, has been found to be a spectroscopic binary. The period $1^d.454$ satisfies the observations of the changes in light, and of the varying separation of the lines in its spectrum. The spectrum has been examined on 61 plates, on 23 of which the lines are double. When the lines are well separated, the two components of each double line are seen to differ in intensity, the lines of the brighter component being 1.5 as intense as the corresponding lines of the fainter component. On 15 plates, the fainter lines have greater wave length than the more intense lines; on 8 plates they have shorter wave length. The following lines are found double: 3819.2, Hη, Hζ, Hϵ, 4009.5, 4026.4, Hδ, 4120.5, 4144.0, Hγ, 4387.8, 4471.8, Hβ, and 4922.1. The hydrogen lines Hκ, Hι, and Hθ, are very wide. Besides the lines of hydrogen, the helium lines 3819.2, 4009.5, 4026.4, 4120.5, 4144.0, 4387.8, 4471.8, and 4922.1 are present in both spectra. In addition to these lines, others are present which have not been found double. These are 4069.4, 4072.0, 4075.9, 4089.2, 4641.1, 4649.2, and 4685.4, which are present in the spectrum of the brighter component. From the intensities of these lines, together with those of the hydrogen and helium lines already mentioned as being present in the spectrum of the brighter component, it appears that this spectrum is of Class B 1 A. The spectrum of the fainter component appears to be of Class B 3 A. The separation is very large, and micrometric measures give the relative velocity of the two components as 610 km.

42. This spectrum is like that of ζ^1 Scorpii in the intensities of the Orion lines (See Remark 43). The lines, however, are not so narrow as in ζ^1 Scorpii.

43. ζ^1 Scorpii. Hβ consists of a dark line, bright on the edge of greater wave length. The bright portion is well defined and appears like a distinct bright line with an intensity equal to 0.2 of the bright line, Hβ, in the spectrum of μ Centauri. Hγ is dark with a bright edge on the side of greater wave length, which is wider, but a little less intense, than the bright line, Hβ. The other hydrogen lines are narrow and wholly dark. All the lines in this spectrum are narrow and unusually well defined. In this respect it differs essentially from the spectra of the greater number of the stars of the Orion type having bright hydrogen lines. This spectrum differs also from that of the typical star, β Centauri, in the intensities of some of the Orion lines, and nearly resembles the spectrum of θ Aræ (See Remark 39). 4350.1 is, however, more intense than in θ Aræ, and is about 0.5 as intense as Hγ, so that on plates taken with one prism, Hγ has the appearance of being double. This line, 4350.1, appears to reach its maximum intensity in this spectrum, and in those of A. G. C. 22297 and k Scorpii, A. G. C. 23098. 4619.8 and 4630.6 are also slightly more intense than in the spectrum of θ Aræ, and form a well marked pair like that at 4641.1 and 4649.2. 4267.4 and 4712.8 are slightly less intense than in θ Aræ, while 4009.5 is unusually faint, having an intensity not more than 0.3 as great as in θ Aræ or β Centauri.

44. β Lupi. This star has been found to be a spectroscopic binary, but the material is not yet sufficient to determine the period. The changes in width in the lines are easily seen by comparisons with the lines in the spectrum of the adjacent star, κ Centauri, which is photographed, either partly or wholly, on nearly all the plates of β Lupi. The lines in β Lupi are double on Plate X 7586, taken June 10, 1896, with an exposure of 80^m. The lines in the spectrum of κ Centauri are very sharply defined on this plate, as on all others where it appears. On X 8572, taken May 24, 1897, with an exposure of 56^m, the lines in β Lupi are as narrow as those in κ Centauri on the same plate. Several plates show the lines in β Lupi to be hazy.

45. ζ Centauri. This star is a spectroscopic binary, with a period of $8^d.024$. The spectrum appears on 67 plates, taken between June 17, 1892, and August 21, 1899. The lines are double on 25 plates. The lines of the brighter component are 1.5 as intense as those of the fainter. On 11 plates the fainter lines have shorter wave length, and on 11 plates they have greater wave length than the corresponding lines of greater intensity. On 3 plates, where the separation is slight, the difference

in intensity could not be detected. The Orion lines, 4009.5, 4026.4, 4120.5, 4144.0, 4387.8, 4471.8, and 4922.1 are distinctly double. The width of the hydrogen lines makes their doubling indistinct. The fainter Orion lines of Class B 2 A, which are present in the spectrum of the brighter component, are not seen double, but this may be due to their faintness. If these lines do not belong to both spectra, the spectrum of the fainter component is of Class B 3 A. If these lines are really common to both spectra, the spectra of both components are alike.

46. π Scorpii. This star is a spectroscopic binary, with a period of $1^d.571$. The spectrum has been examined on 56 plates, taken during the period of time from August 12, 1892, to August 26, 1899. The lines are double on 30 plates. The difference in intensity between the lines of the two spectra is greater than in the other spectroscopic binaries photographed in this series. The lines of the brighter component are about 3.0 as intense as those of the fainter component. On 16 plates the fainter lines have greater wave length, and on 14 plates they have shorter wave length than the corresponding lines of greater intensity. The Orion lines, 4009.5, 4026.4, 4120.5, 4144.0, 4387.8, and 4471.8 are the lines that are usually seen distinctly double, but frequently the components of the hydrogen lines Hδ, Hγ, and Hβ can be separated. The fainter Orion lines of Class B 2 A are present in the spectrum of the brighter component. None of these lines are intense enough in the fainter component to be visible, if present. If these lines are not present in the spectrum of the fainter component, that spectrum is of Class B 3 A; if they are present, both spectra are of Class B 2 A.

47. μ Centauri. The lines Hϵ, Hδ, Hγ, and Hβ are bright. No spectrum of the Orion type has been photographed in this series showing a greater number of bright hydrogen lines than that of μ Centauri, or showing greater intensity of the bright line, Hβ. Dark edges to this line are faintly seen. The bright line, Hγ, lies towards the edge of shorter wave length of the dark band on which it is superposed. Hι, Hθ, Hη, and Hζ are wholly dark, broad, and hazy. Besides the bright lines due to hydrogen, several other bright lines are present in this spectrum. The two most conspicuous are at wave lengths 4232 and 4584 approximately, and these are not more than 0.1 as intense as Hβ. Line 4387.8 is bright on the edge of shorter wave length. A diffuse bright band appears on the side of shorter wave length of the faint dark line 4531.4. The dark line 4553.4 is superposed on a bright band. The dark line 4619.8 is superposed on a faint bright band. 4922.1 and 5015.8 are bright on the edge of greater wave length.

48. κ Canis Majoris. The lines Hϵ, Hδ, Hγ, and Hβ are bright. Hβ appears to be wholly bright, or to have extremely faint dark edges on either side. Hϵ, Hδ, and Hγ consist of broad dark bands, on which narrow bright lines are superposed. The bright lines Hδ and Hγ, are not centrally superposed on the dark bands, but lie nearer the edge of shorter wave length. The dark band Hζ appears darkest in the centre and fades away towards both edges. The space between the lines 4641.1 and 4649.2 is brighter than the continuous spectrum, and other bright lines are present, but not so well marked as in μ Centauri (See Remark 47). 4120.5 and 4144.0 are slightly bright on the edge of greater wave length.

49. o Puppis. Hγ and Hβ are bright, superposed on dark bands. The lines are unusually wide and hazy. The Orion lines are only a little darker than the adjacent portions of the spectrum.

50. On some plates where the definition is sharp, faint traces of the triple line 4069.4, 4072.0, and 4075.9, and also of 4641.1 and 4649.2 are seen.

51. η Lupi. The lines in this spectrum are hazy on several plates, and on X 9512, X 9521, X 9870, and X 9948, lines 4120.5, 4387.8, and 4471.8 appear double. The spectrum of A G. C. 21655, magnitude $7\frac{3}{4}$, which follows $0^s.56$, and is north $15''.6$, is not seen.

52. o Velorum. The spectrum of A. G. C. 11761 is superposed. The lines Hδ, Hγ, and Hβ of A. G. C. 11761 are almost lost in the spectrum of o Velorum, while the lines Hθ, Hη, Hζ, and Hϵ are prominent at the end of shorter wave length. The line Hϵ of A. G. C. 11761 falls upon Hι of o Velorum, thus giving that hydrogen line an appearance of unusual intensity. No lines are perceived as belonging to A. G. C. 11761 except those of hydrogen, hence its spectrum can not be classified with certainty, although as the line K is not seen, it is probably of the Orion type. With the dispersion of two prisms, the spectrum of A. G. C. 11761 is lost.

53. μ Crucis and A. G. C. 17542. These spectra are superposed. The fainter spectrum of A. G. C. 17542 is seen apart from that of μ Crucis only as a small portion on the following side of the image. Owing, however, to the difference in declination, the hydrogen lines of the two spectra are well separated. The spectrum of μ Crucis is like that of α Pavonis of Class B 3 A, except that the helium line 3819.2 is slightly intensified by the superposition of Hη of A. G. C. 17542. In the latter spectrum, the following lines are seen: Hβ, which is bright; Hζ, Hϵ, Hδ, and Hγ, which are unusually wide; 4009.5, 4026.4, and 4471.8, which are of the same intensity as in spectra of Class B 3 A. While, therefore, the fainter Orion lines in this spectrum are lost in the image of μ Crucis, it appears certainly to be of Class *B 3 A*.

54. τ^1 and τ^2 Lupi. These spectra are partly superposed.

55. ρ Scorpii. The line 3994.9 is 1.2 as intense as in α Pavonis, the typical star.

56. b^1 Carinæ. The faint spectrum of A. G. C 12224, magnitude $7\frac{1}{4}$, which follows $4^s.94$, and is north $11''.3$, is partly superposed. This spectrum is of the first type.

57. The portion of the spectrum containing Hβ is not photographed.

58. The line 4120.5 is less intense than in α Pavonis, the typical star.

59. λ Crucis. The lines appear double on several plates, and this star may be a spectroscopic binary.

60. f Centauri. The line 4481.4 is as intense as in the spectrum of ϕ Velorum of Class B 5 A.

61. e^1 and e^2 Carinæ. These spectra are partly superposed.

62. k Puppis, and A. G. C. 9881. These spectra are almost completely superposed. The difference in declination is so slight that the hydrogen lines of the two spectra are barely separated, but owing to the difference in right ascension, the following side of the image contains only the lines of A. G. C. 9881, and the preceding side, only those of k Puppis. The characteristic lines of Class B 3 A are well marked in the spectrum of A. G. C. 9881; k Puppis is probably of Class B 8 A.

63. A. G. C. 10861. This spectrum is completely superposed on that of γ Velorum, except a narrow portion on the preceding side.

64. A. G. C. 9334. The image is fairly good, but Hβ is not distinctly seen.

65. A. G. C. 10566 and 10568. These spectra are almost completely superposed. However, the difference in right ascension is such that the preceding side of the image shows only the lines of A. G. C. 10566, and the following side only those of A. G. C. 10568.

66. A. G. C. 10973. The spectrum of A. G. C. 10974, magnitude 7.0, which follows $0^s.51$, and is south 1′6″.1, is superposed on this spectrum, and the wide lines, Hζ, Hϵ, Hδ, Hγ, and Hβ, of the fainter star are seen.

67. A. G. C. 24839. Hβ is not seen as a dark line, and may be bright. The lines Hϵ, Hδ, and Hγ are broad, with some of the haziness usually seen in spectra of the Orion type having Hβ bright. Superposed on this spectrum are the lines Hζ, Hϵ, and Hδ of A. G. C. 24840, magnitude $8\frac{1}{2}$, which follows $0^s.79$, and is south 11′26″.7. The line Hδ of this fainter star crosses the spectrum of A. G. C. 24839 near Hβ, at about the wave length 4761, and is a well marked line. It thus appears that the absence of Hβ as a dark line in the spectrum of A. G. C. 24839 is not due to the faintness of the image at the end of greater wave length.

68. The image is poor, but the spectrum probably belongs to this Class.

69. A. G. C. 9900 and 9902. These spectra are partly superposed.

70. J Centauri and A. G. C. 18172. These spectra are partly superposed. The spectrum of A. G. C. 18172 is faint, and is classified from a small portion showing on the preceding side of J Centauri.

71. A. G. C. 11024. The line Hβ appears to be bright on the only plate so far obtained of this spectrum. The image, however, is faint and the observation needs to be confirmed.

72. A. G. C. 14656. Lines Hδ and 4922.1 appear slightly bright on the edge of shorter wave length. This effect may be due to the sharply defined edges of the lines.

73. μ^1 Scorpii. This star is a spectroscopic binary, having a period of $34^h\,42^m.5$. The two spectra appear to be alike, and both belong to Class B 3 A, but the lines of one are more intense than those of the other. Besides the lines of hydrogen, the following helium lines are sometimes found to be double: 4009.5, 4026.4, 4120.5, 4144.0, 4387.8, and 4471.8. The lines are well separated on 51 of the 91 plates examined. On 30 of these plates, the lines of the fainter component have greater wave lengths than those of the brighter component, and therefore faint lines appear on the less refrangible side of each of the stronger lines. On 18 plates, the lines of the fainter component have shorter wave lengths than those of the brighter component. On 3 plates, the lines appear approximately equal. The separation is large, and micrometric measures give the relative velocity of the two components as 460 km. The relative intensity of the lines of the two stars appears to vary. On a few plates, the lines are of nearly equal intensity, but frequently the stronger lines are twice as intense as the fainter lines. When the less intense lines have greater wave length, the difference in intensity is greater than when they are of shorter wave length. The estimates in the former case are that the stronger lines have from 1.5 to 2.0 times the intensity of the fainter lines; in the latter, from 1.1 to 1.5. There is thus probably a variation in the light of one or both of the components.

74. δ Centauri. Hδ, Hγ, and Hβ are bright, superposed on dark bands. Hδ and Hγ lie slightly towards the edge of shorter wave length of the broad dark bands on which they are superposed. These dark bands are probably complex. On some plates the edge of shorter wave length of bright Hδ appears like a distinct dark line, superposed on the hazy dark band. On Plate X 8332, a trace of a dark line superposed on the bright line Hγ is seen. The bright lines 4232, 4531, 4553, and 4584 are present, but fainter than in μ Centauri (See Remark 47). The isochromatic plate X 9197 shows the end of greater wave length of this spectrum. Line 4922.1 is wholly dark. 5015.7 is bright and superposed on a faint, dark band. 5047.8 is dark. Three faint bright lines have approximate wave lengths, 5167, 5275, and 5312.

75. α Aræ. The lines in this spectrum are very broad in all the photographs, and on several plates they appear to be double. Hβ consists of a well marked bright line superposed on a hazy, dark band which produces wide edges on each side of the bright line. On Plate X 8792, these dark edges appear double. A faint double reversal is barely seen as a fine dark line superposed on the bright Hβ. Hγ is doubly reversed. This phenomenon is excellently photographed on some plates of this spectrum. On a very wide and hazy dark band, a faint bright band is superposed. This bright band has a sharply defined, moderately wide, dark line centrally superposed on it. This central dark line makes the bright portion look like two distinct bright lines. From an examination of the various plates, it appears as if there are slight changes in the line Hγ in this spectrum, but it is not yet certain whether these changes are real or dependent upon the quality of the photograph. For instance, slight changes in the intensity of the two portions of the bright Hγ are noted. On X 9231, the portion of greater wave length is very faint; on X 9302, the portion of greater wave length is more intense than that of shorter

wave length; on X 9545, the portion of greater wave length is not seen. No brightness is seen in the line Hδ, but it appears to be triple, the central line being narrow and the outer lines hazy. It should perhaps be stated that Hγ has a somewhat similar, although more marked, triple appearance on a few plates where the bright lines are of approximately the same intensity as the continuous spectrum. The Orion lines are the same as in those spectra of Class B 3 A which have broad lines, and they show no bright edges. The bright lines 4232, 4531, 4553, and 4584 are less conspicuous than in the spectrum of μ Centauri.

76. ω Canis Majoris. Hδ, Hγ, and Hβ are bright. The intensity of the bright Hδ is so slight that it merely gives to the dark band on which it is superposed the appearance of being double. The bright lines 4232, 4531, 4553, and 4584 are not distinctly seen in this spectrum.

77. ν^1 Puppis. Double reversals of the hydrogen lines Hγ and Hβ are found in this spectrum. This effect is best seen in Hγ. The underlying dark band is wide, and sometimes the edges appear to be double. The bright line superposed on this dark band is narrow, and has centrally superposed on it a fine dark line. The line Hδ shows a very faint bright line superposed on a broad, dark band which appears triple. Line 4471.8 is bright on the edge of greater wave length.

78. r Puppis. Hδ, Hγ, and Hβ are bright, superposed on dark bands. The Orion lines are faint.

79. E Carinæ. Hβ consists of a narrow line, only slightly brighter than the continuous spectrum, superposed on a wide, dark band. The other hydrogen lines are wide and dark.

80. A. G. C. 17717. Hγ and Hβ are bright. The dark Orion lines are faint, and traces of dark lines not present in spectra of Class B 3 A are seen. Numerous bright spaces or lines are seen, and the faint dark lines may be spaces between these bright lines. Line 4120.5 is barely seen. 4387.8 is bright on the edge of greater wave length. The bright lines at wave lengths 4232, 4531, 4553, 4584, and 4619 are well marked. The dark lines accompanying the second, third, and fifth of these lines in the spectrum of μ Centauri, and described in Remark 47, are not seen in this spectrum.

81. Hβ is bright.

82. A. G. C. 8991. On plate X 6232, the line Hβ in this spectrum appears to be bright. The spectrum, however, is rather faint at the end of greater wave length, and, to confirm this observation, several plates were taken with the 11-inch Draper telescope in Cambridge. On plates C 11754 and C 11771, taken February 4 and February 14, 1899, with exposures of 120^m and 118^m respectively, the line Hβ is bright.

83. η Centauri. This spectrum is composite, with the line Hβ variable. The brighter spectrum belongs to Class B 3 A, the characteristic helium lines of that class being well marked. The fainter spectrum is of Class A, or A 2 F. The helium lines are always broad on the 34 plates examined, and frequently they appear to be double or triple. This effect seems to be due to superposed solar lines belonging to the fainter spectrum. The hydrogen lines Hδ and Hγ are generally narrow, but, on a few plates, they appear to be hazy, although not so broad as the helium lines. On the greater number of the plates, the peculiar combination of narrow hydrogen lines and broad helium lines is presented. Numerous solar lines are distinctly seen, and traces of many others are visible. These lines agree in wave length and relative intensity with lines in the spectrum of α Cygni, and have been identified by superposing plates of η Centauri on X 7990, a photograph of α Cygni taken with two prisms. The wave lengths of the following lines found in the spectrum of η Centauri, are taken from Table VII, page 80: 4163.9, 4173.6, 4179.5, 4233.6, 4300.2 to 4302.6, 4315.2, 4344.7, 4352.0, 4482.0, 4489.6 to 4491.6, 4501.5, 4508.5, 4515.4, 4520.3 to 4522.9, 4541.6, 4549.7, 4556.0, 4584.0, 4586.1, 4619.2, 4629.9, and 4634.8. Many of these lines are well marked on some plates and barely seen on others, but the change in their intensity may be due to the quality of the plate. The line K is not more intense than in the typical star, α Pavonis, of Class B 3 A. On most of the plates, the region of the line K is hazy. On a few plates there appears to be a trace of the line K, narrow, sharply defined, but distinguishable through the general haziness of the region. While the secondary spectrum can not be classified with certainty, it appears to belong to Class A, or A 2 F, and to have narrow lines of well marked intensity, as found in spectra to which remark 40 applies.

The most remarkable peculiarity in the spectrum of η Centauri is the variation of the hydrogen line Hβ. In studying this variation, the spectrum was carefully examined by several different methods; first, the plates were intermingled and a brief description of Hβ, including estimates of its intensity with respect to Hγ, was read off to a recorder. At other times, the plates were superposed on each other, to detect, if possible, any variation in the position of the solar lines with respect to the hydrogen or helium lines, or to determine whether small differences are real or instrumental. Again, the plates were superposed on those of other spectra to identify certain lines, and to compare intensities of lines. No positive changes in the position of the solar lines with respect to those of hydrogen and helium could be detected by the method here employed. The changes in Hβ are complex, and can not yet be explained with certainty. It will be noticed, however, that many of the appearances may be explained if we assume that Hβ is narrow and dark in the fainter component, and that it is bright and variable in the brighter component.

A description of the general appearance of the spectrum on each plate is given below, preceded by the number of the plate, the date, and the length of exposure. All these plates were taken with two prisms except X 4156 and X 5759, which were taken with one prism.

X 4156. June 21, 1892. 6^m. Hβ is dark, slightly hazy, 0.2 as intense as Hγ. All lines are slightly hazy.

X 5759. July 30, 1894. 30^m. Hβ is dark, sharply defined, 0.2 as intense as Hγ, and slightly bright on the edge of greater wave length. The hydrogen lines, Hδ and Hγ, are narrow, and the Orion lines are broad.

X 7508. May 14, 1896. 60^m. Hβ is dark, hazy, and 0.8 as intense as Hγ. All lines are broad. Hδ, Hγ, and 4387.8 appear indistinctly double.

X 8493. April 30, 1897. 77^m. Hβ is dark, well defined, nearly equal to Hγ, and has a very faint bright edge on the side of shorter wave length. Hε, Hδ, and Hγ are well defined on the edge of shorter wave length, and hazy on the edge of greater wave length. The faint solar lines are well seen.

X 8505. May 4, 1897. 78^m. Hβ is dark, well defined, nearly equal to Hγ, and has a very faint bright edge on the side of greater wave length.

X 9052. April 30, 1898. 39^m. Original record of the exposure of this plate says "Clock stopped." There are accordingly several very narrow spectra on the plate. Hβ appears to consist of three dark lines, the central one, which is the most intense, being about 0.3 as intense as Hγ. All the lines are broad, perhaps double.

X 9053. April 30, 1898. 38^m. Hβ consists of two dark lines, the one towards the red, which is the more sharply defined, being about 0.2 as intense as Hγ. The space between these two lines is a little brighter than the continuous spectrum. Upon superposing this plate on X 9052, it appears that, of the three lines seen at Hβ on the latter plate, the one having the greatest wave length is not visible on X 9053. All the lines are wide.

X 9141. May 25, 1898. 72^m. Hβ is dark, well defined, and 0.3 as intense as Hγ. Both edges of Hβ are slightly bright. The Orion, and the faint solar lines are broad.

X 9162. May 27, 1898. 54^m. Hβ is dark, and 0.2 as intense as Hγ. A faint, hazy, dark line is seen near Hβ, towards the violet. The space between this line and Hβ is slightly bright. A very faint line is also seen in the same position with respect to Hγ. These may be solar lines, but the solar lines are, in general, very indistinct on this plate. The helium lines, 4120.5, 4144.0, and 4387.8 are double.

X 9194. June 11, 1898. Two exposures, 60^m and 55^m, respectively. Isochromatic plate. Hβ is not distinctly seen, on account of faintness of the image in that region. All the lines are broad.

X 9207. June 15, 1898. 60^m. Hβ appears to be doubly reversed. The appearance is best described by supposing a faint, hazy, dark band having superposed on it a faint bright band, which in turn has a well defined dark line superposed. This central dark line is about 0.1 as intense as Hγ, and divides the bright band into two bright lines. The edges of the underlying dark band appear like indistinct dark lines. Hγ is well defined, with a wide haziness on the side of greater wave length. The Orion lines are broad. The solar lines are well seen, and rather narrow.

X 9224. June 18, 1898. 64^m. Hβ consists of two dark lines, separated by a bright line or space. The dark line towards the red is better defined and slightly more intense than the one towards the violet. When this plate is superposed on X 9207, the central dark line of Hβ on the latter plate falls on the dark line towards the red on X 9224. The solar lines are not clearly seen. Hδ and Hγ are well defined, but surrounded by haziness. The Orion lines are broad.

X 9280. July 12, 1898. 66^m. Hβ is dark, sharply defined, 0.2 as intense as Hγ, and is superposed on a faint bright band. Two indistinct dark lines are seen near Hβ, towards the violet, and one towards the red. The Orion lines are broad. Numerous faint solar lines are present. Hγ is well defined, but several adjacent hazy lines are seen towards the red.

X 9290. July 19, 1898. 78^m. Hβ consists of two dark lines, both of which are bright on the edge of greater wave length. The dark line towards the red is sharply defined, 0.4 as intense as Hγ, and corresponds to the central dark line of Hβ, on X 9207, when the two plates are superposed. The dark line towards the violet is about 0.2 as intense as Hγ, and is not so well defined as the one towards the red. The bright edge or line towards the violet is also less sharply defined than the one towards the red. The solar lines are numerous, 4233.6 being unusually well marked, and much narrower than the helium lines. Hδ and Hγ are narrow, with hazy lines adjacent to them.

X 9312. August 19, 1898. 48^m. The spectrum is very narrow on this plate. Hβ is dark, single, and 0.7 as intense as Hγ. There is no appearance of bright edges to Hβ. The helium lines 4387.8 and 4471.8 appear to be double. Hδ and Hγ are fairly well defined. The image is too dense to show the solar lines distinctly.

X 9495. May 19, 1899. 64^m. The appearance of Hβ on this plate is that of a double reversal. The central dark line is sharply defined, and 0.1 as intense as Hγ. The bright band on which this line is superposed is very faint. The underlying dark band appears like an indistinct line on each edge. It is of interest that the faint bright lines or spaces at wave lengths 4232, 4553, 4584, and 4619, approximately, which are present in most spectra of the Orion type having bright hydrogen lines, are distinctly photographed on this plate. The solar lines are distinctly seen.

X 9499. May 20, 1899. 70^m. Hβ appears to be doubly reversed. The central dark line is narrow, and 0.3 as intense as Hγ. The bright band is equally intense on each side of this central dark line. The underlying dark band appears like a hazy line on each side. The solar lines are very distinct on this plate. 4344.7 and 4352.0 are distinctly seen near Hγ. The Orion lines are very broad.

X 9505. May 22, 1899. 50^m. Hβ is almost invisible. Two or three very faint dark lines are glimpsed, the most intense of which is not more than 0.05 as intense as Hγ. All the lines are broad or hazy, and the solar lines are indistinct.

X 9510. May 23, 1899. 54^m Hβ appears to be

doubly reversed. The central dark line is narrow, and 0.3 as intense as Hγ. The Orion lines are broad, and the solar lines are well marked and rather narrow.

X 9515. May 24, 1899. 53^m. Hβ is dark, sharply defined, 0.2 as intense as Hγ, and superposed on a bright band. The brightness on the edge of shorter wave length of the dark Hβ is slight, that on the edge of greater wave length is more intense and appears like a narrow bright line. Traces of an underlying dark band are seen, but not distinctly. Hδ and Hγ are single and well defined. The solar lines are distinctly seen.

X 9519. May 25, 1899. 61^m. Hβ is dark, sharply defined, 0.3 as intense as Hγ, and superposed on a faint bright band. The portions of the bright band are equally intense on each side of the dark line. Traces of an underlying dark band are very indistinctly seen. Hδ and Hγ are narrow. The solar lines are well marked. The helium line, 4471.8, is very wide, while the adjacent line, 4481.4, is narrow.

X 9523. May 26, 1899. 42^m. Hβ is dark, sharply defined, 0.3 as intense as Hγ, and superposed on a faint, bright band, which is equally intense on each side of the dark line. Traces of an underlying dark band are faintly seen. The helium lines are broad or double. The solar lines, as well as the hydrogen lines Hδ and Hγ, are narrow.

X 9527. May 27, 1899. 89^m. The spectrum on this plate resembles that on X 9499.

X 9531. May 29, 1899. 46^m. Hβ appears to be doubly reversed. The central dark line is narrow, and 0.4 as intense as Hγ. The bright band is more intense on the edge of greater wave length of this dark line, than on that of shorter wave length. The underlying dark band is very indistinct and hazy. Hγ appears to be bright on the edge of greater wave length. The solar lines are clearly seen.

X 9539. May 30, 1899. 36^m. Hβ is dark, 0.1 as intense as Hγ, and no bright edges are seen. A hazy dark line is seen near Hβ on the side of shorter wave length. The solar lines are distinctly seen, and are a little hazy. Hγ is narrow. The Orion lines are broad or double.

X 9548. May 31, 1899. 58^m. Hβ is dark, 0.4 as intense as Hγ, and has a distinct bright edge on the side of greater wave length. The edge of shorter wave length of Hβ is also bright, but it is very faint. Traces of faint, hazy, dark lines are seen on each side of the bright edges of Hβ. The Orion lines are broad. Hδ, Hγ, and the solar lines, are narrow.

X 9576. June 5, 1899. 61^m. Hβ appears to be doubly reversed. The dark central line is 0.3 as intense as Hγ. The bright band is equally intense on each side of the dark line. The underlying dark band is distinctly seen on each side of the bright lines. Thus Hβ appears to consist of three dark lines, of which the central one is the most intense, and which are separated by bright spaces. Hδ, Hγ, and the solar lines, are narrow. The Orion lines are broad.

X 9583. June 6, 1899. 45^m. Hβ presents a complex appearance on this plate. A narrow, dark line, 0.4 as intense as Hγ, is superposed on a faint bright band. On the outer edges of the bright line or band towards the violet are two dark lines, and towards the red is one dark line. Hδ and Hγ are narrow, as are also the solar lines.

X 9602. June 9, 1899. 47^m. Hβ consists of two dark lines with a bright space between. The dark line towards the violet is more sharply defined, is 0.4 as intense as Hγ, and corresponds to the central dark line of Hβ on X 9207, when the two plates are superposed. Traces of one or two very indistinct dark lines are seen on the side of shorter wave length of the sharply defined dark Hβ. Hγ is narrow. The solar band, extending from 4383.7 to 4385.2, is separated from the helium line 4387.8.

X 9609. June 10, 1899. 35^m. Hβ consists of three dark lines, of which the central line is more sharply defined and slightly more intense than the outer lines. This central line is 0.2 as intense as Hγ. The space between this line and the dark line of greater wave length appears like a bright line. The solar lines are distinctly seen. Hγ is narrow. The helium lines are broad.

X 9619. June 12, 1899. 61^m. Hβ appears to be doubly reversed. The central dark line is narrow, and 0.4 as intense as Hγ. The line K is distinctly seen on this plate. It is narrow and faint, having intensity 2. In other respects the spectrum on this plate agrees with that on X 9207.

X 9666. June 19, 1899. 40^m. Hβ is almost invisible, but appears to consist of three extremely faint dark lines with spaces slightly bright. The solar lines are indistinct and faint.

X 9861. July 25, 1899. 62^m. Hβ is dark, narrow, 0.5 as intense as Hγ, and bright on the edge of greater wave length. Hγ is slightly bright on the edge of greater wave length. The Orion lines are very wide.

X 9911. August 7, 1899. 45^m. Hβ appears to be doubly reversed. The central dark line is narrow, and 0.5 as intense as Hγ. The bright band on which this dark line is superposed is more intense towards the red. The underlying dark band appears like a hazy line on each edge. The solar lines are well marked and narrow.

84. κ Eridani. Lines 3918.7, 3920.6, 3926.8, and K are not seen, which does not appear to be due to poor definition as 3819.2 is well defined. 4009.5, 4120.5, 4267.4, and 4712.8, are fainter than in φ Velorum, the typical star.

85. α Eridani. On a few plates, Hβ appears to be double, or to have a faint bright line superposed centrally on the wide dark band, as in the spectrum of α Columbæ. This observation, however, needs confirmation. The line K is less intense than line 3926.8. The lines are very wide and hazy.

86. Lines 4128.5, 4131.4, and 4481.4, are somewhat more intense than in the spectrum of φ Velorum, the typical star. 4481.4 is estimated as 0.8 as intense as 4471.8, and the lines 4128.5 and 4131.4, when seen together, are about equal to 4144.0.

87. ϵ Normæ. The spectrum of A. G. C. 22244, magnitude 7, which precedes $0^s.81$ and is north $20''.2$, is superposed. A narrow portion of this faint spectrum appears on Plate X 6865, and the broad hydrogen lines Hδ, Hγ, and Hβ, are seen as in spectra of the first type.

88. ϵ Volantis. No trace is seen of the spectrum of A. G. C. 10924, magnitude 8, which follows $0^s.46$ and is north $7''.4$.

89. Lines 4128.5 and 4131.4, when seen together, are about 1.5 as intense as in the spectrum of ϕ Velorum, the typical star.

90. A. G. C. 16939. This spectrum is superposed on the spectra of α^1 and α^2 Crucis, and a narrow portion of it only appears on the preceding side.

91. A. G. C. 11917. This spectrum resembles that of o^2 Canis Majoris in the intensity of line 3994.9.

92. A. G. C. 16566. The broad hydrogen lines Hδ, Hγ, and Hβ, of A. G. C. 16565, magnitude $8\frac{1}{2}$, which precedes $0^s.43$ and is south $6'8''.5$, are superposed on this spectrum.

93. A. G. C. 6182. This spectrum may be composite. A well marked line is present which identifies as the solar line 4233.6. This line is narrow, while the Orion lines are wide. 4481.4 is also narrow, but the adjacent helium line, 4471.8, is wide and hazy. Very faint lines are seen which appear to coincide with the solar lines 4173.6, 4179.5, 4300.8 to 4302.6, 4315.2, 4520.3 to 4522.9, 4549.7, 4556.0, and 4584.0 When, however, spectra are too faint to be photographed with more than one prism, it is difficult to distinguish between solar and Orion lines if they are faint and indistinct.

94. a Centauri. The line 3994.9 is well marked but not quite as intense as in o^2 Canis Majoris (See Remark 96). The spectrum may resemble that of o^2 Canis Majoris in the presence of faint Orion lines not usually seen in Class B 5 A, but they are not well defined. The spectrum is slightly peculiar in the extreme faintness of line 3926.8, which is barely seen, and in the increased intensity of the double line, 3918.7 and 3920.6, which together are 1.2 as intense as the line K.

95. ϵ Capricorni. This spectrum is probably composite and appears to show changes due to motion of one or more bodies. On Plate X 5692, taken July 14, 1894, with an exposure of 43^m, and on X 7157, taken September 18, 1895, with an exposure of 60^m, the hydrogen lines are narrow and sharply defined, while the line K and the Orion lines are wide and hazy. The hydrogen lines are as narrow as in spectra to which remark 40 applies, and the Orion lines are so wide that remark 18 would be used to describe them. It appears from an examination of these plates as if the two systems of lines proceed from different bodies, but no lines are seen except those present in the typical stars of Class B 5 A. Other plates show all the lines, including those of hydrogen, to be hazy, and in addition to the Orion lines of Class B 5 A, several solar lines are present. On X 10077, taken October 27, 1899, with an exposure of 75^m, two lines which appear to be the solar lines 4173.6 and 4179.5 are present, with almost as great intensity as the helium line 4144.0. The helium line 4387.8 is double. This may be due to the presence of the double solar line 4383.7 and 4385.2. On all the plates showing hazy hydrogen lines, the band containing the Orion lines 4415.1 and 4417.5 is more intense than on X 5692 and X 7157 mentioned above. This increased intensity may be due to the presence of the solar lines 4415.3 and 4417.9. A line is present which appears to be the solar line 4490.0. Traces of other faint lines are seen.

96. o^2 and η Canis Majoris. The more marked Orion lines have about the same intensity as in ϕ Velorum, the typical star, with the following exceptions: line 3964.6 is at least 2.0 as intense, and 4922.1 is 1.5 as intense as the same lines in ϕ Velorum, while 3994.9, which is very faint in ϕ Velorum, is in this spectrum about as intense as 4009.5. Besides the well marked Orion lines characteristic of Class B 5 A, the following lines are seen: 4069.4, 4072.0, 4075.9, 4553.4, 4568.6, 4576.5, 4591.6, 4598.2, 4619.8, 4630.6, 4641.1, 4649.2, with nearly as great intensity as in Class B 1 A. 4630.6 is here more intense than 4641.1 or 4649.2. The line K is 2.0 as intense as in the spectrum of ϕ Velorum.

97. α Columbæ. Hβ consists of a faint bright line only slightly more intense than the continuous spectrum, and superposed upon a broad dark band to which it gives a double appearance. The other lines of hydrogen are dark and wide.

98. p Carinæ. Hγ and Hβ are bright, superposed on dark bands. Hβ bright, and the dark band on which it is superposed, are slightly more intense on the edges of shorter, than on those of greater wave length. Hγ bright, lies towards the edge of shorter wave length of the dark band on which it is superposed. Double reversal is seen in the line Hβ, the bright line being crossed by a fine dark line. The Orion lines 4267.4 and 4712.8 are faint in this spectrum.

99. J Velorum. This spectrum shows the lines Hγ and Hβ variable. On Plate X 4710, taken June 2, 1893, with an exposure of 60^m, Hβ appears as a narrow, bright line superposed on a wide dark band, and has an intensity about 0.1 as great as that of Hβ in the spectrum of μ Centauri. Hγ shows a slight central brightness which gives it the appearance of being double. On plates X 6376, and X 7376, taken April 19, 1895, and March 17, 1896, with exposures of 60^m and 61^m respectively, all the lines are dark. On eight additional plates, taken in April and May 1899, all the lines are dark.

100. κ^1 Apodis. This spectrum shows marked changes. On Plate X 6794, taken June 27, 1895, with an exposure of 92^m, the line Hβ is almost invisible, but upon the most careful scrutiny it appears to be an extremely faint dark line with an equally faint bright edge towards the red. The lines Hϵ, Hδ, and Hγ are narrow and sharply defined, while the Orion lines 4009.5, 4026.4, 4120.5, 4128.5 to 4131.4, 4144.0, 4387.8, and 4471.8 are wide and hazy. Besides these well marked Orion lines, traces of fainter lines are seen on this plate, especially of 4649.2 which is not present in typical spectra showing

the above named Orion lines of the same intensity as in this spectrum. Lines 4415.1 and 4417.5 are also more intense than in Class B 5 A. On Plate X 6801, taken June 28, 1895, with an exposure of 78^m, the spectrum does not differ essentially from that on X 6794. On X 9596, taken June 8, 1899, with an exposure of 81^m, Hβ is bright on the edge of greater wave length, with intensity *1* on the scale of the estimates in Table XIX. All the other lines, including those of hydrogen, appear double on this plate. On X 9812 and X 9830, taken July 13, and July 17, 1899, with exposures of 75^m and 65^m, respectively, Hβ is bright, intensity *3*, and the other lines of the spectrum are double. On X 9877, taken July 27, 1899, the image is too faint to show Hβ distinctly. On this plate the Orion lines are not so wide as those of hydrogen. On X 9895, taken August 2, 1899, with an exposure of 77^m, Hβ is bright, with intensity *5*, and 4144.0, Hγ, 4387.8 and 4471.8 appear double.

101. A. G. C. 9181. The lines Hγ and Hβ in this spectrum are variable. On Plate X 4417, taken October 5, 1892, with an exposure of 55^m, these lines, as well as the other hydrogen lines, are dark. On X 6210, taken November 28, 1894, with an exposure of 42^m, Hβ is bright and superposed on a faint dark band. The intensity of Hβ is about 0.3 as great as that of bright Hβ in the adjacent star ω Canis Majoris. Hγ is wholly dark on this plate. On X 6432, taken April 27, 1895, with an exposure of 58^m, Hβ is bright, and is 1.2 as intense as Hβ in ω Canis Majoris. The image on this plate is too dense to show Hγ. On X 6455, taken April 30, 1895, with an exposure of 60^m, Hβ is bright, and 1.5 as intense as Hβ in ω Canis Majoris. Hγ is also bright on the latter plate. On X 8300, taken January 28, 1897, with an exposure of 61^m, Hβ is dark. In order to ascertain, if possible, the period of the variability of these hydrogen lines, a large number of photographs have been secured with the 11 inch Draper telescope at Cambridge. Plates taken in October and November, 1897, show Hβ bright, and varying from 0.1 to 0.5 of the intensity of Hβ in ω Canis Majoris. In December, 1897, this line was again dark, and in 37 photographs taken since December 1, 1897, Hβ is either distinctly dark or not clearly seen. In the latter case the plates are poor. The material is not at present sufficient to determine the period of the variability of this line. Lines 4415.1 and 4417.5 are more intense in this spectrum than in the typical spectra of Class B 5 A, and are about equal to the same lines in β Centauri of Class B 1 A.

102. γ Circini. The image is found to consist of two spectra so completely superposed that no difference either in right ascension or declination is perceived. The brighter spectrum is of Class B 5 A, the fainter, of Class F 8 G, or G. One star is therefore probably white or bluish in color, the other, yellow, and judging from the relative intensities of the two spectra, they must be nearly equal in magnitude. This composite spectrum is therefore an exception to the general rule that when double stars are of approximately equal magnitudes, they have similar spectra. In the brighter spectrum, the hydrogen series is seen from Hκ to Hβ inclusive, and 3819.2, 4009.5, 4026.4, 4120.5, 4128.5, 4131.4, 4144.0, 4471.8, 4481.4, and 4922.1 are present with about the same intensities as in ϕ Velorum, the typical star of Class B 5 A. The fainter image shows distinctly lines 4215.7, 4227.0, the band G, and 4326.0, characteristic of Class G. The line K is also seen as a faint haze, being almost obliterated by the bright part of the spectrum of the Orion star. The whole spectrum appears also to be crossed by numerous, indistinct, solar lines.

103. β^1 Sagittarii. A trace of the spectrum of the companion star, A. G. C. 26486, magnitude 7, which follows $2^s.54$ and is north $5''.6$, is seen on Plate X 7093. The spectrum of A. G. C. 26486 is seen from Plate B 19946 to be of Class A 5 F, or F.

104. ν Puppis. Lines 3856.2 and 3863.2 are present in this spectrum, and 3819.2 and 4922.1 have slightly greater intensity than in the spectrum of γ Gruis, the typical star.

105. H. P. 625 and + 23° 558. These spectra are partly superposed. In H. P. 625, the Orion lines are rather faint and hazy. In Pleione, + 23° 558, Hβ is bright, and the Orion system of lines, while not completely defined, appears to be the same as in Class B 8 A.

106. The Orion lines, except 4026.4, are slightly fainter than in γ Gruis, the typical star.

107. l Centauri. The lines 4128.5, 4131.4, and 4144.0, are not so well defined as in the typical star, and traces of numerous lines are seen between Hδ and Hγ.

108. f Eridani. A. G. C. 4241 and 4242. These spectra are completely superposed. The difference in right ascension, $0^s.28$, is not sufficient to show any portion of one spectrum free from the image of the other. The hydrogen lines are wide, but show no separation. The line K, however, is double, the more intense component belonging to the fainter star A. G. C. 4241, which is south $8''.7$. The spectrum of A. G. C. 4241 is probably of Class A, although the fainter lines are lost by the superposition of the spectrum of A. G. C. 4242, which is clearly of Class B 8 A. The presence of the two spectra is very easily proven by superposing the more intense line K on the line K in the spectrum of γ Gruis, the typical star of Class B 8 A, when it is observed that 4471.18 and 4481.4 do not match the same lines in the spectrum of γ Gruis. These lines in the two spectra do match, however, when the line K in γ Gruis is superposed on the fainter line K in the spectrum of A. G. C. 4242.

109. m Velorum and A. G. C. 13453. These spectra are partly superposed.

110. A. G. C. 14349. This spectrum may be of Class B 5 A.

111. Line 4026.4 has the same intensity as in γ Gruis, but other Orion lines are not clearly seen.

112. β Orionis. The lines in this spectrum are very sharply defined. The relative intensity of the well marked Orion lines is similar to that in the spectra of Class B 8 A, and both the systems of Orion and solar lines are present. Many more lines are present, however, than in γ Gruis, the typical star, and the intensities of all the

lines, except those due to hydrogen, are greater than in γ Gruis. The hydrogen lines are not more than 0.5 as intense as in γ Gruis. 47 lines, in addition to those of hydrogen, have been measured in this spectrum, from Hι to wave length 5016. A list of these lines is given in Table XXV.

113. μ Sagittarii. This spectrum is like that of β Orionis, as far as can be determined by plates taken with one and two prisms.

114. X Eridani. The line 4471.8 is 1.4, or 1.5 as intense as in the spectrum of λ Centauri, the typical star.

115. κ^1 Volantis. The line 4471.8 is fainter than in the spectrum of λ Centauri, the typical star.

116. ω Fornacis. No trace is seen of the spectrum of the companion star, A. G. C. 2692, magnitude 8, which precedes $0^s.79$ and is south $5''.0$.

117. β^1 and β^2 Tucanæ. These spectra are superposed. The difference in declination, however, is sufficient to show the two systems of lines well separated. The spectrum of β^1 Tucanæ shows wide hydrogen lines from Hλ to Hβ, and the Class, B 9 A, to which the spectrum belongs, is well defined. In the case of β^2 Tucanæ there are no well marked lines to assist in the classification, except K, and the lines of hydrogen, which are seen from Hη to Hβ. These lines are narrow and of about the same intensity as in α Cygni and l Puppis. The spectrum of β^2 Tucanæ is probably of Class A 2 F and has narrow lines.

118. κ Lupi and A. G. C. 20571. These spectra are superposed. The lines K, Hϵ, Hδ, Hγ, 4481.4, and Hβ of the fainter spectrum, A. G. C. 20571, are identified among the lines in the spectrum of κ Lupi. The spectrum of A. G. C. 20571 is probably of Class A.

119. λ Telescopii. The line 4026.4 is slightly fainter than in λ Centauri, the typical star.

120. h^2 Sagittarii. All lines are very faint except those due to hydrogen.

121. ϕ Phœnicis. The line K is not seen distinctly in this spectrum. Traces of 4026.4 and 4481.4 are seen but no other lines are visible except those of hydrogen.

122. The hydrogen lines, K, and 4026.4, have the same intensity as in λ Centauri, but fainter lines are not seen.

123. A. G. C. 9589. The line K is as intense as in α Canis Majoris, Class A, but 4026.4 is present.

124. The line K is a little more intense than in α Canis Majoris, the typical star, and has 0.2 of the intensity of Hδ, but the solar lines in general appear to be less numerous, or less intense, than in the typical star.

125. On plates taken with two prisms the lines of hydrogen are wide and hazy, and 4481.4 is the only well marked solar line.

126. N Carinæ. The line K is even a little more intense than in α Canis Majoris, the typical star, but the solar lines are not seen except 4128.5, 4131.4, and 4481.4. 4026.4 is present, and faint traces of 4120.5, 4144.0, 4387.8, and 4471.8 are also seen. The lines are slightly narrower than in α Canis Majoris, the typical star.

127. A. G. C. 6141. The line K is 1.5 as intense as in α Canis Majoris, the typical star, while 4026.4 is well marked and fully as intense as in λ Centauri, Class B 9 A. The solar lines are, in general, faint. 4128.5, 4131.4 seen together, 4383.7 and 4385.2 seen together, and 4481.4 are well marked.

128. ψ Centauri. This spectrum resembles that of N Carinæ (See Remark 126), in the presence of line 4026.4.

129. α Geminorum. The spectra of the two components of this double star are not separated. The lines are wide, however, on the two plates examined.

130. ι Piscis Aust. Solar lines are not well seen except 4128.5, 4131.4, and 4481.4. The presence of 4026.4 is suspected.

131. ξ Lupi and A. G. C. 21587. These spectra are superposed, but the difference in right ascension between the two stars is sufficient to show the spectrum of ξ Lupi on the preceding side, and of A. G. C. 21587 on the following side. The line K, which is single on both edges of the image, is distinctly double in the centre where the two spectra are superposed. Both spectra appear to be of Class A.

132. This spectrum appears on the edge of the plates.

133. This spectrum is faint, and is classified from the relative intensity of the line K and the lines of hydrogen.

134. A. G. C. 9243. This spectrum is peculiar in the scarcity of lines. The image is well seen, from Hζ to Hβ. Line K is barely seen. 4128.5 and 4131.4, seen as one, are the most intense lines except those of hydrogen. Another well marked line appears to coincide with the additional hydrogen line, 4200.7, as found in spectra of classes Od, Oe, Oe 5 B, and B. Since, however, 4542.4 is not present, it is more probable that the line at 4200 is a solar line. The Orion line, 4026.4, is suspected to be present. 4077.9 and 4233.6 are faintly seen.

135. A. G. C. 17504. The lines 4128.5 and 4131.4 show increased intensity as in the spectrum of α Doradus. (See Remark 145.)

136. A. G. C. 21206. The faint lines, Hδ and Hγ, of A. G. C. 21205, magnitude $8\frac{3}{4}$, which precedes $1^s.02$ and is north $2'\ 29''.3$, are superposed on this spectrum.

137, This spectrum resembles that of τ^9 Eridani (See Remark 144) in the intensity of the double line, 4128.5 and 4131.4, but the line K is as intense as in the typical star, α Canis Majoris.

138. This spectrum resembles those of ν Fornacis and τ^9 Eridani in the intensity of the double line, 4128.5 and 4131.4, but other lines, except those of hydrogen, are not seen.

139. A. G. C. 19867. The intensities of some of the lines are like those in τ^9 Eridani. (See Remark 144.) Since, however, this spectrum appears on the edge of the plates and is not in the best focus, an exact comparison could not be made.

140. This spectrum is probably like that of α Doradus. (See Remark 145.)

141. α Andromedæ. This spectrum is peculiar. In the intensity of the hydrogen and calcium lines it resembles α Canis Majoris. The solar lines, however, are much less numerous than in the spectrum of Sirius, and several Orion lines are present, of which the most intense are

4026.4, 4267.4, and 4471.8. An exact study of all the lines in this spectrum was not attempted since the only plate in this series on which the spectrum appears is not very good.

142. β Aurigæ. This star is a spectroscopic binary with a period of $3^d.984$. Both components appear to be of equal, or nearly equal brightness, and to have similar spectra. On three of the four plates taken with the 13 inch Boyden telescope, the line K is double, and when the definition is good, Hδ, Hγ, and 4481.4, are also double.

143. ν Fornacis. This spectrum is peculiar in the faintness of the line K, which is barely seen on plates of normal exposure, and in the intensity of the double line 4128.5 and 4131.4, which together are three or four times as intense as any other line in the spectrum except those of hydrogen. 4077.9 is fairly well marked among the fainter lines.

144. τ^9 Eridani. This spectrum resembles that of ν Fornacis (See Remark 143), but appears to be more peculiar. The line K is not seen, while, in general, the solar lines are more intense than in α Canis Majoris, the typical star. The double line, 4128.5 and 4131.4, is 0.4 as intense as the line Hδ, and 4077.9 is 1.2 or 1.3 as intense as in α Canis Majoris. The absence of the line K is not due to faintness of the spectrum at the end of shorter wave length, for two lines are seen between Hη and Hζ. These lines appear to be the Orion lines 3856.2 and 3863.2, which are well marked in the spectrum of ϕ Velorum, Class B 5 A. 3863.2 appears double. 4026.4 and 4471.8 are present with nearly as great intensity as in the spectrum of λ Centauri, Class B 9 A.

145. α Doradus. This spectrum resembles that of ν Fornacis and of τ^9 Eridani, in the marked intensity of the double line 4128.5 and 4131.4, but differs from them in showing the line K nearly as intense as in α Canis Majoris, and in having fewer lines present. Except the lines of hydrogen, the following are the only lines that are well marked; 3856.2, 3863.2, the line K, and the double line 4128.5 and 4131.4. 3920.6 and 4471.8 are faintly seen.

146. L^1 Puppis. This spectrum is like that of α Doradus. (See Remark 145.)

147. θ^2 Microscopii. The lines, in general, are hazy and ill defined. The spectrum resembles that of α Doradus. The Orion lines 4267.4, 4387.8, and 4471.8 are present and narrow. Owing to the faintness of this star no lines of shorter wave length than K are seen except those due to hydrogen.

148. θ Eridani. The spectrum of A. G. C. 3224, magnitude $5\frac{1}{4}$, which follows $0^s.82$ and is north $1''.1$, is superposed. The lines are a little hazy, but not separated. It is probable that both stars have similar spectra.

149. μ Piscis Austrini. The hydrogen lines are hazy and the solar lines are very faint and indistinct on all the plates, although in the adjacent star, τ Piscis Austrini, the lines are well defined.

150. A. G. C. 8592 and 8594. These spectra are partly superposed.

151. A. G. C. 32414. The faint spectrum of A. G. C. 32415, magnitude 7.4, which follows $2^s.72$ and is south $6'\,46''.1$, is partly superposed. This spectrum appears to be of Class B 8 A.

152. A. G. C. 17472. This spectrum is not exactly in focus on the plates examined, but the intensities of the solar lines resemble those in the spectrum of ι Phœnicis.

153. The intensities of the lines resemble those in the spectrum of α Cygni, but the lines are not so narrow as in the latter spectrum.

154. α Cygni. Two plates of this spectrum have been taken with the 13 inch Boyden telescope. Plate X 4098, taken with one prism, is not very good. Plate X 7990, taken with two prisms, shows the spectrum from Hζ to about wave length 5020. A list of the lines in this spectrum, from Hκ to Hβ, is given in Table VII, column 6, of this volume. The spectrum differs from that of the typical star, ι Centauri, in the intensity of many of the lines. The line K is of approximately the same intensity as in ι Centauri, but the lines of hydrogen are only about 0.7 as wide as in the latter spectrum. The Orion lines, 3854.2, 3856.2, 3863.2, and 4471.8, are present, the latter being very faint. Only two lines of greater wave length than Hβ are seen. These are well marked and agree in position and intensity with the helium lines 4922.1 and 5015.7, as present in the spectra of the Orion stars. It appears far more probable, however, that these are solar lines. The spectra of ϵ Sagittarii, β Carinæ, and γ Centauri, of Class A, as photographed on isochromatic plates, show two lines in approximately the same positions as those in α Cygni. They are probably 4920.8 and 5014.5. Line 4227.0, which is well marked in ι Centauri, is barely seen in α Cygni.

155. l Puppis. This spectrum appears to be almost exactly like that of α Cygni, as far as can be determined with plates taken with one prism. The only difference that has been noted is that line 4491.6 is less intense than in α Cygni.

156. This spectrum is like that of α Cygni, as far as can be determined with plates taken with one prism.

157. o^1 and o^2 Centauri. These spectra are partly superposed on all the plates except X 6340, which is taken with narrow images, so that the two spectra are separated. Both spectra are peculiar in having narrow, sharply defined lines.

158. θ^1 Microscopii. This spectrum is peculiar. The faintness and haziness of the line K, which is not more than 0.1 as intense as Hδ, combined with the intensity of the solar lines, suggest a composite type. If this is the case, the secondary spectrum is probably of Class A, for there is no trace of the helium line 4471.8, which is present in all classes of Orion spectra. In general aspects, the spectrum resembles that of the peculiar star, δ Normæ, of Class A 3 F, but the line K is much less intense, and the solar lines are less numerous. 4077.9 is unusually intense, being 0.3 or 0.4 as intense as Hδ, and is sharply defined. Two lines between Hη and Hζ, which appear to be the solar lines 3856.5 and 3872.7, are better defined than the line K, and thus it appears that the hazi-

ness of the line K is not due to poor focus. A hazy line which probably includes the solar lines 3918.6 and 3920.4, is nearly as intense as the line K. 4172.9 is, next to 4077.9, the most intense solar line, and 4179.5 is present, but faint. 4215.7, 4383.7 to 4385.2, 4481.4 and 4490.0 are well marked. 4128.5 is 1.5 as intense as the adjacent line 4131.4. This may be due to the presence of 4128.1. Lines between Hε and Hδ differ in intensity from those in the typical star, ι Centauri, and there may be differences in wave lengths, but an exact comparison is difficult since this spectrum is too faint to photograph satisfactorily with two prisms. 3997.6 and 3998.1 which are present in ι Centauri, are not seen in the spectrum of θ^1 Microscopii.

159. ι Phœnicis. This spectrum closely resembles that of θ^1 Microscopii, but the line K is 2.0 as intense, and 4215.7 is also nearly 2.0 as intense as in the latter spectrum.

160. α Piscis Austrini. On some plates the lines are broad, and some lines appear to be double. On other plates, the lines are well defined.

161. The line 4077.9 is more intense than in the spectrum of τ^3 Eridani, the typical star, and the spectrum may resemble that of δ Normæ.

162. This spectrum resembles δ Normæ in the intensity of line 4077.9, but the intensity of the lines in general resembles more closely that of τ^3 Eridani, the typical star.

163. δ Normæ. This spectrum is very peculiar, and suggests a composite type. While the lines of hydrogen are as intense as in the typical star, τ^3 Eridani, and the line K is not more than 0.7 or 0.8 as intense as the line H, the solar lines resemble those of Class F 5 G. The type may be composite but the line K is well defined on both edges, instead of being hazy as is usual when the spectrum of a fainter star is superposed. 4077.9 is peculiarly intense and is fully 0.5 as intense as Hδ. The solar lines are nearly equal in intensity to those of α Canis Minoris of Class F 5 G, except that 4227.0 and 4415.3 are only about 0.5 as intense as in α Canis Minoris. The space between 4131.4 and 4172.9 appears like a faint bright band. In the intensity of 4077.9 this spectrum resembles the peculiar star, ζ Capricorni of Class G. 4240.0 is well marked.

164. The space between Hδ and 4172.9 appears like a faint bright band, and several other regions appear brighter than the continuous spectrum.

165. The image is faint.

166. α Circini. Line 4077.9, which may include 4076.8, is as intense as in Class F 5 G. 4215.7 is 1.5 as intense as in α Carinæ, the typical star, and is about equal to 4227.0. Several solar lines between Hγ and Hβ differ in intensity from those in α Carinæ. 4367.9 and 4469.5 are fainter than in α Carinæ, 4395.3 and 4400.2 to 4401.6, which are fairly well marked in α Carinæ, are not seen in α Circini. 4422.8, 4435.2, and 4455.0 are more intense than in α Carinæ.

167. ω Ophiuchi. This spectrum is very nearly like that of α Circini. (See Remark 166.) The line K, however, is about 0.8 as intense, and 4490.0 is 1.5 as intense as in the spectrum of α Circini. The space between 4131.4 and 4172.9 is bright, as in δ Normæ, and the spaces between 4077.9 and Hδ, and between Hδ and 4131.4 appear a little brighter than the continuous spectrum.

168. b Ophiuchi. This spectrum resembles that of ω Ophiuchi in having the line K less intense than H, and in having 4077.9 more marked than in the typical star. The lines are not very well defined, but in many cases they appear as intense as in the spectrum of α Canis Minoris of Class F 5 G. 4227.0, however, is no more intense than in Class F.

169. A. G. C. 9247 and 9250. These two spectra are superposed. The solar lines in the spectrum of A. G. C. 9250 are nearly lost among the more intense lines in the spectrum of A. G. C. 9247.

170. A. G. C. 21767. The broad lines Hε, Hδ, and Hγ of A. G. C. 21771, magnitude 7.1, which follows $4^s.30$ and is north $2'\,36''.8$, are partly superposed on this spectrum.

171. A. G. C. 5810 and γ Cæli. These spectra are partly superposed. The spectrum of A. G C. 5810 is faint.

172. The spectrum is faint, but it appears to resemble that of ξ Phœnicis.

173. ξ Phœnicis. This spectrum is very peculiar. If the type is composite, as is suggested by the combination of wide, hazy, hydrogen lines and several intense solar lines, the two classes of spectra are not readily distinguished. The lines Hδ, Hγ, and Hβ are as intense as in Class A, and are covered with a haze extending over the edges of the lines themselves. The lines K and H are as wide as in the stars of Class G. The end of shorter wave length is not seen beyond the hydrogen line Hη. The spectrum resembles the peculiar star ζ Capricorni of Class G, in the marked intensity of line 4077.9, and of 4215.7. It also resembles the peculiar star τ^9 Eridani of Class A, in the intensity of the double line 4128.5 and 4131.4. 4077.9, which may include 4076.8, is about 0.7 as intense as Hδ; 4215.7 is about 0.6 as intense as Hδ; and 4128.5 and 4131.4 together are 0.4 as intense as Hδ. 4435.2 is conspicuous among the fainter solar lines. The faintness of the star renders an exact comparison of the solar lines difficult, since on plates taken with two prisms, only the more intense lines are seen.

174. p Velorum. The line K is only about 0.9 as intense as the line H. The hydrogen lines Hδ, Hγ, and Hβ are as intense as in Class F. The solar lines are sharp and well defined.

175. m Hydræ. The lines are well defined and there is no trace of the spectrum of the companion star A. G. C. 19998, magnitude 7, which follows $0^s.58$ and is south $6''.8$.

176. G Carinæ. Line 4077.9 has greater intensity than in the typical star, and is about equal to the same line in δ Canis Majoris, Class F 8 G.

177. The image is very narrow.

178. α Persei. The intensities of several lines in or near the band G are different from those in α Canis Minoris, the typical star. Lines 4294.3 and 4305.8 are 2.0 as intense as in the typical star. 4173.6 and 4179.5 are

also more intense than in α Canis Minoris, and the spectrum resembles the star δ Canis Majoris in the intensities of the above named lines.

179. β Doradus. In respect to the intensity of the lines Hδ, Hγ, and Hβ, and in the appearance of the lines of the band G, this spectrum resembles the typical star, ρ Puppis, but in respect to the bands K and H, the intensity of 4077.9, and several other well marked solar lines, there is a strong resemblance to the spectrum of δ Canis Majoris of Class F 8 G. The lines are not so sharp as in δ Canis Majoris. The lines 4294.3 and 4297.1 are intermediate in intensity between the same lines in ρ Puppis and in δ Canis Majoris.

180. This spectrum is like that of β Doradus. (See Remark 179.)

181. δ Volantis. This spectrum is like that of β Doradus, except that the lines 4294.3 and 4297.1 are less intense, and resemble the same lines in ρ Puppis, the typical star.

182. The solar lines are unusually intense. The double line 4161.7 and 4163.9, as well as 4233.6, 4294.3, and 4297.1 are 2.0 as intense as in the typical star, α Canis Minoris, while some lines present in the typical star, especially 4435.2, are absent or faint. The pair of lines, 4172.9 to 4173.6, and 4177.8 to 4179.5, are well marked, even on plates taken with one prism, as are also 4383.7 to 4385.2, 4395.3, 4400.2, and 4417.9. The lines in this spectrum agree with those in ϵ Aurigæ, for which a list is given in the seventh column of Table VII.

183 The line 4326.0 is 0.7 or 0.8 as intense as in α Fornacis, the typical star, and the intensity of the fine lines in the band G is intermediate between this and Class F 5 G.

184. The spectrum resembles that of δ Canis Majoris but the lines are not so sharp.

185. δ Canis Majoris. The lines are unusually narrow with sharp edges. The line Hγ is well separated from the solar line 4337.6, and Hβ is separated from 4855.7 on the side of shorter wave length, and from 4864.2 to 4866.5 on the side of greater wave length. The lines K and H are as wide as in α Boötis. The band G is not continuous. On plates taken with two prisms, the following lines are seen in this region, all distinctly separated; 4288.1, 4289.8, 4294.3, 4297.1, 4300.2, 4302.6, 4305.8, 4308.0, 4309.5, and 4315.2. The spectrum is crowded with lines and nearly all the solar lines are more intense than in the typical star. The intensities, however, do not appear to be so peculiar as in the stars, ι^1 Scorpii, b Velorum, and y Carinæ of Class F 5 G, in whose spectra the lines are narrow.

186. x Carinæ. This spectrum has not been photographed with more than one prism. It closely resembles the spectrum of δ Canis Majoris. The lines Hγ and Hβ appear somewhat fainter, and the fine lines more intense than in δ Canis Majoris.

187. The spectrum appears to be like that of δ Canis Majoris.

188. α^1 and α^2 Centauri. These spectra are almost completely superposed. The spectrum of the fainter star, which is α^2 Centauri, extends about 0.2 mm. on the preceding side of the image. This spectrum, probably owing to its red color, is not photographed well at the end of shorter wave length, and at this end, the spectrum of α^1 is seen alone. A few lines in the spectrum of α^1 are intensified by superposition of the lines of α^2, while others are made hazy and indistinct by the bright part of the spectrum of α^2. It is difficult to classify the spectrum of α^2 Centauri correctly, since so small a portion is seen apart from the spectrum of α^1. The spectrum of α^2 may more nearly resemble those of Class K, than of Class K 5 M, but the band G appears to be resolved into lines as in the latter class, and line 4227.0 appears to be nearly as intense as in α Tauri.

189. The line 4077.9 is 1.5 as intense as in α Aurigæ.

190. ω^2 Scorpii. In the intensity of the bright bands at wave lengths 4470 to 4525, and 4614 to 4648, and in the faintness of the end of shorter wave length, this spectrum resembles those of Class K.

191. γ^1 and γ^2 Volantis. These spectra are superposed. A faint, narrow, edge of γ^1 appears on the preceding side of the spectrum of γ^2.

192. x Velorum. On the best plates, the lines Hζ, Hϵ, Hδ, Hγ, and Hβ of A. G. C. 14573, are superposed on this spectrum, but on a plate taken with narrow images, the two spectra are separated.

193. ζ Capricorni. The lines of hydrogen are fully as intense as in α Aurigæ, while the bright bands 4470 to 4525, and 4614 to 4648, and the general absorption towards the end of shorter wave length are as marked as in Class K. 4077.9, which may have 4076.8 superposed, but which is seen as a single line, is unusually intense, being fully 2.0 as intense as Hδ. 4215.7 is also very intense, being 1.5 as intense as 4227.0. The two lines, 4077.9 and 4215.7, have been found to be unusually intense in the spectrum of ξ Phoenicis of Class F. Another strongly marked line probably includes the lines 4554.2 and 4556.0.

194. c^3 Aquarii. This spectrum is composite. It resembles that of α Aurigæ, except in the line K and the lines of hydrogen. Hγ and Hβ are as intense as in Class F 5 G. Hδ exceeds Hγ and Hβ in intensity and is equal to Hδ in Class F. The line K is not more than 0.5 as wide as H and Hϵ combined. H and Hϵ combined are wider than in Class G, and nearly equal to the same band in Class K. Hθ, Hη, and Hζ are broad, as in spectra of classes A to F. The peculiarities of this spectrum can be best explained by supposing a fainter spectrum belonging to Class A, or A 2 F, to be superposed upon a brighter spectrum of Class G.

195. ω Sagittarii. The line 4077.9 is only about 0.8 as intense as in α Reticuli, the typical star.

196. In the intensity of the lines Hδ, Hγ, and Hβ, this spectrum is intermediate between those of α Aurigæ and α Reticuli. 4077.9 is 1.5 as intense as in α Reticuli.

197. ν^1 Sagittarii. The spectrum of $-22°4906$, which appears to be of Class B 8 A, or B 9 A, is superposed on this spectrum towards the end of shorter wave length.

198. A. G. C. 25108. The line Hδ appears wider and fully 1.5 as intense as Hγ or Hβ. This effect was noted on several plates, hence it is probably not due to defect in focus.

199. The line 4227.0 is 0.8 as intense as in α Phoenicis, the typical star, and Hγ is 0.7 as intense as 4326.0.

200. A. G. C. 20566. The faint spectrum of A. G. C. 20565, magnitude 7¾, which precedes 3^s.32 and is north 2″.3, is superposed, and a narrow portion only appears on the preceding side. The spectrum of A. G. C. 20565 is of the second type, and probably similar to that of A. G. C. 20566.

201, A. G. C. 10769. This spectrum may be of Class K 5 M.

202. ϵ Carinæ. This spectrum is composite. The type is nearest to Class K, with the striking peculiarity of the almost entire absence of the wide line K, characteristic of that class. There is a decided haze covering the region but no distinct line or band. The hydrogen lines Hγ and Hβ are nearly as intense as in α Aurigæ, and Hδ is 2.0 as intense as Hγ or Hβ, on plates taken with one and two prisms. The hydrogen lines Hη and Hζ are seen as in stars of classes A or B. Hι and Hθ are also dimly seen on plates taken with one prism. 4227.0 is not more than 0.5 as intense as in Class K, and appears hazy. The bright bands 4470 to 4525, 4556 to 4586, and 4614 to 4648 are seen with nearly as great intensity as in α Tauri. On plates taken with one prism, the pair of lines composed of 4383.7 and 4385.2, seen as one, and 4405.0 and 4408.5, seen as one, are nearly as conspicuous as in α Tauri. Two anomalous lines between Hϵ and Hδ agree in position with the helium lines 4009.5 and 4026.4. The presence of these two lines causes this spectrum to look peculiar in this region. On plates taken with one prism, the effect of the presence of 4026.4 is that a band at wave length 4025, approximately, is much more intense than in typical spectra of classes G, K, or K 5 M. On X 8194, taken with two prisms, this band is resolved into lines, one of which corresponds exactly with 4026.4 in the Orion spectra. This line is fully as intense as the solar line 4024.8, and the well marked band visible on plates taken with one prism, appears to be formed by the superposition of these two lines. Likewise, a line not seen in spectra of Class K, corresponds to the helium line 4009.5, and a line of unusual intensity for spectra of Class K, corresponds to the helium line 4471.8. Other Orion lines could not be distinguished because they fall on solar lines or bands. It thus appears that this spectrum is composed of two spectra completely superposed, the brighter one being of Class K, or possibly K 5 M, while the fainter one is of the Orion type.

203. o^1 Canis Majoris. The line Hγ is as intense as in Class G 5 K, but Hβ is very faint, and the spectrum at the end of greater wave length is like that of Class K 2 M. The end of shorter wave length shows marked absorption, so that the spectrum is faint in the region having shorter wave length than 4227.0. The latter line is less intense than in the typical star, and is about equal to the same line in Class G 5 K.

204. δ^1 and δ^2 Apodis. These spectra are partly superposed.

205. The lines Hδ, Hγ, and Hβ are 2.0 as intense as in α Tauri, the typical star, and the edges of the absorption bands are less marked than in α Tauri.

206. The edges of the absorption bands at 4762 and 4954 are not so distinctly seen as in α Tauri, the typical star.

207. The edges of the absorption bands at 4762 and 4954 are more sharply defined than in α Tauri, the typical star, and are intermediate in intensity between those in α Tauri and γ Hydri.

208. t^2 Carinæ. The spectrum of A. G. C. 14561, magnitude 7¼, which follows 0^s.69 and is south 4′ 45″.2, is superposed. The well marked hydrogen lines Hι, Hθ, Hη, Hζ, Hϵ, Hδ, Hγ, and Hβ of this spectrum are readily identified among the many lines in the spectrum of t^2 Carinæ.

209. A. G. C. 15986. No trace is seen of the spectrum of A. G. C. 15988, magnitude 8¼, which follows 3^s.70 and is north 48″.3.

210. A. G. C. 12635. This spectrum may be of Class K.

211. α Orionis. This spectrum is slightly peculiar in the intensity of the lines of hydrogen, and of 4227.0. The lines of hydrogen are as intense as in the spectra of Class G 5 K, and Hγ, as in that class, is as intense as 4326.0. 4227.0 is less intense than in the typical star, γ Hydri, and is equal to 4227.0 in spectra of Class K. In the increased intensity of the hydrogen lines, and the diminished intensity of 4227.0, a composite type of spectrum is suggested. The edges of the absorption bands at 4762, 4954, and 5168 are intermediate in intensity between those in the spectra of γ Hydri and γ Crucis.

212. α Scorpii. The spectrum is of Class Ma, except that the hydrogen lines Hβ, Hγ, and Hδ are about 2.0 as intense as in γ Hydri, the typical star, the line K is hazy, and the hydrogen lines Hη and Hζ are present as in stars of the first type. The spectrum thus appears to be composite, and the fainter spectrum is probably of Class A, or between A and F.

213. β Gruis. This spectrum shows more intense bright bands and more marked changes in light than the typical star, γ Crucis. The bands 4556 to 4586, 4611 to 4626, and 4659 to 4668 are more intensely bright and have better defined edges than in γ Crucis. The edges of the absorption bands at 4762, 4954, and 5168 are strongly marked, and in the region of greater wave length than 4554, the dark lines are ill defined and appear like spaces between bright bands of varying width and intensity. 4315.2 is not more than 0.3 as intense as in the spectrum of γ Crucis, and is barely seen on plates taken with one prism.

214. This spectrum is similar to that of β Gruis.

215. L^2 Puppis. The spectrum resembles that of Class Mb, except that the hydrogen lines Hδ, Hγ, and Hβ, are bright. Hδ is nearly as intense as the bright Hβ in μ Centauri, and Hγ is about 0.9 as intense as Hδ. Hβ is faintly seen but appears to be bright. The region of Hϵ is not included in the photographs. The dark lines towards the end of greater wave length of this spectrum appear to be absent or broadened into dark spaces between bright bands. The lines that formed the band G are even less conspicuous than in Class Mb, and there is no change in the distribution of the light at this point.

216. R Carinæ. The spectrum is like that of L^2 Puppis

(See Remark 215), except that Hβ is more distinctly bright in this spectrum. Hδ is here 1.5 as intense as Hγ, and Hβ is about 0.2 as intense as Hγ.

217. S Carinæ. Hδ, Hγ, and Hβ are bright. Hγ is slightly more intense than Hδ, and Hβ is fainter. The dark line spectrum, which is of Class Mb, is faint.

218. ζ Phoenicis. No trace is seen of the spectrum of A. G. C. 1067, magnitude 8, which precedes $0^s.73$ and is south 2″.7.

219. κ Tucanæ. The lines are ill defined on all the plates. This is probably due to the superposed spectrum of the companion star, A. G. C. 1212, magnitude 7, which follows $0^s.07$ and is north 6″.2.

220. A. G. C. 10986. There is no trace of the spectrum of A. G. C. 10985, magnitude 7¾, which precedes $1^s.17$ and is north 32″.7.

221. υ Carinæ. There is no trace of the spectrum of A. G. C. 13390, magnitude 7½, which follows $0^s.87$ and is south 3″.6.

222. u Carinæ. No trace is seen of the spectrum of A. G. C. 14912, magnitude 7.6, which follows $1^s.85$ and is north 1′ 2″.3.

223. h Centauri. No trace is seen of the spectrum of A. G. C. 18854, magnitude 8, which precedes $0^s.13$ and is south 14″.1.

224. k Centauri. No trace is seen of the spectrum of A. G. C. 18834, magnitude 6¾, which follows $0^s.62$ and is south 3″.8. The lines in k Centauri are slightly hazy.

225. A. G. C. 19406. No lines are seen belonging to the spectrum of A. G. C. 19407, magnitude 7¾, which follows $0^s.27$ and is south 10″.0. The lines in the spectrum of A. G. C. 19406 are, however, very poorly defined, but it has not been determined whether this is due to the quality of the plates, or to the superposed spectrum.

226. μ Lupi. No trace is seen of the spectrum of A. G. C. 20714, magnitude 7, which follows $1^s.57$ and is south 16″.3.

227. θ Indi. No trace is seen of the spectrum of A. G. C. 29213, magnitude 7¼, which precedes $0^s.55$ and is north 1″.7.

228. β Piscis Aust. No trace is seen of the spectrum of A. G. C. 30705, magnitude 7, which follows $0^s.37$ and is south 29″.7.

229. A. G. C. 8227. The spectrum of A. G. C. 8225, magnitude 7¾, which precedes $0^s.91$ and is north 10″.3, is not seen.

230. A. G. C. 14483. The spectrum of A. G. C. 14482, magnitude 8¼, which precedes $1^s.20$ and is south 1′ 8″.4, is superposed. On Plate X 9122, the lines Hγ and 4471.8 of the fainter spectrum are readily identified among the lines of A. G. C. 14483. The spectrum of A. G. C. 14482 is therefore, also, of the Orion type.

231. A. G. C. 25197. The spectrum of A. G. C. 25196, magnitude 8¼, which precedes $0^s.14$ and is south 41″.4, is not seen.

232. π Puppis. The spectrum of A. G. C. 9286, magnitude 8¼, which precedes $3^s.02$ and is south 59″.8, is not seen.

CHAPTER XIII.

General Catalogue.

A CATALOGUE of all the stars classified in Table XVI is given in Table XVII, in the order of right ascension. The explanation of the successive columns is given below, the heading in each case being prefixed. Exceptions are noted in the remarks following the Table.

No. A current number for reference.

M. P. The number of the star in the Southern Meridian Photometry, with the letter S prefixed, is given for all stars south of declination —30°, which occur in that work. For stars north of declination —30°, the number is taken from the Harvard Photometry and the letter H is prefixed. The stars S. M. P. 1858, 6370, 6908, and 7919, although north of —30°, are not contained in the Harvard Photometry. When a star is double according to the Southern Meridian Photometry or the Harvard Photometry, and the companion star does not appear in this catalogue, the number of the star is printed in Italics.

Constellation. For southern stars, the constellation is taken from the Argentine General Catalogue; for northern stars, from the Harvard Photometry. Since the designation by constellation given in the Harvard Photometry follows the notation of Heis, it will, in some cases, differ from that given here. These cases are specified in the remarks following Table XVII.

Des. For southern stars, the designation, like the constellation, is taken from the Argentine General Catalogue; for northern stars, from the Harvard Photometry.

A. G. C. The number of the star in the Argentine General Catalogue, when the star occurs in that work. Italics indicate that an adjacent star of magnitude $8\frac{1}{4}$ or brighter, is also contained in the Argentine General Catalogue.

R. A. 1900. The approximate right ascension of the star for 1900.

Dec. 1900. The approximate declination of the star for 1900.

Mag. The photometric magnitude of the star according to the catalogue given in the second column.

Class. The class of spectrum of each star taken from Table XVI.

Remarks. The numbers referring to the remarks following Table XVI.

No. Pl. The number of plates on which each spectrum has been examined.

Plate Numbers. The numbers designating the plates in the X series. The left hand figure, 1, is omitted when the number is 10,000, or greater. When more than three plates were examined, the additional plate numbers are given in Table XVIII.

Prs. The greatest number of prisms with which each star has been successfully photographed.

TABLE XVII

GENERAL CATALOGUE

No.	M. P.	Constellation.	Des.	A. G. C.	R. A. 1900.	Dec. 1900.	Mag.	Class.	Remarks.	No. Pl.	Plate Numbers.	Prs.
					h. m.	° ′						
1	H 5	Andromeda	α	—	0 3.2	+28 33	2.08	A Pec.	141	1	7982	3
2	S 14	Phœnix	ϵ	57	4.4	−46 18	3.85	K	—	11	4444,4962,5209	2
3	S 38	Tucana	ζ	233	14.9	−65 29	4.28	F 8 G	—	9	4399,5166,5948	2
4	S 57	Hydrus	β	336	20.5	−77 49	2.89	G	—	10	4450,4451,5325	3
5	S 59	Phœnix	α	355	21.3	−42 51	2.45	K	—	19	4445,4497,5397	3
6	S 60	Phœnix	κ	351	21.3	−44 14	3.95	A 3 F	18	13	4487,4497,5907	2
7	S 64	Sculptor	η	377	22.9	−33 34	4.81	Mb	—	12	5056,5147,5176	1
8	H 68	Cetus	—	419	25.4	−24 21	5.23	A 3 F	—	9	5139,5290,5801	1
9	S 75	Phœnix	—	427	25.6	−48 46	5.47	F 5 G	—	4	5007,5265,5277	1
10	S 76	Phœnix	λ^1	443	26.6	−49 22	4.80	A 2 F	—	4	5007,5265,5277	1
11	S 78	Tucana	β^1	451	27.0	−63 31	4.50	B 9 A	117	9	4984,5158,5299	1
12	S 79	Tucana	β^2	452	27.0	−63 31	4.33	A 2 F	40,117	9	4984,5158,5299	1
13	S 84	Tucana	—	467	28.1	−63 35	5.07	A 2 F	—	4	6963,7085,7160	1
14	S 88	Tucana	θ	491	29.2	−71 49	5.99	A 5 F	68	2	4930,7319	1
15	S 91	Phœnix	λ^2	519	30.9	−48 33	5.45	F 8 G	—	4	5007,5265,5277	1
16	H 88	Cetus	—	544	32.1	−25 19	5.62	K	—	1	7308	1
17	H 95	Cetus	—	608	35.4	−24 21	6.15	K	—	1	7308	1
18	S 106	Phœnix	μ	626	36.6	−46 38	4.61	K	199	6	5023,5115,5167	1
19	S 109	Phœnix	ξ	633	37.2	−57 3	5.81	F Pec.	173	10	4951,6168,6936	2
20	S 118	Phœnix	η	662	38.8	−58 1	4.49	A	18	14	4951,5128,5841	2
21	S 142	Hydrus	λ	762	45.1	−75 28	4.95	K 5 M	—	10	9784,9794,9822	1
22	S 146	Phœnix	ρ	769	46.1	−51 32	5.00	F 5 G	—	7	9345,9743,9785	1
23	H 158	Sculptor	α	902	53.8	−29 54	4.06	B 5 A	—	8	4484,5252,5300	1
24	S 178	Phœnix	—	965	58.3	−46 56	5.18	K	—	4	4535,6903,0097	1
25	S 187	Phœnix	β	1024	1 1.6	−47 15	3.39	K	199	13	4333,4535,5398	2
26	S 196	Phœnix	ζ	*1069*	4.2	−55 47	4.07	B 8 A	218	4	4332,5185,5941	1
27	S 216	Phœnix	ν	1174	10.6	−46 4	4.92	G	—	6	9332,9744,9801	1
28	S 220	Tucana	κ	*1210*	12.3	−69 24	4.90	F 8 G	219	6	9327,9795,9843	1
29	S 257	Phœnix	γ	1411	24.0	−43 50	3.32	K 5 M	207	15	3900,5148,5168	2
30	H 236	Cetus	—	1421	24.8	−22 9	5.09	A	—	1	5342	1
31	S 262	Phœnix	δ	1462	27.0	−49 35	3.92	K	199	11	3896,5210,5301	2
32	S 290	Eridanus	α	1594	34.0	−57 44	0.51	B 5 A	18,85	20	3859,4498,5442	3
33	S 334	Phœnix	ψ	1864	49.6	−46 48	4.11	Mb	—	12	4931,5024,5202	1
34	S 337	Phœnix	ϕ	1871	50.2	−43 0	4.95	B 9 A	121	7	9346,9802,9823	1
35	H 302	Cetus	—	1895	52.0	−23 1	5.15	K 5 M	206	8	5159,5181,5186	1
36	S 343	Eridanus	χ	1905	52.0	−52 7	3.62	G 5 K	—	3	4473,5705,7248	1
37	S 345	Hydrus	η^2	1924	52.4	−68 9	4.65	K	199	3	4537,5008,5942	1
38	S 350	Eridanus	—	1932	53.1	−52 16	5.97	F 8 G	—	2	5705,7248	1
39	S 351	Phœnix	—	1931	53.2	−47 53	4.65	G 5 K	—	5	5024,5406,5419	1
40	H 313	Cetus	—	1962	55.1	−21 19	5.75	Ma	—	1	5270	1
41	H 315	Cetus	υ	1965	55.3	−21 34	3.83	Ma	—	11	4446,4536,5253	2
42	S 355	Phœnix	—	1973	55.5	−42 31	5.35	K	—	1	0108	1
43	S 356	Hydrus	α	1981	55.6	−62 4	2.96	F	18	13	4300,5853,7705	3
44	S 367	Fornax	π	1998	56.8	−30 29	5.19	G 5 K	—	4	6874,7123,7293	2
45	S 369	Phœnix	χ	2016	57.7	−45 12	4.91	K	68	4	9894,0063,0097	1
46	S 370	Fornax	—	2024	58.0	−30 9	6.43	A 3 F	—	3	6874,7123,7293	1
47	H 331	Fornax	ν	2065	2 0.0	−29 47	4.63	A Pec.	143	8	4952,5426,5842	2
48	H 333	Aries	α	—	1.5	+23 0	2.04	K 2 M	—	1	7955	3
49	S 438	Eridanus	ϕ	2339	12.9	−51 58	3.74	B 8 A	18	8	4334,5025,5706	2
50	S 461	Hydrus	δ	2498	19.9	−69 7	4.24	A 2 F	—	6	5009,5399,5943	2

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51	S 473	Eridanus	κ	2556	2 23.3	−48 9	4.28	B 5 A	84	6	4475,5211,5291	1
52	S 475	Fornax	ϕ	2565	23.8	−34 15	5.16	A 2 F	—	6	5116,5843,6156	1
53	H 404	Fornax	ω	*2693*	29.5	−28 40	4.78	B 9 A	116	6	5140,5326,5835	1
54	S 497	Hydrus	μ	2824	33.8	−79 33	5.27	K	—	1	7273	1
55	S 509	Eridanus	s	2838	36.0	−43 20	4.72	A	18	19	5057,5296,5310	2
56	—	Hydrus	—	2853	36.2	−67 44	R	K	—	2	5446,6966	1
57	S 516	Eridanus	ι	2851	36.7	−40 17	3.92	K	—	8	4447,4489,4490	1
58	S 523	Hydrus	ϵ	2887	38.1	−68 42	4.17	B 9 A	—	5	4301,5292,5951	1
59	S 534	Fornax	—	2919	40.1	−32 57	6.09	A	132	2	5169,7086	1
60	S 539	Horologium	—	2965	41.7	−67 8	6.19	F 8 G	—	3	5466,6966,7145	1
61	S 548	Hydrus	ζ	3003	44.0	−68 3	4.79	A 2 F	—	10	5160,5446,6137	1
62	S 550	Fornax	β	3009	44.9	−32 50	4.16	K	—	5	5149,5169,6147	1
63	H 453	Eridanus	τ^2	3034	46.5	−21 25	4.83	K	199	4	5182,5262,5707	1
64	—	Hydrus	—	3116	49.5	−67 56	R	K	—	2	5446,6966	1
65	S 575	Hydrus	ν	3171	51.1	−75 29	4.66	K 2 M	—	7	5303,5498,5499	1
66	S *584*	Eridanus	θ	*3223*	54.5	−40 42	R	A 2 F	148	16	4380,5117,6130	2
67	S 591	Horologium	β	3279	56.9	−64 28	4.98	A 5 F	—	8	5263,5319,5952	1
68	H 482	Cetus	α	—	57.1	+ 3 42	2.68	Ma	—	1	7944	3
69	H 487	Eridanus	τ^3	3284	58.0	−24 1	4.10	A 3 F	—	7	4485,5266,6166	2
70	H 512	Fornax	α	3462	3 7.9	−29 23	3.77	F 8 G	—	10	4433,4508,5334	2
71	H 530	Eridanus	—	3588	13.9	−22 52	5.02	K	—	2	7257,8029	2
72	H 533	Eridanus	τ^4	3607	15.1	−22 7	3.79	Mb	—	9	5271,7257,7807	2
73	S 657	Eridanus	e	3623	15.9	−43 27	4.27	G 5 K	—	3	5170,6138,7192	1
74	H 541	Perseus	α	—	17.1	+49 30	1.94	F 5 G	178	1	7983	3
75	S 696	Reticulum	κ	3879	27.6	−63 18	4.80	F 5 G	—	6	5187,5344,5927	1
76	H 579	Eridanus	τ^5	3897	29.4	−21 58	4.21	B 8 A	—	5	4335,5141,5854	1
77	S 722	Eridanus	y	4006	33.5	−40 36	4.48	K	199	4	5254,5959,6213	1
78	S 734	Fornax	δ	4101	38.3	−32 15	4.92	B 5 A	—	5	5203,5359,5420	1
79	H 608	Taurus	—	—	39.0	+23 48	3.82	B 5 A	86	7	7956,8123,8124	2
80	S 738	Eridanus	h	4121	39.1	−37 38	4.42	K 2 M	—	4	5150,5293,6149	1
81	H 610	Taurus	q	—	39.3	+24 10	4.44	B 5 A	86	7	7956,8123,8124	2
82	H 613	Taurus	—	—	39.9	+24 4	3.98	B 5 A	86	7	7956,8123,8124	2
83	H 615	Taurus	—	—	40.4	+23 39	4.22	B 5 A	86	7	7956,8123,8124	2
84	H 618	Taurus	η	—	41.6	+23 48	3.00	B 5 A	86	7	7956,8123,8124	2
85	H 623	Eridanus	τ^6	4191	42.6	−23 32	4.30	F 8 G	183	8	4378,4538,4539	2
86	S 755	Reticulum	β	4211	42.9	−65 7	3.76	K	—	5	4430,5320,6158	2
87	H 625	Taurus	—	—	43.3	+23 45	3.77	B 8 A	105	7	7956,8123,8124	2
88	R	Taurus	—	—	43.3	+23 51	R	*B 8 A*	105	2	8127,8179	2
89	H 627	Eridanus	τ^7	4208	43.4	−24 11	4.82	A 2 F	—	5	4538,4539,5335	2
90	—	Eridanus	—	4225	44.0	−36 24	R	B 8 A	111	2	5400,6139	1
91	S 764	Eridanus	f	4241	44.9	−37 55	4.52	A	108	6	4414,5294,5304	1
92	S 765	Eridanus		4242	44.9	−37 55		B 8 A	108	6	4414,5294,5304	1
93	S 766	Eridanus	g	4256	45.7	−36 30	4.12	K	—	7	5400,5427,6139	2
94	—	Eridanus	—	4286	46.9	−36 43	R	B 9 A	122	2	5400,6139	1
95	S 779	Hydrus	γ	4353	48.8	−74 33	3.12	Ma	—	8	4336,6262,5485	3
96	H 646	Eridanus	τ^8	4336	49.5	−24 55	4.70	B 5 A	—	3	5183,6167,7203	1
97	H 660	Eridanus	τ^9	4447	55.7	−24 18	4.62	A Pec.	144	2	5142,5976,	1
98	S 809	Reticulum	δ	4487	57.2	−61 41	4.31	Ma	—	14	5161,5297,5312	1
99	S 821	Reticulum	γ	4545	59.5	−62 27	4.41	Mb	—	11	5297,5312,5131	1
100	S 823	Reticulum	ι	4550	59.7	−61 22	4.79	K 5 M	—	14	5161,5297,5312	1

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101	S 850	Horologium	δ	4686	4 7.4	−42 15	4.78	F	—	8	4474,5409,5977	2
102	S 858	Horologium	α	4757	10.7	−42 32	3.79	K	—	10	4474,5409,5977	2
103	S 868	Reticulum	α	4812	13.1	−62 43	3.35	G 5 K	—	7	4434,4499,5855	2
104	S 869	Dorado	γ	4811	13.4	−51 44	4.31	F 5 G	—	5	5171,5496,6132	1
105	S 872	Eridanus	X	4821	14.1	−34 2	3.76	B 9 A	114	7	4466,4476,5401	2
106	S 874	Reticulum	ε	4840	14.7	−59 32	4.39	K 2 M	—	3	5336,5917,6272	1
107	S 894	Eridanus	d	4940	20.2	−34 14	3.94	K 5 M	205	7	5373,5953,6214	2
108	—	Cælum	—	4974	22.2	−44 23	R	F 8 G	—	2	7221,7251	1
109	S 925	Cælum	δ	5106	27.8	−45 10	5.28	B 3 A	—	7	5321,5421,5961	1
110	H 796	Eridanus	v^1	5137	29.6	−29 58	4.43	K	—	9	4477,5328,5360	2
111	H 797	Taurus	α	—	30.2	+16 19	1.00	K 5 M	—	11	3864,3868,3870	3
112	S 942	Eridanus	v^2	5187	31.7	−30 46	3.78	K	199	9	4477,5328,5360	2
113	S 943	Dorado	α	5198	31.8	−55 15	3.53	A Pec.	145	5	4381,5856,7324	2
114	—	Cælum	—	5244	34.1	−42 5	R	A 5 F	—	1	6150	1
115	S 964	Cælum	α	5295	37.3	−42 3	4.55	F 2 G	—	4	5337,5410,6150	1
116	S 972	Cælum	β	5313	38.5	−37 20	5.16	F 5 G	—	6	5352,5447,5970	1
117	—	Cælum	—	5351	40.4	−41 15	R	K 5 M	—	2	5337,6150	1
118	H 845	Orion	π^4	—	45.9	+ 5 26	3.98	B 3 A	—	1	4531	1
119	S 1057	Pictor	η^1	5798	5 0.2	−49 18	5.44	F 5 G	—	6	0060,0078,0087	1
120	S 1060	Cælum	γ	5807	0.8	−35 37	4.59	K	171	6	5361,5402,6159	1
121	—	Cælum	—	5810	0.9	−35 51	R	F	171	4	5402,6159,7166	1
122	H 901	Lepus	ε	5816	1.3	−22 30	3.26	K 5 M	—	4	4478,5151,6195	2
123	S 1066	Pictor	η^2	5850	2.3	−49 43	4.91	K 5 M	—	6	0060,0078,0087	1
124	S 1071	Dorado	ζ	5893	3,8	−57 37	4.70	F 8 G	—	3	5205,6170,7204	1
125	H 932	Auriga	α	—	9.3	+45 54	0.18	G	—	9	3886,3887,4534	3
126	H 936	Orion	β	6004	9.7	− 8 19	0.32	B 8 A Pec.	40,112	9	3879,4084,4101	3
127	S 1114	Columba	—	6062	12.2	−35 2	6.80	A 2 F	133	4	5466,6171,7167	1
128	S 1116	Columba	o	6098	13.9	−34 59	4.96	K	—	6	5322,5466,6171	1
129	S 1117	Dorado	θ	6119	13.9	−67 18	4.75	K	—	3	5313,6178,7187	1
130	H 963	Lepus	—	6141	16.2	−21 20	4.63	A	127	4	5458,5486,6204	1
131	S 1124	Columba	—	6158	16.7	−34 48	6.50	F	—	4	5466,6171,7167	1
132	—	Columba	—	6182	17.7	−34 26	R	B 5 A	93	5	5466,6171,6240	1
133	H 979	Orion	γ	—	19.7	+ 6 16	1.86	B 2 A	—	1	7978	3
134	H 994	Lepus	β	6344	24.0	−20 51	3.03	G	—	7	4479,6151,7325	2
135	H 997	Orion	—	6359	24.7	− 1 11	4.90	Ma	—	1	3856	1
136	H 1005	Orion	δ	6401	26.9	− 0 23	2.36	B	18,19	6	3856,3873,3874	3
137	H 1006	Lepus	—	6404	26.9	−20 56	5.36	A	—	1	6151	1
138	S 1176	Columba	ε	6427	27.7	−35 33	3.86	K	—	8	4415,6187,7243	2
139	—	Orion	—	6458	29.4	− 4 52	R	A 2 F	133	1	3881	1
140	S 1187	Columba	—	6466	29.6	−35 13	5.60	K	—	1	4415	1
141	H 1021	Orion	—	6469	30.1	− 6 5	4.47	B 1 A	38	1	3881	1
142		Orion	—	6471	30.1	− 6 4		B 1 A	38	1	3881	1
143	H 1023	Orion	θ^1	6478	30.3	− 5 27	4.41	Oe 5 B	16	1	3881	1
144	—	Orion	—	6481	30.4	− 4 34	R	B	25	1	3881	1
145	—	Orion	—	6482	30.4	− 4 29	R	B	25	1	3881	1
146	H 1025	Orion	c	6483	30.4	− 4 54	4.60	B 3 A	68	1	3881	1
147	H 1024	Orion	θ^2	6484	30.4	− 5 29	4.90	B 1 A	37	1	3881	1
148	—	Orion	—	6487	30.5	− 4 26	R	B 5 A	68	1	3881	1
149	R	Orion	—	—	30.5	− 5 29	R	B 1 A	37	1	3881	1
150	H 1027	Orion	ι	6486	30.5	− 5 59	2.97	Oe 5 B	15	1	4069	1

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151	H 1026	Orion	—	6493	5 30.7	− 4 55	4.95	F	—	1	3881	1
152	H 1029	Orion	ϵ	6501	31.2	− 1 16	1.76	B	—	4	3851,4041,7979	3
153	—	Orion	—	6503	31.3	− 5 43	R	B 3 A	68	1	3881	1
154	—	Orion	—	6512	31.7	− 6 8	R	B 3 A	68	1	3881	1
155	—	Orion	—	6533	32.5	− 6 0	R	B 1 A	36	1	3881	1
156	—	Orion	—	6535	32.7	− 5 0	R	B 3 A	68	1	3881	1
157	S 1199	Dorado	β	6561	32.7	−62 33	3.70	F 5 G	179	6	4431,4500,5497	2
158	—	Orion	—	6542	32.9	− 4 52	R	B 1 A	—	1	3881	1
159	H *1045*	Orion	ζ	6614	35.8	− 2 0	R	B	18,19	1	8115	3
160	H 1047	Orion	—	6616	35.8	− 1 11	5.06	B 3 A	—	1	3851	1
161	S 1214	Mensa	γ	6674	35.8	−76 25	4.97	K	68	6	0066,0079,0113	1
162	S 1217	Columba	α	6633	36.0	−34 8	2.74	*B 5 A*	18,97	13	4480,5919,6263	2
163	H 1057	Lepus	γ	6733	40.4	−22 28	3.76	F 8 G	—	2	4481,8197	2
164	S 1264	Dorado	δ	6852	44.6	−65 46	4.49	A 5 F	—	3	5403,5989,7213	1
165	S 1268	Pictor	β	6848	44.9	−51 6	3.92	A 3 F	18	32	4467,4468,6201	2
166	H 1086	Lepus	δ	6884	47.0	−20 54	3.98	K	—	4	4509,7235,7320	2
167	S 1284	Columba	β	6896	47.5	−35 49	3.06	K	—	10	4432,5429,6160	2
168	S 1288	Pictor	γ	6915	48.0	−56 12	4.29	K	—	4	5278,6179,7185	1
169	S 1293	Pictor	—	6925	48.7	−52 8	4.75	K	—	5	0074,0092,0101	1
170	S 1294	Columba	—	6931	49.2	−37 40	5.59	K	—	1	0080	1
171	S 1295	Columba	λ	6937	49.5	−33 50	5.00	B 5 A	—	4	5305,6202,6252	1
172	H 1091	Orion	α	—	49.8	+ 7 23	0.91	Ma	211	6	3875,3883,4533	3
173	S 1297	Dorado	ϵ	6972	50.0	−66 56	4.98	B 5 A	—	4	5329,6180,6273	1
174	S 1310	Columba	ξ	7011	52.1	−37 8	4.93	K	—	1	0080	1
175	H 1100	Auriga	β	—	52.2	+44 57	2.07	A Pec.	142	4	7973,8135,8146	3
176	S 1315	Pictor	—	7034	52.7	−52 40	5.25	A 5 F	165	1	0074	1
177	S 1319	Dorado	—	7066	53.4	−63 8	4.41	K	—	4	5362,6188,7189	1
178	S 1322	Columba	γ	7064	54.0	−35 18	4.49	B 3 A	—	5	4432,5314,5429	1
179	S 1329	Columba	η	7120	56.1	−42 49	4.00	K	—	5	4510,6142,7244	2
180	—	Columba	—	7164	57.8	−42 52	R	B 8 A	—	2	4510,7244	1
181	S 1366	Columba	—	7274	6 1.9	−35 30	6.10	A 2 F	133	1	6133	1
182	S 1374	Columba	—	7321	3.5	−34 18	6.16	B 5 A	57	1	6133	1
183	S 1388	Pictor	—	7410	6.1	−62 8	4.97	K	—	2	0067,0137	1
184	S 1400	Pictor	δ	7467	8.4	−54 56	4.84	B 1 A	18	5	5430,6134,6254	1
185	S 1404	Dorado	ν	7513	9.3	−68 49	5.21	B 9 A	—	6	5422,5479,6143	1
186	S 1416	Dorado	η^2	7557	11.1	−65 34	4.81	Mb	—	1	0088	1
187	S 1429	Columba	κ	7586	13.0	−35 6	4.50	K	—	4	5338,6152,7194	1
188	—	Columba	—	7672	16.1	−34 22	R	B 8 A	—	3	5338,6152,7194	1
189	S 1444	Canis Major	ζ	7681	16.5	−30 2	3.25	B 3 A	—	3	4491,6161,8203	2
190	S 1445	Columba	—	7697	17.0	−34 6	5.57	B 2 A	—	4	5448,6152,6162	1
191	S 1453	Columba	δ	7731	18.4	−33 23	3.84	G 5 K	—	4	5448,6162,8257	2
192	S 1471	Dorado	—	7817	20.2	−69 45	6.94	F 8 G	132	1	7311	1
193	S 1480	Carina	α	7843	21.8	−52 39	−0.96	F	—	24	3841,3849,3850	3
194	S 1499	Canis Minor	λ	7904	24.4	−32 31	4.60	B 5 A	—	5	4416,5279,6205	1
195	S 1503	Canis Major	—	7914	24.9	−32 18	6.00	B 3 A	—	4	5279,6205,7237	1
196	H 1235	Canis Major	ξ^1	7989	27.6	−23 21	4.21	B 1 A	—	4	4598,5505,6215	1
197	S 1528	Canis Major	—	*8017*	28.9	−31 57	5.93	B 3 A	—	4	5279,6205,7237	1
198	S 1530	Carina	—	8034	29.0	−51 45	5.68	F 8 G	—	2	5460,0124	1
199	H 1242	Canis Major	ξ^2	8065	30.8	−22 53	4.35	A	—	4	4598,5505,6215	1
200	—	Canis Major	—	8109	32.5	−22 32	R	B 8 A	68	1	7214	1

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201	S 1553	Carina	N	8133	6 32.8	−52 53	4.46	A	126	2	5460,7186	1
202	—	Canis Major	—	8161	34.2	−23 29	R	F 8 G	—	1	7214	1
203	S 1569	Puppis	ν	8181	34.7	−43 6	3.23	B 8 A	18,104	5	4492,5487,6153	2
204	S 1583	Puppis	—	*8227*	36.0	−48 8	4.99	K	229	2	9380,0104	1
205	H 1275	Canis Major	α	8348	40.7	−16 34	−1.43	A	—	16	3862,3869,3968	3
206	—	Canis Major	—	8495	45.5	−24 2	R	A	133	1	4512	1
207	H 1294	Canis Major	—	8500	45.5	−23 58	6.15	A	—	1	4512	1
208	S 1643	Canis Major	κ	8518	46.1	−32 24	3.90	*B 2 A*	18,48	6	4469,6209,6224	2
209	—	Canis Major	—	8520	46.6	−20 48	R	B 3 A	29	1	7175	1
210	S 1649	Puppis	—	8551	47.2	−34 15	4.93	K	—	2	0105,0130	1
211	S 1650	Pictor	α	8570	47.2	−61 50	3.29	A 5 F	—	4	4517,6197,8310	2
212	S 1653	Puppis	τ	8568	47.4	−50 30	2.76	K	—	5	4493,4540,5962	2
213	S 1654	Carina	A	8573	47.6	−53 31	4.35	G 5 K	196	5	5363,5436,6198	1
214	H 1306	Canis Major	—	8592	49.0	−18 55	5.50	F	150	2	5330,7175	1
215	—	Canis Major	—	8594	49.0	−18 49	R	A 2 F	150	2	5330,7175	1
216	H 1308	Canis Major	—	8602	49.2	−20 6	4.43	B 1 A	—	2	5330,7175	1
217	—	Canis Major	—	8607	49.2	−24 34	R	A 2 F	—	1	4512	1
218	—	Canis Major	—	8624	49.8	−24 25	R	A	—	1	4512	1
219	H 1312	Canis Major	o^1	8629	49.9	−24 4	4.04	K 2 M	203	5	4108,4115,4512	2
220	H 1311	Canis Major	—	8631	50.0	−23 48	6.37	Ob	7	5	4108,4115,4512	2
221	H 1314	Canis Major	—	8646	50.7	−20 17	5.88	A 2 F	—	2	5330,7175	1
222	H 1315	Canis Major	π	8658	51.3	−20 1	4.45	F 5 G	—	2	5330,7175	1
223	H 1317	Canis Major	—	8671	51.6	−22 49	5.19	B 3 A	—	2	4108,4115	1
224	H 1320	Canis Major	—	8724	53.4	−24 30	5.19	F 5 G	—	3	4108,4115,4512	1
225	S 1685	Puppis	—	8739	53.6	−48 35	4.91	Ma	—	2	0081,0117	1
226	—	Canis Major	—	8742	54.1	−27 2	R	B 3 A	68	1	6233	1
227	H 1325	Canis Major	ϵ	8752	54.7	−28 50	1.49	B 1 A	39,40	5	4102,8396,8940	2
228	—	Canis Major	—	8808	56.8	−28 21	R	F 8 G	—	2	4513,6233	1
229	S *1708*	Canis Major	—	8815	57.0	−25 4	R	B 3 A	—	1	4511	1
230	H 1333	Canis Major	σ	8839	57.7	−27 47	3.49	K 5 M	—	3	4513,6233,8204	2
231	H 1337	Canis Major	o^2	8873	58.8	−23 41	3.05	B 5 A Pec.	40,96	6	4511,6225,6232	2
232	—	Canis Major	—	8991	7 3.2	−23 41	R	*B 3 A*	82	3	6225,6232,6255	1
233	H 1350	Canis Major	δ	9021	4.3	−26 14	1.85	F 8 G Pec.	40,185	4	6275,8274,8948	2
234	—	Canis Major	—	9031	4.6	−23 53	R	B 3 A	68	1	6232	1
235	S 1775	Puppis	A	9060	5.5	−39 29	4.87	B 3 A	58	1	0094	1
236	—	Canis Major	—	9123	8.1	−25 46	R	B 3 A	—	2	6432,6455	1
237	—	Canis Major	—	9121	8.1	−27 10	R	B 3 A	—	1	6455	1
238	S 1793	Puppis	—	9135	8.1	−48 46	5.08	K 2 M	—	2	6189,7205	1
239	—	Canis Major	—	9131	8.4	−27 18	R	A 2 F	133	1	6455	1
240	—	Canis Major	—	9165	9.6	−22 44	R	B 3 A	—	1	5353	1
241	—	Canis Major	—	9168	9.6	−27 11	R	B 3 A	—	1	6455	1
242	S 1803	Volans	γ^1	9199	9.6	−70 20	3.62	G	191	2	5467,6216	1
243	S 1804	Volans	γ^2	9206	9.6	−70 20		K	191	2	5467,6216	1
244	S 1805	Puppis	I	9176	9.7	−46 35	4.54	F	—	5	5323,5449,6203	1
245	H 1368	Canis Major	—	9181	10.2	−26 10	4.54	*B 5 A* Pec.	101	10	4417,4518,6210	2
246	S 1813	Puppis	L^1	9194	10.2	−45 0	5.08	A Pec.	146	2	8983,8989	2
247	S 1815	Puppis	L^2	9197	10.5	−44 29	var.	Md	215	2	8983,8989	2
248	H 1370	Canis Major	ω	9198	10.7	−26 35	3.69	*B 3 A*	76	12	4417,4518,6210	2
249	—	Canis Major	—	9205	10.8	−26 51	R	K 5 M	—	2	6432,6455	1
250	—	Canis Major	—	9226	11.5	−23 33	R	A	133	1	5353	1

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251	S 1825	Puppis	—	9243	7 11.9	−46 41	5.84	A	134	3	6203,7224,7391	1
252	S 1826	Puppis	—	9244	11.9	−48 6	4.88	B 8 A	—	5	5339,6189,7205	1
253	H 1374	Canis Major	—	9247	12.4	−23 9	4.67	K 5 M	169	1	5353	1
254	—	Canis Major	—	9250	12.5	−23 9	R	F	169	1	5353	1
255	H 1375	Canis Major	—	9255	12.6	−27 43	4.92	Mb	—	1	4417	1
256	S 1840	Puppis	—	9276	13.3	−36 25	5.20	B 3 A	—	12	4507,5480,6226	2
257	S 1842	Puppis	—	9283	13.4	−46 36	5.61	K 5 M	132	1	7224	1
258	S 1845	Puppis	π	*9288*	13.6	−36 55	2.49	K 5 M	205,232	17	4507,5480,6226	2
259	—	Canis Major	—	9287	13.7	−26 37	R	B 5 A	—	2	4417,6455	1
260	H 1380	Canis Major	—	9311	14.5	−24 23	4.77	Oe	—	3	5315,6265,7231	1
261	H 1381	Canis Major	τ	9313	14.5	−24 47	4.31	Oe 5 B	—	3	5315,6265,7231	1
262	H 1383	Canis Major	—	9323	14.8	−26 25	5.36	G	—	2	4417,6455	1
263	S 1856	Puppis	v^1	9326	14.8	−36 33	4.80	*B 3 A*	18,77	15	4507,5480,6226	2
264	S 1858	Canis Major	—	9334	15.0	−24 47	7.30	B 3 A	64	1	7231	1
265	S 1860	Puppis	v^2	9338	15.1	−36 34	5.33	B 3 A	—	13	4507,5480,6226	2
266	—	Canis Major	—	9364	16.5	−26 31	R	F	—	1	6455	1
267	—	Canis Major	—	9374	16.8	−26 47	R	B 3 A	—	1	4417	1
268	S 1874	Volans	δ	9407	16.9	−67 47	3.92	F 5 G	181	5	4514,6221,7245	2
269	H 1399	Canis Major	η	9476	20.2	−29 7	2.41	B 5 A Pec.	40,96	5	4470,7206,8346	2
270	—	Puppis	—	9589	24.0	−28 57	R	B 9 A	123	1	7206	1
271	S 1939	Puppis	—	9621	25.3	−31 15	6.10	B 3 A	68	1	6164	1
272	H 1416	Puppis	—	9632	25.6	−22 49	4.83	A 3 F	—	1	0138	1
273	S 1951	Puppis	σ	9652	26.1	−43 6	2.99	K 5 M	—	6	4519,6244,5488	2
274	S 1953	Puppis	—	9664	26.9	−30 45	4.72	G	—	1	6164	1
275	S 1961	Carina	—	9697	27.6	−52 26	5.94	G 5 K	—	1	9091	1
276	H *1423*	Gemini	α	—	28.2	+32 7	R	A	18,129	2	8116,8120	3
277	H 1431	Puppis	—	9733	29.8	−22 5	4.51	F 8 G	—	3	5423,6206,0138	1
278	—	Puppis	—	9752	30.3	−25 54	R	A	133	1	5450	1
279	—	Puppis	—	9755	30.5	−26 48	R	K	—	1	5450	1
280	—	Puppis	—	9787	31.4	−26 24	R	A 2 F	133	1	5450	1
281	S 1996	Carina	Q	9845	33.2	−52 18	4.91	K 5 M	—	3	9091,9414,0075	1
282	S 1997	Puppis	f	9850	33.6	−34 44	4.67	B 8 A	—	2	5306,7225	1
283	H 1442	Canis Minor	α	—	34.1	+ 5 30	0.46	F 5 G	—	7	3876,3882,4026	3
284	H 1445	Puppis	k	9880	34.7	−26 34	3.86	B 8 A	62	2	5450,6211	1
285	H 1446	Puppis	—	9881	34.7	−26 34		B 3 A	62	2	5450,6211	1
286	—	Puppis	—	9900	35.3	−26 38	R	B 8 A	69	1	5450	1
287	—	Puppis	—	9902	35.4	−26 41	R	B 3 A	69	1	5450	1
288	S 2025	Puppis	d^3	9935	36.3	−38 1	5.97	B 5 A	—	1	4506	1
289	—	Puppis	—	9940	36.4	−37 20	R	B 3 A	68	1	6234	1
290	S 2036	Puppis	—	9978	37.8	−38 18	5.67	B 8 A	—	1	4506	1
291	H 1458	Puppis	—	10001	38.6	−26 7	5.84	K	—	1	5450	1
292	H 1459	Gemini	β	—	39.2	+28 16	1.12	K	—	2	4025,8117	3
293	H 1461	Puppis	—	10025	39.5	−28 11	5.04	K 5 M	—	2	4379,6181	1
294	H 1462	Puppis	l	10033	39.8	−28 43	4.15	A 2 F Pec.	40,155	2	4379,6181	1
295	—	Puppis	—	10053	40.2	−37 58	R	B 5 A	68	1	5489	1
296	H 1464	Puppis	—	10055	40.4	−24 26	5.39	B 3 A	—	3	4505,7238,8259	2
297	—	Puppis	—	10088	41.0	−37 43	R	B 8 A	—	2	5489,6234	1
298	—	Puppis	—	10109	41.5	−37 39	R	B 3 A	—	3	4506,5489,6234	1
299	S 2075	Puppis	c	10113	41.7	−37 44	3.40	K 5 M	—	5	4506,5489,6234	2
300	S 2076	Puppis	—	10120	41.8	−34 0	5.40	F 8 G	—	1	6172	1

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301	—	Puppis	—	10145	7 42.6	−37 42	R	B 3 A	68	1	5489	1
302	S 2082	Volans	ζ	10203	43.0	−72 22	3.82	K	—	2	5404,7392	1
303	H 1472	Puppis	o	10182	43.9	−25 42	4.68	*B 2 A*	18,49	5	5388,8259,8275	2
304	S 2090	Puppis	—	10188	43.9	−38 16	5.30	B 3 A	—	5	4504,4506,5489	1
305	S 2094	Puppis	—	10211	44.5	−46 22	5.28	B 2 A	—	3	5324,6173,7230	1
306	—	Puppis	—	10215	44.9	−24 40	R	G	—	5	4505,5388,7238	2
307	H 1474	Puppis	ξ	10225	45.1	−24 37	3.40	G	189	6	4505,7238,8259	2
308	S 2102	Puppis	Q	10249	45.3	−46 50	4.68	K	—	5	5324,5431,6144	1
309	S 2108	Puppis	P	10268	46.2	−46 8	4.11	B	—	4	5324,5431,6173	1
310	S 2110	Puppis	—	10269	46.3	−46 37	5.98	B 2 A	—	3	5324,6173,7230	1
311	S 2120	Puppis	—	10316	47.7	−50 15	5.85	K 5 M	132	1	6444	1
312	—	Puppis	—	10331	48.2	−46 58	R	B 3 A	—	4	5468,6144,6173	1
313	S 2129	Puppis	a	10343	48.8	−40 19	3.72	G 5 K	—	1	6256	1
314	S 2134	Puppis	b	10350	49.1	−38 36	4.67	B 3 A	—	4	4504,5389,6276	1
315	S 2139	Puppis	—	10387	50.1	−50 16	7.24	B 3 A	29	1	6444	1
316	S 2142	Puppis	—	10390	50.2	−49 21	4.81	B 3 A	50	32	6320,6337,6355	2
317	S 2143	Puppis	J	10392	50.3	−47 51	4.28	B 1 A	18,34	8	5468,6144,6235	1
318	S 2155	Puppis	—	10430	51.6	−49 55	7.59	B 3 A	29	1	6444	1
319	H 1492	Puppis	j	10450	52.6	−22 37	4.26	F 8 G	—	2	5331,7329	1
320	S 2171	Puppis	—	10482	53.7	−30 4	4.91	A 2 F	—	4	9084,9368,0082	1
321	S 2178	Carina	χ	10507	54.2	−52 43	3.56	B 3 A	—	3	4501,6243,8347	2
322	—	Puppis	—	10510	54.3	−47 37	R	B 5 A	—	2	5468,6144	1
323	H 1500	Puppis	—	10512	54.8	−23 2	5.22	G 5 K	—	2	5331,7329	1
324	S 2190	Puppis	—	10534	55.3	−48 58	4.50	B 1 A Pec.	41	61	5437,6182,6315	2
325	—	Carina	—	10565	55.9	−63 2	R	B 8 A	68	1	6174	1
326	S 2201	Puppis	—	10546	56.0	−39 1	5.20	F	132	1	5354	1
327	—	Puppis	—	10558	56.0	−48 6	R	B 3 A	—	7	6182,6320,6337	1
328	S 2206	Puppis	—	10566	56.4	−49 42	5.98	B 3 A	65	15	6182,6315,6320	1
329	S 2207	Puppis	—	10568	56.4	−49 42		B 3 A	65	15	6182,6315,6320	1
330	—	Carina	—	10613	57.2	−60 33	R	B 3 A	—	1	0093	1
331	—	Puppis	—	10605	57.3	−48 42	R	A 2 F	—	14	5437,6182,6315	1
332	—	Puppis	—	10618	57.5	−48 36	R	A	137	14	5437,6182,6315	1
333	S 2223	Carina	—	10639	57.9	−59 56	6.52	B 8 A	111	1	0093	1
334	S 2224	Carina	—	10641	57.9	−60 19	5.06	Ma	—	1	0093	1
335	—	Puppis	—	10646	58.5	−49 20	R	B 3 A	—	8	6320,6329,6355	1
336	S 2235	Carina	D	10678	59.1	−63 17	4.97	B 3 A	—	3	5462,6174,7407	1
337	—	Puppis	—	10689	59.8	−49 40	R	F	—	3	6320,6413,6507	1
338	—	Puppis	—	10693	59.9	−48 2	R	B 3 A	—	2	6182,6345	1
339	S 2248	Puppis	ζ	10691	8 0.1	−39 43	2.33	Od	11	18	3960,4032,4033	2
340	—	Puppis	—	10705	0.6	−49 13	R	K	—	4	6320,6413,6421	1
341	H 1515	Puppis	ρ	10763	3.3	−24 1	2.88	F 5 G	—	5	3974,3980,6165	2
342	S 2276	Carina	—	10779	3.3	−62 33	6.40	B 3 A	—	1	6174	1
343	S 2277	Vela	—	10769	3.5	−44 58	4.82	K	201	4	9092,9423,0068	1
344	—	Vela	—	10781	3.7	−48 12	R	B 3 A	—	1	9418	1
345	S 2300	Vela	—	10856	6.3	−43 49	5.21	B 3 A	—	2	0068,0118	1
346	S 2303	Vela	—	10861	6.4	−47 3	4.91	B 3 A	63	6	3961,4070,6266	2
347	S 2305	Vela	γ	10863	6.5	−47 2	1.91	Oa Pec.	5	11	3961,4060,4070	2
348	S 2309	Vela	—	10873	6.7	−47 38	5.38	B 3 A	—	5	4070,6266,8514	2
349	—	Carina	—	10897	7.1	−63 30	R	B 8 A	111	1	6174	1
350	S 2313	Carina	B	10904	7.3	−60 59	4.82	F 5 G	—	3	9389,9422,0093	1

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351	S 2314	Volans	ϵ	*10923*	8 7.6	−68 19	4.45	B 5 A	88,89	2	5395,6244	1
352	S 2318	Puppis	h^1	10901	7.8	−39 19	4.27	K 5 M	205	4	5364,6190,7246	1
353	S 2321	Puppis	—	10913	8.0	−42 41	4.85	A 3 F	—	3	9374,9405,0100	1
354	—	Vela	—	10920	8.2	−48 9	R	B 3 A	—	1	9418	1
355	—	Vela	—	10953	9.3	−45 57	R	B 3 A	—	1	0089	1
356	S 2336	Puppis	r	10963	9.7	−35 35	5.00	*B 3 A*	78	1	5340	1
357	S 2344	Puppis	—	*10973*	10.2	−36 1	5.27	B 3 A	66	1	5340	1
358	S 2350	Puppis	h^2	10984	10.5	−40 2	4.30	K	—	4	5364,6190,6267	1
359	S 2351	Vela	—	*10986*	10.5	−46 41	5.31	B 3 A	220	5	3961,4070,6266	1
360	—	Vela	—	10989	10.6	−46 16	R	B 3 A	—	1	0089	1
361	—	Puppis	—	10999	11.0	−40 31	R	B 5 A	—	1	7246	1
362	—	Vela	—	11024	11.7	−46 10	R	B 3 A	71	1	0089	1
363	S 2393	Puppis	q	11111	14.8	−36 21	4.53	A 5 F	164	2	5340,6258	1
364	S 2413	Volans	—	11201	17.2	−65 18	4.96	K	—	3	4004,6302,8246	2
365	S 2415	Puppis	w	11191	17.5	−32 44	4.77	K	—	2	9399,0110	1
366	S 2416	Puppis	—	11194	17.5	−36 10	5.33	B 3 A	—	1	6258	1
367	S 2433	Vela	B	11248	19.5	−48 10	4.83	B 2 A	18	3	9430,9450,0106	1
368	S 2437	Volans	κ^1	11293	20.1	−71 12	5.41	B 9 A	115	2	5417,6207	1
369	S 2439	Volans	κ^2	11297	20.2	−71 11	5.71	A	138	2	5417,6207	1
370	S 2441	Carina	ϵ	11285	20.4	−59 11	1.74	K Comp.	202	3	3992,4593,8194	2
371	S 2444	Chamæleon	α	11334	21.1	−76 36	4.06	F 5 G	—	5	4019,5432,6145	1
372	S 2468	Chamæleon	θ	11405	23.7	−77 10	4.19	K	—	5	4019,5432,6145	1
373	S 2481	Volans	β	11407	24.7	−65 48	3.61	K	—	5	4004,6302,8246	2
374	S 2490	Vela	A	11424	25.9	−47 36	5.51	B 5 A	—	1	0106	1
375	S 2536	Vela	C	11583	31.7	−49 36	4.91	K	—	2	9173,9420	1
376	S 2543	Carina	e^2	11624	33.0	−57 40	4.76	K	61	4	9121,9388,9419	1
377	S 2544	Carina	e^1	11622	33.0	−57 53	5.40	B 3 A	61	4	9121,9388,9419	1
378	S 2554	Vela	e	11653	34.2	−42 38	4.08	A 5 F	—	2	5355,6346	1
379	S 2572	Pyxis	β	11714	36.2	−34 57	3.92	G 5 K	—	2	5365,6366	1
380	S 2576	Vela	—	11733	36.6	−53 5	5.56	B 5 A	68	2	4503,8380	2
381	S 2577	Vela	—	11751	37.1	−52 42	5.41	B 5 A	—	2	4503,8380	2
382	S 2582	Vela	b	11755	37.3	−46 17	3.71	F 5 G Pec.	40,182	6	4502,4515,6259	2
383	S 2583	Vela	o	*11760*	37.4	−52 34	3.58	B 3 A	52	3	4503,6403,8380	2
384	S 2584	Vela	n	11770	37.9	−46 57	4.81	A 3 F	—	5	5451,6199,6405	2
385	S 2589	Vela	—	11786	38.5	−45 3	5.21	B 5 A	—	2	4515,6259	1
386	S 2590	Carina	d	11790	38.5	−59 24	4.40	B 2 A	—	3	5425,6191,7353	1
387	S 2595	Vela	—	11797	39.0	−47 44	5.48	B 3 A	—	3	6199,6405,8367	2
388	S 2599	Vela	—	11814	39.4	−52 44	5.68	B 9 A	—	2	4503,8380	2
389	S 2600	Vela	—	11817	39.5	−52 45	5.05	B 5 A	—	2	4503,8380	2
390	S 2602	Pyxis	α	11806	39.6	−32 49	3.72	B 2 A	—	7	4011,6268,8250	2
391	S 2614	Vela	d	11852	40.8	−42 17	3.98	G 5 K	—	5	5355,5490,5491	1
392	S 2623	Vela	δ	11887	42.0	−54 20	2.00	A	124	5	3981,3993,8216	2
393	S 2629	Vela	a	11900	42.6	−45 40	4.01	A	—	3	4515,6259,8368	2
394	S 2633	Vela	—	11917	43.1	−45 32	5.58	B 5 A	91	1	4515	1
395	S 2639	Carina	f	11956	44.1	−56 25	4.65	B 3 A	—	2	5469,6200	1
396	H 1621	Pyxis	γ	12006	46.3	−27 21	4.33	K 2 M	—	1	5396	1
397	S 2659	Vela	g	12013	46.4	−44 57	4.94	A 2 F	57	1	4515	1
398	S 2670	Vela	f	12035	47.1	−46 10	5.23	B	—	2	4515,8368	2
399	R	Vela	—	—	51.6	−47 13	R	Oa	—	1	5405	1
400	S 2702	Carina	—	12149	51.6	−59 59	5.96	B 3 A	—	2	4516,8276	2

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401	S 2706	Carina	c	12175	8 52.8	−60 16	3.95	B 8 A	—	2	4516,8276	2
402	S 2707	Vela	H	12180	53.3	−52 21	4.71	B 5 A	—	5	9093,9369,9382	1
403	S 2717	Carina	b^1	*12221*	54.5	−58 51	5.09	B 3 A	56	2	4516,8276	2
404	S 2727	Vela	—	12235	55.5	−46 51	5.21	F	—	3	4109,5405,7344	1
405	S 2729	Vela	w	12253	56.3	−40 52	4.37	F 8 G	—	4	9085,9394,9395	1
406	S 2737	Carina	b^2	12286	56.9	−58 42	5.23	F	132	1	4516	1
407	—	Vela	—	12298	57.5	−51 10	R	B 3 A	—	1	6212	1
408	S 2744	Vela	—	12297	57.6	−41 28	5.68	B 5 A	—	1	9395	1
409	S 2751	Vela	—	12330	58.7	−51 48	5.41	B 9 A	—	1	6212	1
410	—	Vela	—	12370	9 0.7	−47 3	R	B 3 A	—	3	4109,5405,7344	1
411	S 2761	Vela	c	12372	0.7	−46 42	3.74	K	—	4	4109,5405,6269	1
412	S 2762	Volans	α	12378	0.9	−66 0	4.13	A 5 F	—	2	4103,6245	1
413	S 2777	Vela	λ	12438	4.3	−43 2	2.10	K 5 M	205	9	3955,3956,3962	2
414	S 2787	Carina	E	12465	4.8	−70 8	4.76	*B 3 A*	18,79	4	5492,6222,6303	2
415	S 2788	Carina	G	12472	4.9	−72 12	4.53	F 5 G	176	3	5418,6236,6237	1
416	S 2802	Vela	—	12515	7.4	−44 27	5.04	B 5 A	—	1	8195	2
417	S 2808	Carina	a	12535	8.4	−58 33	3.51	B 3 A	—	13	3994,4071,4595	2
418	S 2814	Carina	i	12557	9.0	−61 54	4.20	B 3 A	—	2	5433,6316	1
419	S 2823	Carina	—	12590	10.4	−59 0	5.56	G 5 K	—	3	6356,6565,8260	2
420	S 2825	Vela	z	12593	10.6	−42 49	5.34	B 3 A	—	2	9103,0125	1
421	—	Vela	—	12600	11.0	−37 11	R	G	—	2	5438,6223	1
422	S 2834	Vela	—	12613	11.3	−55 9	5.19	K	132	1	6509	1
423	S 2838	Vela	l	12617	11.7	−38 9	4.80	K	—	1	7429	1
424	S 2841	Vela	k	12620	11.8	−37 0	4.70	F 5 G	—	3	5438,6223,7429	1
425	S 2844	Carina	β	12636	12.1	−69 18	1.73	A	124	8	3963,4062,4063	2
426	—	Carina	—	12638	12.6	−57 58	R	B 5 A	—	2	6406,8206	2
427	S 2849	Vela	—	12635	12.7	−43 51	4.94	K 5 M	210	2	9103,9406	1
428	S 2857	Carina	g	12652	13.4	−57 7	4.16	Ma	—	5	5506,6321,6406	2
429	S 2868	Carina	ι	12672	14.4	−58 51	2.24	F	—	14	3994,4071,4595	2
430	—	Vela	—	12723	16.5	−54 45	R	B 5 A	29	1	6509	1
431	H 1690	Pyxis	θ	12728	17.1	−25 32	4.93	Ma	—	1	5562	1
432	—	Carina	—	12759	18.1	−61 34	R	B 5 A	89	1	6316	1
433	S 2903	Carina	k	12782	18.5	−61 58	4.82	K	199	2	6316,7384	1
434	S 2907	Vela	—	12785	18.8	−55 5	5.70	A 2 F	133	1	6509	1
435	S 2911	Vela	κ	12788	19.0	−54 35	2.59	B 3 A	—	12	3995,6445,6467	2
436	—	Vela	—	12809	19.9	−47 51	R	B 5 A	—	1	9177	1
437	H 1700	Hydra	G	12868	22.7	−21 54	5.02	K	—	2	5567,7317	1
438	S 2958	Antlia	ϵ	12930	25.1	−35 30	4.40	K 2 M	—	1	6347	1
439	S 2978	Vela	ψ	12989	26.8	−40 1	3.53	F 5 G	—	4	4072,5574,6332	2
440	S 2996	Vela	N	13030	28.2	−56 36	2.98	K 5 M	—	4	4012,6330,7386	2
441	S 2999	Vela	—	13028	28.4	−40 13	5.37	K	—	1	4072	1
442	S 3004	Carina	R	13073	29.7	−62 21	var.	Md	216	5	7379,7384,8267	2
443	S 3006	Vela	—	13077	30.2	−48 34	5.31	B 3 A	—	2	5530,6331	1
444	S 3020	Carina	h	13112	31.5	−58 47	4.18	B 5 A	—	3	5507,6322,7413	1
445	—	Vela	—	13135	32.8	−48 18	R	F	172	2	5530,6331	1
446	S 3030	Vela	M	13145	33.3	−48 55	4.41	A 5 F	164	2	5530,6331	1
447	S 3053	Carina	m	13217	36.6	−60 53	4.56	B 9 A	—	3	5537,6278,6357	1
448	S 3084	Carina	l	13336	42.5	−62 3	var.	G	—	1	8267	2
449	S 3095	Carina	υ	*13389*	44.6	−64 37	2.99	F	221	3	4034,6433,8348	2
450	S 3110	Vela	u	13417	46.1	−45 16	5.30	B 8 A	111	2	6338,7375	1

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451	—	Vela	—	13440	9 46.9	−46 28	R	K	—	2	6338,7375	1
452	S 3119	Vela	—	13451	47.5	−45 44	5.61	K	—	2	6338,7375	1
453	—	Vela	—	13453	47.8	−46 3	R	B 8 A	109	1	6338	1
454	S 3121	Vela	m	13455	47.9	−46 5	4.45	G 5 K	109	2	6338,7375	1
455	H 1769	Hydra	—	13506	50.2	−18 32	5.29	Ma	—	1	4171	1
456	S 3155	Vela	ϕ	13593	53.4	−54 5	3.67	B 5 A	—	3	4079,6270,8402	2
457	H 1797	Leo	α	—	10 3.1	+12 28	1.42	B 8 A	18	3	3996,4086,6622	1
458	—	Carina	S	13882	6.2	−61 3	var.	Md	217	2	4013,4052	1
459	S 3260	Carina	—	13964	10.1	−61 9	6.68	B 3 A	—	2	4013,4052	1
460	S 3265	Vela	q	13968	10.6	−41 37	3.96	A 2 F	—	4	4080,6238,8247	2
461	S 3274	Carina	ω	14008	11.4	−69 32	3.61	B 8 A	18	5	4073,6304,6685	2
462	S 3293	Carina	q	14054	13.7	−60 50	3.42	K 5 M	205	7	4013,4051,4052	2
463	—	Vela	—	14083	15.0	−55 37	R	F 8 G	—	3	4710,6376,7376	1
464	S 3308	Vela	—	14105	15.8	−54 32	4.47	K	—	4	4710,6376,9396	1
465	S 3317	Vela	J	14145	17.2	−55 33	4.44	*B 5 A* Pec.	99	11	4710,6376,7376	1
466	S 3323	Vela	r	14156	18.1	−41 9	4.88	K 5 M	—	1	8485	2
467	—	Hydra	—	14204	19.9	−18 9	R	P	1	1	4087	1
468	—	Carina	—	14244	21.4	−58 5	R	F	—	1	4706	1
469	S 3359	Carina	I	14276	22.4	−73 32	4.02	F 5 G	—	2	4714,6424	1
470	S 3360	Antlia	α	14266	22.5	−30 34	4.23	K 5 M	206	5	4705,5508,6446	1
471	—	Carina	—	14283	22.7	−73 28	R	A 2 F	—	1	4714	1
472	S 3369	Carina	—	14295	23.7	−57 8	4.91	F 5 G Pec.	40,182	7	7430,9086,9094	1
473	S 3374	Carina	s	14304	24.2	−58 14	4.05	F	—	2	4706,6323	1
474	S 3380	Antlia	δ	14319	24.9	−30 6	5.82	B 9 A	—	2	4705,6446	1
475	—	Vela	—	14349	26.5	−56 34	R	B 8 A	110	2	9122,9249	1
476	S 3399	Carina	K	14383	27.8	−71 29	4.91	A 2 F	—	15	4715,4790,6260	2
477	S 3406	Carina	p	14392	28.5	−61 11	3.62	*B 5 A*	18,98	10	4035,4066,4074	2
478	S 3408	Carina	—	14405	28.7	−72 43	4.82	K 5 M	—	2	4714,6458	1
479	—	Carina	—	14404	29.0	−58 9	R	A 2 F	153	3	4053,4054,9094	1
480	—	Carina	—	14417	29.6	−57 41	R	B 8 A	—	2	9122,9249	1
481	S 3428	Carina	r	14478	31.8	−57 3	4.55	K 5 M	—	7	4053,9094,9122	1
482	—	Carina	—	*14483*	31.8	−57 41	R	B	24,230	3	4053,9122,9249	1
483	S 3429	Carina	—	14489	32.0	−57 43	R	B	24	2	4053,4054	1
484	S 3432	Carina	t^1	14504	32.6	−59 3	5.28	K	—	3	4005,4053,4709	1
485	S 3436	Vela	p	14517	33.2	−47 43	3.99	F 2 G	174	4	4081,6317,8403	2
486	—	Carina	—	14528	33.6	−58 13	R	A 2 F	153	2	4053,9094	1
487	—	Carina	—	14536	34.2	−56 44	R	B 3 A	—	4	9094,9122,9249	1
488	S 3446	Chamæleon	γ	14557	34.3	−78 6	4.09	Ma	—	3	4717,6414,6686	1
489	S 3452	Carina	t^2	*14558*	34.9	−58 40	4.74	K 5 M	208	1	4709	1
490	—	Carina	—	14566	35.2	−58 18	R	Mb	68	2	4054,4709	1
491	S 3454	Vela	x	14569	35.3	−55 5	4.40	G	189,192	3	4716,6339,7414	1
492	—	Vela	—	14571	35.4	−55 28	R	B 3 A	29,58	1	6339	1
493	S 3455	Vela	—	14573	35.4	−55 5	6.62	B 8 A	—	1	6339	1
494	—	Carina	—	14583	35.7	−60 28	R	B 3 A	—	1	6480	1
495	—	Carina	—	14606	36.8	−64 35	R	A	138	4	3958,4036,5563	1
496	—	Carina	—	14623	37.4	−59 27	R	B 3 A	68	2	4709,6480	1
497	S 3465	Carina	—	14626	37.4	−59 9	6.48	Oc Pec.	10	13	4005,4044,4709	1
498	—	Vela	—	14624	37.5	−55 33	R	A	133	1	6339	1
499	R	Carina	—	—	37.8	−58 15	R	Oa	—	4	4005,4053,4054	1
500	S 3472	Carina	—	14653	38.7	−63 57	5.18	B 3 A	—	6	3958,3967,4036	1

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501	S 3474	Carina	—	14656	10 38.9	−58 42	5.51	B 3 A Pec.	40,72	3	4044,4053,4709	1
502	S 3475	Carina	—	14663	39.2	−60 28	7.58	B 3 A	58	1	6480	1
503	—	Carina	—	14664	39.3	−60 39	R	B 5 A	—	2	5568,6480	1
504	S 3476	Carina	θ	14667	39.4	−63 52	3.01	B	23	15	3957,3958,3964	2
505	S 3477	Carina	w	14673	39.7	−60 3	4.44	K 5 M	—	14	4005,4044,4709	1
506	S 3479	Carina	—	14684	40.1	−59 36	6.68	Oc Pec.	9	14	4005,4044,4709	1
507	—	Carina	—	14691	40.3	−59 12	R	Oc	8	3	4709,6480,6592	1
508	—	Carina	—	14692	40.3	−63 44	R	B 3 A	—	3	3958,4036,6487	1
509	S 3482	Carina	—	14702	40.5	−63 26	5.12	B 3 A	—	7	3958,3964,3967	1
510	—	Carina	—	14698	40.6	−59 28	R	B	27	3	4044,4709,6480	1
511	—	Chamæleon	—	14730	40.8	−79 16	R	B 5 A	89	1	6686	1
512	S 3485	Carina	η	14720	41.2	−59 10	var.	Q	2	11	4005,4044,4709	1
513	—	Carina	—	14743	41.7	−71 55	R	F 8 G	—	1	6458	1
514	S 3495	Vela	μ	14751	42.5	−48 54	2.81	G 5 K	—	9	3959,5439,6281	2
515	S 3496	Carina	—	14754	42.5	−60 5	6.38	A	133	4	4044,4709,4846	1
516	—	Carina	—	14764	42.7	−63 59	R	B 5 A	68	1	6487	1
517	S 3498	Carina	—	14769	42.8	−63 44	5.45	B 8 A	68	4	3958,4036,5563	1
518	S 3502	Carina	—	14775	43.2	−63 52	5.05	B 5 A	—	6	3958,3967,4036	1
519	—	Carina	—	14788	43.9	−59 21	R	B 5 A	—	6	4044,4709,4846	1
520	—	Carina	—	14797	44.2	−59 24	R	A 2 F	40	6	4044,4709,4846	1
521	S 3510	Chamæleon	δ^1	14817	44.4	−79 57	5.48	K	—	2	4834,6416	1
522	—	Carina	—	14811	44.8	−59 42	R	Oe 5 B	17	1	6480	1
523	S 3517	Chamæleon	δ^2	14829	44.9	−80 1	4.62	B 3 A	—	3	4726,4834,6416	1
524	—	Carina	—	14827	45.5	−58 48	R	A	—	1	4709	1
525	—	Carina	—	14846	46.8	−60 44	R	B 5 A	—	1	6480	1
526	—	Carina	—	14902	49.3	−58 22	R	B 3 A	—	3	4050,6425,7380	1
527	S 3555	Carina	—	14903	49.3	−60 17	7.44	B 1 A	—	1	6480	1
528	S 3556	Carina	u	*14910*	49.4	−58 19	3.85	K	199,222	10	4021,4050,5575	2
529	—	Vela	—	14935	50.5	−41 43	R	A	137	2	4727,6436	1
530	S 3570	Carina	T	14955	51.3	−59 59	6.03	K	199	2	4050,4846	1
531	—	Carina	—	14965	52.0	−59 51	R	Q	3	1	4050	1
532	S 3574	Antlia	ι	14963	52.1	−36 36	4.61	K	—	5	4184,4732,6368	1
533	S 3576	Carina	—	14971	52.2	−59 55	7.64	Q	4	1	4050	1
534	—	Carina	—	15004	53.7	−59 12	R	F	—	1	4050	1
535	S 3601	Vela	i	15048	55.5	−41 41	4.58	A 2 F	—	2	4727,6436	1
536	—	Carina	—	15152	59.8	−57 25	R	B 3 A	—	1	4064	1
537	H 1932	Hydra	χ^1	15166	11 0.5	−26 45	5.19	F 5 G	—	2	4762,6481	1
538	—	Carina	—	15175	0.7	−59 19	R	B	—	1	4065	1
539	H 1933	Hydra	χ^2	15183	1.1	−26 45	5.55	B 8 A	106	2	4762,6481	1
540	—	Carina	—	15204	1.9	−59 25	R	B 3 A	—	6	4050,4065,4733	1
541	S 3659	Carina	—	15215	2.3	−58 7	6.04	K	—	2	4064,4733	1
542	S 3662	Carina	z	15222	2.4	−61 53	4.80	K	—	7	9104,9174,9383	1
543	H 1942	Hydra	—	15253	3.9	−27 32	5.35	A 2 F	—	2	4762,6481	1
544	S 3678	Carina	x	15266	4.4	−58 26	4.03	F 8 G Pec.	40,186	4	4043,4064,4733	1
545	S 3679	Carina	—	15269	4.4	−61 24	5.47	A	140	3	9174,9634,9732	1
546	—	Carina	—	15293	5.4	−58 18	R	F 8 G	184	2	4064,4733	1
547	S 3692	Carina	—	15305	5.8	−60 26	8.06	Oa	—	3	4065,4754,7355	1
548	—	Carina	—	15318	6.6	−57 55	R	B 8 A	—	2	4064,4733	1
549	H 1946	Crater	β	15317	6.7	−22 17	4.42	A 2 F	—	3	4763,7398,7399	1
550	—	Carina	—	15344	7.7	−57 53	R	Mb	—	2	4064,4733	1

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551	S 3716	Carina	y	15356	11 8.3	−59 46	4.73	F 5 G Pec.	40,182	7	4065,4754,6291	1
552	—	Carina	—	15377	9.2	−59 4	R	B 3 A	—	7	4065,4733,4754	1
553	S 3774	Centaurus	π	15539	16.4	−53 56	4.38	B 5 A	18	5	4744,4745,6437	1
554	S 3785	Centaurus	—	15571	18.4	−35 37	5.00	K 5 M	—	2	9112,9252	1
555	S 3794	Centaurus	—	15619	20.6	−35 31	5.44	K	—	2	9112,9252	1
556	S 3840	Centaurus	o^1	15755	27.1	−58 53	4.93	F 8 G Pec.	157,187	6	4728,6340,7356	1
557	S 3841	Centaurus	o^2	15756	27.1	−58 58	5.30	A 2 F Pec.	156,157	6	4728,6340,7356	1
558	S 3848	Hydra	—	15777	27.9	−30 32	4.94	Ma	—	1	4037	1
559	—	Centaurus	—	15779	27.9	−59 10	R	A 2 F	133	2	6340,7377	1
560	S 3853	Hydra	ξ	15786	28.1	−31 18	3.65	G 5 K	—	3	4037,5641,8252	2
561	S 3871	Centaurus	A	15825	30.0	−53 42	4.79	B 8 A	—	7	4771,5564,6377	1
562	S 3883	Centaurus	λ	15848	31.1	−62 28	3.31	B 9 A	—	7	4014,6417,6499	2
563	—	Centaurus	—	15862	31.8	−60 30	R	B 3 A	—	1	4707	1
564	S 3893	Centaurus	—	15877	32.4	−60 44	5.21	K	—	2	4707,5591	1
565	S 3905	Centaurus	—	15901	33.5	−61 16	5.38	A	—	2	4707,5591	1
566	S 3918	Hydra	o	15950	35.2	−34 11	4.98	B 8 A	—	2	4784,5584	1
567	—	Centaurus	—	15962	35.9	−53 24	R	Ma	—	1	6377	1
568	S 3927	Centaurus	—	15975	36.2	−61 32	4.85	G	—	3	4707,5591,6499	1
569	S 3933	Hydra	—	*15986*	36.7	−31 56	4.98	K 5 M	209	5	9123,9371,9401	1
570	S 3949	Centaurus	—	16039	38.8	−61 56	5.17	F 8 G Pec.	40,187	2	6417,6499	1
571	S 3962	Centaurus	—	16080	40.8	−45 8	5.42	B 8 A	57	2	4711,5596	1
572	S 3963	Musca	λ	16085	40.9	−66 10	3.77	A 5 F	—	5	4038,6349,7590	2
573	S 3966	Centaurus	—	16100	41.7	−60 37	4.28	G	—	2	4707,5591	1
574	S 3978	Musca	μ	16133	43.4	−66 15	4.69	K 5 M	—	2	4038,6349	1
575	H 2024	Hydra	—	16139	43.7	−26 11	5.67	Mb	—	1	4166	1
576	S 3987	Centaurus	j	16151	44.8	−63 14	4.62	B 5 A	18	5	4772,5603,6426	1
577	S 3990	Musca	—	16162	45.2	−69 40	4.92	G 5 K	—	2	9087,9175	1
578	S 3995	Centaurus	B	16179	46.1	−44 37	4.59	K	—	2	4711,5596	1
579	S 4005	Hydra	β	16217	47.9	−33 21	4.47	B 9 A	—	2	4764,5598	1
580	—	Centaurus	—	16263	50.0	−62 43	R	A 2 F	153	2	4772,6426	1
581	—	Crux	—	16329	52.6	−61 53	R	B 5 A	—	1	6324	1
582	—	Crux	—	16359	53.7	−63 47	R	A 2 F	153	2	4772,6426	1
583	S 4039	Chamæleon	ϵ	16382	54.7	−77 40	5.06	B 9 A	—	2	4746,6577	1
584	S 4059	Crux	θ^1	16451	58.0	−62 45	4.47	A 5 F	—	3	4718,4828,6324	1
585	S 4066	Crux	θ^2	16479	59.2	−62 36	4.94	B 3 A	—	3	4718,4828,6324	1
586	S 4069	Chamæleon	κ	16484	59.6	−75 57	4.93	K 5 M	68	2	9095,9178	1
587	S 4083	Crux	η	16541	12 1.7	−64 3	4.31	F	—	5	4785,4835,6350	1
588	S 4089	Centaurus	—	*16566*	2.9	−50 6	4.79	B 5 A	92	6	6469,7461,7514	2
589	S 4093	Centaurus	δ	16572	3.2	−50 10	2.81	*B 3 A*	18,74	9	4104,6469,7461	2
590	H 2060	Corvus	α	16576	3.3	−24 10	4.32	F 2 G	—	2	6470,6500	1
591	H 2063	Corvus	ϵ	16615	5.0	−22 3	3.14	K	—	4	4119,6611,6668	2
592	H 2066	Corvus	—	16634	5.9	−23 2	5.25	A 2 F	—	3	4119,6611,6668	1
593	S 4107	Centaurus	ρ	16652	6.4	−51 48	4.15	B 3 A	—	4	4708,5600,6351	1
594	—	Crux	—	16704	8.9	−63 51	R	B 1 A	29	2	4773,6488	1
595	S 4134	Crux	δ	16726	9.8	−58 11	3.08	B 3 A	18	5	4015,6359,7584	2
596	S 4147	Musca	ϵ	16761	12.1	−67 24	4.15	Mb	214	3	4791,5576,6669	1
597	S 4148	Chamæleon	β	16766	12.5	−78 45	4.34	B 5 A	18	2	4792,5607	1
598	S 4153	Crux	ζ	16778	13.0	−63 26	4.25	B 3 A	—	3	4773,6378,6488	1
599	S 4157	Centaurus	F	16793	13.6	−54 35	4.97	Ma	—	2	9105,9253	1
600	S 4173	Crux	ϵ	16835	15.9	−59 51	3.53	K 2 M	—	8	4075,4847,4881	2

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					h. m.	° ′						
601	S 4176	Musca	ζ^2	16845	12 16.6	−66 58	5.30	A 5 F	—	2	5576,6669	1
602	—	Musca	ζ^1	16847	16.6	−67 45	R	K	—	3	4791,5576,6669	1
603	—	Musca	—	16878	17.9	−67 5	R	K	—	1	6669	1
604	—	Crux	—	16939	21.0	−62 34	R	B 5 A	90	6	4076,4090,6418	1
605	S 4207	Centaurus	G	16946	21.1	−50 53	5.07	B 3 A	57,58	2	4802,6489	1
606	S 4208	Crux	α^1	16942	21.1	−62 32	1.02	B 1 A	18,32	13	4076,4090,4591	2
607	S 4209	Crux	α^2	16943	21.1	−62 32						
608	—	Crux	—	16959	21.8	−63 14	R	B 8 A	—	2	4773,6488	1
609	S 4222	Centaurus	σ	16976	22.6	−49 40	4.14	B 3 A	—	5	4703,4802,6397	1
610	—	Crux	—	16978	22.7	−63 47	R	A	133	2	4773,6488	1
611	S 4242	Crux	γ	17048	25.6	−56 33	1.55	Mb	—	9	3982,3988,3989	2
612	S 4245	Musca	—	17061	26.1	−72 27	5.96	K	—	1	6501	1
613	S 4247	Musca	γ	17072	26.5	−71 35	4.01	B 5 A	18	9	4022,4165,5577	2
614	H 2134	Corvus	β	17129	29.1	−22 50	2.81	G 5 K	—	5	4111,6438,7507	2
615	S 4264	Centaurus	—	17149	30.6	−39 19	5.95	A	—	4	4719,6427,6536	1
616	S 4270	Musca	α	17156	31.3	−68 35	2.91	B 3 A	—	6	4122,6409,6486	2
617	S 4276	Centaurus	τ	17180	32.3	−47 59	3.99	A 2 F	—	6	4123,4857,6293	2
618	S 4289	Centaurus	l	17234	34.4	−39 26	4.71	B 8 A	107	6	4719,5597,6427	1
619	S 4294	Centaurus	γ	17269	36.0	−48 24	2.36	A	124	8	4123,4857,6293	2
620	S 4297	Crux	—	17270	36.2	−59 8	5.04	B 8 A	—	2	3975,3976	1
621	S 4301	Centaurus	w	17300	37.1	−48 16	4.63	K	—	3	4857,6360,6652	1
622	—	Centaurus	—	17320	38.0	−39 38	R	A 5 F	—	4	4719,6427,6536	1
623	S 4310	Crux	ι	17366	39.7	−60 26	4.71	K	—	2	9113,9266	1
624	S 4312	Musca	β	17374	40.1	−67 33	3.26	B 3 A	18	13	4016,6294,6552	2
625	S 4317	Crux	—	17390	40.6	−55 56	4.93	B 3 A	—	2	9124,9268	1
626	S 4324	Crux	β	17411	41.8	−59 8	1.49	B 1 A	30,31	19	3975,3976,4192	2
627	—	Centaurus	—	17460	44.7	−47 55	R	A	133	3	4729,4893,5642	1
628	—	Crux	—	17472	45.4	−59 47	R	A 2 F	152	2	9113,9266	1
629	—	Centaurus	—	17489	46.5	−39 8	R	B 8 A	—	1	6639	1
630	—	Centaurus	—	17488	46.5	−47 33	R	A	133	3	4729,4893,5642	1
631	S 4352	Crux	—	17504	47.4	−59 47	5.78	A	135	2	9113,9266	1
632	S 4354	Centaurus	e	17506	47.5	−48 24	4.36	K 2 M	—	4	4729,4893,5578	1
633	S 4361	Centaurus	n	17521	47.9	−39 38	4.31	A 5 F	—	5	4755,5539,6398	1
634	S 4365	Crux	λ	17540	48.7	−58 36	4.84	B 3 A	59	15	3975,3976,7524	2
635	S 4366	Crux	—	17542	48.8	−56 37	5.42	*B 3 A*	53	6	4734,4814,4836	1
636	S 4367	Crux	μ	17541	48.8	−56 38	4.29	B 3 A	53	6	4734,4814,4836	1
637	S 4373	Crux	—	17572	50.1	−56 17	5.62	Oe 5 B	14	4	4734,6390,6447	1
638	S 4402	Musca	δ	17693	55.4	−71 0	3.60	K 2 M	—	6	4017,4154,6296	2
639	—	Musca	—	17717	56.3	−70 56	R	*B 3 A*	18,80	2	6448,7634	2
640	S 4412	Centaurus	ξ^1	17747	57.7	−48 59	5.00	A	124	3	4747,5592,9817	1
641	S 4422	Centaurus	f	17811	13 0.4	−47 56	4.94	B 3 A	60	6	9088,9372,9426	1
642	S 4425	Centaurus	ξ^2	17826	1.0	−49 22	4.36	B 3 A	—	2	4747,5592	1
643	S 4432	Musca	θ	*17840*	1.7	−64 46	5.64	Oa Pec.	6	2	4082,4088	1
644	—	Musca	—	17843	1.8	−67 16	R	Ma	—	1	9114	1
645	S 4453	Centaurus	—	17936	6.0	−59 23	4.74	B 8 A	—	11	9096,9176,9384	1
646	—	Musca	—	17939	6.2	−65 42	R	A	—	4	4082,4088,9250	1
647	S 4461	Centaurus	—	17949	6.5	−37 16	4.82	G 5 K	—	4	4765,5585,6459	1
648	S 4467	Centaurus	—	17977	8.0	−58 34	4.99	F 8 G	—	11	9096,9106,9176	1
649	S 4470	Musca	η	17989	8.5	−67 22	4.91	B 8 A	—	7	9114,9378,9409	1
650	—	Musca	—	18031	10.1	−64 36	R	F 5 G	—	2	4082,4088	1

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					h. m.	° ′						
651	S 4480	Musca	—	18039	13 10.5	−66 15	4.82	K	—	8	9250,9403,9459	1
652	H 2249	Hydra	γ	18121	13.5	−22 39	3.35	G 5 K	—	8	4023,6379,6513	2
653	—	Musca	—	18135	14.6	−67 1	R	B 3 A	—	1	9114	1
654	S 4507	Centaurus	ι	18149	15.0	−36 11	2.98	A 2 F	—	5	4124,5684,8296	2
655	S 4514	Centaurus	—	18172	16.1	−60 27	6.60	B 3 A	70	5	4712,4870,4892	1
656	S 4515	Centaurus	J	18174	16.2	−60 28	4.56	B 5 A	70	6	4712,4829,4870	1
657	S 4521	Centaurus	m	18202	17.2	−64 1	4.43	G	—	5	9131,9373,9436	1
658	S 4522	Musca	ι^1	18192	17.2	−74 22	4.90	K	—	6	9132,9390,9466	1
659	—	Centaurus	—	18232	18.6	−63 58	R	F 5 G	—	2	9131,9473	1
660	H 2263	Virgo	α	18262	19.9	−10 38	1.23	B 2 A	18	4	3985,3997,4089	1
661	S 4541	Centaurus	—	18268	20.3	−39 14	5.12	K	—	3	3977,4736,5599	1
662	S 4567	Centaurus	d	18376	25.2	−38 54	3.95	K	199	2	4736,5599	1
663	S 4610	Centaurus	ε	18559	33.6	−52 58	2.58	B 1 A	—	6	4125,6439,6440	2
664	—	Centaurus	—	18566	33.8	−49 27	R	Mb	—	1	4106	1
665	—	Centaurus	—	18646	38.0	−50 31	R	A	137	6	4803,4837,5655	1
666	S 4641	Centaurus	i	18696	40.0	−32 33	4.25	F 5 G	—	4	4748,5654,7374	1
667	S 4646	Centaurus	M	18700	40.4	−50 56	4.61	K	199	6	4803,4837,5655	1
668	—	Centaurus	—	18716	41.2	−49 45	R	A 3 F	—	2	4837,6562	1
669	S 4653	Centaurus	—	18720	41.4	−49 50	5.56	K	—	2	4837,6562	1
670	S 4672	Centaurus	ν	18772	43.5	−41 12	3.54	B 2 A	—	6	4112,4126,5619	2
671	S 4675	Centaurus	g	18779	43.6	−33 58	4.28	Mb	214	2	4756,5601	1
672	S 4676	Centaurus	μ	18773	43.6	−41 59	3.33	*B 2 A*	47	6	4112,4126,5619	2
673	S 4685	Centaurus	—	18819	45.6	−46 25	5.85	B 3 A	—	2	9694,9700	1
674	S 4690	Centaurus	k	*18833*	46.0	−32 30	4.35	B 5 A	224	9	4720,4830,5540	1
675	—	Centaurus	—	18839	46.3	−31 8	R	F 8 G	—	1	6570	1
676	S 4701	Centaurus	h	*18855*	47.4	−31 27	4.88	B 5 A	223	5	5540,5601,6570	1
677	—	Centaurus	—	18859	47.7	−46 39	R	*B 3 A*	81	2	9694,9700	1
678	S 4715	Centaurus	ζ	18897	49.3	−46 47	2.81	B 2 A Pec.	45	67	4127,5628,7591	2
679	—	Centaurus	—	18918	50.0	−30 47	R	K	—	1	6570	1
680	S 4724	Centaurus	—	18920	50.4	−63 11	4.76	K	—	2	9120,9260	1
681	—	Centaurus	—	18929	50.5	−45 53	R	B 5 A	57	1	6399	1
682	S 4731	Centaurus	φ	18960	52.2	−41 36	4.04	B 3 A	—	5	4193,4816,5634	2
683	S 4732	Centaurus	υ^1	18968	52.5	−44 19	4.05	B 3 A	—	8	4216,4766,5593	1
684	—	Centaurus	—	18995	54.0	−45 38	R	A 2 F	68	1	6399	1
685	S 4748	Centaurus	υ^2	19027	55.4	−45 7	4.50	F 5 G	180	9	4766,5593,5629	1
686	S 4749	Apus	θ	19014	55.6	−76 19	5.68	Mb	214	2	4039,4067	1
687	S 4753	Centaurus	β	19043	56.7	−59 53	0.83	B 1 A	—	26	3984,4055,4056	3
688	S 4757	Octans	—	19007	56.9	−84 4	6.92	K	132	1	6653	1
689	—	Centaurus	—	19057	57.4	−40 56	R	A	137	3	5652,6419,6472	1
690	S 4772	Centaurus	χ	19107	59.9	−40 42	4.59	B 3 A	—	6	4749,4849,5652	1
691	H 2378	Hydra	π	19128	14 0.7	−26 12	3.51	K	—	8	4155,5685,6428	2
692	S 4775	Centaurus	θ	19129	0.8	−35 52	2.19	K	199	6	4128,5670,5695	2
693	S 4798	Centaurus	—	19179	3.3	−52 57	4.83	K	—	2	9125,9254	1
694	S 4820	Centaurus	—	19273	8.0	−56 37	5.22	*B 3 A*	18,81	4	4767,5100,5565	1
695	S 4828	Apus	—	19271	9.6	−82 23	R	B 8 A	68	1	6653	1
696	S 4837	Octans	δ	19284	10.9	−83 13	4.10	K 2 M	—	7	4774,4858,4882	1
697	H 2400	Boötes	α	—	11.1	+19 44	0.03	K	—	5	3986,3987,3998	3
698	S 4845	Lupus	ι	19354	13.0	−45 36	3.91	B 3 A	18	6	4172,5612,8385	2
699	S 4848	Centaurus	v	19358	13.3	−55 56	4.36	B 5 A	—	5	4767,4871,5100	1
700	S 4853	Lupus	—	19379	14.3	−44 43	4.81	F	—	3	4172,5612,8480	2

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					h. m.	° ′						
701	S 4854	Centaurus	ψ	19387	14 14.5	−37 26	4.19	A	128	2	4786,6361	1
702	S 4858	Centaurus	—	*19406*	15.5	−58 0	4.95	G	225	3	9107,9133,9269	1
703	S 4866	Centaurus	a	19445	16.8	−39 3	4.61	B 5 A	94	3	4817,5897,6371	1
704	H 2417	Hydra	k	19455	17.3	−27 18	4.90	K 2 M	—	6	4713,5129,6461	1
705	—	Hydra	—	19473	18.1	−29 13	R	A 2 F	133	2	6845,7439	1
706	S 4879	Lupus	τ^1	19514	19.7	−44 46	4.58	B 3 A	54	2	4787,5604	1
707	S 4880	Lupus	τ^2	19515	19.8	−44 56	4.35	F 8 G	54	2	4787,5604	1
708	—	Lupus	—	19540	20.8	−45 41	R	A 3 F	161	2	4787,5604	1
709	H 2427	Hydra	l	19577	22.4	−29 3	5.01	B 8 A	—	4	4793,6362,6845	1
710	—	Hydra	—	19593	23.4	−28 40	R	F 8 G	68	1	6845	1
711	S 4896	Lupus	—	19598	23.7	−44 53	5.61	B 9 A	122	2	4787,5604	1
712	S 4897	Lupus	—	19597	23.7	−49 4	5.54	A 2 F	—	1	4804	1
713	S 4921	Lupus	σ	19661	25.9	−50 1	4.61	B 2 A	—	7	4731,4804,5664	1
714	S 4941	Centaurus	η	19737	29.2	−41 43	2.54	*B 3 A* Comp.	83	34	4156,5759,7508	2
715	S 4950	Lupus	ρ	19785	31.2	−49 0	4.04	B 5 A	18	2	4788,6380	1
716	S 4960	Centaurus	α^1	19825	32.8	−60 25	0.20	G	188	23	3983,4592,5162	3
717	S 4961	Centaurus	α^2	19826	32.8	−60 25		K 5 M	188	21	4592,5162,5760	3
718	S 4969	Circinus	α	19849	34.4	−64 33	3.37	F	166	7	4185,6400,6514	2
719	S 4972	Centaurus	—	19867	34.9	−35 43	5.82	A	139	3	4775,5602,6515	1
720	S 4975	Lupus	α	19873	35.2	−46 57	2.46	B 2 A	—	8	4129,5861,6603	2
721	S 4976	Apus	α	19851	35.4	−78 38	3.80	K 5 M	206	12	4092,4859,5697	2
722	S 4978	Centaurus	b	19890	35.7	−37 21	4.17	B 3 A	—	3	4167,4173,5613	1
723	H 2456	Libra	—	19930	37.4	−24 34	5.85	B 9 A	122	2	4831,7455	1
724	S 4987	Centaurus	c^1	19931	37.5	−34 44	3.76	K	—	3	4775,5602,6515	1
725	S 4993	Centaurus	c^2	19958	38.8	−34 46	4.96	A	18	3	4775,5602,6515	1
726	H 2463	Hydra	m	*19997*	40.2	−25 1	5.04	F 5 G	175	5	4831,5656,5928	1
727	H 2469	Hydra	—	20035	41.5	−25 12	5.84	A	140	2	4831,7455	1
728	H 2471	Hydra	—	20044	42.0	−25 40	5.68	G 5 K	—	2	4831,7455	1
729	H 2472	Hydra	—	20048	42.2	−26 13	6.07	B 9 A	—	3	4831,5049,5542	1
730	S 5032	Octans	π^1	20034	44.2	−82 49	5.60	K	—	2	4774,6594	1
731	H 2477	Hydra	E	20100	44.5	−27 32	4.96	K 2 M	—	8	4794,5049,5542	1
732	S 5034	Lupus	o	20109	45.1	−43 9	4.43	B 5 A	—	6	4805,5570,5579	1
733	—	Hydra	—	20181	48.4	−27 56	R	K	—	1	6613	1
734	H 2490	Libra	—	20184	48.5	−24 14	5.69	K	—	1	6563	1
735	S 5081	Lupus	β	20263	52.0	−42 44	2.74	B 2 A Pec.	44	58	4130,5873,5874	2
736	S 5085	Centaurus	κ	20286	52.6	−41 42	3.36	B 3 A	50	32	4130,5886,7586	2
737	H 2503	Hydra	—	20295	52.8	−27 15	5.83	A 5 F	68	1	4850	1
738	H 2507	Hydra	—	20376	56.2	−27 40	5.66	A 5 F	68	1	4850	1
739	H 2514	Libra	σ	20431	58.3	−24 53	3.25	Mb	—	8	4186,4187,4189	2
740	S 5119	Lupus	π	20428	58.3	−46 40	3.84	B 5 A	—	3	4838,5920,6538	1
741	—	Lupus	—	20450	59.1	−48 30	R	B 3 A	—	1	4839	1
742	—	Lupus	—	20463	59.8	−51 39	R	B 3 A	—	2	6450,6604	1
743	—	Lupus	—	20478	15 0.4	−48 42	R	K	—	1	4839	1
744	S 5143	Lupus	λ	20514	2.1	−44 54	4.34	B 3 A	—	2	4822,5698	1
745	S 5157	Lupus	—	*20566*	4.8	−44 54	6.31	K	200	1	5698	1
746	S 5161	Lupus	κ	20570	5.0	−48 22	4.17	B 9 A	118	5	4839,5761,8558	2
747	S 5162	Lupus	—	20571	5.0	−48 22	5.94	A	118	2	4839,5761	1
748	S 5163	Lupus	ζ	20572	5.1	−51 43	3.46	K	199	9	4188,5887,6450	2
749	S 5170	Lupus	e	20591	6.1	−44 8	4.97	B 3 A	—	2	9089,9251	1
750	—	Circinus	—	20640	8.5	−60 32	R	B 1 A	—	7	9566,9579,9586	1

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751	—	Lupus	—	20655	15 8.9	−47 42	R	A 2 F	—	4	4759,4839,6381	1
752	S 5186	Circinus	δ	20649	8.9	−60 35	5.25	Oe 5 B	—	11	9443,9451,9566	1
753	S 5188	Circinus	ε	20654	9.2	−63 15	4.85	K	—	2	9115,9267	1
754	—	Lupus	—	20670	9.5	−43 7	R	B 5 A	—	2	9089,9251	1
755	S 5193	Circinus	β	20668	9.6	−58 26	4.00	A 3 F	—	5	4795,4883,5101	1
756	S 5194	Triang. Aust.	γ	20657	9.6	−68 19	3.00	A	18	10	4131,5626,6393	2
757	—	Lupus	—	20686	9.9	−47 30	R	K	—	1	6539	1
758	S 5201	Circinus	—	20695	10.8	−60 8	5.35	Oe 5 B	—	13	9443,9451,9491	1
759	—	Lupus	—	20716	11.5	−40 42	R	A 5 F	—	2	5050,8658	2
760	S 5207	Lupus	μ	*20713*	11.5	−47 31	4.18	B 8 A	226	4	4757,5609,6381	1
761	H 2540	Lupus	f	20721	11.7	−29 47	4.69	K	199	2	4738,5666	1
762	S 5214	Lupus	—	20731	12.4	−40 26	5.69	B 8 A	—	4	5050,6474,7592	2
763	S 5220	Lupus	δ	20779	14.8	−40 18	3.37	B 2 A	18	6	4194,5050,6352	2
764	S 5223	Lupus	—	20782	15.0	−40 24	6.13	A 2 F	133	1	5050	1
765	—	Lupus	—	20787	15.1	−37 52	R	A	138	1	5643	1
766	S 5226	Lupus	ν^1	20786	15.1	−47 34	4.98	F 8 G	—	4	4757,5609,6381	1
767	S 5227	Lupus	ν^2	20783	15.1	−47 57	5.66	G	—	4	4757,5609,6381	1
768	S 5228	Circinus	—	20775	15.1	−60 18	5.58	F 5 G	—	5	9451,9566,9603	1
769	S 5229	Circinus	γ	20785	15.4	−58 58	4.41	B 5 A Comp.	102	8	4768,4795,4883	1
770	S 5230	Lupus	ϕ^1	20793	15.5	−35 54	3.28	K 5 M	—	9	4195,4721,5108	2
771	—	Lupus	—	20801	15.8	−43 56	R	A 2 F	133	2	5069,6306	1
772	S 5231	Lupus	ε	20806	15.9	−44 20	3.56	B 3 A	—	5	5069,6306,8410	2
773	S 5237	Lupus	ϕ^2	20825	16.8	−36 30	4.69	B 3 A	18	9	4195,4721,5108	2
774	S 5245	Lupus	υ	20847	18.2	−39 22	5.33	A	137	4	4776,5643,6298	1
775	S 5251	Lupus	k	20861	18.8	−38 22	4.63	A	—	5	4776,5643,6298	1
776	S 5263	Apus	κ^1	20878	20.6	−73 2	5.61	*B 5 A* Pec.	100	7	6794,6801,9596	1
777	S 5264	Lupus	—	20909	20.9	−36 25	5.60	B 5 A	—	6	4721,5108,5605	2
778	S 5282	Lupus	—	20948	22.4	−46 23	4.88	K	—	3	9261,9398,9427	1
779	—	Lupus	—	20959	22.8	−38 17	R	A 5 F	133	3	5643,6462,6546	1
780	S 5305	Triang. Aust.	ε	21051	27.6	−65 59	4.07	K	—	4	4806,4860,6451	1
781	H 2585	Libra	—	21090	28.5	−27 42	5.26	K	—	4	4218,5051,6529	1
782	S 5310	Lupus	γ	21084	28.5	−40 50	2.96	B 3 A	18	4	4157,5677,7578	2
783	S 5312	Lupus	d	21095	29.0	−44 37	4.76	B 3 A	—	7	4818,4897,5130	1
784	S 5313	Apus	κ^2	21078	29.2	−73 7	5.76	B 8 A	—	7	6794,6801,9596	1
785	S 5315	Lupus	—	21102	29.3	−44 4	5.29	K 5 M	—	4	4818,4897,5130	1
786	H 2595	Libra	υ	21146	30.9	−27 48	3.93	K 2 M	—	11	4218,5051,5935	2
787	S 5324	Lupus	ω	21153	31.3	−42 14	4.04	K 5 M	206	9	4872,5084,5131	1
788	H 2601	Libra	τ	21186	32.6	−29 27	3.91	B 3 A	—	5	4158,5109,5615	2
789	S 5337	Lupus	ψ^1	21207	33.4	−34 5	4.44	K	199	6	4861,4894,4896	1
790	—	Lupus	—	*21206*	33.5	−43 58	R	A	136	4	4897,6353,6571	1
791	S 5344	Lupus	g	21226	34.3	−44 20	4.51	F 5 G	—	11	4818,4897,5130	1
792	S 5356	Lupus	ψ^2	21274	36.3	−34 23	4.75	B 5 A	—	5	4861,4894,5635	1
793	S 5387	Lupus	—	21360	40.4	−34 22	5.65	B 8 A	—	3	4861,4894,5945	1
794	S 5410	Lupus	χ	21454	44.6	−33 20	4.20	B 9 A	—	5	4168,4174,5910	1
795	H 2640	Scorpius	b	21469	45.0	−25 27	4.79	B 3 A	—	2	9654,9655	2
796	S 5416	Triang. Aust.	β	21484	46.4	−63 7	3.09	F	—	4	4219,5875,7559	2
797	H 2651	Scorpius	A	21521	47.6	−25 2	4.74	B 3 A	—	2	9654,9655	2
798	S 5450	Lupus	ξ	21586	50.5	−33 40	5.08	A	131	3	6671,8812,8818	1
799	S 5451	Lupus	—	21587	50.5	−33 40		A	131	3	6671,8812,8818	1
800	H 2662	Scorpius	ρ	21592	50.7	−28 55	4.01	B 3 A	55	2	4834,5678	1

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801	S 5464	Lupus	—	21630	15 52.7	−41 27	4.87	G 5 K	—	2	9127,9255	1
802	H 2671	Scorpius	π	21638	52.8	−25 49	3.08	B 2 A Pec.	46	56	4221,5657,7822	2
803	S 5469	Lupus	η	*21653*	53.4	−38 6	3.77	B 3 A	18,51	19	4220,5899,6307	2
804	H 2674	Scorpius	δ	21685	54.4	−22 20	2.52	B	18,21	11	4338,5708,6441	2
805	S 5486	Norma	ι^1	21694	55.4	−57 29	4.82	A 2 F	18	8	9108,9270,9386	1
806	S 5489	Norma	η	21710	55.8	−48 57	4.66	G 5 K	—	6	4739,5571,5631	1
807	S 5496	Lupus	—	21728	56.8	−38 19	5.10	B 5 A	—	2	5899,6307	1
808	—	Lupus	—	*21767*	58.0	−37 35	R	F	170	3	4777,5863,6307	1
809	S 5510	Norma	δ	21792	59.5	−44 54	4.78	A 3 F Pec.	163	3	4823,5912,6343	1
810	H *2690*	Scorpius	β	*21805*	59.6	−19 32	R	B 1 A	35	1	5921	1
811	S 5512	Lupus	θ	21810	16 0.0	−36 32	4.42	B 3 A	—	3	4777,5863,6596	1
812	—	Lupus	—	21828	0.7	−36 29	R	F	—	3	4777,5863,6596	1
813	H 2698	Scorpius	ω^1	21841	1.0	−20 24	4.10	B 2 A	—	5	4832,5921,5929	1
814	S 5516	Norma	ι^2	21827	1.0	−57 40	5.84	A	133	2	9108,9270	1
815	H 2700	Scorpius	ω^2	21849	1,6	−20 36	4.57	G	190	5	4832,5921,5929	1
816	S 5549	Apus	δ^1	21881	5.3	−78 27	4.73	Mb	204	20	4175,4758,4807	2
817	S 5551	Apus	δ^2	21886	5.5	−78 25	5.19	K 5 M	204	20	4175,4758,4807	2
818	S 5555	Triang. Aust.	δ	21939	6.4	−63 26	4.04	G	—	3	4885,5606,6615	1
819	S 5578	Norma	γ^1	22012	9.6	−49 49	4.95	F 8 G	184	3	4789,5888,6531	1
820	S 5593	Norma	γ^2	22075	12.4	−49 55	4 19	K	—	3	4789,5888,6531	1
821	H 2737	Scorpius	o	22146	14.6	−23 56	4.70	A 3 F	—	7	4722,5616,6363	1
822	S 5609	Norma	—	22147	15.0	−49 20	5.40	B 5 A	—	3	4789,5888,6531	1
823	H 2738	Scorpius	σ	22158	15.1	−25 21	2.99	B 1 A	30	9	4339,5093,5119	2
824	—	Triang. Aust.	—	22165	16.3	−62 54	R	A 2 F	133	1	6615	1
825	S 5625	Triang. Aust.	ζ	22185	17.6	−69 52	4.99	G	—	11	9090,9391,9410	1
826	S 5631	Apus	γ	22170	18.1	−78 41	3.94	K	199	18	4175,5102,5110	2
827	S *5641*	Norma	ϵ	*22246*	19.8	−47 20	R	B 5 A	87	6	4750,5572,6373	1
828	S 5648	Norma	—	22297	22.5	−46 2	5.38	B 1 A Pec.	42	9	6626,9452,9474	1
829	H 2764	Scorpius	α	22314	23.2	−26 13	1.06	Ma Comp.	212	16	4093,5730,6588	3
830	S 5655	Apus	—	22293	23.3	−70 47	5.53	K	68	1	9735	1
831	S 5667	Scorpius	N	22347	24.8	−34 29	4.46	B 3 A	—	6	4797,5015,5070	1
832	H 2775	Ophiuchus	ω	22374	26.2	−21 15	4.66	F	167	3	4819,4840,5913	1
833	S 5690	Apus	β	22393	28.8	−77 18	4.22	K	—	4	4873,5111,5153	1
834	H 2783	Scorpius	τ	22451	29.7	−28 0	2.90	B	22	6	4362,5837,7612	2
835	S 5703	Scorpius	H	22454	29.8	−35 3	4.08	Ma	—	8	4796,5015,5070	1
836	S 5751	Ara	—	22613	37.8	−58 19	5.89	B 3 A	—	5	4170,4851,5699	2
837	S 5752	Triang. Aust.	α	22607	38.0	−68 51	1.89	K 2 M	—	9	4169,5793,5794	2
838	S 5755	Ara	—	22626	38.8	−58 9	5.74	B	20	5	4170,4851,5699	2
839	S 5767	Ara	η	22672	41.1	−58 52	3.60	K 5 M	—	8	4170,4851,5699	2
840	S 5787	Scorpius	ϵ	22731	43.7	−34 7	2.29	K	—	8	4190,5658,7550	3
841	S 5793	Scorpius	—	22748	44.5	−41 4	5.48	Oe	12	7	4985,5058,6325	2
842	S 5794	Scorpius	μ^1	22761	45.1	−37 53	3.26	B 3 A Pec.	73	91	4382,5710,5776	3
843	S 5798	Scorpius	—	22763	45.3	−41 41	6.78	Oc	—	9	4400,4985,5058	2
844	S 5800	Scorpius	μ^2	22778	45.6	−37 51	3.74	B 2 A	—	90	4382,5710,5776	3
845	S 5809	Scorpius	ζ^1	22812	47.0	−42 12	4.96	*B 1 A* Pec.	40,43	12	4400,4985,5058	2
846	—	Scorpius	—	22814	47.0	−41 39	R	B	26,27	8	4400,4985,5058	2
847	—	Scorpius	—	*22824*	47.1	−41 41	R	B	28	2	5058,6463	1
848	S 5812	Scorpius	—	22827	47.3	−41 40	6.95	Oa	—	12	4400,4985,5058	2
849	—	Scorpius	—	22829	47.4	−42 19	R	F 5 G	—	2	4985,5058	1
850	S 5815	Scorpius	ζ^2	22832	47.6	−42 12	3.53	K 5 M	—	12	4400,4985,5058	2

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851	S 5821	Scorpius	—	22843	16 48.0	−41 0	6.11	Oe	13	8	4985,5058,6463	2
852	—	Scorpius	—	22845	48.1	−41 56	R	B	29	1	5058	1
853	S 5837	Ara	ζ	22916	50.4	−55 50	3.02	K 5 M	—	7	4363,4886,5738	2
854	S 5844	Ara	ϵ^1	22941	51.6	−53 0	4.17	K 2 M	—	11	4176,4177,5029	1
855	—	Ara	—	22949	52.0	−54 26	R	A 2 F	68	2	6755,6756	1
856	S 5872	Ara	ϵ^2	23018	55.2	−53 5	5.39	F 8 G	—	11	4176,4177,5029	1
857	S 5898	Scorpius	k	23098	58.2	−33 59	4.98	B 1 A Pec.	42	9	9109,9324,9411	1
858	S 5924	Scorpius	—	23206	17 3.5	−44 26	4.93	G 5 K	—	2	9116,9262	1
859	S 5930	Scorpius	η	23250	5.0	−43 6	3.37	F 2 G	—	10	4419,4874,5763	2
860	S 5980	Apus	ζ	23378	11.5	−67 40	4.70	K 2 M	—	7	9128,9428,9593	1
861	—	Ara	—	23459	14.7	−56 26	R	K	—	4	4862,4887,6657	1
862	H 2895	Ophiuchus	ξ	23481	15.0	−21 1	4.51	F 5 G	—	3	4824,5636,5645	1
863	—	Ara	—	23472	15.2	−60 35	R	B 8 A	—	2	5052,5608	1
864	H 2899	Ophiuchus	θ	23500	15.8	−24 54	3.44	B 3 A	—	7	4401,5722,6589	2
865	S 6019	Scorpius	—	23522	17.0	−44 4	4.98	B 8 A	—	7	9263,9416,9606	1
866	S 6020	Ara	β	23516	17.0	−55 27	2.72	K 2 M	—	38	4408,4420,4862	2
867	S 6021	Ara	γ	23515	17.0	−56 17	3.42	B 1 A	18,33	38	4408,4420,4862	2
868	—	Ophiuchus	—	23577	18.7	−21 21	R	K	—	1	5645	1
869	—	Ophiuchus	—	23589	19.1	−29 35	R	A 2 F	133	2	4999,6857	1
870	H 2909	Ophiuchus	b	23614	20.2	−24 6	4.47	F	168	4	4740,5820,6606	1
871	S 6044	Ara	—	23603	20.4	−55 6	5.97	K	—	2	4887,6849	1
872	H 2916	Ophiuchus	d	23629	21.0	−29 47	4.38	F 5 G	—	7	4898,4999,5632	2
873	—	Ophiuchus	—	23633	21.3	−29 39	R	B 9 A	—	4	4898,4999,5632	1
874	S 6056	Ara	δ	23636	22.1	−60 37	3.76	B 8 A	18	9	4435,5052,5608	2
875	—	Ara	—	23656	22.9	−56 50	R	B 8 A	—	3	4408,6504,6849	1
876	S 6063	Scorpius	υ	23698	24.0	−37 13	2.84	B 3 A	—	15	4364,5195,5196	3
877	S 6064	Ara	α	23694	24.1	−49 47	2.86	*B 3 A*	18,75	49	4901,5059,5795	2
878	H 2927	Ophiuchus	c	23739	25.3	−23 53	4.88	A	—	7	4820,4841,5617	1
879	S 6082	Scorpius	λ	23778	26.8	−37 2	1.79	B 2 A	18	15	4364,5195,5196	3
880	S 6093	Ara	σ	23805	28.3	−46 26	4.54	A	—	7	9325,9429,9594	1
881	S 6099	Scorpius	Q	23841	29.6	−38 34	4.19	K	—	5	4778,5668,6547	1
882	S 6100	Ara	—	23835	29.7	−49 59	5.78	K	—	1	9322	1
883	S 6104	Scorpius	θ	23849	30.1	−42 56	1.99	F	—	7	4439,5731,7551	2
884	S 6124	Ara	λ	23888	32.6	−49 21	4.85	F 5 G	68	5	9322,9567,9639	1
885	S 6154	Scorpius	κ	23966	35.5	−38 59	2.59	B 2 A	18	5	4402,5754,7605	2
886	S 6155	Pavo	η	23958	35.9	−64 41	3.51	K	—	7	4461,4902,5777	2
887	S 6191	Scorpius	ι^1	24107	40.5	−40 6	3.10	F 5 G Pec.	40,182	4	4421,5778,7657	2
888	H 2972	Sagittarius	X	24120	41.3	−27 48	4.87	F 8 G	184	1	7057	1
889	—	Sagittarius	—	24156	42.2	−26 57	R	B 3 A	—	1	7057	1
890	S 6202	Scorpius	—	24169	42.7	−31 40	4.95	B 8 A	—	9	9129,9440,9453	1
891	S 6204	Scorpius	G	24179	43.0	−37 1	3.22	K 2 M	—	8	4409,4903,5779	2
892	S 6205	Scorpius	ι^2	24182	43.1	−40 4	4.89	A 2 F Pec.	40,156	2	4421,5778	1
893	—	Scorpius	—	24218	44.6	−40 45	R	Ma	—	1	4421	1
894	S 6264	Scorpius	—	24321	49.5	−44 19	4.87	K	—	8	9110,9438,9461	1
895	S 6276	Scorpius	—	24348	50.7	−41 42	4.71	Ma	—	5	9100,9256,9333	1
896	H 3035	Sagittarius	W	24577	58.6	−29 35	4.88	F 5 G	—	3	5739,5909,9200	2
897	S 6338	Ara	θ	24574	58.8	−50 6	3.84	B 1 A	39,40	6	4008,5715,7599	2
898	S 6339	Pavo	π	24559	58.9	−63 40	4.39	A 5 F	—	3	4741,4986,5701	1
899	S 6341	Sagittarius	γ	24596	59.4	−30 25	3.02	K	—	6	4403,5739,5909	2
900	—	Ara	—	24630	18 1.1	−45 47	R	B 8 A	106	5	4723,4852,5071	1

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901	H 3039	Sagittarius	—	24649	18 1.8	−28 28	4.69	K	—	1	6795	1
902	—	Telescopium	—	24650	2.1	−45 57	R	F 8 G	68	1	5071	1
903	S 6370	Sagittarius	—	R	2.5	−21 16	7.80	Oa	—	1	4096	1
904	S 6374	Telescopium	ϵ	24703	3.9	−45 58	4.54	K	199	12	4723,4852,4875	2
905	S 6400	Pavo	—	24745	6.2	−63 5	5.62	K	—	2	4986,5701	1
906	—	Telescopium	—	24765	6.4	−46 20	R	A	—	1	6702	1
907	H 3062	Sagittarius	μ	24812	7.8	−21 5	4.08	B 8 A Pec.	40,113	6	4904,5103,5122	2
908	S 6412	Corona Aust.	—	24818	8.6	−44 14	5.37	K	—	1	6646	1
909	—	Sagittarius	—	*24839*	9.1	−36 37	R	B 3 A	67	3	7072,8823,8827	1
910	H 3068	Sagittarius	—	24854	9.3	−20 25	6.17	B 1 A	—	2	5103,5930	1
911	H 3069	Sagittarius	—	24850	9.3	−20 46	5.60	B	—	2	5103,5930	1
912	—	Pavo	—	24848	10.0	−63 55	R	G	132	2	4986,5701	1
913	S 6428	Sagittarius	η	24888	10.9	−36 48	2.96	Mb	—	16	4365,5030,5085	2
914	—	Sagittarius	—	24897	11.1	−28 19	R	F 8 G	—	2	7103,7137	1
915	H 3076	Sagittarius	—	24919	11.8	−27 5	4.71	K 5 M	206	11	4751,5043,5086	1
916	—	Telescopium	—	24925	12.4	−45 44	R	F 8 G	—	1	6702	1
917	S 6442	Pavo	ξ	24958	14.0	−61 33	4.15	K 2 M	—	9	4889,4906,5120	1
918	H 3084	Sagittarius	δ	24987	14.6	−29 53	2.83	K	—	8	4178,5163,5807	2
919	S 6458	Sagittarius	—	25020	16.1	−36 44	5.55	B 8 A	—	5	4365,5030,5112	1
920	S 6465	Sagittarius	—	25037	16.7	−36 18	5.55	K	—	2	4365,8823	1
921	S 6466	Telescopium	—	25032	16.8	−49 42	6.64	F 8 G	—	2	6961,7092	1
922	S 6471	Sagittarius	ϵ	25060	17.6	−34 25	1.93	A	18	9	4410,5206,5740	3
923	H 3105	Sagittarius	—	25108	19.4	−20 35	4.87	G 5 K	198	12	4724,4798,4825	1
924	S 6484	Telescopium	α	25105	19.6	−46 1	3.69	B 3 A	—	7	4440,5755,6454	2
925	S 6491	Telescopium	ζ	25140	21.1	−49 7	4.00	K	—	4	4877,5732,6961	1
926	—	Sagittarius	—	25160	21.5	−26 41	R	A 5 F	133	1	6914	1
927	H 3111	Sagittarius	λ	25171	21.8	−25 28	3.06	K	—	11	4404,5723,7570	2
928	—	Sagittarius	—	25172	21.9	−26 49	R	A 3 F	—	1	6914	1
929	S 6499	Pavo	ν	25153	22.0	−62 20	4.85	B 8 A	—	5	4863,4889,5673	1
930	—	Sagittarius	—	25182	22.1	−17 51	R	B 8 A	—	1	7451	1
931	—	Sagittarius	—	*25197*	22.8	−26 38	R	A	133,231	1	6914	1
932	—	Corona Aust.	—	25233	24.0	−41 59	R	A 5 F	—	3	4853,5586,7118	1
933	H 3121	Sagittarius	—	25257	24.3	−18 47	5.73	K	—	1	7451	1
934	S 6510	Telescopium	δ^1	25243	24.4	−45 59	5.06	B 8 A	—	6	4440,5755,6454	2
935	S 6513	Telescopium	δ^2	25255	24.7	−45 49	5.30	B 5 A	—	6	4440,5755,6454	2
936	S 6523	Corona Aust.	θ	25297	26.4	−42 23	4.41	G 5 K	—	4	4853,5586,5922	1
937	S 6557	Pavo	ζ	25383	31.3	−71 31	4.04	K	—	7	4462,4936,4937	1
938	H 3147	Lyra	α	—	33.6	+38 41	0.19	A	—	4	4094,7890,7905	3
939	S 6566	Pavo	—	25454	33.8	−64 39	5.83	K	—	2	9117,9264	1
940	S 6572	Pavo	—	25500	35.7	−64 58	4.76	A 2 F	—	6	9117,9264,9336	1
941	—	Sagittarius	—	25560	37.4	−36 49	R	K	—	3	6694,6858,7068	1
942	S 6584	Sagittarius	—	25565	37.6	−35 45	4.91	B 3 A	—	7	4769,4779,5624	1
943	—	Sagittarius	—	25587	38.6	−35 58	R	K	—	2	6694,6858	1
944	S 6594	Pavo	θ	25574	38.8	−65 11	5.93	A 3 F	—	2	9117,9264	1
945	H 3157	Sagittarius	φ	25614	39.4	−27 6	3.33	B 8 A	—	6	4411,4907,5785	2
946	S 6617	Pavo	λ	25692	42.9	−62 18	4.35	B 2 A	18	3	4821,5031,5637	1
947	S 6640	Pavo	κ	25786	46.6	−67 21	var.	F 5 G	180	6	6532,6985,7768	2
948	H 3196	Sagittarius	ν^1	25853	48.1	−22 52	5.02	G 5 K	196,197	16	4752,4759,4994	1
949	H 3200	Sagittarius	ν^2	25876	49.1	−22 47	5.15	K	—	16	4752,4759,4994	1
950	H 3199	Sagittarius	σ	25874	49.1	−26 25	2.30	B 3 A	18	16	4405,4406,5060	3

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951	H 3203	Sagittarius	—	25895	18 49.9	−23 18	5.94	B 8 A	—	4	4759,4994,6796	1
952	S 6653	Corona Aust.	—	25886	49.9	−37 28	5.54	B 5 A	—	3	9111,9323,9771	1
953	—	Pavo	—	25869	50.0	−66 47	R	K	165	2	6532,7768	2
954	S 6656	Telescopium	λ	25897	50.5	−53 4	4.86	B 9 A	119	5	4864,5756,6674	1
955	H 3213	Sagittarius	ξ^1	25919	51.4	−20 47	4.97	A	125	8	4422,4899,4987	2
956	H 3218	Sagittarius	ξ^2	25927	51.8	−21 14	3.53	K	—	9	4422,4899,4987	2
957	S 6661	Corona Aust.	ϵ	25928	52.0	−37 14	4.91	F 5 G	—	6	8740,9111,9323	2
958	—	Sagittarius	—	25944	52.4	−22 40	R	A 2 F	—	4	4759,5104,6796	1
959	—	Corona Aust.	—	26000	55.1	−42 3	R	A	—	3	5733,5931,6318	1
960	S 6683	Corona Aust.	ζ	26027	56.1	−42 14	4.76	A	—	5	4799,5733,5931	1
961	S 6686	Sagittarius	ζ	26041	56.3	−30 1	2.69	A 2 F	—	6	4436,5001,5587	2
962	S 6693	Sagittarius	—	26084	58.0	−31 12	5.65	A	—	1	7582	1
963	H 3252	Sagittarius	o	26102	58.7	−21 53	3.91	K	—	11	4956,5890,6540	2
964	—	Corona Aust.	—	26119	59.6	−42 58	R	K	—	1	7129	1
965	S 6705	Corona Aust.	γ	26123	59.7	−37 12	4.28	F 8 G	—	5	4780,4957,5724	2
966	—	Corona Aust.	—	26134	19 0.1	−37 57	R	G 5 K	165	1	5724	1
967	H 3258	Sagittarius	τ	26149	0.7	−27 49	3.48	K	—	10	4457,4908,5787	2
968	S 6716	Corona Aust.	δ	26162	1.3	−40 39	4.41	K	—	4	4742,4854,5647	1
969	S 6727	Corona Aust.	α	26189	2.7	−38 4	4.22	A 2 F	—	5	4957,5017,5690	2
970	S 6728	Corona Aust.	—	26191	2.7	−39 59	6.38	K	165	4	5017,5647,5914	1
971	S 6731	Corona Aust.	—	26198	3.0	−42 3	5.92	B 5 A	—	2	5914,6318	1
972	S 6732	Corona Aust.	β	26206	3.1	−39 30	3.99	G 5 K	—	8	4966,5017,5690	2
973	H 3270	Sagittarius	π	26225	3.8	−21 11	3.11	F 2 G	—	10	4009,4423,5164	2
974	—	Sagittarius	—	26229	4.2	−39 10	R	B 8 A	111	2	5690,7096	1
975	S *6797*	Sagittarius	β^1	*26485*	15.4	−44 38	R	B 8 A	103	11	4437,4760,5032	2
976	S 6803	Sagittarius	β^2	26500	16.0	−44 59	4.35	F	—	11	4437,4760,5032	2
977	S 6805	Sagittarius	α	26527	16.9	−40 48	4.13	B 8 A	—	10	4441,5072,5766	2
978	—	Sagittarius	—	26532	17.2	−43 55	R	Ma	—	1	7093	1
979	—	Sagittarius	—	26557	17.8	−44 23	R	K	—	1	7093	1
980	S 6857	Telescopium	ι	26780	27.8	−48 19	4.95	K	—	12	9257,9321,9393	1
981	H 3370	Sagittarius	h^1	26827	29.9	−24 56	5.82	A 3 F	162	6	4958,5878,6647	1
982	H 3373	Sagittarius	h^2	26843	30.6	−25 6	4.64	B 9 A	120	6	4958,5878,6647	1
983	S 6908	Sagittarius	—	26977	36.3	−25 6	6.55	A 5 F	133	1	6822	1
984	S 6916	Pavo	—	26980	37.9	−72 45	5.49	A 3 F	—	1	5797	1
985	H 3414	Sagittarius	f	27075	40.6	−20 0	5.06	K	—	8	4826,4988,5648	1
986	S 6929	Pavo	—	27100	42.2	−59 26	5.54	A 2 F	—	3	9632,9661,9888	1
987	H 3429	Aquila	α	—	45.9	+ 8 36	0.97	A 5 F	18	4	4097,7907,8083	3
988	S 6952	Sagittarius	ι	27239	48.3	−42 8	4.08	K	—	4	4770,4967,5285	1
989	S 6954	Pavo	—	27237	48.7	−59 10	5.31	A	—	6	9118,9632,9661	1
990	S 6957	Pavo	ϵ	27225	49.0	−73 10	4.04	A	125	10	4397,5198,5797	2
991	H 3446	Sagittarius	ω	27272	49.7	−26 34	4.95	G 5 K	195	15	4753,4781,5002	1
992	S 6966	Pavo	μ^1	27273	50.7	−67 13	5.70	K	—	1	7769	2
993	H 3451	Sagittarius	b	27289	50.8	−27 26	4.72	K 2 M	—	16	4753,4781,5002	1
994	—	Sagittarius	—	27292	51.0	−38 19	R	F 5 G	—	2	5073,7125	1
995	S 6969	Pavo	μ^2	27298	52.2	−67 13	5.20	K	—	1	7769	2
996	H 3459	Sagittarius	A	27332	52.8	−26 28	5.03	G 5 K	—	16	4753,4781,5002	1
997	S 6975	Sagittarius	θ^1	27344	53.2	−35 33	4.68	B 3 A	—	2	4843,5594	1
998	S 6976	Sagittarius	θ^2	27346	53.3	−34 58	5.38	A 3 F	—	2	4843,5594	1
999	S 6979	Pavo	—	27330	53.3	−59 39	4.87	Mb	—	2	9118,9888	1
1000	S 6981	Sagittarius	—	27354	53.7	−37 58	5.98	K	—	6	5073,5915,6823	1

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1001	—	Pavo	—	27380	19 55.5	−67 35	R	G 5 K	68	1	7769	2
1002	H 3477	Sagittarius	c	27430	56.5	−27 59	4.69	Mb	—	11	4844,4938,5105	1
1003	S 6994	Sagittarius	—	27440	56.9	−38 13	4.68	K 5 M	—	12	4909,4968,4980	1
1004	—	Sagittarius	—	27438	56.9	−39 8	R	F	172	2	5915,7125	1
1005	—	Sagittarius	—	27442	57.0	−37 48	R	K	—	3	5073,6823,7125	1
1006	—	Sagittarius	—	27452	57.4	−38 9	R	G	—	6	5073,5915,6823	1
1007	S 7006	Pavo	δ	27468	58.9	−66 26	3.56	G 5 K	—	7	4396,4995,5767	2
1008	S 7009	Telescopium	ξ	27496	59.7	−53 10	4.82	Ma	—	15	9258,9413,9454	1
1009	S 7074	Pavo	α	27918	20 17.7	−57 3	2.05	B 3 A	—	25	4010,5199,5268	3
1010	S 7113	Pavo	ϕ^1	28140	27.3	−60 55	4.73	F	—	4	4865,4878,5675	1
1011	S 7121	Pavo	ρ	28179	29.2	−61 52	5.02	F 5 G	—	5	4865,4878,5675	1
1012	S 7126	Indus	α	28213	30.6	−47 39	3.20	K	199	12	4442,4472,5165	2
1013	S 7134	Pavo	ϕ^2	28236	31.8	−60 53	5.24	F 8 G	—	4	4865,4878,5675	1
1014	S 7137	Pavo	υ	28259	32.8	−67 7	5.32	B 9 A	—	7	4180,5891,6986	2
1015	S 7150	Pavo	β	28338	36.0	−66 34	3.54	A 5 F	—	13	4180,5380,5891	2
1016	S 7152	Indus	η	28363	36.7	−52 17	4.73	F	—	2	4866,5691	1
1017	H 3631	Cygnus	α	—	38.0	+44 56	1.47	A 2 F Pec.	40,154	2	4098,7990	2
1018	H 3638	Capricornus	ψ	28455	40.2	−25 38	4.33	F 8 G	183	5	4761,5201,5269	1
1019	—	Capricornus	—	28516	42.5	−19 38	R	F 5 G	—	1	7126	1
1020	S 7168	Indus	ζ	28510	42.6	−46 36	4.90	K 5 M	—	5	9259,9318,9751	1
1021	H 3652	Capricornus	—	28539	43.4	−26 9	5.73	B 8 A	68	5	4761,4989,5810	1
1022	S 7171	Microscopium	α	28544	43.8	−34 9	4.98	K	199	8	4800,5588,6808	1
1023	—	Capricornus	—	28557	44.1	−27 45	R	K	—	1	6797	1
1024	—	Capricornus	—	28593	45.6	−27 37	R	F 8 G	68	4	4989,5719,6797	1
1025	—	Microscopium	—	28595	45.6	−28 22	R	A 3 F	161	1	6797	1
1026	S 7181	Microscopium	β	28597	45.8	−33 33	6.20	A 2 F	—	6	4800,5588,6808	1
1027	H 3661	Capricornus	ω	28598	45.9	−27 17	4.43	Ma	—	11	4292,4387,4939	1
1028	S 7191	Indus	β	28615	47.0	−58 49	3.66	K	—	20	4329,4358,4398	2
1029	—	Capricornus	—	28648	47.8	−19 29	R	K	—	1	7126	1
1030	—	Capricornus	—	28651	48.0	−26 41	R	F 5 G	177	1	6797	1
1031	—	Microscopium	—	28656	48.1	−28 18	R	Mb	—	1	6797	1
1032	H 3678	Capricornus	—	28702	50.9	−26 40	5.92	F 8 G	—	1	4387	1
1033	S 7225	Microscopium	γ	28782	55.1	−32 39	4.75	G 5 K	—	1	4919	1
1034	H 3706	Capricornus	η	28879	58.7	−20 15	5.17	A 3 F	—	7	4927,5924,6809	1
1035	S 7241	Microscopium	—	28918	21 0.3	−32 44	5.15	K	—	2	4919,6893	1
1036	H 3715	Capricornus	A	28951	1.3	−25 24	4.63	Ma	—	15	4782,4981,4996	1
1037	S 7277	Indus	—	29117	8.6	−53 41	5.80	A 5 F	—	3	5725,5903,7148	1
1038	S 7286	Microscopium	ϵ	29200	11.9	−32 36	4.84	A	125	8	4947,5681,5940	2
1039	S 7293	Indus	θ	*29216*	12.7	−53 52	4.56	A 5 F	227	5	4867,5725,5903	2
1040	S 7304	Microscopium	θ^1	29248	14.4	−41 14	5.01	A 2 F Pec.	158	8	4959,5383,5384	1
1041	S 7319	Microscopium	θ^2	29314	18.0	−41 26	5.87	A Pec.	147	8	4959,5383,5384	1
1042	S 7320	Pavo	γ	29309	18.2	−65 50	4.17	F 8 G	—	3	4879,5768,7081	1
1043	H 3779	Capricornus	ζ	29382	20.9	−22 51	3.79	G Pec.	193	23	4293,4297,4940	2
1044	H 3783	Capricornus	b	29426	23.0	−22 15	4.46	G 5 K	—	18	4293,4297,4940	2
1045	H 3802	Capricornus	—	29544	29.2	−20 31	5.87	F 5 G	—	5	5692,7131,7157	1
1046	S 7366	Octans	ν	29533	30.4	−77 50	3.73	K	—	16	4344,4359,4463	2
1047	H 3809	Capricornus	ϵ	29598	31.5	−19 54	4.53	B 5 A Pec.	95	16	4845,5692,7131	1
1048	H 3827	Capricornus	—	29717	37.6	−20 4	6.25	A 3 F	162	1	7131	1
1049	S 7403	Piscis Aust.	ι	29737	39.0	−33 29	4.41	A	18,130	6	4970,5004,5653	1
1050	S 7411	Piscis Aust.	θ	29795	41.9	−31 22	5.25	A 2 F	—	10	4910,5088,5208	2

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1051	S 7432	Grus	γ	29935	21 47.9	−37 50	3.20	B 8 A	—	17	4294,5381,5440	2
1052	S 7448	Indus	δ	29999	51.1	−55 28	4.51	F	—	7	4960,5068,5079	1
1053	—	Indus	—	30057	53.6	−56 22	R	B 8 A	—	2	4920,5113	1
1054	S 7463	Indus	ε	30105	55.7	−57 11	4.79	K 5 M	—	5	4920,5113,5682	1
1055	—	Indus	—	30133	56.9	−56 28	R	G	—	2	4920,5113	1
1056	S 7474	Grus	λ	30209	22 0.1	−40 2	4.52	K 2 M	—	7	4948,5640,5799	1
1057	S 7481	Grus	α	30241	1.9	−47 27	1.92	B 5 A	18,86	26	4181,5273,5757	3
1058	S 7486	Piscis Aust.	μ	30260	2.6	−33 29	4.64	A 2 F	149	6	4928,5385,5811	1
1059	S 7487	Piscis Aust.	ν	30261	2.6	−34 32	4.97	K 5 M	—	3	4928,6879,7127	1
1060	—	Piscis Aust.	—	30268	2.9	−33 37	R	A 2 F	—	1	7127	1
1061	S 7490	Piscis Aust.	—	30290	4.1	−34 31	5.51	A 5 F	132	3	4928,6879,7127	1
1062	S 7491	Piscis Aust.	τ	30294	4.3	−33 3	4.95	F 8 G	—	5	4928,5811,6879	1
1063	—	Grus	—	30378	8.5	−41 51	R	G	—	5	5005,5089,6894	1
1064	S 7509	Grus	μ^1	30395	9.6	−41 51	4.86	G	—	6	4911,5005,5089	1
1065	S 7517	Grus	μ^2	30405	10.4	−42 8	5.16	G 5 K	—	6	4911,5005,5089	1
1066	S 7524	Tucana	α	30422	11.6	−60 46	2.90	K 2 M	—	17	4295,4783,4990	2
1067	S 7525	Grus	—	30425	11.7	−54 7	5.44	G	—	1	5207	1
1068	S 7533	Tucana	—	30468	14.0	−58 1	6.31	K 5 M	68	1	6819	1
1069	S 7543	Tucana	—	30557	18.3	−58 17	5.40	G 5 K	—	1	6819	1
1070	S 7550	Tucana	δ	30594	20.2	−65 28	4.74	B 9 A	—	4	4982,5390,5702	1
1071	—	Tucana	—	30604	20.8	−58 30	R	A 2 F	68	1	6819	1
1072	S 7563	Grus	δ^1	30647	23.3	−44 0	4.07	G 5 K	—	7	4345,4971,5053	1
1073	S 7564	Grus	δ^2	30657	23.8	−44 15	4.26	Mb	—	7	4345,4971,5053	1
1074	S 7572	Piscis Aust.	β	*30704*	25.8	−32 51	4.48	A	228	5	4983,5687,5881	1
1075	S 7573	Tucana	ν	30709	26.2	−62 29	4.80	Mb	—	6	9130,9319,9329	1
1076	—	Piscis Aust.	—	30762	28.4	−32 39	R	B 8 A	68	2	6683,7149	1
1077	S 7588	Grus	—	30805	30.7	−41 6	6.12	A 2 F	133	1	5790	1
1078	S 7589	Piscis Aust.	—	30810	31.0	−32 11	5.48	K	132	1	6683	1
1079	S 7590	Grus	—	30814	31.2	−41 6	5.65	A 2 F	68	1	5790	1
1080	—	Grus	—	30830	32.0	−40 22	R	F 8 G	132	1	5790	1
1081	H 4007	Piscis Aust.	ε	30889	35.1	−27 34	4.06	B 8 A	—	2	4880,5831	1
1082	S 7612	Octans	β	30879	35.9	−81 54	4.35	F	—	8	4972,5125,5136	1
1083	S 7615	Grus	β	30913	36.7	−47 24	2.09	Mb	213	17	4182,4296,5650	3
1084	S 7619	Grus	ρ	30930	37.7	−41 56	4.83	K	—	8	5021,5081,5683	1
1085	S 7627	Grus	η	30968	39.5	−54 1	4.87	K	—	15	4921,5075,5098	1
1086	—	Grus	—	31012	41.4	−42 13	R	K	68	1	7107	1
1087	S 7645	Grus	ε	31044	42.5	−51 50	3.69	A 2 F	—	7	4360,5382,5832	2
1088	—	Piscis Aust.	—	31083	44.4	−33 20	R	A 5 F	—	1	7158	1
1089	S 7668	Piscis Aust.	γ	31123	47.0	−33 24	4.63	A	—	10	4929,5126,5703	1
1090	S 7680	Piscis Aust.	δ	31184	50.4	−33 4	4.08	K	199	10	4929,4941,5126	1
1091	S 7684	Piscis Aust.	α	31213	52.1	−30 9	1.27	A 3 F	160	34	4183,4297,5726	3
1092	S 7693	Grus	ζ	31263	55.0	−53 17	4.13	G 5 K	—	12	4330,4483,5144	2
1093	S 7715	Grus	θ	31380	23 1.2	−44 4	4.40	F 5 G	—	11	4346,5215,5275	1
1094	H 4083	Aquarius	c^1	31385	1.3	−24 17	4.82	G 5 K	—	3	4949,5693,7159	1
1095	H 4093	Aquarius	c^2	31431	4.1	−21 43	3.55	K	—	13	4361,4961,5744	2
1096	S 7730	Grus	—	31437	4.4	−43 24	5.89	F 8 G	—	5	4346,5215,5275	1
1097	H 4096	Aquarius	c^3	31442	4.5	−23 00	4.89	G Comp.	194	9	4961,5138,4744	2
1098	S 7734	Grus	ι	31445	4.7	−45 47	4.06	K	199	14	4443,4460,5391	2
1099	S 7758	Tucana	γ	31563	11.6	−58 47	3.98	F 2 G	—	13	5392,5866,5987	2
1100	S 7764	Sculptor	γ	31591	13.5	−33 5	4.34	K	—	7	5082,5145,5852	1

No.	M. P.	Constellation.	Des.	A. G. C.	R. A. 1900.	Dec. 1900.	Mag.	Class.	Remarks.	No. Pl.	Plate Numbers.	Prs.
					h. m.	° ′						
1101	H 4139	Aquarius	b^1	31676	23 17.7	−20 39	4.12	K	—	10	4331,5034,5694	2
1102	H 4145	Aquarius	b^2	31734	20.8	−21 12	4.36	K 5 M	—	9	4331,5034,5694	2
1103	S 7807	Phœnix	—	31826	26.0	−45 24	5.83	K	—	2	5076,6862	1
1104	—	Phœnix	—	31853	27.3	−45 41	R	A 2 F	133	1	6862	1
1105	S 7815	Sculptor	β	31859	27.6	−38 23	4.58	B 9 A	—	7	5091,5175,5216	1
1106	H 4157	Aquarius	b^3	31869	28.0	−21 28	4.73	A	18	4	5083,5090,5833	1
1107	S 7816	Phœnix	ι	31906	29.7	−43 10	4.87	A 2 F Pec.	159	13	4912,5022,5127	1
1108	—	Phœnix	—	31934	31.2	−45 27	R	A 5 F	133	2	5076,6862	1
1109	S 7823	Phœnix	—	31955	32.5	−46 3	4.92	A 2 F	—	8	5076,5386,5813	1
1110	—	Phœnix	—	31975	33.6	−46 10	R	A 5 F	133	1	6862	1
1111	S 7857	Phœnix	σ	32130	41.9	−50 47	5.35	B 5 A	—	5	5006,5114,5783	1
1112	H 4205	Sculptor	δ	32161	43.7	−28 41	4.56	A	—	4	5055,5387,5905	1
1113	—	Tucana	—	32240	48.4	−66 31	R	F 8 G	—	3	5393,5906,7084	1
1114	S 7893	Tucana	η	32311	52.3	−64 52	5.12	A 2 F	—	6	5054,5133,5814	1
1115	—	Tucana	—	32324	53.1	−63 34	R	A 2 F	133	1	5814	1
1116	S 7901	Phœnix	π	32333	53.7	−53 19	5.12	K	—	12	5035,5146,5174	1
1117	S 7902	Sculptor	—	32337	54.3	−30 3	5.62	K 5 M	—	6	5765,6826,6888	1
1118	S 7904	Tucana	ϵ	32347	54.7	−66 8	4.64	B 9 A	—	4	4855,5393,5906	1
1119	—	Phœnix	—	32359	55.4	−53 40	R	G	—	2	5825,7133	1
1120	S 7910	Octans	θ	32376	56.4	−77 37	4.62	K	—	3	9265,9331,9890	1
1121	S 7913	Sculptor	ζ	32389	57.2	−30 17	4.93	B 5 A	—	11	4950,5394,5895	1
1122	S 7919	Sculptor	—	*32414*	59.2	−29 50	6.61	A 2 F	133,151	3	6922,7108,7307	1

REMARKS.

23. In H. P., — Ceti.
47. In H. P., — Ceti.
53. In H P., — Ceti.
56. A. G. C. magn. 7.1.
64. A. G. C. magn. 6.7.
66. θ Eridani. Combined in the photometer with S. M. P. 585, A. G. C. 3224. Resulting magn. 3.13.
70. In H. P., — Eridani.
78. In S. M. P., for — Fornacis, read δ Fornacis.
88. Pleione. +23° 558, magn. 6.2. In Vol. XLIV, magn. 5.19.
90. A. G. C. magn. 6.7.
94. A. G. C. magn. 7.0.
108. A. G. C. magn. 6.6.
114. A. G. C. magn. 6.6.
117. A. G. C. magn. 6.5.
121. A. G. C. magn. 7.1.
132. A. G. C. magn. 6.4.
139. A. G. C. magn. 6.8.
144. A. G. C. magn. 7.1.
145. A. G. C. magn. 6.9.
148. A. G. C. magn. 7.
149. −5° 1320, magn. 7.8.
153. A. G. C. magn. 7.
154. A. G. C. magn. 6.6.
155. A. G. C. magn. 6.8.
156. A. G. C. magn. 7¾.
158. A. G. C. magn. 6.7.
159. ζ Orionis. Combined in the photometer with H. P. 1046. Resulting magn. 1.89.
180. A. G. C. magn. 7.0.
188. A. G. C. magn. 6.3.
200. A. G. C. magn. 6¾.
202. A. G. C. magn. 6.9.
206. A. G. C. magn. 7¾.
207. A. G. C. magn. 6.6.
209. A. G. C. magn. 7.1.
215. A. G. C. magn. 6.8.
217. A. G. C. magn. 7¼.
218. A. G. C. magn. 7.
222. In H. P., — Canis Majoris.
226. A. G. C. magn. 6.6.
228. A. G. C. magn. 7¼.
229. Combined in the photometer with S. M. P. 1709. Resulting magn. 5.80.
230. In H. P., — Canis Majoris.

232. A. G. C. magn. 6.3.
234. A. G. C. magn. 7.0.
236. A. G. C. magn. 6.5.
237. A. G. C. magn. 7.
239. A. G. C. magn. 7¼.
240. A. G. C. magn. 7¼.
241. A. G. C. magn. 6.8.
248. In H. P., — Canis Majoris.
249. A. G. C. magn. 6.5.
250. A. G. C. magn. 6.8.
254. A. G. C. magn. 7.
259. A. G. C. magn. 7.0.
261. In H. P., — Canis Majoris.
266. A. G. C. magn. 7½.
267. A. G. C. magn. 6.7.
270. A. G. C. magn. 6.3.
272. In H. P., — Argus.
276. α Geminorum. Combined in the photometer with H. P. 1424. Resulting magn., 1.56.
277. In H. P., — Argus.
278. A. G. C. magn. 7.0.
279. A. G. C. magn. 6.6.
280. A. G. C. magn. 7.0.
284, 285. In H. P., κ Argus.
286. A. G. C. magn. 6.9.
287. A. G. C. magn. 7.2.
289. A. G. C. magn. 6.7.
291. In H. P., — Argus.
293. In H. P., — Argus.
294. In H. P., τ Argus.
295. A. G. C. magn. 7.
296. In H. P., — Argus.
297. A. G. C. magn. 6.8.
298. A. G. C. magn. 7.2.
301. A. G. C. magn. 6.6.
303. In H. P., o Argus
306. A. G. C. magn. 6.3.
307. In H. P., ξ Argus.
312. A. G. C. magn. 6.9.
319. In H. P., e Argus.
322. A. G. C. magn. 6.7.
323. In H. P., — Argus.
325. A. G. C. magn. 6.5.
327. A. G. C. magn. 7½.
330. A. G. C. magn. 6.7.
331. A. G. C. magn. 6.6.
332. A. G. C. magn. 6.7.
335. A. G. C. magn. 7½.
337. A. G. C. magn. 7.1.
338. A. G. C. magn. 7½.
340. A. G. C. magn. 7½.
341. In H. P., ι Argus.
344. A. G. C. magn. 6.7.
349. A. G. C. magn. 6.6.
354. A. G. C. magn. 6.3.
355. A. G. C. magn, 6.6.
360. A. G. C. magn. 7½.
361. A. G. C. magn. 6.9.
362. A. G. C. magn. 6.8.
396. In H. P., o³ Argus.
399. Z. C. 8ʰ 4141, magn. 9.
407. A. G. C. magn. 7.1.
410. A. G. C. magn. 6.8.
421. A. G. C. magn. 6.6.
426. A. G. C. magn. 6.7.
430. A. G. C. magn. 6.8.
431. In H. P., — Argus.
432. A. G. C. magn. 7¼.
436. A. G. C. magn. 6.7.
437. In H. P., — Hydræ.
445. A. G. C. magn. 6¾.
451. A. G. C. magn. 6.4.
453. A. G. C. magn. 7¾.
463. A. G. C. magn. 6.5.
467. Gaseous nebula, N. G. C. 3242, −17° 3140.
468. A. G. C. magn. 6.8.
471. A. G. C. magn. 6.6.
475. A. G. C. magn. 6.7.
479. A. G. C. magn. 7.
480. A. G. C. magn. 6.8.
482. A. G. C. magn. 7¼.
483. A. G. C. magn. 7½.
486. A. G. C. magn. 6.6.
487. A. G. C. magn. 6.6.
490. A. G. C. magn. 6.8.
492. A. G. C. magn. 7¾.
494. A. G. C. magn. 7.1.
495. A. G. C. magn. 6.4.
496. A. G. C. magn. 7¾.
498. A. G. C. magn. 7½.
499. Z. C. 10ʰ 2684, magn. 8.7.
503. A. G. C. magn. 7½.
507. A. G. C. magn. 8½.
508. A. G. C. magn. 6.6.
510. A. G. C. magn. 6.8.
511. A. G. C. magn. 6.5.
513. A. G. C. magn. 6.9.
516. A. G. C. magn. 6.3.
519. A. G. C. magn. 7.
520. A. G. C. magn. 6.7.
522. A. G. C. magn. 7¾.
524. A. G. C. magn. 6.7.
525. A. G. C. magn. 8.
526. A. G. C. magn. 6.9.
529. A. G. C. magn. 6.4.
531. A. G. C magn. 8½.
534. A. G. C. magn. 7.0.
536. A. G. C. magn. 7¼.
537. In H. P., χ Hydræ.
538. A. G. C. magn. 7.1.
539. In H. P., — Hydræ.
540. A. G. C. magn. 7.3.
546. A. G. C. magn. 7½.
548. A. G. C. magn. 7.
550. A. G. C. magn. 7¼.
552. A. G. C. magn. 6.6.
559. A. G. C. magn. 7¾.
563. A. G. C. magn. 6.6.

567. A. G. C. magn. 6.7.
580. A. G. C. magn. 6.9.
581. A. G. C. magn. 6.3.
582. A. G. C. magn. 6.3.
594. A. G. C. magn. 6.9.
602. A. G. C. magn. 6.5.
603. A. G. C. magn. 7.0.
604. A. G. C. magn. 6.8.
608. A. G. C. magn. 6.8.
610. A. G. C. magn 6.5.
622. A. G. C. magn. 6.9.
627. A. G. C. magn. 6.8.
628. A. G. C. magn. 6.6.
629. A. G. C. magn. 6.6.
630 A. G. C. magn. 6.7.
639. A. G. C. magn. 6.6.
644. A. G. C. magn. 7.2.
646. A. G. C. magn. 6.6.
650. A. G. C. magn. 6.8.
653. A. G. C. magn. 7½.
659. A. G. C. magn. 6.4.
664. A. G. C. magn. 6.8.
665. A. G. C. magn. 6.9.
668. A. G. C. magn. 6.7.
675. A. G. C. magn. 6.7.
677. A. G. C. magn. 6.6.
679. A. G. C. magn. 6.9.
681. A. G. C. magn. 7.0.
684. A. G. C. magn. 7.0.
689. A. G. C. magn. 6.5.
695. A. G. C. magn. 6.8.
704. In H. P., — Hydræ.
705. A. G. C. magn. 7.
708. A. G. C. magn. 6.3.
709. In H. P., — Hydræ.
710. A. G. C. magn. 7½.
723. In H. P., — Hydræ.
726. In H. P., — Hydræ.
731. In H. P., — Hydræ.
733. A. G. C. magn. 6.9.
738. In H. P., — Lupi.
739. In H. P., γ Scorpii.
741. A. G. C. magn. 6.8.
742. A. G. C. magn. 6.8.
743. A. G. C. magn. 6.4.
750. A. G. C. magn. 6.3.
751. A. G. C. magn. 6.5.
754. A. G. C. magn. 6.7.
757. A. G. C. magn. 7.
759. A. G. C. magn. 6.9.
761. In H. P., δ Lupi.
765. A. G. C. magn. 6¾.
771. A. G. C. magn. 7.0.
779. A. G. C. magn. 6.8.
781. In H. P., — Scorpii.
786. In H. P., — Scorpii.
788. In H. P., σ Scorpii.
790. A. G. C. magn. 7¼.
808. A. G. C. magn. 6.4.
810. β Scorpii. Combined in the photometer with H. P 2691, A. G. C. 21806. Resulting magn. 2.91.
812. A. G. C. magn. 6.5.
821. In H. P., — Scorpii.
824. A. G. C. magn. 6.6.
827. ε Normæ. Combined in the photometer with S. M. P. 5640, A. G. C. 22244. Resulting magn. 4.67.
846. A. G. C. magn. 6.6.
847. A. G. C. magn. 6.8.
849. A. G. C. magn. 6.6.
852. A. G. C. magn. 7½.
855. A. G. C. magn. 6.5.
861. A. G. C. magn. 6.4.
862. In H. P., — Ophiuchi.
863. A. G. C. magn. 6.3.
868. A. G. C. magn. 6.4.
869. A. G. C. magn. 7½.
870. In H. P., — Ophiuchi.
873. A. G. C. magn. 6.7.
875. A. G. C. magn. 6.4.
878. In H. P., — Ophiuchi.
889. A. G. C. magn. 6.7.
893. A. G. C. magn. 6.5.
900. A. G. C. magn. 7.
902. A. G. C. magn. 7½.
903. This star is −21° 4864, and is not in the A. G. C.
906. A. G. C. magn. 7½.
909. A. G. C. magn. 7½.
912. A. G. C. magn. 6.4.
914. A. G. C. magn. 6.7.
916. A. G. C. magn. 7.
926. A. G. C. magn. 6.8.
928. A. G. C. magn. 6.6.
930. A. G. C. magn. 6.6.
931. A. G. C. magn. 7.
932. A. G. C. magn. 6.3.
941. A. G. C. magn. 6.8.
943. A. G. C. magn. 7.0.
953. A. G. C. magn. 6.5.
955. In H. P., — Sagittarii.
956. In H. P., ξ Sagittarii.
958. A. G. C. magn. 6.6.
959. A. G. C. magn. 6.9.
964. A. G. C. magn. 7.5.
966. A. G. C. magn. 6.8.
974. A. G. C. magn. 7.
975. β^1 Sagittarii. Combined in the photometer with S. M. P. 6798, A. G. C. 26486. Resulting magn. 4.10.
978. A. G. C. magn. 6.6.
979. A. G. C. magn. 7.
981. In H. P., — Sagittarii.
982. In H. P., h Sagittarii.
994. A. G. C. magn. 6.8.
1001. A. G. C. magn. 6.6.
1004. A. G. C. magn. 7.0.
1005. A. G. C. magn. 7.
1006. A. G. C. magn. 7.
1019. A. G. C. magn. 6.9.
1023. A. G. C. magn. 7¼.

1024. A. G. C. magn. 6.8.
1025. A. G. C. magn. 6.8.
1029. A. G. C. magn. 6.9.
1030. A. G. C. magn. 8.
1031. A. G. C. magn. 6.7.
1053. A. G. C. magn. 6.3.
1055. A. G. C. magn. 7.2.
1060. A. G. C. magn. 6.4.
1063. A. G. C. magn. 6.8.
1071. A. G. C. magn. 6.9.
1076. A. G. C. magn. 6.8.
1080. A. G. C. magn. 6.6.
1086. A. G. C. magn. 7.2.
1088. A. G. C. magn. 6.6.
1104. A. G. C. magn. 6.8.
1108. A. G. C. magn. 6.9.
1110. A. G. C. magn. $7\frac{1}{4}$.
1112. In H. P., — Piscis Austrini.
1113. A. G. C. magn. 6.7.
1115. A. G. C. magn. 7.1.
1119. A. G. C. magn. $6\frac{3}{4}$.

Table XVIII gives the additional plate numbers for all stars whose spectra were examined on more than three plates. The first column gives the number of the star taken from the first column of Table XVII. As in Table XVII, the left hand figure, 1, is omitted when the number is 10,000 or greater.

TABLE XVIII.

ADDITIONAL PLATE NUMBERS.

No.	Plate Numbers.	No.	Plate Numbers.	No.	Plate Numbers.
2	5883,5973,6835,7673,7704, 7795,8006,0055		7799,7863,8041,8760,8863, 9349,9352	70	6192,6261,7116,7856,8060, 8142,8190
3	7151,7239,7804,7843,8759, 9993	31	5949,7240,7794,8047,8066, 8130,8768,9359	72	8029,8143,8762,8874,9353, 0017
4	5932,7653,7719,7910,8747, 8943,9965	32	5896,6184,7607,7729,7831, 7893,7916,7943,7963,8070,	75	7079,7146,7309
5	6136,7643,7717,7793,7849, 7888,7900,7954,8767,8778,		8086,8093,8769,8926,9966, 9977,9996	76	5975,7314
	8878,8925,9348,9962,9980, 0000	33	5261,5302,5419,5933,5934, 6146,6884,7109,0123	77	7229
6	6889,6953,7100,7717,8013, 8059,8767,8789,8793,9365	34	9835,0062,0071,0108	78	6148,7280
7	5295,5341,5583,6873,6931, 7171,8842,8856,9850	35	5834,6902,6948,7144,7302	79	8127,8158,8179,8180
8	6827,6935,6947,7101,7162, 7163	39	5925,7181	80	7211
9	5966	41	5270,7062,7271,8005,8184, 8863,8887,0011	81	8127,8158,8179,8180
10	5966	43	7920,8017,8071,8087,8748, 8873,8944,8947,9982,0006	82	8127,8158,8179,8180
11	5445,5704,6963,7085,7160, 7247	44	8037	83	8127,8158,8179,8180
12	5445,5704,6963,7085,7160, 7247	45	0112	84	8127,8158,8179,8180
13	7247	47	6874,6937,7123,7293,8037	85	5335,6193,7258,8016,8185
15	5966	49	7256,7800,8007,8761,0043	86	7232,8061
18	5884,7091,7301	50	7806,8131,0034	87	8127,8158,8179,8180
19	7197,7312,8053,8824,8829, 8834,8868	51	5950,7153,7218	89	7258,8016
20	5981,6168,6936,7197,7312, 7993,8053,8824,8829,8834, 8868	52	7134,7172,7191	91	5327,5960,7176
21	9893,0057,0064,0070,0121, 0127,0141	53	6954,7198,7279	92	5327,5960,7176
22	9815,9842,0058,0072	55	5343,5958,5968,5974,5982, 5983,6169,6932,7164,7165,	93	7193,8048,8888,9355
23	5826,6964,7061,7201,7209		7272,8054,8794,8825,8835, 8867	95	5495,7977,8008,8072,8323
24	0122	57	5916,5967,6176,7110,7202	98	5969,6131,6177,6194,6251, 6941,7078,7173,7250,7313, 8837
25	5957,6890,6903,7728,7805, 7855,8930,9354,0097,0122	58	7102,7241	99	6177,6194,6251,6941,7078, 7173,7313,8837
26	7152	61	6239,6940,6966,7102,7145, 7228,7241	100	5969,6131,6177,6194,6251, 6941,7078,7173,7250,7313, 8837
27	9816,0061,0076	62	7086,7210	101	7220,7233,8055,8208,8307
28	0059,0065,0111	63	7182	102	7220,7233,8055,8208,8307, 8770,0007
29	5908,6965,7216,7217,7255,	65	6157,7154,7219,7249	103	7323,8132,8342,0035
		66	7706,7921,8141,8749,8879, 8945,9985,0002,0018,0021, 0025,0039,0056	104	7088,7089
		67	6185,7087,7294,7295,7303	105	6140,7242,8137,8333
		69	7322,7989,8027,8207	107	7094,8196,8334,8889
				109	7147,7174,7221,7251
				110	5428,6141,7315,8191,8324, 8976
				111	4530,7922,7964,7965,8106,

No.	Plate Numbers.	No.	Plate Numbers.	No.	Plate Numbers.
	8112,8118,8218	191	8978	309	7230
112	5428,6141,7315,8191,8324,	193	3861,3865,3871,3872,3877,	312	7230
	8976		3878,3880,3888,3889,3892,	314	7226
113	8018,0046		3979,4597,5307,6163,6241,	316	6404,6413,6421,6444,6456,
115	7234		7801,7813,7897,8114,8931,		6507,8039,8050,8057,8063,
116	6186,7177,7304		0013		8067,8125,8128,8129,8136,
119	0098,0102,0109	194	7237,7327		8139,8140,8174,8175,8181,
120	6253,7166,7310	195	7327		8182,8187,8193,8199,8205,
121	7310	196	7214		8210,8215,8484,9014
122	8186	197	7327	317	9421,9442,9449,9456,9489
123	0098,0102,0109	199	7214	320	0131
125	7968,7971,7984,8099,8109,	203	8266,8298	324	6154,6301,6320,6329,6336,
	8219	205	3969,3970,3971,3972,3973,		6337,6345,6355,6375,6385,
126	4532,7896,7945,7966,8096,		3999,4000,4001,4085,7946,		6395,6404,6413,6421,6444,
	8104		7967,8094,8097		6456,6465,6507,8039,8050,
127	7296	208	7297,8273,8299		8057,8063,8067,8068,8073,
128	6240,7167,7296	211	8344		8074,8080,8081,8125,8128,
130	7178	212	7326,8248		8129,8136,8139,8140,8147,
131	7296	213	6274,7212		8174,8175,8181,8182,8183,
132	7167,7296	219	6217,8395		8187,8193,8199,8205,8210,
134	8028,8935,9986,0152	220	6217,8395		8215,8394,8484,8502,9007,
136	4041,7979,8119	227	0008,0154		9014,9051,9058,9076,9442,
138	8209,8265,8450,8890,8977	231	6255,8198,8326		9449,9456,9489
152	8119	233	0156	327	6345,6421,6456,6507
157	6196,8213,8335	244	7224,7391	328	6329,6337,6345,6355,6375,
161	0128,0134,0135	245	6432,6455,8300,8308,8309,		6385,6404,6413,6421,6456,
162	8138,8145,8214,8231,8795,		9434,9441		6465,6507
	8875,8939,0001,0030,0144	248	6432,6455,6479,8274,8300,	329	6329,6337,6345,6355,6375,
165	6231,6300,6319,6344,6354,		8308,8309,9434,9441		6385,6404,6413,6421,6456,
	6365,6374,6394,7184,7406,	252	7328,7395		6465,6507
	7993,8038,8043,8049,8056,	256	7215,8249,8253,8258,8336,	331	6320,6329,6337,6355,6375,
	8062,8133,8144,8221,8232,		8365,8891,8932,8968		6404,6413,6421,6456,6465,
	8343,9006,9013,9351,9356,	258	7215,8249,8253,8258,8336,		6507
	0074,0092,0101,0136		8365,8366,8891,8932,8968,	332	6320,6329,6337,6355,6375,
166	8256		8995,9000,9050,0158		6404,6413,6421,6456,6465,
167	8192,8325,8936,0003,0103,	263	7215,8249,8253,8258,8336,		6507
	0114,0149		8365,8366,8891,8932,8968,	335	6413,6421,6456,6465,6507
168	7305		8995,9000	339	5354,6155,6257,7421,8188,
169	0129,0136	265	7215,8249,8253,8258,8365,		8228,8229,8230,8233,8234,
171	7222		8366,8891,8932,8968,8995		8241,8245,8994,9078,0155
172	7957,7972,8113	268	8345,8990	340	6456
173	7188	269	8955,0150	341	8211,8242
174	8220	273	8355,8436,8973	343	0118
177	7252	283	4031,4042,8095,8098	346	7505,9418,0089
178	6219,7236	299	8360,8397	347	6266,7505,8472,8478,8513,
179	8272,8430	303	8337,8352		8514,0089,0153
184	7156,7223	304	6234,6276	348	9418,0089
185	6264,7190,7311	306	8259,8352	352	7422
187	7316	307	8275,8337,8352	358	7246
190	7194	308	6173,7230	359	9418,0089

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371	6277,7330
372	6277,7330
373	8969,9008
376	0142
377	0142
382	6405,8367,9102
384	8367,9102
390	8269,8412,8415,9001
391	6422,6423
392	8254,0148
402	9415,0139
405	0132
411	7344
413	4061,6208,8195,8356,8956, 0159
414	8473
417	6246,6356,6457,6508,6549, 6555,6560,6565,7595,8260
425	6303,7397,7513,8473,8996
428	8200,8206
429	6246,6356,6457,6508,6549, 6555,6560,6565,7595,8260, 0143
435	6509,6550,6556,6566,7385, 8189,8201,8212,0146
439	8381
440	8268
442	8338,8339
460	9002
461	8431,8437
462	6279,7523,7546,8243
464	9407
465	9407,9431,9435,9457,9464, 9467,9471,9490
470	7345,7438
472	9249,9400,9431,9457
476	6458,6510,6551,6557,6561, 6567,6591,8237,8373,9012, 9015,9036
477	6271,7521,7522,8349,8357, 8369,8451
481	9249,9370,9400,9424
485	8503
487	9400
495	6487
497	4725,4801,4868,4869,5568, 6358,6480,6592,7361,7415
499	4709
500	5563,6280,6487
504	3965,3966,3967,4036,5563, 6280,6487,7346,7516,8407, 9184,9185
505	4725,4801,4846,4868,4869, 5568,6358,6480,6592,7361, 7415
506	4725,4801,4846,4868,4869, 5568,6358,6480,6592,7361, 7415
509	4036,5563,6280,6487
512	4725,4801,4846,4868,4869, 6358,6480,6592
514	6434,6435,7538,8251,9187, 0160
515	6480
517	6487
518	5563,6280,6487
519	4869,5568,6480
520	4869,5568,6480
528	6407,6425,6511,7380,7416, 8294,8454
532	7381,7460
540	4754,6292,7355
542	9425,9468,9634,9732
544	6348
551	6292,7355,7382,7417
552	6292,6348,7382,7417
553	6525,6687
556	7357,7377,7431
557	7357,7377,7431
561	6526,7360,7373,7437
562	7506,8414,8486,9016
569	9738,9752
572	8418,9003
576	7372,7400
587	7362,7432
588	8295,8332,8341
589	7514,8295,8332,8340,8341, 9197
591	8438
593	6512
595	8432,9004
600	6333,6334,8404,8433,9235
604	6638,7359,7410
606	
607	6418,6638,7359,7378,7410, 7515,8399,8416,8997,9699
609	6489,6544
611	6369,7401,7576,7635,7636, 9180
613	6408,6501,6569,8408,8474, 8492
614	8262,9188
615	6583
616	7539,8479,9201
617	6360,6652,7585
618	6536,6583,7358
619	6360,6652,7585,9192,9193
622	6583
624	6558,6602,7540,8423,8439, 8504,9011,9017,9037,9227
626	6295,7364,7402,7524,7632, 7633,7644,8255,8261,8361, 9186,9652,9665,9695,9733, 9759
632	5642
633	6559,6639
634	7632,9119,9402,9458,9627, 9652,9665,9674,9684,9695, 9733,9759
635	6390,6447,6471
636	6390,6447,6471
637	6471
638	7634,8419,9018
641	9472,9775,9817
645	9397,9408,9465,9469,9644, 9734
646	6593
647	9387,9408,9465,9469,9644, 9767,9780.9828
648	9767,9780,9828
649	9645,9734,9818,9836
651	9635,9645,9734,9776,9884
652	8270,8400,8413,9038,9236
654	8446,9198
655	6341,6584
656	4892,6341,6584
657	9473,9781
658	9739,9753,9766
660	6623
663	7547,8377,9148
665	6460,6562,6670
666	7403
667	6460,6562,6670
670	5633,7596,8362
672	5633,7596,8362
674	5601,5620,6391,6570,6578, 6612
676	6578,6612
678	8263,9168,9228,9273,9494, 9498,9504,9509,9514,9518, 9522,9526,9530,9536,9538,

No.	Plate Numbers.
	9540,9542,9547,9556,9563,
	9569,9571,9574,9575,9582,
	9585,9589,9595,9601,9608,
	9616,9617,9618,9620,9626,
	9633,9642,9653,9673,9675,
	9682,9685,9686,9689,9691,
	9694,9700,9705,9706,9712,
	9714,9716,9719,9721,9723,
	9726,9746,9789,9856,9858,
	9867,9905,9938,9942
682	8384,8461
683	5629,5630,6370,6449,6640
685	5630,6370,6399,6449,6585,
	6640
687	4057,4058,4059,4596,5663,
	7365,7490,7525,7526,7533,
	7534,7535,7536,7537,7577,
	7639,7640,7911,8376,9029,
	9031,9199,9557
690	6419,6420,6472
691	6527,8297,8405,8417,9932
692	7491,7648,9564
694	6342
696	5696,6410,6502,6653
697	6624,7904
698	8389,8390,8480
699	5565,6342
704	6579,7404,9837
709	7439
713	5665,6297,6429,6430
714	8493,8505,9052,9053,9141,
	9162,9194,9207,9224,9280,
	9290,9312,9495,9499,9505,
	9510,9515,9519,9523,9527,
	9531,9539,9548,9576,9583,
	9602,9609,9619,9666,9861,
	9911
716	5760,6392,6473,6654,6688,
	7366,7418,7484,7541,7556,
	7557,7560,7561,7562,7572,
	7573,7645,7901,8363,8732
717	6392,6473,6654,6688,7366,
	7418,7484,7541,7556,7560,
	7561,7562,7572,7573,7645,
	7901,8363,8732
718	7567,8487,8620,9149
720	7548,7549,7558,7649,9189
721	6595,6655,6846,7411,7419,
	8434,8462,8613,9286
726	7405,7455
731	5118,5862,6528,6613,7440
732	5621,7412,9845
735	5885,7485,7586,8264,8271,
	8374,8420,8424,8435,8552,
	8572,9010,9028,9032,9039,
	9041,9042,9044,9047,9054,
	9060,9077,9079,9138,9161,
	9172,9179,9181,9202,9225,
	9229,9272,9274,9282,9291,
	9294,9296,9299,9309,9315,
	9506,9511,9516,9520,9524,
	9532,9541,9549,9570,9610,
	9676,9724,9861,9868,9900
736	8271,8374,8420,8424,8435,
	8447,8572,9032,9039,9042,
	9047,9079,9161,9172,9225,
	9229,9272,9274,9296,9315,
	9506,9516,9520,9524,9532,
	9541,9549,9610,9868
739	5614,6537,8378,8475,9237
746	9142,9169
748	6604,7502,8364,8455,9019,
	9283
750	9592,9598,9603,9811
751	6539
752	9579,9586,9592,9598,9603,
	9811,9829,9876
755	5898,6401
756	6516,7501,8421,8440,9245,
	9281,9295
758	9559,9566,9579,9586,9592,
	9598,9603,9811,9829,9876
760	6539
762	8658
763	6474,7592,8658
766	6539
767	6539
768	9811,9829
769	5101,5622,5898,6401,9598
770	5605,6305,6411,8391,8409,
	8488
772	8566,8633
773	5605,6305,6411,8391,8409,
	8488
774	6546
775	6462,6546
776	9812,9830,9877,9895
777	6305,6411,8391
780	6475
781	6641
782	8495
783	6353,6656,7456,9846
784	9812,9830,9877,9895
785	6353
786	5944,6476,6529,6641,6689,
	8401,8498,9150
787	5543,5667,6452,6642,7420,
	7441
788	6614,8425
789	5635,5945,6530
790	7456
791	5566,5762,6353,6412,6571,
	6656,7456,9846
792	5945,6530
794	6671,6856
796	8494
802	8481,8621,9143,9163,9218,
	9226,9284,9534,9543,9552,
	9572,9643,9651,9659,9663,
	9664,9667,9672,9683,9687,
	9688,9690,9692,9693,9696,
	9697,9698,9701,9702,9703,
	9704,9707,9708,9711,9713,
	9715,9717,9718,9720,9722,
	9725,9728,9745,9747,9748,
	9787,9788,9862,9869,9901,
	9906,9944,9956
803	7864,8626,9496,9503,9507,
	9512,9521,9525,9528,9533,
	9544,9550,9870,9912,9948,
	9971
804	7492,7646,8371,8392,8406,
	8470,8743,9203
805	9404,9444,9629,9768,9777
806	6442,6503,9098
813	7383,74433
815	7383,7433
816	5102,5110,5644,5937,6402,
	6431,6477,6517,6625,6746,
	6747,6847,7568,7818,7824,
	8441,8567
817	5102,5110,5644,5937,6402,
	6431,6477,6517,6625,6746,
	6747,6847,7568,7818,7824,
	8441,8567
821	6616,7117,7434,7457
823	5709,6308,6309,7579,8517,
	8559
825	9460,9587,9637,9735,9754,
	9782,9797,9855

No.	Plate Numbers.	No.	Plate Numbers.	No.	Plate Numbers.
826	5111,5936,5937,6402,6431,		7782,7790,7814,7820,7837,		8507,8739
	6477,6518,6747,6847,7568,		7840,7850,7851,7898,7902,	877	6464,7543,7656,7809,7816,
	7818,7824,8441,8525,8567		7917,7919,7974,7980,8009,		7990,8052,8375,8442,8489,
827	6597,6865,7095		8045,8370,8411,8468,8526,		8500,8574,8792,9144,9170,
828	9492,9561,9605,9831,9884,		8573,8627,9030,9040,9043,		9231,9246,9277,9302,9497,
	9896		9045,9048,9080,9139,9164,		9502,9508,9513,9517,9529,
829	6643,7486,7493,7587,7623,		9208,9230,9275,9300,9310,		9535,9545,9551,9573,9646,
	7637,7889,8082,8726,8727,		9553,9902		9668,9860,9863,9864,9871,
	8728,8729,9952	845	5753,6325,6463,6598,7691,		9903,9939,9941,9943,9945,
831	5623,6443,6848		7865,8471,8476,9287		9950,9957,9959,9972,9990,
833	5889	846	5753,6463,6598,7865,8476		0014
834	7622,8448,8509	848	5753,6325,6463,6598,7691,	878	6478,6599,6627,7128
835	5094,5623,5836,6443,7450		7865,8471,8476,9287	879	5679,5700,6645,7494,7641,
836	6310,8506	850	5753,6325,6463,6598,7691,		7776,7969,8449,8464,8490,
837	7542,7650,8379,8733,9292,		7865,8471,8476,9287		8507,8739
	9978	851	6598,7691,7865,8471,8476	880	9741,9779,9813,9832
838	6310,8506	853	7817,8463,8499,8614	881	6645,6757
839	6310,7844,8422,8506,9949	854	5830,6453,6644,6701,6866,	883	7642,9195,9660,9907
840	7858,7912,8457,8735,9182		7063,7064,7065	884	9742,9762
841	6463,6598,7691,8476	856	5830,6453,6644,6701,6866,	885	7652,8587
842	7626,7683,7687,7690,7694,		7063,7064,7065	886	7819,8535,8608,9303
	7697,7700,7703,7707,7708,	857	9599,9638,9740,9769,9805,	887	8638
	7709,7710,7711,7712,7713,		9885	890	9580,9729,9736,9778,9799,
	7714,7715,7716,7720,7721,	859	6364,6617,7598,8456,8607,		9821
	7722,7723,7724,7725,7726,		8659,9055	891	6311,7618,7688,7826,9297
	7727,7730,7731,7732,7733,	860	9630,9792,9798,9878	894	9600,9657,9755,9761,9814
	7734,7735,7736,7737,7738,	861	6849	895	9756,9886
	7739,7740,7741,7742,7743,	864	7426,7487,8496,8560	897	8651,9669,9670
	7744,7745,7746,7747,7748,	865	9656,9770,9806,9820	899	7569,7760,9200
	7749,7750,7751,7752,7759,	866	4887,5805,5819,6504,6657,	900	6607,6739
	7761,7782,7790,7814,7820,		6672,6849,7503,7810,7815,	904	5000,5071,5646,5821,6327,
	7837,7840,7850,7851,7898,		7823,7859,8051,8393,8482,		6607,6739,7124,9056
	7902,7917,7919,7974,7980,		8510,8518,8579,8622,8634,	907	5796,5930,9034
	8009,8045,8370,8411,8468,		8746,9033,9046,9049,9061,	913	5112,5716,7072,7563,7697,
	8526,8573,8627,9030,9040,		9081,9140,9165,9209,9219,		8561,8568,8600,8823,8827,
	9043,9045,9048,9080,9139,		9276,9301,9311,9677,9727		9288,9946,0036
	9164,9208,9230,9275,9300,	867	4887,5805,5819,6504,6657,	915	5095,5121,5680,7056,7103,
	9310,9553,9902		6672,6849,7503,7810,7815,		7137,7179,7427
843	6325,6463,7691,7865,8471,		7823,7859,8051,8393,8482,	917	5806,5876,6505,6548,6554,
	8476		8510,8518,8579,8622,8634,		6673
844	7683,7687,7690,7694,7697,		8746,9033,9046,9049,9061,	918	7552,7664,8497,8744,0040
	7700,7703,7707,7708,7709,		9081,9140,9165,9209,9219,	919	7072,8823
	7710,7711,7712,7713,7714,		9276,9301,9311,9677,9727	922	7504,7651,7825,7906,8736,
	7715,7716,7720,7721,7722,	870	6749		9196
	7723,7724,7725,7726,7727,	872	5900,6326,6857,9082	923	4842,5232,5573,5581,5946,
	7730,7731,7732,7733,7734,	873	6857		6802,6867,7066,7067
	7735,7736,7737,7738,7739,	874	7593,8469,8615,8628,9151,	924	7580,9145,9298,9988
	7740,7741,7742,7743,7744,		9304	925	7092
	7745,7746,7747,7748,7749,	876	5679,5700,6645,7494,7641,	927	7571,7866,8501,9191,9238,
	7750,7751,7752,7759,7761,		7776,7969,8449,8464,8490,		9960,9968,9994

No.	Plate Numbers.	No.	Plate Numbers.	No.	Plate Numbers.
929	5806,5876	987	8091	1036	5019,5078,5106,5123,5135,
934	7580,9145,9298	988	5638		5143,5639,6860,6944,7113,
935	7580,9145,9298	989	9750,9772,9888		7454,9840
936	7118	990	6609,7614,7698,9083,9146,	1038	6933,8581,8639,8652,9678
937	5016,5096,5808,6618		9247,0023	1039	7148,9221
938	8090	991	5003,5018,5067,5781,5788,	1040	5735,6760,6851,6899,6927
940	9631,9749,9879		5823,5939,6868,6869,6870,	1041	5735,6760,6851,6899,6927
942	5780,6694,6858,7068		6915,7139	1043	5033,5686,5798,5880,6682,
945	6803,7588,7676	993	5003,5018,5067,5781,5788,		6861,6984,7168,7658,7684,
947	8645,8660,8843		5823,5939,6868,6869,6870,		7811,7841,8511,8646,8863,
948	5104,5134,5154,5178,5618,		6915,7138,7139		9147,9278,9313,0031,0054
	5741,5822,5877,5938,6796,	996	5003,5018,5067,5781,5788,	1044	5033,5686,5798,5880,6682,
	6850,7104,7111		5823,5939,6868,6869,6870,		6861,6984,7168,7658,7684,
949	5104,5134,5154,5178,5618,		6915,7138,7139		7811,7841,8511,9278,9313
	5741,5822,5877,5938,6796,	1000	6898,7058,7125	1045	9731,9758
	6850,7104,7111	1002	5718,6897,6982,7105,7112,	1046	4890,5676,6690,6691,6950,
950	5765,7564,7647,7913,8483,		7428,8844,9839		7098,7452,7685,7778,7861,
	8508,8741,9183,9709,9927,	1003	5073,5087,5097,5660,5915,		8653,9234,0028
	9963,9991,0019		6823,6898,7058,7125	1047	7157,9455,9493,9588,9649,
951	6850	1006	6898,7058,7125		9731,9758,9800,9809,9897,
954	7135,7136	1007	6949,7604,7769,8774		0077,0120,0140
955	5786,7574,7846,8766,9288	1008	9568,9647,9710,9730,9757,	1049	5849,6798,6945
956	5786,7574,7846,8766,9288,		9793,9808,9889,0069,0107,	1050	5789,6824,7106,8788,8809,
	9554		0126,0133		9171,9360
957	9334,9640,9771	1009	5688,7575,7589,7903,7908,	1051	5441,5689,7625,7821,7847,
958	6850		7970,8088,8089,8519,8536,		7886,8745,9241,9555,9976,
960	6318,7129		8617,8630,8730,9057,9233,		9989,9992,0020,0045
961	7582,7833,9953		9865,9930,9958,9961,9964,	1052	5124,5743,5911,6928
963	6541,7611,7834,8601,9293,		9973,9984	1054	6871,9848
	9546,9908,0050	1010	5734	1056	5864,6692,6832,6833
965	5764,7827	1011	5734,5902	1057	6878,7544,7787,7891,7892,
967	7581,7677,8569,8616,9210,	1012	5879,6943,7583,7628,8775,		7909,7992,8084,8092,8588,
	9232,0022		9240,9581,9872,9954		8609,8640,8731,9279,9289,
968	5914	1013	5734		9679,9866,9924,9933,9934,
969	5764,7827	1014	7074,7080,7860,7976		9974,0041,0052
970	7096	1015	6986,7074,7080,7600,7665,	1058	6879,6919,7127
972	7096,7613,8580,9951,0044		7860,7976,8661,9248,9987	1062	6919,7127
973	5901,6540,6541,7606,7611,	1018	5810,7140	1063	6951,8860
	7624,7834	1020	9764,9881	1064	6894,6951,8860
975	5066,5717,5809,7093,7624,	1021	6983,7140	1065	6894,6951,8860
	8623,9035,9220	1022	7097,7119,7458,9662,9847	1066	5020,5107,5649,7666,7835,
976	5066,5717,5809,7093,7624,	1024	6983		7987,8742,8776,8946,9874,
	8623,9035,9220	1026	7097,7119,7458		9931,9979,0032,0037
977	6506,7619,7692,7777,8629,	1027	4969,4989,5719,6797,6917,	1070	7082
	9239,0026		6983,7459,8859	1072	5758,5824,5986,7169
980	9412,9439,9562,9607,9658,	1028	4459,4482,5080,5200,5272,	1073	5758,5824,5986,7169
	9737,9763,9807,9880		5892,6518,6519,6520,7594,	1074	6683,7149
981	6822,6892,7069		7671,7828,8520,9357,9671,	1075	9765,9774,9882
982	6822,6892,7069		9969,0015	1082	5274,5782,7120,7121,7453
985	5923,6758,6859,7073,7180	1034	7059,7075,7130,8845	1083	7659,7678,7829,7899,7914,

No.	Plate Numbers.	No.	Plate Numbers.	No.	Plate Numbers.
	8107,8734,8737,8964,8979,		9995		7792,7836
	9314,9929,9999,0048	1092	5838,7090,7099,7798,7862,	1102	5800,5882,6853,6895,6946,
1084	5893,6825,6934,7060,7107		7887,8012,8647,9358		7836
1085	5137,5179,5184,5589,5904,	1093	5582,5839,5963,5964,5971,	1105	5840,5955,6901,7150
	5954,6768,6852,6900,7076,		6834,7207,9833	1106	7083
	7195,8861	1095	5865,6887,6929,7115,7693,	1107	5217,5276,5894,6882,7208,
1087	6938,7672,7786,9316		7812,7842,7992,8854,8777		9320,9330,9650,9841,9883
1089	5812,5850,6886,6920,7158,	1096	5582,7207	1109	5978,5979,6862,7143,9849
	7199,0119	1097	5947,6887,6929,7115,7693,	1111	7170,8841
1090	5703,5850,6886,6920,7158,		8854	1112	7200
	7199,0119	1098	5851,6762,6880,6952,7770,	1114	5956,6939,7122
1091	7667,7668,7669,7699,7779,		7988,8058,8654,9361,0038,	1116	5791,5825,5980,6883,6921,
	7894,7895,7915,7942,7962,		0053		7077,7133,7270,8855
	8085,8108,8512,8589,8635,	1099	5988,6684,7785,7830,7848,	1117	6922,7108,7278
	8641,8738,8787,8929,8964,		9317,9681,0033,0042,0049	1118	7084
	8979,9289,9314,9348,9364,	1100	6881,6962,7132,9834	1121	5965,6826,6888,6922,7108,
	9680,9875,9925,9947,9955,	1101	5800,5882,6853,6895,6946,		7278,7307,8862

A list of all the stars, in Tables XVI and XVII, whose spectra are of the Orion type with one or more bright hydrogen lines, is given in Table XIX. The first seven columns of this table are taken from the second, third, fourth, fifth, sixth, seventh, and eighth columns of Table XVII. The eighth column gives the class to which the spectrum would belong, if all the lines were dark. The ninth column gives the brightness of the hydrogen lines. The estimates were made in the following manner: — The intensity of Hβ in the spectrum of μ Centauri was assumed as *10*. The intensity of Hβ in each spectrum taken with one and two prisms was then estimated by superposition upon Hβ in the spectrum of μ Centauri on Plates X 5633, and X 8362 respectively. The intensity of the other hydrogen lines was estimated by comparing those in each spectrum with Hβ. The intensities are printed in Italics to indicate that the lines are bright. In four cases Hβ, and in two of these Hγ also, have been found to be variable, being sometimes bright and sometimes dark. The laws regulating these changes have not yet been determined.

The tenth column gives numbers referring to the remarks following Table XVI.

TABLE XIX.

SPECTRA OF THE ORION TYPE HAVING BRIGHT HYDROGEN LINES.

M. P.	Constellation.	Des.	A. G. C.	R. A. 1900.	Dec. 1900.	Mag.	Class.	Hε	Hδ	Hγ	Hβ	Remarks.
				h. m.	° ′							
R	Taurus	—	—	3 43.3	+23 51	R	B 8 A	0	0	0	*2*	105
S 1217	Columba	α	6633	5 36.0	−34 8	2.74	B 5 A	0	0	0	*1*	18,97
S 1643	Canis Major	κ	8518	6 46.1	−32 24	3.90	B 2 A	*3*	*2*	*3*	*6*	18,48
—	Canis Major	—	8991	7 3.2	−23 41	R	B 3 A	0	0	0	*1*	82
H 1368	Canis Major	—	9181	10.2	−26 10	4.54	B 5 A	0	0	var.	var.	101
H 1370	Canis Major	ω	9198	10.7	−26 35	3.69	B 3 A	0	*1*	*2*	*4*	76
S 1856	Puppis	ν^1	9326	14.8	−36 33	4.80	B 3 A	0	*1*	*3*	*5*	18,77
H 1472	Puppis	o	10182	43.9	−25 42	4.68	B 2 A	0	0	*1*	*3*	18,49
S 2336	Puppis	r	10963	8 9.7	−35 35	5.00	B 3 A	0	*1*	*2*	*4*	78
S 2787	Carina	E	12465	9 4.8	−70 8	4.76	B 3 A	0	0	0	*1*	18,79
S 3317	Vela	J	14145	10 17.2	−55 33	4.44	B 5 A	0	0	var.	var.	99
S 3406	Carina	p	14392	28.5	−61 11	3.62	B 5 A	0	0	*2*	*5*	18,98
S 4093	Centaurus	δ	16572	12 3.2	−50 10	2.81	B 3 A	0	*2*	*5*	*10*	18,74
S 4366	Crux	—	17542	48.8	−56 37	5.42	B 3 A	0	0	0	*2*	53
—	Musca	—	17717	56.3	−70 56	R	B 3 A	0	0	*4*	*5*	18,80
S 4676	Centaurus	μ	18773	13 43.6	−41 59	3.33	B 2 A	*2*	*3*	*6*	*10*	47
—	Centaurus	—	18859	47.7	−46 39	R	B 3 A	0	0	0	*2*	81
S 4820	Centaurus	—	19273	14 8.0	−56 37	5.22	B 3 A	0	0	0	*2*	18,81
S 4941	Centaurus	η	19737	29.2	−41 43	2.54	B 3 A Comp.	0	0	0	var.	83
S 5263	Apus	κ^1	20878	15 20.6	−73 2	5.61	B 5 A Pec.	0	0	0	var.	100
S 5809	Scorpius	ζ^1	22812	16 47.0	−42 12	4.96	B 1 A Pec.	0	0	0	*2*	40,43
S 6064	Ara	α	23694	17 24.1	−49 47	2.86	B 3 A	0	0	*2*	*7*	18,75

The following general notes on the spectra of the Orion type having bright hydrogen lines may be considered supplementary to the remarks on the individual spectra. When the dark lines only are considered, these spectra do not usually differ essentially from ordinary spectra of the Orion type. Generally, the Orion lines are very broad and hazy, sometimes appearing double. In the spectrum of ζ^1 Scorpii, however, all the lines are narrow, even those due to hydrogen. The reversal of the hydrogen lines is never complete. Dark borders are seen either on both edges or on one edge. The maximum brightness is at the line Hβ. When Hβ is intensely bright, the lines Hγ, Hδ, and possibly Hε, are also bright, and form a series decreasing in intensity. In this case, the dark borders to the bright Hβ are very faint. These dark borders increase in intensity with each hydrogen line of shorter wave length until the line Hζ, which is wholly dark, is reached. All the visible hydrogen lines of shorter wave length than Hζ are also

dark. When Hβ is bright and moderately intense, the dark band on which it is superposed is always well seen. In this case, Hγ has a bright line separating, as it were, the broad dark Hγ into two portions. When Hβ is faintly bright, the dark band on which it is superposed is wide and well marked. The other hydrogen lines are then wide and hazy, often appearing double. Double reversals of Hγ and Hβ were found in the spectra of several stars. The dark bands on which the bright hydrogen lines are superposed appear to be complex in some spectra. For instance, in δ Centauri, on Plates X 8295 and X 8332, a distinct dark line is seen near the edge of shorter wave length of the dark band on which Hδ is superposed. In α Aræ, the hazy dark band on which the bright Hγ is superposed appears on some plates to be separated into several, indistinct, dark lines. Some other bright lines besides the lines of hydrogen are seen in many of these spectra. The most conspicuous of these are at wave lengths 4232 and 4584, approximately. In general, the others are faint, and appear to be spaces between dark lines, or bright edges to dark lines.

A list of the stars in Tables XVI and XVII, whose spectra are of the composite type, is given in Table XX. The first, second, third, fourth, fifth, sixth, seventh, and tenth columns are taken from Table XVII. The eighth column gives the class to which the brighter spectrum belongs, the ninth column gives the probable class or type of the fainter spectrum.

TABLE XX.

STARS WHOSE SPECTRA ARE OF THE COMPOSITE TYPE.

M. P.	Constellation.	Des.	A. G. C.	R. A. 1900.	Dec. 1900.	Mag.	Class of Br. Sp.	Class of Ft. Sp.	Remarks.
				h. m.	° ′				
S 2441	Carina	ε	11285	8 20.4	−59 11	1.74	K	Orion	202
S 4941	Centaurus	η	19737	14 29.2	−41 43	2.54	*B 3 A*	A 2 F	83
S 5229	Circinus	γ	20785	15 15.4	−58 58	4.41	B 5 A	F 8 G or G	102
H 2764	Scorpius	α	22314	16 23.2	−26 13	1.06	Ma	A or A 5 F	212
H 4096	Aquarius	c^3	31442	23 4.5	−23 00	4.89	G	A 2 F or A 3 F	194

A list of the stars in Tables XVI and XVII whose spectra show lines that are periodically double, is given in Table XXI. The first seven columns and the tenth column are taken from Table XVII. The eighth column gives the period. The ninth column gives the spectrum of the brighter component, the tenth, that

of the fainter component. In the case of β Aurigæ, however, no difference was detected between the intensities of the lines of the two stars. β Lupi is not included in this list, because the lines have not yet been found to be periodically double. See Remark 44. A Remark on the spectroscopic binary, ζ Ursæ Majoris, which has not been photographed at Arequipa, will be found on page 95.

TABLE XXI.

SPECTROSCOPIC BINARIES

M. P.	Constellation.	Des.	A. G. C.	R. A. 1990.	Dec. 1900.	Mag.	Period.	Class of Br. Sp.	Class of Ft. Sp.	Remarks.
				h. *m.*	° ′		*d.*			
H 1100	Auriga	β	—	5 52.2	+44 57	2.07	3.984	A	A	142
S 2190	Puppis	—	10534	7 55.3	−48 58	4.50	1.454	B 1 A	B 3 A	41
S 4715	Centaurus	ζ	18897	13 49.3	−46 47	2.81	8.024	B 2 A	B 2 A	45
H 2671	Scorpius	π	21638	15 52.8	−25 49	3.08	1.571	B 2 A	B 2 A	46
S 5794	Scorpius	μ^1	22761	16 45.1	−37 53	3.26	1.446	B 3 A	B 3 A	73

CHAPTER XIV.

Intensities of Lines.

Table XXII gives the wave lengths and intensities of the lines and bands in the typical stars of seven classes of spectra, of which the first five contain bright lines, and are subdivisions of Class O, stars of the fifth type, the seventh is of Class B, the marked Orion type, and the sixth is intermediate between these two classes. Since only two of these stars have been photographed with more than one prism, the material for this table has been secured altogether from plates taken with the dispersion of a single prism. A complete list of the lines in the spectrum of ζ Puppis, as photographed with two prisms, is given in Table XXII with the exception of 3783.4, 4608.2, 5202.2, and 5414. The intensities of the lines in the spectrum of ϵ Orionis, as shown in an excellent photograph taken with three prisms, is given in the third column of Table XXIII.

The first column of Table XXII gives the designations of the lines of hydrogen and calcium. The additional hydrogen lines, first identified in the spectrum of ζ Puppis, are called, for convenience, Hβ', Hγ', Hδ', Hϵ', Hζ', Hη', and Hθ'. The line Hβ', wave length 5414, does not appear in this table, because the plates here discussed do not include that portion of the spectrum. The second column of Table XXII gives the wave lengths of the lines and bands. The wave lengths are taken, in general, from Table IV, page 53. The wave lengths of the additional hydrogen lines are taken from the table contained in Circular No. 55. The wave lengths of the bright bands 4059, 4606, 4633, and 4688, are only approximate. The next seven columns give the intensities of the lines and bands found in the spectra of the stars whose designations are given at the head of the columns. When a line is bright, the number indicating its intensity is placed in Italics, when dark, in Roman type. To determine the intensities, a scale was adopted in which the intensity of the dark hydrogen lines in the spectra of α Canis Majoris and γ Centauri was assumed to be 100, and the intensity of the bright band 4688 in the spectrum of A. G. C. 8631 was assumed to be *100*. The intensities of the dark hydrogen lines in the spectra of ζ Puppis, 29 Canis Majoris, τ Canis Majoris, and ϵ Orionis, were estimated by superposing plates of each star respectively upon Plate X 6293, γ Centauri. It is difficult to compare intensities of lines on plates

of different densities. Therefore, in estimating the intensities of the hydrogen lines in each of the four stars named above, a plate was selected having nearly the same density as Plate X 6293. The plate of each typical star was in turn superposed upon Plate X 6293, film to film, so that the ends of the same hydrogen lines in each spectrum coincided. Plate X 6155 was used for ζ Puppis; X 7231 for 29 Canis Majoris; X 6265 for τ Canis Majoris; and X 4041 for ϵ Orionis. The intensity of each hydrogen line in the typical star was then estimated by comparing it with the same line in the spectrum of γ Centauri. The intensities of the hydrogen lines of each typical star thus obtained from a plate of the same density as X 6293, were retained for the plates not comparable with X 6293, and in each case the intensities of the Orion lines were determined by comparison with the hydrogen lines on the same plate. In this way, it was hoped to keep the scale constant, and to eliminate large errors due to differences in length of exposure. When more than one plate was used the mean of the estimates of any given line was taken for its intensity. Plates X 6155, X 6257, and X 7421 were used for ζ Puppis; X 6265 and X 7231 for 29 Canis Majoris and τ Canis Majoris; X 3851 and X 4041 for ϵ Orionis. A line that was barely seen was called 1; a line that was faint, but distinctly seen, was called 2. For intensities 1 to 5, smaller differences could be estimated than when the intensity was greater. In the latter case, care was taken to preserve in each spectrum the relations of the more intense lines to the hydrogen lines. Small variations in intensities cannot be detected on plates taken with one prism, hence some slight differences will be noticed between the intensities given in this table for the lines in the spectrum of ϵ Orionis, and those given in Table XXIII, where a plate with the dispersion of three prisms was employed.

As stated above, the bright band 4688 in the spectrum of A. G. C. 8631 was taken as the standard in estimating the intensities of the bright bands in the spectra of classes Oa, Ob, Oc, Od, and Oe. The estimates were made in the same way as those of the dark lines in the spectra of ζ Puppis, 29 Canis Majoris, τ Canis Majoris, and ϵ Orionis. Owing to the width and haziness of the bright bands, the uncertainty in the estimates of intensities is greater than in the case of dark lines. Plates X 4065 and X 7355 were used for A. G. C. 15305; X 4108, X 4115, and X 4512 for A. G. C. 8631; X 5058 for A. G. C. 22763; X 6155, X 6257, and X 7421 for ζ Puppis; X 6265 and X 7231 for 29 Canis Majoris.

When a space is left blank it indicates that the corresponding portion of the spectrum is too faint to appear on the photograph. When the presence of a line is undetermined because of poor focus, faintness of the image, or proximity of an

intense line or band which may obscure a faint line, the number is replaced by dots. When the line is not seen, although the region is included in the photograph and the focus is good, 0 is inserted. When a number is placed between two lines, it indicates that the combined intensity is estimated.

TABLE XXII.

LINES IN CLASSES O TO B.

Des.	λ	Oa A.G.C. 15305.	Ob A.G.C. 8631.	Oc A.G.C. 22763.	Od ζ Puppis.	Oe 29 Canis Majoris.	Oe 5 B τ Canis Majoris.	B ε Orionis.	Des.	λ	Oa A.G.C. 15305.	Ob A.G.C. 8631.	Oc A.G.C. 22763.	Od ζ Puppis.	Oe 29 Canis Majoris.	Oe 5 B τ Canis Majoris.	B ε Orionis.
Ho	3697.4							1		4089.2	0	..	0	0	6	12	15
Hξ	3704.0							12		4096.9	0	..	0	0	18	6	2
Hν	3711.8							10	Hδ	4101.8	*2*	*15*	*3*	20	25	25	25
Hμ	3721.9						8	18		4116.2	0	..	0	0	3	6	10
	3728.1						..	1		4120.5	0	..	0	0	2	4	5
Hλ	3734.2				10		10	18		4144.0	0	0	0	0	3	4	5
Hκ	3750.2				12		15	20		4186.2	0	0	0	0	1	2	2
	3760.1				0		..	5	Hδ′	4200.7	0	*10*	*2*	10	5	4	1
Hι	3770.8				15		20	25		4254.1	0	0	0	0	0	0	2
	3779.5				0		..	2		4318.0	0	0	0	0	0	0	2
	3784.6				0		..	2		4320.7	0	0	0	0	0	0	
	3790.9				0		..	2	Hγ	4340.7	*3*	*10*	*4*	20	25	25	25
Hθ	3798.1				18	20	25	25		4350.1	0	..	0	0	0	0	2
	3805.1				0	..		1		4367.3	0	0	0	0	2	2	2
	3812.4				0	..	..	1		4387.8	0	0	0	0	3	4	5
Hθ′	3815.7				3	..	..	..		4415.1	0	0	0	0	0	0	2
	3819.2				0	15	15	15		4417.5	0	0	0	0	0	0	
Hη	3835.5				20	25	25	25		4471.8	*1*	0	*2*	1	15	15	15
Hη′	3860.8				5	1	..	..		4481.4	0	0	0	0	1	1	1
Hζ	3889.1				20	25	25	25		4514.5	0	0	*2*	0	5	3	2
Hζ′	3924.0				7	3	4	2	Hγ′	4542.4	..	*12*	*3*	10	5	4	1
	3926.8				0					4553.4	0	..	0	0	0	0	4
K	3933.8				2	2	5	2		4568.6	0	0	0	0	0	0	4
	3964.6				0	0	1	3		4606	0	*12*	0	0	0	0	0
Hε	3970.2		*1*		20	25	25	25		4633	*100*	0	*20*	*8*	*3*	0	0
	3994.9		0		0	0	1	1		4649.2	..	0	0	0	0	15	25
	4009.5		0		0	0	1	3		4661.7	..	..	0	0	0	1	2
Hε′	4026.0		*2*		8	20	15	15		4675.3	..	..	0	0	0	0	2
	4026.4		0	*1*	0					4688	R	*100*	*40*	*20*	*8*	5	2
	4059	*2*	*10*	*5*	0	3	0	0		4712.8	..	0	0	0	4	4	4
	4069.4	0	0	0	0	2	5	5	Hβ	4861.5		*10*	*3*	20	15	25	25
	4072.0	0	0	0	0					4922.1		0	0	0	3	5	6
	4075.9	0	0	0	0	2	3	3									

REMARKS.

3924.0, 3926.8. These lines are not separated on any plate. The first is an additional hydrogen line, and the second is due to helium. In ζ Puppis, the total intensity probably belongs to the hydrogen line, since in the spectrum of this star, helium lines are absent or faint. In 29 Canis Majoris, τ Canis Majoris, and ϵ Orionis, both lines may be present.

4026.0, 4026.4. These lines are not separated on any plate. The first is due to hydrogen, and the second to helium. In A. G. C. 8631, and in ζ Puppis, the line seen is assumed to be due to hydrogen, since helium lines are absent or faint in these spectra. In the typical stars, 29 Canis Majoris, τ Canis Majoris, and ϵ Orionis, both lines may be present.

4542.4. In 29 Canis Majoris, this line is bright on the edge of greater wave length.

4633. This wide bright band appears, in the spectra of Class Oa, to consist of two portions, as described on page 146. In 29 Canis Majoris, band 4633 is separated into two bright lines. This may be due to a dark line superposed upon the bright band.

4688. This bright band may be present in Class Oa. See p. 146. It diminishes in width in the spectrum of each typical star from A. G. C. 8631 to 29 Canis Majoris, where it is but little wider than the dark lines in the spectrum. The dark line in τ Canis Majoris and ϵ Orionis, which appears to be the reversal of this bright line, has slightly shorter wave length than the bright line in 29 Canis Majoris.

4861.5. In 29 Canis Majoris, this line is bright on the edge of greater wave length.

The wave lengths and intensities of all the lines found in the spectra of the typical stars of classes B, B 1 A, B 2 A, B 3 A, and B 5 A, are given in Table XXIII. In the spectrum of γ Gruis, Class B 8 A, a few solar lines are present which are not included in this table, but which are given in the description of the spectrum of this star on p. 153. The spectrum of λ Centauri appears to contain all the more intense solar lines found in the spectrum of α Canis Majoris, and is only included in Table XXIII, in order to show the intensities of the helium and hydrogen lines. The first column of Table XXIII gives the designations of the lines of hydrogen and calcium. The second column gives the wave lengths of the lines found in the Orion stars, from 3613 to Hβ. These wave lengths are in general taken from Table IV, page 53. Approximate wave lengths are given for twelve faint lines not included in Table IV. The wave lengths of the additional hydrogen lines are taken from the table contained in Circular No. 55. An error found in Table IV, in lines between Hζ and K, was corrected by a graphical interpolation from micrometric measures of Plate X 7945, β Orionis. The wave length 3947.8, given in Table IV, was found to be wrong, and the error was due to the correction being applied with the opposite sign. The corrected value, 3945.0, is given in Table XXIII. The next seven columns give the intensities of the lines in ϵ Orionis, β Centauri, γ Orionis, α Pavonis, ϕ Velorum, γ Gruis, and λ Centauri, respectively. The following plates were used for estimates of the lines between 3819.2 and Hβ: — for ϵ Orionis, X 8119 taken with three prisms; for β Centauri, X 8376 and X 7911 taken with two and three prisms, respectively; for γ Orionis, X 7978 taken with three prisms; for α Pavonis, X 8519 and X 8089 taken with two and three prisms, respectively; for ϕ Velorum, X 8402 taken with

two prisms; for γ Gruis, X 9241, and for λ Centauri, X 8486, each taken with two prisms.

Plates taken with two or three prisms do not generally include lines of shorter wave length than 3819.2, or, if visible, these lines are too faint and hazy for their intensities to be estimated. For lines of shorter wave length than 3819.2, it is necessary to use plates of long exposure taken with one prism. Such a plate of the typical star of each class was not always available, in which case a plate of a similar spectrum was substituted. The following plates were used: — for Class B, Plate X 3856, δ Orionis; for Class B 1 A, X 4059, β Centauri; for Class B 2 A, X 4129, α Lupi; for Class B 3 A, X 5268, α Pavonis; for Class B 5 A, X 3859, α Eridani; for Class B 8 A, X 5689, γ Gruis; and for Class B 9 A, X 6499, λ Centauri.

In estimating the intensities of the hydrogen lines, X 7585, γ Centauri, and X 8097, α Canis Majoris, were used for plates taken with two and three prisms, respectively.

TABLE XXIII.

LINES IN CLASSES B TO B 9 A.

Des.	λ	B	B 1 A	B 2 A	B 3 A	B 5 A	B 8 A	B 9 A	Des.	λ	B	B 1 A	B 2 A	B 3 A	B 5 A	B 8 A	B 9 A
		ϵ Orionis.	β Centauri.	γ Orionis.	α Pavonis.	ϕ Velorum.	γ Gruis.	λ Centauri.			ϵ Orionis.	β Centauri.	γ Orionis.	α Pavonis.	ϕ Velorum.	γ Gruis.	λ Centauri.
	3613.		3							3819.2	15	18	20	20	10	2	0
	3634.	2	5						$H\eta$	3835.5	25	35	40	50	60	80	90
$H\sigma$	3683.5	0	0	0	0	0				3850.	..	..	..	..	0	0	0
$H\rho$	3686.7	0	0	0	0	0				3854.2	..	..	..	..	0	0	0
$H\pi$	3691.5	0	1	0	0	1				3856.2	..	..	1	3	8	0	0
Ho	3697.4	8	5	0	0	15			$H\eta'$	3860.8	..	..	0	0	0	0	0
$H\xi$	3704.0	18	25	22	25	25				3863.2	..	..	1	..	5	0	0
$H\nu$	3711.8	10	20	20	20	25		20		3864.	..	..	1	..	0	0	0
$H\mu$	3721.9	18	22	30	25	35		40		3867.6	1	2	6	2	1	0	0
	3728.1	1	..	..	..	..		0		3872.4	1	2	4	2	1	0	0
$H\lambda$	3734.2	18	25	35	35	40		60		3876.4	0	2	4	..	0	0	0
$H\kappa$	3750.2	20	30	40	50	50	80	80		3881.7	1	1	0	..	0	0	0
	3760.1	5	5	..	0	0	0	0	$H\zeta$	3889.1	25	35	40	50	60	80	90
$H\iota$	3770.8	25	35	40	50	60	80	90		3912.2	2	3	3	1	0	0	0
	3779.5	2	..	..	0	0	0	0		3918.7	2	3	3	2	2	0	0
	3784.6	2	..	..	0	0	0	0		3920.6			3	2		0	0
	3790.9	2	..	..	0	0	0	0	$H\zeta'$	3924.0	..	0	0	0	0	0	0
$H\theta$	3798.1	25	35	40	50	60	80	90		3925.9	..	..	1	0	0	0	0
	3805.1	1	..	..	0	0	0	0		3926.8	2	3	5	6	5	0	0
	3812.4	1	..	..	0	0	0	0	K	3933.8	3	2	4	4	8	5	8

Des.	λ	B ε Orionis.	B1A β Centauri.	B2A γ Orionis.	B3A α Pavonis.	B5A φ Velorum.	B8A γ Gruis.	B9A λ Centauri.
	3936.	0	0	2	1	0	0	0
	3945.0	2	2	2	1	0	0	0
	3954.8	2	2	2	1	0	0	0
	3962.	2	0	0	0	0	0	0
	3964.6	3	3	7	5	2	0	0
H	3968.6	..	..	..	..	..	..	..
Hε	3970.2	25	35	40	50	60	80	90
	3975.2	1	..	1	0	0	0	0
	3982.8	2	2	1	0	0	0	0
	3994.9	2	3	5	1	0	0	0
	4009.5	4	7	10	10	5	1	0
Hε′	4026.0	15	0	0	0	0	0	0
	4026.4		20	22	22	12	8	5
	4033.	0	0	1	0	0	0	0
	4036.0	0	1	2	0	0	0	0
	4042.2	0	1	2	0	0	0	0
	4045.	0	0	1	0	0	0	0
	4069.4	3	3	3	1	0	0	0
	4072.0	2	3	3	1	0	0	0
	4075.9	3	4	3	1	0	0	0
	4084.9	1	3	2	0	0	0	0
	4089.2	15	5	2	0	0	0	0
	4093.7	1	1	1	0	0	0	0
	4096.9	4	2	1	0	0	0	0
Hδ	4101.8	25	35	40	50	60	80	90
	4111.2	0	1	1	0	0	0	0
	4116.2	10	2	0	0	0	0	0
	4120.5	5	8	6	6	3	2	..
	4128.5	0	1	1	2	3	3	3
	4131.4	0	..	1	2	3	3	
	4134.0	1	2	1	0	0	0	0
	4144.0	5	8	12	12	7	3	..
	4152.	0	0	1	1	0	0	0
	4154.7	2	2	2	2	1	0	0
	4163.	0	1	1	0	0	0	0
	4169.2	2	2	3	3	1	0	0
	4186.2	2	2	1	1	0	0	0
	4190.	2	2	1	1	0	0	0
Hδ′	4200.7	2	0	0	0	0	0	0
	4224.8	0	0	2	0	0	0	0
	4237.4	0	1	2	0	0	0	0
	4242.6	0	1	2	0	0	0	0
	4248.	0	1	1	0	0	0	0
	4254.1	3	4	2	1	0	0	0
	4267.4	2	3	5	5	3	2	0
	4276.7	2	3	2	0	0	0	0
	4285.1	2	3	2	0	0	0	0
	4291.	0	1	0	0	0	0	0
	4295.	0	1	0	0	0	0	0
	4304.4	1	2	2	0	0	0	0
	4318.0	3	2	2	0	0	0	0
	4320.7		2		0	0	0	0
	4327.3	1	2	1	0	0	0	0
	4334.5	1	2	0	0	0	0	0
Hγ	4340.7	25	35	40	50	60	80	90
	4346.	0	1	0	0	0	0	0
	4350.1	3	3	1	0	0	0	0
	4361.0	0	1	0	0	0	0	0
	4367.3	2	2	1	0	0	0	0
	4373.2	0	2	1	0	0	0	0
	4380.1	2	1	0	0	0	0	0
	4387.8	5	8	15	15	7	3	0
	4395.7	1	2	2	0	0	0	0
	4415.1	3	5	2	0	0	0	0
	4417.5				0	0	0	0
	4437.9	0	2	3	3	0	0	0
	4440.	0	1	1	0	0	0	0
	4447.7	0	2	2	0	0	0	0
	4453.	0	2	2	0	0	0	0
	4471.8	15	18	22	22	10	5	4
	4481.4	2	2	3	4	7	6	7
	4490.6	1	1	0	0	0	0	0
	4514.5	1	0	1	0	0	0	0
	4531.4	1	1	2	0	0	0	0
	4535.	1	0	1	0	0	0	0
Hγ′	4542.4	2	0	0	0	0	0	0
	4553.4	5	5	4	2	1	0	0
	4568.6	4	3	3	1	0	0	0
	4576.5	2	2	3	1	0	0	0
	4591.6	2	2	1	0	0	0	0
	4598.2	2	2	1	0	0	0	0
	4603.7	1	1	1	0	0	0	0
	4611.2	2	2	0	0	0	0	0
	4619.8	1	2	2	1	0	0	0
	4630.6	2	2	3	0	0	0	0
	4641.1	4	4	4	0	0	0	0
	4649.2	25	10	4	1	0	0	0
	4661.7	2	3	1	0	0	0	0
	4675.3	2	3	1	0	0	0	0
	4685.4	3	1	0	0	0	0	0
	4697.9	1	2	0	0	0	0	0
	4705.0	1	2	0	0	0	0	0
	4712.8	4	4	4	5	3	1	0
Hβ	4861.5	25	35	40	50	60	80	90

REMARKS.

3954.8 This line appears to have a faint component on the side of greater wave length in γ Orionis. This companion is also seen, but very indistinctly, in α Pavonis.

4318.0, 4320.7. In α Lupi, these lines are clearly separated, and are equally intense.

4346. This line is closely double on Plate X 8361 of β Crucis.

4350.1. This line is a fine double in β Crucis. It also appears double in α Lupi.

4361.0. This line is seen in α Lupi, but not in γ Orionis.

4387.8. This line is present in γ Gruis, and also the adjacent solar band, extending from 4383.7 to 4385.2. In λ Centauri, the Orion line is not present.

4415.1, 4417.5. These lines are separated on plates of β Crucis and α Lupi taken with two prisms.

4641.1. This line is wide in ϵ Orionis and γ Orionis, and double in β Centauri, α Lupi, and several other spectra.

Table XXIV is supplementary to Table XXIII, and gives the wave lengths and intensities of the lines between 4812.2 and 5875.9. The first column gives the designations of two lines of hydrogen, Hβ and Hβ', and one of helium, D_3. The second column gives the wave lengths taken from the tenth column of Table XXVI. The next six columns give the intensities of these lines in spectra of classes B, B 1 A, B 2 A, B 3 A, B 5 A, and B 8 A. Since, in several cases, the typical stars already selected for these classes were not satisfactorily photographed on isochromatic plates, the intensities of these lines were estimated on the best photograph that had been secured of any spectrum in each class. The following plates were used: — for Class B, X 8119, ϵ Orionis, taken November 10, 1896, exposure 106^m; for Class B 1 A, X 9186, β Crucis, taken June 8, 1898, exposure 65^m; for Class B 2 A, X 8739, λ Scorpii, taken July 23, 1897, exposure 45^m; for

TABLE XXIV.

LINES IN CLASSES B TO B 8 A BETWEEN 4812.2 AND 5875.9.

Des.	λ	B	B 1 A	B 2 A	B 3 A	B 5 A	B 8 A	Des.	λ	B	B 1 A	B 2 A	B 3 A	B 5 A	B 8 A
		ϵ Orionis.	β Crucis.	λ Scorpii.	σ Sagittarii.	α Eridani.	γ Gruis.			ϵ Orionis.	β Crucis.	λ Scorpii.	σ Sagittarii.	α Eridani.	γ Gruis.
	4812.2	0	1	0	0	0	0		5159.0	..	1	..	..	0	0
	4819.6	0	1	0	0	0	0		5197.8	..	2	..	..	0	0
	4829.4	0	2	0	0	0	0		5218.8	..	2	..	..	0	0
Hβ	4861.5	25	35	40	50	60	80	Hβ'	5413.6	2	0	0	0	0	0
	4889.0	..	2	..	0	0	0		5588.	2	0	0	0	0	1
	4906.3	..	2	1	0	0	0		5653.9	..	1	..	0	0	0
	4922.1	7	10	10	10	8	1		5677.7	..	2	..	0	0	0
	4941.6	..	3	2	0	0	0		5697.8	..	3	1	0	0	0
	4959.4	..	1	0	0	0	0		5721.7	..	2	0	0	0	0
	4999.4	..	2	2	0	0	0		5740.8	..	3	2	0	0	0
	5015.7	5	5	4	4	4	0		5773.3	..	1	..	0	0	0
	5047.8	2	3	3	3	1	0	D_3	5875.9		20	10			
	5141.5	..	1	..	..	0	0								

REMARKS.

4922.1. A parhelium line, belonging to series e.

4999.4. This line is ill defined in β Crucis, α Crucis, and β Centauri, and double in ϵ Canis Majoris, on X 8940.

5015.7. A parhelium line belonging to series d.

5047.8. A parhelium line belonging to series f.

5413.6. The additional hydrogen line, Hβ'. It has been photographed as a dark line in the spectra of ζ Puppis, ϵ Orionis, δ Orionis, ζ Orionis, δ Scorpii, and θ Carinæ.

5588. Present in ϵ Orionis, δ Orionis, and ζ Orionis. Approximate wave length obtained by estimating position with respect to solar lines in α Aurigæ and α Scorpii. The faint line in γ Gruis is probably one component of the solar band, 5587.0 and 5589.6.

5875.9. The helium line D_3. It is photographed in the spectra of λ Scorpii, α Crucis, β Crucis, α Muscæ, and β Centauri on the isochromatic plates, X 8739, X 8997, X 9186, X 9201, and X 9199, respectively, and also in δ Orionis on several plates taken with the 11-inch Draper telescope. This line is more intense than any other line of greater wave length than Hβ. It has been observed visually as a bright line in the spectrum of β Lyræ, and as a dark line in the spectrum of β Orionis. It was also photographed in β Orionis by Keeler in 1894. See Astronomy and Astro-Physics, Vol. XIII, p. 487. This line is bright on the edge of greater wave length in β Centauri, on X 9199.

Class B 3 A, X 7647, σ Sagittarii, taken June 29, 1897, exposure 65^m; for Class B 5 A, X 8926, α Eridani, taken October 14, 1897, exposure 60^m; and for Class B 8 A, X 8745, γ Gruis, taken July 24, 1897, exposure 60^m. All these plates were taken with two prisms, except that of ϵ Orionis, which was taken with three prisms. The scale of the intensities is the same as that in Table XXIII.

TABLE XXV.

LINES IN THE SPECTRUM OF β ORIONIS.

Designation.	λ	Int.	Designation.	λ	Int.	Designation.	λ	Int.
Hι	3770.8	25	Hε	3970.2	35	Solar	4352.0	3
Hθ	3798.1	35	Nitrogen	3994.9	4	Oxygen	4367.3	1
Helium	3819.2	15	Parhelium	4009.5	5	Parhelium	4387.8	6
Hη	3835.5	35	Helium	4026.4	10	"	4437.9	1
Orion	3854.2	4	Solar	4067.0	1	Helium	4471.8	10
Silicon	3856.2	6	Oxygen	4075.9	2	Magnesium	4481.4	10
"	3863.2	6	Hδ	4101.8	40	Solar	4508.5	1
Helium	3867.6	3	Helium	4120.5	5	"	4522.9	1
Parhelium	3872.4	3	Silicon	4128.5	8	"	4549.7	1
Hζ	3889.1	35	"	4131.4	8	Silicon	4553.4	1
Solar	3906.6	1	Parhelium	4144.0	6	"	4568.6	1
Orion	3918.7	4	Solar	4154.9	2	"	4576.5	1
"	3920.6	4	"	4163.9	2	Solar	4584.0	2
Parhelium	3926.8	5	"	4173.6	2	"	4629.9	1
K	3933.8	17	"	4179.5	2	Helium	4712.8	3
Orion	3936.	1	"	4233.6	4	Hβ	4861.5	40
Parhelium	3964.6	5	Carbon	4267.4	5	Parhelium	4922.1	10
H	3968.6	15	Hγ	4340.7	40	"	5015.7	8

A list of the lines in the spectrum of β Orionis is given in Table XXV. The identification of these lines was made by superposing the spectrum of β Orionis on X 7966, taken with three prisms, upon X 8119, ϵ Orionis, for Orion lines, and upon X 8109, α Aurigæ, for solar lines.

The first column gives the designations of the lines of hydrogen, calcium, and other substances with which these lines have been identified by spectroscopists. In the case of a number of the fainter lines, the words Orion and solar are used in this column to indicate whether the line is present in Orion or solar spectra. The second column gives the wave lengths of the lines taken from Tables VII, XXIII, and XXIV. The third column gives the estimated intensities of the lines on the same scale as that used in Table XXIII.

CHAPTER XV.

Wave Lengths of Lines.

The wave lengths of the greater portion of the lines in the spectra of the stars may be determined with accuracy from the wave lengths of lines in the solar spectrum, in the spectrum of hydrogen, or of other known elements. For other lines, the micrometer described on page 2 has been used. It has two screws at right angles to each other, the pitch of each being $\frac{1}{24}$ of an inch. These screws move a brass plate on which the photograph was placed beneath a fixed microscope. The position of each screw was read by a circle divided to thousandths. All of the measures were made by Miss F. Cushman. One screw only was used, and a setting was made on each line in the spectrum, moving the screw always in one direction. A second setting was made in the same way, and then a third. The measures are thus more nearly independent than if the three settings on each line had been made in succession.

The measurements of the Orion lines whose wave lengths are greater than Hβ, a few others of slightly shorter wave length, and as many hydrogen and helium lines as could be well seen, are given in Table XXVI. The designation of the line is given in the first column and is followed in the second, fourth, sixth, and eighth columns, by the means of the three readings, expressed in twenty-four thousandths of an inch. The corresponding residuals, found by subtracting the means from the individual readings, negative values being expressed by Italics, are given in the third, fifth, seventh, and ninth columns. Three plates were measured; X 8997 of α Crucis, taken Dec. 20, 1897, and showing two images, with exposures of 60^m and 27^m, respectively; X 9184 of θ Carinæ, taken June 8, 1898, exposure 60^m; and X 9186 of β Crucis, taken June 8, 1898, with an exposure of 65^m. Two measures only were made of each image on X 8997. Image 1 on this plate is so dense that lines between Hϵ and Hβ were burned out. The measures of this image were only used in determining the wave lengths of three faint lines 5057.5, 5859.0, and 5888.6, which were not visible in image 2 on the same plate. The tenth column contains the wave lengths of the lines. For unknown lines they have been found as described below, for known lines they are assumed from previous determinations, and are inserted in heavy face type.

The eleventh column gives the residuals expressed in tenths of a unit, and found by subtracting the values given in the tenth column from those derived from the individual plates. When the wave length in the tenth column is derived from a single plate, the letter A is substituted for the residual.

TABLE XXVI.

WAVE LENGTHS OF THE ORION LINES BETWEEN 4812.2 AND 5888.6.

Des.	α Crucis Image 1.	Resid.	α Crucis Image 2.	Resid.	θ Carinæ.	Resid.	β Crucis.	Resid.	λ	Resid.
Hε	. . .	. . . .	87186	*01*,01	85258	*26*,26,01	85097	*71*,26,44	**3970.2**	. . . .
Hδ	. . .	. . . .	77816	39,*39*	75982	01,14,*16*	75729	15,*02*,*13*	**4101.8**	. . . .
Hγ	. . .	. . . .	63442	*08*,07	61483	*05*,11,*06*	61350.	06,*20*,15	**4340.7**	. . . .
	. . .	. . . .	56726	*14*,13	54732	*25*,20,06	54590	04,*07*,04	**4471.8**	. . . .
	. . .	. . . .	48704	*18*,18	. . .	. . . . .	46505	*01*,03,*01*	**4649.2**	. . . .
	. . .	. . . .	46156	*17*,16	. . .	. . . . .	43880	00,*02*,02	**4712.8**	. . . .
	. . .	. . . .	. . .	. . . .	. . .	. . . . .	40030	12,*08*,*03*	4812.2	. . . A
	. . .	. . . .	. . .	. . . .	. . .	. . . . .	39755	02,*10*,09	4819.6	. . . A
	. . .	. . . .	. . .	. . . .	. . .	. . . . .	39392	18,*28*,11	4829.4	. . . A
Hβ	41658	02,*03*	40444	05,*04*	38358	*05*,08,*02*	38207	04,*06*,01	**4861.5**	. 1 1 1
	. . .	. . . .	. . .	. . . .	. . .	. . . . .	37226	*15*,*42*,58	4889.0	. . . A
	. . .	. . . .	. . .	. . . .	. . .	. . . . .	36611	03,*06*,03	4906.3	. . . A
	39522	08,*09*	38290	*07*,07	36213	*10*,06,05	36071	*07*,*07*,14	**4922.1**	. 3 0 *3*
	. . .	. . . .	37620	05,*04*	. . .	. . . . .	35373	*06*,09,*02*	4941.6	. 0 . 1
	. . .	. . . .	37020	05,*06*	. . .	. . . . .	. . .	. . . . . .	4959.4	. A . .
	. . .	. . . .	. . .	. . . .	. . .	. . . . .	33455	02,*04*,02	4999.4	. . . A
	36369	08,*08*	35167	01,*01*	33052	*01*,*15*,15	32932	*16*,*02*,17	**5015.7**	.2 11 *1*
	. . .	. . . .	34686	*120*,120	. . .	. . . . .	. . .	. . . . . .	5031.2	. A . .
	35338	*01*,01	34198	28,*27*	32058	*12*,01,10	31924	20,*08*,*12*	**5047.8**	. *15* 2 *7*
	35022	*48*,48	. . .	. . . .	. . .	. . . . .	. . .	. . . . . .	5057.5	A . . .
	. . .	. . . .	. . .	. . . .	. . .	. . . . .	29005	15,10,*25*	5141.5	. . . A
	. . .	. . . .	. . .	. . . .	. . .	. . . . .	28488	*19*,30,*11*	5159.0	. . . A
	. . .	. . . .	. . .	. . . .	. . .	. . . . .	27358	*49*,01,49	5197.8	. . . A
	. . .	. . . .	. . .	. . . .	. . .	. . . . .	26759	*13*,12,02	5218.8	. . . A
	. . .	. . . .	. . .	. . . .	21741	*24*,01,24	. . .	. . . . . .	**5413.6**	. . 2 .
	. . .	. . . .	. . .	. . . .	. . .	. . . . .	15960	93,*34*,*59*	5653.9	. . . A
	. . .	. . . .	. . .	. . . .	. . .	. . . . .	15445	*24*,*02*,25	5677.7	. . . A
	. . .	. . . .	17231	13,*13*	15194	01,*12*,12	15057	*27*,27,01	5697.8	. 13 4 *18*
	. . .	. . . .	. . .	. . . .	. . .	. . . . .	14514	*36*,16,19	5721.7	. . . A
	. . .	. . . .	. . .	. . . .	14279	09,*06*,*03*	14138	*08*,*17*,26	5740.8	. .10 *11*
	. . .	. . . .	. . .	. . . .	. . .	. . . . .	13448	19,*89*,71	5773.3	. . . A
	15172	06,*05*	. . .	. . . .	. . .	. . . . .	. . .	. . . . . .	5859.0	A . . .
D_3	14848	03,*02*	13648	*21*,22	. . .	. . . . .	11425	03,11,*15*	**5875.9**	. *1* . *1*
	14602	07,*06*	. . .	. . . .	. . .	. . . . .	. . .	. . . . .	5888.6	A . . .

The reduction of the measures to wave lengths was made under the supervision of Mr. E. S. King. X 8729, an isochromatic plate of α Scorpii, taken on July 20, 1897, with an exposure of 64^m, with the same prisms as the plates named above, and showing the end of greater wave length, as far as the two D lines of sodium, was also measured. The wave lengths of numerous well marked lines in α Scorpii were ascertained by identification with known lines in the solar spectrum. By means of Hartmann's formula, wave lengths were computed, corresponding to the lines in α Scorpii, and residuals found by subtracting the known wave lengths of these lines from their computed values. The measures of the lines in α Crucis, θ Carinæ, and β Crucis, were then corrected by comparing them graphically with the measures of the lines in α Scorpii. Wave lengths of the lines, from 4812.2 to 5888.6, in α Crucis, θ Carinæ, and β Crucis, were next computed by the same formula that had already been used in the case of α Scorpii. The approximate wave lengths thus obtained were then corrected by means of the residual curve derived from the measures of α Scorpii as described above. The wave lengths thus found for Hβ, Hβ', and D_3, must not be considered as independent determinations, since these lines were used as standards in deriving the formulas. The wave length of Hβ' was assumed to be 5413.6, a provisional value derived by Mr. King. In order to apply Hartmann's formula to determine the wave lengths of the less refrangible lines, it was important to use a known line whose wave length was greater than that of Hβ'. Otherwise, extrapolation would be necessary. Such a line occurs in stars of the Orion type, and has been found to be identical with the helium line D_3. To determine its wave length, all the plates which show it distinctly, X 8739 of λ Scorpii, X 8997 of α Crucis, X 9186 of β Crucis, X 9201 of α Muscæ, and X 9199 of β Centauri, were in turn superposed on X 8729 of α Scorpii, which shows the double sodium line, D. In each case, the dark line in the Orion spectra was seen to have somewhat shorter wave length than the component, 5890.0, of the D line in α Scorpii. This was also the case when the five plates above named were superposed on the spectrum of α Tucanæ on X 8946, and on the spectrum of ϵ Scorpii on X 8735, both of which show the double D line of sodium. For an approximate determination of the wave length of the Orion line, the spectrum of β Centauri on X 9199 was superposed on the spectrum of α Scorpii on X 8729, so that the line Hβ in both spectra coincided. The two plates were firmly clamped together and the double image thus formed was treated as a single spectrum. The Orion line in β Centauri was then seen to fall between the solar lines 5857.8 and 5890.0 in α Scorpii. Measures were made of the intervals between the dark Orion line and the lines 5857.8, 5890.0, and 5896.0, using a two inch

eye piece having a scale divided to fifths of a millimetre in its focus. Interpolating between the measures of the Orion line from lines 5857.8 and 5890.0, gave the wave length 5879.1 for the Orion line. Interpolating likewise between the measures of the Orion line from lines 5857.8 and 5896.0, gave the wave length 5879.0 for the Orion line. The close approach of the wave length thus obtained by these necessarily rough measures to the wave length of the helium line D_3, 5875.9, makes it hardly possible to doubt that this Orion line is the line D_3. Further evidence of the identity of this line comes from the fact that it is present in spectra where the helium lines, in general, are strongly marked, and has not been seen on isochromatic plates of spectra in which the helium lines are absent or very faint.

The brightest star of the fifth type, and the only one that can be photographed with a large dispersion, is γ Velorum. A special study has, therefore, been made of the wave lengths and intensities of the lines in its spectrum. Two isochromatic plates, X 8513, taken May 7, 1897, exposure 63^m, and X 10153, taken Dec. 2, 1899, exposure 78^m, were measured with the micrometer as described on page 240. These plates were both taken with two prisms, but the prisms were different, so that the dispersion of the latter plate is somewhat greater than that of the former.

The results of the investigation are given in Table XXVII. The first column contains the designations of the lines due to hydrogen. The second and third columns give the means of the two micrometer readings of X 8513 and X 10153, respectively. When the two edges of a band were measured, the results are placed on separate lines and connected with a brace. The fourth and fifth columns give the residuals from the means contained in the second and third columns, expressed in twenty-four thousandths of an inch, negative values being indicated by Italics. When a line was measured only once, the letter A takes the place of the residual. The sixth and seventh columns give the wave lengths corresponding to the measures of X 8513 and X 10153, respectively. The wave lengths of known lines are placed in heavy face type. The other lines are given as computed by Hartmann's formula, and corrected by a residual curve formed by taking the differences between the computed and known values of the hydrogen, and a few Orion, lines. In applying Hartmann's formula, Hζ, Hγ, and Hβ were used as standards for lines of shorter wave length than Hβ, measured on X 8513, and Hϵ, Hγ, and Hβ, for similar lines on X 10153. Hϵ, Hβ, and Hβ' were used as standards for lines of greater wave length than Hβ on both plates. By comparison with spectra of α Scorpii, ϵ Scorpii, and δ Canis Majoris, taken with the same dispersion as X 10153, the error at wave length 5780 was found to be -2.3, -0.4, and $+2.0$. A similar comparison made between X 8513 and X 8936, β Columbæ,

showed an error of + 7.1 at this point. The definition of the lines in this region is much inferior on both of the latter plates to that of X 10153. On the other hand, on X 10153, owing to chromatic aberration, the lines and bands are so broad, from Hδ towards the violet, that all detail is lost, and neither measures nor estimates of intensity could safely be made for lines of shorter wave length than Hε.

The eighth and ninth columns contain residuals which, when applied to the known wave lengths, give the wave lengths computed by the formula and corrected by the residual curves. The tenth and eleventh columns give the intensities of the lines and bands as estimated on X 8513 and X 10153, respectively, except for lines of shorter wave length than Hζ, which were estimated on X 6266 taken Dec. 18, 1894, with one prism, exposure 30^m, and for line 4922.1, which was estimated on X 8514, taken May 7, 1897, exposure 30^m. These two plates are not isochromatic. The lines are referred to, in the remarks following the table, by the wave lengths given in the sixth column, except in cases where the line was measured on X 10153 only, when the wave length is that given in the seventh column.

TABLE XXVII.

LINES IN THE SPECTRUM OF γ VELORUM.

Des.	X 8513	X 10153	Resid.		Resid.		λ	λ	Res.	Res.	Int.	Int.
Hλ	....	....	..	..	..	..	**3734.2**	....	.	.	8	.
Hκ	....	....	..	..	..	..	**3750.2**	....	.	.	10	.
Hι	....	....	..	..	..	..	**3770.8**	....	.	.	12	.
Hθ	98191	....	*295*	295	..	..	**3798.1**	....	12	.	15	.
	96710	....	65	*66*	..	..	**3819.2**	....	9	.	10	.
Hη	95380	....	60	*61*	..	..	**3835.5**	....	8	.	15	.
	92238	....	*36*	35	..	..	3875.5	....	.	.	16	.
	91924	....	..	A	..	..	3879.5	....	.	.	*1*	.
	91443	....	..	A	..	..	3885.7	....	.	.		
Hζ	91144	....	*73*	72	..	..	**3889.1**	....	4	.	12	.
	91020	....	..	A	..	..	3891.0	....	.	.	*1*	.
	90401	....	*43*	43	..	..	3899.0	....	.	.		
	88316	....	*35*	34	..	..	3926.2	....	.	.	*3*	.
	87327	....	29	*29*	..	..	3939.4	....	.	.		
	86338	....	*92*	92	..	..	3952.8	....	.	.	*2*	.
	85283	....	*63*	63	..	..	3967.3	....	.	.		
Hε	85074	85074	*56*	57	*19*	19	**3970.2**	**3970.2**	*1*	*11*	10	8
	81163	....	*96*	96	..	..	**4026.4**	....	*2*	.	4	.
	80872	....	*122*	122	..	..	4030.6	....	.	.	*2*	.
	80606	....	..	A	..	..	4034.7	....	.	.		

Des.	X 8513	X 10153	Resid.		Resid.		λ	λ	Res.	Res.	Int.	Int.
	78888	78814	*54*	53	*125*	126	4061.1	4056.8	.	.	*5*	.
	77388	.. ..	*146*	146	..	..	4084.6	....	.	.		
	77118	.. ..	*47*	46	..	..	**4089.2**	....	*4*	.	3	.
	76899	.. ..	12	*12*	..	..	4092.1	....	.	.	*2*	.
	76465	.. ..	*99*	99	..	..	4098.0	....	.	.		
Hδ	76224	76063	*71*	71	54	*54*	**4101.8**	**4101.8**	*2*	*9*	10	12
	76086	.. ..	*62*	62	..	..	4103.8	....	.	.	*2*	.
	75455	.. ..	..	A	..	..	**4116.2**	.....	*5*	.	2	.
	75433	.. ..	*156*	156	..	..	4116.1	....	.	.	*2*	.
	75294	.. ..	..	A	..	..	4117.9	....	.	.	*2*	.
	74505	73876	..	A	*183*	184	4131.1	4133.1	.	.		
	71728	.. ..	..	A	..	..	4177.0	....	.	.	*1*	.
	70455	.. ..	..	A	..	..	4198.7	....	.	.		
Hδ′	.. ..	69536	..	..	*29*	30	.. ..	**4200.7**	.	*5*	.	1
	69132	68545	..	A	A	..	4221.8	4216.6	.	.	*2*	*3*
	68157	67539	..	A	A	..	4239.1	4233.5	.	.		
	67359	66014	..	A	*08*	08	4253.5	4259.7	.	.	*4*	*5*
	65742	64754	..	A	*13*	14	4283.1	4281.8	.	.		
	64083	62881	*79*	79	136	*136*	4314.5	4315.3	.	.	*4*	*5*
	62934	61762	*69*	68	*13*	12	4336.7	4335.8	.	.		
Hγ	62755	61511	*63*	63	*17*	17	**4340.7**	**4340.7**	*5*	*2*	5	5
	62580	.. ..	..	A	..	..	4343.7	....	.	.	*2*	.
	62209	.. ..	..	A	..	..	4351.0	....	.	.		
	62034	.. ..	..	A	..	..	4354.5	....	.	.	1	.
	58077	56690	*22*	21	*05*	04	4436.3	4433.1	.	.	*5*	*5*
	57382	55826	*36*	36	*02*	01	4451.2	4450.3	.	.		
	57099	55588	..	A	*06*	07	4457.3	4455.1	.	.	5	3
	56896	.. ..	..	A	..	..	4461.8	....	.	.	*2*	.
	56645	.. ..	..	A	..	..	4467.3	....	.	.		
	56458	54762	*36*	36	04	03	**4471.8**	**4471.8**	*4*	1	5	3
	56290	.. ..	*34*	35	..	..	4475.2	....	.	.	*3*	.
	55800	.. ..	*99*	99	..	..	4486.3	....	.	.		
	55246	.. ..	*338*	337	..	..	4499.1	....	.	.	1	.
	54597	.. ..	..	A	..	..	**4514.5**	....	*4*	.	2	.
	....	52058	..	..	*57*	58	....	**4531.4**	.	6	.	2
Hγ′	53379	51418	*121*	121	08	*09*	**4542.4**	**4542.4**	*3*	3	2	2
	52936	.. ..	05	*04*	..	..	4552.4	....	.	.	*2*	.
	49526	.. ..	*53*	53	..	..	4634.8	....	.	.	3	.
	49372	.. ..	*55*	56	..	..	4638.6	....	.	.		
	49234	47308	*55*	55	*06*	07	4642.1	4636.5	.	.	*100*	*100*
	48123	45966	*32*	32	00	00	4670.2	4668.7	.	.		
	47649	45564	*67*	67	02	*02*	4682.4	4678.5	.	.	*20*	*30*
	46958	44800	*36*	35	12	*12*	4700.4	4697.2	.	.		
	43921	41601	*62*	63	..	A	4782.5	4778.8	.	.	*2*	*2*
	43320	41219	*02*	01	89	*88*	4799.4	4788.9	.	.		

Des.	X 8513	X 10153	Resid.		Resid.		λ	λ	Res.	Res.	Int.	Int.
	41525	38849	*51*	51	*21*	21	4850.8	4852.9	.	.	*2*	*2*
	41259	.. ..	*40*	40	..	..	4858.6	....	.	.		
Hβ	41160	38504	*56*	57	12	*11*	**4861.5**	**4861.5**	0	5	3	6
	41036	.. ..	*26*	27	..	..	4865.2	....	.	.	*2*	*2*
	40666	38209	*24*	25	*10*	10	4876.2	4870.3	.	.		
	....	.. ..	..	..	..	..	4922.1	....	.	.	3	.
	35917	.. ..	..	A	..	..	5025.2	....	.	.	*1*	.
	33520	30410	*45*	46	*47*	47	5106.5	5106.9	.	.	2	1
	25746	22186	*15*	15	09	*09*	5403.7	5402.8	.	.	.	*2*
Hβ′	....	21918	..	..	18	*19*	....	**5413.6**	.	*2*	*4*	3
	25278	21644	*53*	52	12	*13*	5423.5	5424.3	.	.	.	*2*
	24498	20666	*63*	62	*48*	48	5456.9	5464.1	.	.	*4*	*4*
	23980	20278	*12*	11	39	*40*	5479.4	5480.1	.	.		
	....	17878	..	..	02	*01*	....	5582.2	.	.	.	*1*
	....	17614	..	..	09	*10*	....	5593.8	.	.	.	2
	....	17315	..	..	27	*27*	....	5607.0	.	.	.	*1*
	19952	15822	*43*	43	*03*	04	5665.2	5674.5	.	.	*70*	*60*
	18975	14962	*73*	73	14	*15*	5713.3	5714.6	.	.		
	....	13555	..	..	*29*	29	....	5782.1	.	.	.	3
	....	13248	..	..	..	A	....	5797.2	.	.	.	3
	17522	13193	*45*	45	*10*	10	5787.2	5799.9	.	.	*10*	*10*
	16905	12760	*76*	76	*18*	19	5819.5	5821.3	.	.		

REMARKS.

3875.5. This conspicuous, wide, dark band near Hζ has not been found in any other spectrum examined for this classification. It resembles Hζ, but is slightly more intense.

3879.5 to 3885.7. A faint, bright band on the edge of shorter wave length of Hζ.

3891.0 to 3899.0. A faint, bright band on the edge of greater wave length of Hζ.

3926.2 to 3939.4. A bright band covering the position of the line K. It appears uncertain whether this is a reversal of the calcium line, or a bright band on the edge of shorter wave length of an indistinct dark line, K.

3952.8 to 3967.3. A bright band on the edge of shorter wave length of Hε.

4030.6 to 4034.7. A bright band on the edge of greater wave length of the line 4026.4.

4092.1 to 4098.0. A bright band between line 4089.2 and Hδ, or it may be described as a bright band on the edge of shorter wave length of Hδ.

4103.8 to 4116.1. A bright band on the edge of greater wave length of Hδ. The dark Orion line 4116.2 appears on the edge of greater wave length of the bright band.

4200.7. This additional hydrogen line is ill defined on X 8513, and was not measured with the micrometer. It is, however, seen to be present, and dark on the latter plate, by superposition upon the spectrum of ζ Puppis.

4314.5 to 4336.7. A wide, bright band on the edge of shorter wave length of Hγ.

4343.7 to 4351.0. A faint, bright band on the edge of greater wave length of Hγ.

4436.3 to 4451.2. A conspicuous, bright band on the edge of shorter wave length of the dark line 4457.3.

4457.3. This dark line is not present in any other spectrum examined for this classification. It is wider than the adjacent helium line 4471.8.

4634.8 to 4638.6. This dark line is on the edge of shorter wave length of the intensely bright band 4642.1 to 4670.2.

4682.4 to 4700.4. A narrow dark line is superposed on this bright band on Plate X 10153.

4850.8 to 4858.6. The edge of shorter wave length of the bright band upon which the dark line, Hβ, is superposed.

4865.2 to 4876.2. The edge of greater wave length of the bright band upon which the dark line, Hβ, is superposed.

4922.1. Not measured owing to faintness of the image on isochromatic plates at this point. The line is, however, distinctly seen on ordinary plates, and readily identified by superposition upon spectra of the Orion type. The edge of greater wave length is slightly bright.

5025.2. Owing to the absorption of rays in this region on isochromatic plates, this bright line or band is photographed more distinctly on ordinary plates. On the latter plates, this bright band covers the position of the parhelium line 5015.7, seen in Orion spectra, and there is a dark line on the edge of shorter wave length of the bright band. The dark line has the approximate wave length 4999.

5413.6. This additional hydrogen line, Hβ′, presents on X 10153, a similar appearance to Hβ. A distinct dark line is superposed on a bright band. The dark line coincides with Hβ′ in ζ Puppis, when the two spectra are superposed. On X 8513, the bright band shows no dark line crossing it, and it is not certain whether this is due to the difference in exposure of the two plates, or to a change in the star.

5582.2 to 5607.0. A bright band on which a distinct dark line, 5593.8, is superposed. This band was measured only on X 10153. The appearance is similar to that of Hβ and Hβ′ on this plate. On X 8513, a faint bright band is present, but no reversal is seen.

5665.2 to 5713.3. On X 10153 this bright band has a faint, dark line superposed.

5782.1 and 5797.2. These two dark lines are situated on the edge of shorter wave length of the bright band, 5787.2 to 5819.5.

The general characteristics of the spectrum of γ Velorum may be stated as follows: —

The dark lines show little contrast to the continuous spectrum, except towards the end of shorter wave length, where the lines of hydrogen are much more intense than those of greater wave length. The two series of hydrogen lines are present. Plates taken with one prism show the first series of hydrogen lines from Hβ to Hλ, inclusive. The space between Hκ and Hι appears like a bright band. Hν and Hμ have not been seen, but two wide dark bands of still shorter wave length than Hν are indistinctly seen. The approximate centres of these bands are 3683 and 3704, respectively. The dark line Hβ is superposed on a bright band. This combination of a dark and bright line is directly opposite to that seen in many of the spectra of the Orion type, in which Hβ is bright and superposed on a dark band. Hγ has a wide, well marked bright band on the edge of shorter wave length, and a narrow bright band on the edge of greater wave length. Fainter bright bands are visible on both edges of the hydrogen lines, Hζ, Hε, and Hδ. Three lines, Hδ′, Hγ′, and Hβ′, of the additional series of hydrogen, are present. Hε′, if present, is not separated from the helium line 4026.4. On X 10153, Hβ′ presents a similar appearance to Hβ, being dark and superposed on a bright band. On this same plate the bright bands, 4682.4 to 4700.4, 5582.2 to 5607.0, 5665.2 to 5713.3, are also reversed. All the photographs of the spectrum of this star were carefully examined for changes, but none were noted except the reversals refered to above, and that Hζ was unusually faint on X 7505. Hδ′ and Hγ′ are dark. In some cases the bright edges of the dark lines are well marked, in others the brightness is not sharply enough defined to determine whether the effect is due to bright spaces in the continuous

spectrum, or to actual bright edges of the lines. The Orion lines, in general, are faint and ill defined. The helium lines, 3819.2, 4026.4 and 4471.8 are well marked, as are also the unknown lines, 3875.5 and 4457.3, which have not been found in any other spectrum.

The bright bands in this spectrum are wide and most of them have hazy edges. As photographed on an isochromatic plate, two similar pairs of bright bands form the most conspicuous feature of the spectrum. The wave lengths of the centres of the first pair of these bands are 4656 and 4691, respectively. The other pair, fainter and wider apart, are at the extreme end of greater wave length, and have centres at 5689 and 5803, respectively. The band 4691 appears to be the same as that present in the spectra of classes Ob, Oc, Od, and Oe, for which the approximate wave length 4688 has been given. The band 4656 has a greater wave length than the bright band 4606 in spectra of class Ob, or the bright band 4633 in spectra of classes Oc, Od, and Oe. A few other bright bands are well marked, as may be seen from the intensities given in the preceding table. Some of the bright bands, however, are very faint, and may be spaces between faint, dark lines, or bands on which indistinct, dark lines are superposed.

Measures of the bright bands in H. P. 1311, A. G. C. 8631, are given in Table XXVIII. The plate used was X 4512, taken with one prism, on December 18, 1892, with an exposure of 64 minutes. The first column gives the designation of the hydrogen lines with which the bands are assumed to be identical. The second and

TABLE XXVIII.

MEASURES OF THE BANDS IN H. P. 1311, A. G. C. 8631.

Desig.	Measure.	Resid.	Wave length.	Desig.	Measure.	Resid.	Wave length.
	47911	10 *36* 27	4049.2		35731	*15* *05* 19	4527.9
	47605	*01* *05* 07	4059.2	Hγ′	35343	*22* *10* 33	4546.6
	47337	*20* *01* 20	4068.0		35199	32 03 *36*	4553.7
	46683	*33* 06 28	4089.6		34522	*22* *07* 28	4587.5
Hδ	46041	03 *02* *02*	4111.5		34117	01 *18* 18	4608.3
	45616	*26* *15* 42	4126.1		33788	*08* 15 *06*	4625.5
Hδ′	43677	03 *22* 18	4195.4		33255	03 *22* 19	4654.0
	43205	*06* 22 *15*	4212.8		32658	*04* *02* 06	4687.3
Hγ	40156	*21* *13* 33	4340.7		32256	*08* *07* 15	4710.4
	39736	05 *21* 17			30125	*40* 10 30	4844.8
				Hβ	29691	*04* *24* 29	4875.5
					29545	*09* *13* 23	4886.1

third columns give the mean of three measures made with the micrometer, and the corresponding residuals. Both edges of each band were measured. As has been stated on page 147, several of these bands appear to be double, or to have a dark line superposed. When this effect was seen under the micrometer, the dark line was also measured. The band near 4059 is double, the portion of shorter wave length being wider and much fainter than the other. The fourth column gives the wave lengths corresponding to these measures. Estimates of the intensities of these bands are given in Table XXII.

CHAPTER XVI.

MISCELLANEOUS.

Table XXIX contains an index to all stars in Parts I and II, which have letters assigned to them. The constellations are arranged in alphabetical order. The letter designating the star is followed by the class of spectrum according to the notation of Part II. The class of spectrum is followed by the H. P. number of the star taken from the first column of Table XII, for stars occurring in Part I, and the number from the first column of Table XVII, for stars occurring in Part II. When the same star has been classified in both Parts, it occupies two lines in the index, the first line referring to Part I, and the second line to Part II. Numbers taken from Part I are printed in Italics. The notation of the spectra in Part I was changed to that of Part II by means of Table XV, and not by an examination of the photographs, except in the cases of π Aquarii, γ Cassiopeiæ, P Cygni, β Lyræ, ϕ Persei, and υ Sagittarii. The peculiarities of some of these spectra are so marked that it is difficult to classify them by means of a simple notation. An attempt has been made to give the class whose typical star each spectrum most nearly resembles. The peculiarities of these spectra are fully discussed in the Remarks following Table XI. In the case of υ Sagittarii, the photographs examined show that the line Hβ is variable in this spectrum. This line has already been found to be variable in the spectra of A. G. C. 9181, J Velorum, κ^1 Apodis, and η Centauri, classified in Part II. The phenomenon presented in the spectrum of υ Sagittarii resembles in some respects that seen in η Centauri. On one plate of υ Sagittarii, Hβ is a faint bright line, on one plate, it is a faint dark line, on four plates, a well defined dark line, and on two plates, Hβ appears to be entirely absent.

The abbreviations Comp. and Pec. are used in the Index, as in Part II, to indicate Composite and Peculiar, respectively. Seven stars appear in two constellations in the table, since the designations are different in Part I, which follows the notation of Bayer and Heis, and Part II, which follows the notation of Lacaille and Gould. κ Argus in Part I is k Puppis in Part II; τ Argus is l Puppis; ξ Argus is ξ Puppis; e Argus is j Puppis; ι Argus is ρ Puppis; γ Scorpii is σ Libræ, and o Scorpii is τ Libræ. The designation o Scorpii is applied to H. P. 2601 in Part I, and to H. P. 2737 in Part II. H. P. 1370 is — Canis Majoris in Part I, and ω Canis Majoris in Part II. H. P. 2595 is — Scorpii in Part I, and υ Libræ in Part II.

TABLE XXIX.

INDEX TO LETTERS.

Andromeda.		
α	A Pec.	*5*
"	" "	1
β	Ma	*185*
γ	K Comp.	*324*
δ	K	*92*
ζ	K	*119*
λ	K	*4174*
μ	A 2 F	*148*
ο	B 5 A Comp.	*4073*
Antlia.		
α	K 5 M	470
δ	B 9 A	474
ε	K 2 M	438
ι	K	532
Apus.		
α	K 5 M	721
β	K	833
γ	K	826
δ^1	Mb	816
δ^2	K 5 M	817
ζ	K 2 M	860
θ	Mb	686
κ^1	*B 5 A* Pec.	776
κ^2	B 8 A	784
Aquarius.		
α	G	*3899*
β	G	*3795*
γ	A	*3950*
δ	A 2 F	*4047*
ε	A	*3647*
ζ	F 5 G	*3970*
η	B 8 A	*3994*
λ	Ma	*4040*
π	*B 1 A*	*3960*
τ	K 5 M	*4031*
b^1	K	*4139*
"	"	1101
b^2	K 5 M	*4145*
b^2	K 5 M	1102
b^3	A	1106
c^1	G 5 K	1094
c^2	K	*4093*
"	"	1095
c^3	G Comp.	1097
Aquila.		
α	A 5 F	*3429*
"	"	987
β	K	*3450*
γ	K 2 M	*3418*
δ	F	*3343*
ζ	A	*3259*
η	G	*3436*
θ	A	*3514*
λ	A	*3260*
Ara.		
α	*B 3 A*	877
β	K 2 M	866
γ	B 1 A	867
δ	B 8 A	874
ϵ^1	K 2 M	854
ϵ^2	F 8 G	856
ζ	K 5 M	853
η	K 5 M	839
θ	B 1 A	897
λ	F 5 G	884
σ	A	880
Argo.		
ι	F 5 G	*1515*
κ	B 2 A	*1445*
ξ	G Pec.	*1474*
τ	A	*1462*
e	G	*1492*
Aries.		
α	K	*333*
"	K 2 M	48
β	A 5 F	*295*
γ	A Pec.	*291*
κ	A	*332*
Auriga.		
α	G	*932*
"	"	125
β	A	*1100*
"	A Pec.	174
δ	K	*1093*
ε	F 5 G Pec.	*877*
ζ	K Comp.	*879*
η	B 3 A	*896*
θ	A Pec.	*1104*
ι	K 2 M	*862*
π	Ma	*1102*
υ	Ma	*1072*
χ	B 1 A	*1001*
Boötes.		
α	K	*2400*
"	"	697
β	G 5 K	*2515*
γ	F	*2436*
δ	K	*2541*
ε	K Comp.	*2467*
η	G	*2360*
θ	F 8 G	*2426*
ρ	K	*2433*
σ	F	*2442*
υ	K 5 M	*2343*
Cælum.		
α	F 2 G	115
β	F 5 G	116
γ	K	120
δ	B 3 A	109
Cancer.		
β	K 2 M	*1533*
ζ	F 8 G	*1521*
ι	G 5 K	*1605*
Canis Major.		
α	A	*1275*
"	"	205
β	B 1 A	*1201*
γ	B 5 A	*1340*
δ	F 8 G Pec.	*1350*
"	" "	233
ε	B 1 A	*1325*
"	"	227
ζ	B 3 A	*1195*
"	"	189
η	B 5 A Pec.	*1399*
"	" "	269
κ	*B 2 A*	208
λ	B 5 A	194
ξ^1	B 1 A	196
ξ^2	A	199
o^1	G 5 K	*1312*
"	K 2 M	219
o^2	B 5 A Pec.	*1337*
"	" "	231
π	F 5 G	222
σ	K 5 M	230
τ	Oe 5 B	261
ω	*B 3 A*	248
Canis Minor.		
α	F 5 G	*1442*
"	"	283
β	B 8 A	*1403*
Capricornus.		
α^1	G	*3537*
α^2	K	*3538*
β	G Comp.	*3554*
γ	F Comp.	*3818*
δ	A 5 F	*3848*
ε	B 5 A Pec.	1047
ζ	G 5 K Pec.	*3779*
"	G Pec.	1043
η	A 3 F	1034
ν	A	*3552*

ψ	F 8 G	1018
ω	Ma	1027
b	G 5 K	1044
A	Ma	1036

CARINA.

α	F	193
β	A	425
ϵ	K Comp.	370
η	Q	512
θ	B	504
ι	F	429
υ	F	449
χ	B 3 A	321
ω	B 8 A	461
a	B 3 A	417
b^1	B 3 A	403
b^2	F	406
c	B 8 A	401
d	B 2 A	386
e^1	B 3 A	377
e^2	K	376
f	B 3 A	395
g	Ma	428
h	B 5 A	444
i	B 3 A	418
k	K	433
l	G	448
m	B 9 A	447
p	*B 5 A*	477
q	K 5 M	462
r	K 5 M	481
s	F	473
t^1	K	484
t^2	K 5 M	489
u	K	528
w	K 5 M	505
x	F 8 G Pec.	544
y	F 5 G Pec.	551
z	K	542
A	G 5 K	213
B	F 5 G	350
D	B 3 A	336
E	*B 3 A*	414
G	F 5 G	415
I	F 5 G	469
K	A 2 F	476
N	A	201
Q	K 5 M	281
R	Md	442
S	Md	458
T	K	530

CASSIOPEIA.

α	K	*94*
β	F 5 G	*9*
γ	*B* Pec.	*142*
δ	A 5 F	*219*
ϵ	B 3 A	*287*
ζ	B 2 A	*82*
η	F 8 G	*120*
κ	B	*71*
λ	B 5 A	*69*
o	B 2 A	*107*
ρ	F 8 G Pec.	*4224*
A	A 2 F	*304*
R	Md	*4234*

CENTAURUS.

α^1	G	716
α^2	K 5 M	717
β	B 1 A	687
γ	A	619
δ	*B 3 A*	589
ϵ	B 1 A	663
ζ	B 2 A Pec.	678
η	*B 3 A* Comp.	714
θ	K	692
ι	A 2 F	654
κ	B 3 A	736
λ	B 9 A	562
μ	*B 2 A*	672
ν	B 2 A	670
ξ^1	A	640
ξ^2	B 3 A	642
o^1	F 8 G Pec.	556
o^2	A 2 F Pec.	557
π	B 5 A	553
ρ	B 3 A	593
σ	B 3 A	609
τ	A 2 F	617
υ^1	B 3 A	683
υ^2	F 5 G	685
ϕ	B 3 A	682
χ	B 3 A	690
ψ	A	701
a	B 5 A	703
b	B 3 A	722
c^1	K	724
c^2	A	725
d	K	662
e	K 2 M	632
f	B 3 A	641
g	Mb	671
h	B 5 A	676
i	F 5 G	666
j	B 5 A	576
k	B 5 A	674
l	B 8 A	618
m	G	657
n	A 5 F	633
v	B 5 A	699
w	K	621
A	B 8 A	561
B	K	578
F	Ma	599
G	B 3 A	605
J	B 5 A	656
M	K	667

CEPHEUS.

α	A 5 F	*3757*
β	B 1 A	*3798*
γ	K	*4182*
δ	G	*3981*
ϵ	A 5 F	*3942*
ζ	K	*3923*
η	K	*3656*
ι	K	*4037*
μ	Ma	*3845*

CETUS.

α	Ma	*482*
"	"	68
β	K	*103*
γ	A	*433*
δ	B 2 A	*418*
η	K	*183*
θ	K	*220*
ι	K	*45*
μ	A 5 F	*437*
o	Md	*370*
υ	K 5 M	*315*
"	Ma	41

CHAMÆLEON.

α	F 5 G	371
β	B 5 A	597
γ	Ma	488
δ^1	K	521
δ^2	B 3 A	523
ϵ	B 9 A	583
θ	K	372
κ	K 5 M	586

CIRCINUS.

α	F	718
β	A 3 F	755
γ	B 5 A Comp.	769
δ	Oe 5 B	752
ϵ	K	753

COLUMBA.

α	*B 5 A*	162
β	K	167
γ	B 3 A	178
δ	G 5 K	191
ϵ	K	138
η	K	179
κ	K	187
λ	B 5 A	171
ξ	K	174
o	K	128

CORONA AUST.

α	A 2 F	969
β	G 5 K	972
γ	F 8 G	965
δ	K	968
ϵ	F 5 G	957
ζ	A	960
θ	G 5 K	936

CORONA BOR.

α	A	*2594*
β	F Pec.	*2572*
γ	A	*2625*
ϵ	K	*2673*

Corvus.

α	F 2 G	590
β	G 5 K	*2134*
"	"	614
γ	B 8 A	*2078*
δ	A	*2120*
ϵ	K	*2063*
"	"	591
η	F	*2128*

Crater.

α	K	*1918*
β	A 2 F	549
γ	A 2 F	*1973*
δ	K	*1963*

Crux.

α^1	B 1 A	606
α^2		607
β	B 1 A	626
γ	Mb	611
δ	B 3 A	595
ϵ	K 2 M	600
ζ	B 3 A	598
η	F	587
θ^1	A 5 F	584
θ^2	B 3 A	585
ι	K	623
λ	B 3 A	634
μ	B 3 A	636

Cygnus.

α	A 2 F Pec	*3631*
"	" "	1017
β	K Comp.	*3362*
γ	F 8 G Pec.	*3564*
δ	A	*3419*
ϵ	K	*3648*
ζ	K	*3732*
η	K	*3460*
θ	F 5 G	*3393*
ι	A 2 F	*3365*
κ	K	*3316*
ξ	K 5 M	*3716*
o^1	A 2 F	*3527*
	K Comp.	*3528*
o^2	G 5 K	*3541*
ρ	K	*3807*
τ	F	*3741*
υ	*B 3 A*	*3747*
χ	Md Pec.	*3434*
A	Oe 5 B	*3750*
P	*B 1 A* Pec.	*3547*
T	K	*3654*

Delphinus.

α	B 8 A	*3624*
β	F 5 G	*3605*
γ	G 5 K	*3645*
δ	A 2 F	*3635*
ϵ	B 5 A	*3592*
ζ	A	*3600*

Dorado.

α	A Pec.	113
β	F 5 G	157
γ	F 5 G	104
δ	A 5 F	164
ϵ	B 5 A	173
ζ	F 8 G	124
η^2	Mb	186
θ	K	129
ν	B 9 A	185

Draco.

α	A	*2381*
β	G	*2937*
γ	K 5 M	*3009*
δ	K	*3307*
ϵ	K	*3447*
ζ	B 5 A	*2878*
θ	F 8 G	*2696*
ι	K	*2569*
κ	*B 5 A*	*2135*
λ	Ma	*1988*
ξ	K	*3003*
τ	K	*3328*
ϕ	A Pec.	*3120*
χ	F 8 G	*3122*
d	F 8 G Pec.	*3136*
e	Ma	*3498*
i	Ma	*2356*

Equuleus.

α	F 8 G Comp.	*3739*

Eridanus.

α	B 5 A	32
β	A 2 F	*910*
γ	K 5 M	*653*
ϵ	K Pec.	*576*
η	K	*464*
θ	A 2 F	66
ι	K	57
κ	B 5 A	51
ν	B 2 A	*799*
o^1	F 5 G	*701*
τ^2	K	63
τ^3	A 2 F	*487*
"	A 3 F	69
τ^4	Mb	*533*
"	"	72
τ^5	B 8 A	*579*
"	"	76
τ^6	F 8 G	85
τ^7	A 2 F	89
τ^8	B 5 A	96
τ^9	A Pec.	97
υ^1	K	110
υ^2	K	112
ϕ	B 8 A	49
χ	G 5 K	36
ω	A 5 F	*854*
c	A 5 F	*806*
d	K 5 M	107
e	G 5 K	73
f	A	91
	B 8 A	92
g	K	93
h	K 2 M	80
s	A	55
y	K	77
X	B 9 A	105

Fornax.

α	F 8 G	70
β	K	62
δ	B 5 A	78
ν	A Pec.	47
π	G 5 K	44
ϕ	A 2 F	52
ω	B 9 A	53

Gemini.

α	A	*1423*
"	"	276
β	K	*1459*
"	"	292
γ	A	*1249*
δ	F	*1377*
ϵ	G 5 K	*1263*
ζ	G	*1334*
η	Ma	*1160*
θ	A 2 F	*1295*
ι	K	*1394*
κ	G 5 K	*1457*
λ	A 2 F	*1373*
μ	Ma	*1194*
ξ	F 5 G	*1272*
ρ	F	*1405*
σ	K	*1453*
υ	K 5 M	*1430*

Grus.

α	B 5 A	1057
β	Mb	1083
γ	B 8 A	1051
δ^1	G 5 K	1072
δ^2	Mb	1073
ϵ	A 2 F	1087
ζ	G 5 K	1092
η	K	1085
θ	F 5 G	1093
ι	K	1098
λ	K 2 M	1056
μ^1	G	1064
μ^2	G 5 K	1065
ρ	K	1084

Hercules.

α	Mb	*2879*
β	K	*2774*
γ	F	*2747*
δ	A	*2880*
ϵ	A	*2844*
ζ	G	*2807*

η	K	*2810*
ι	B 3 A	*2959*
μ	G 5 K	*2976*
ν	F	*3010*
ξ	K	*3007*
o	A	*3048*
π	K 2 M	*2885*
ρ	A	*2914*
σ	A	*2787*
τ	B 5 A	*2745*
ϕ	A	*2713*
b	F 8 G	*3047*
e	A	*2893*
g	Mb	*2772*
u	B 3 A	*2890*
A	Ma	*3065*

Horologium.

α	K	102
β	A 5 F	67
δ	F	101

Hydra.

α	K 2 M	*1698*
β	B 9 A	579
γ	G 5 K	*2249*
"	"	652
δ	A	*1588*
ϵ	F 8 G	*1608*
ζ	K	*1629*
η	B 3 A	*1599*
θ	A	*1676*
ι	K	*1734*
λ	K	*1800*
μ	K 5 M	*1837*
ν	Ma	*1893*
ξ	G 5 K	560
o	B 8 A	566
π	K	*2378*
"	"	691
ρ	A	*1613*
χ^1	F 5 G	537
χ^2	B 8 A	539
k	K 2 M	704
l	B 8 A	709
m	F 5 G	726
E	K 2 M	731
G	K	437
U	N	*1869*

Hydrus.

α	F	43
β	G	4
γ	Ma	95
δ	A 2 F	50
ϵ	B 9 A	58
ζ	A 2 F	61
η^2	K	37
λ	K 5 M	21
μ	K	54
ν	K 2 M	65

Indus.

α	K	1012
β	K	1028
δ	F	1052
ϵ	K 5 M	1054
ζ	K 5 M	1020
η	F	1016
θ	A 5 F	1039

Leo.

α	B 8 A	*1797*
"	"	457
β	A 2 F	*2025*
γ	K	*1823*
δ	A 2 F	*1949*
ϵ	G Pec.	*1747*
ζ	F	*1812*
η	A Pec.	*1793*
θ	A	*1951*
ι	F 5 G	*1969*
μ	K	*1760*
o	F 5 G Comp.	*1740*
π	Ma	*1782*
ρ	B Pec.	*1859*
σ	A	*1965*
b	A	*1925*
R	Md	*1752*

Lepus.

α	F	*1014*
β	G	*994*
"	"	134
γ	F 8 G	*1057*
"	"	163
δ	K	*1086*
"	"	166
ϵ	K 5 M	*901*
"	"	122
ζ	A 2 F	*1065*
η	F 5 G	*1101*
μ	A Pec.	*929*

Libra.

α	A 2 F	*2480*
β	B 8 A	*2539*
γ	K	*2589*
δ	A	*2506*
σ	Mb	739
τ	B 3 A	788
υ	K 2 M	786

Lupus.

α	B 2 A	720
β	B 2 A Pec.	735
γ	B 3 A	782
δ	B 2 A	763
ϵ	B 3 A	772
ζ	K	748
η	B 3 A	803
θ	B 3 A	811
ι	B 3 A	698
κ	B 9 A	746
λ	B 3 A	744
μ	B 8 A	760
ν^1	F 8 G	766
ν^2	G	767
ξ	A	798
o	B 5 A	732
π	B 5 A	740
ρ	B 5 A	715
σ	B 2 A	713
τ^1	B 3 A	706
τ^2	F 8 G	707
υ	A	774
ϕ^1	K 5 M	770
ϕ^2	B 3 A	773
χ	B 9 A	794
ψ^1	K	789
ψ^2	B 5 A	792
ω	K 5 M	787
d	B 3 A	783
e	B 3 A	749
f	K	761
g	F 5 G	791
k	A	775

Lyra.

α	A	*3147*
"	"	938
β *B 2 A*	Comp.	*3193*
γ	A	*3232*
δ^1	B 3 A	*3207*
δ^2	Mb	*3210*
η	B 3 A	*3291*
ν	A 2 F	*3192*
R	Mb	*3224*

Mensa.

γ	K	161

Microscopium.

α	K	1022
β	A 2 F	1026
γ	G 5 K	1033
ϵ	A	1038
θ^1	A 2 F Pec.	1040
θ^2	A Pec.	1041

Monoceros.

S	Oe 5 B	*1256*
T	G	*1205*

Musca.

α	B 3 A	616
β	B 3 A	624
γ	B 5 A	613
δ	K 2 M	638
ϵ	Mb	596
ζ^1	K	602
ζ^2	A 5 F	601
η	B 8 A	649
θ	Oa Pec.	643
ι^1	K	658
λ	A 5 F	572
μ	K 5 M	574

Norma.

γ^1	F 8 G	819
γ^2	K	820
δ	A 3 F Pec.	809
ϵ	B 5 A	827
η	G 5 K	806
ι^1	A 2 F	805
ι^2	A	814

Octans.

β	F	1082
δ	K 2 M	696
θ	K	1120
ν	K	1046
π^1	K	730

Ophiuchus.

α	A 5 F	*2944*
β	K	*2962*
γ	A	*2979*
δ	Ma	*2726*
ϵ	K	*2736*
ζ	B	*2788*
η	A	*2868*
θ	B 3 A	*2899*
"	"	864
κ	K	*2838*
λ	A	*2773*
ν	K	*3005*
ξ	F 5 G	862
ω	F	832
b	F	870
c	A	878
d	F 5 G	872

Orion.

α	Ma	*1091*
"	"	172
β	B 8 A Pec.	*936*
"	" "	126
γ	B 2 A	979
"	"	133
δ	B	*1005*
"	"	136
ϵ	B	*1029*
"	"	152
ζ	B	*1045*
"	"	159
η	B 1 A	*975*
θ^1	Oe 5 B	*1023*
"	"	143
θ^2	B 2 A	*1024*
"	B 1 A	147
ι	Oe 5 B	*1027*
"	"	150
κ	B	*1068*
λ	Oe 5 B	*1019*
ν	B 2 A	*1132*
ξ	B 2 A	*1153*
o^1	Ma	*850*
π^3	F 8 G	*840*
π^4	B 3 A	*845*
"	"	118
π^5	B 3 A	*857*
σ	B	*1039*
τ	B 5 A	*948*
ϕ^1	B	*1017*
ϕ^2	K	*1030*
χ^1	F 8 G	*1089*
χ^2	B 2 A	*1122*
c	B 1 A	*1025*
"	B 3 A	146
"	F	*1026*
"	F	151
U	Md	—

Pavo.

α	B 3 A	1009
β	A 5 F	1015
γ	F 8 G	1042
δ	G 5 K	1007
ϵ	A	990
ζ	K	937
η	K	886
θ	A 3 F	944
κ	F 5 G	947
λ	B 2 A	946
μ^1	K	992
μ^2	K	995
ν	B 8 A	929
ξ	K 2 M	917
π	A 5 F	898
ρ	F 5 G	1011
υ	B 9 A	1014
ϕ^1	F	1010
ϕ^2	F 8 G	1013

Pegasus.

α	A	*4080*
β	Ma	*4078*
γ	B 2 A	*23*
ϵ	K	*3836*
ζ	B 8 A	*4013*
η	G	*4020*
θ	A	*3913*
ι	F 5 G	*3907*
κ	F 5 G	*3843*
λ	K	*4026*
μ	K	*4034*
ξ	F 5 G	*4024*
o	A	*4015*
ϕ	Ma	*4217*

Perseus.

α	F 5 G	*541*
"	"	74
β	B 8 A	*496*
γ	G Comp.	*483*
δ	B 5 A	*591*
ϵ	B	*649*
ζ	B 1 A	*638*
η	K	*443*
θ	G	*429*
κ	K	*498*
μ	G	*702*
ν	F 5 G	*602*
ξ	Oe 5 B	*652*
o	B 1 A	*600*
ρ	Mb	*489*
σ	K	*560*
τ	G Comp.	*454*
υ	K	*251*
ϕ	*B* Pec.	*269*
ψ	*B 5 A*	*578*

Phœnix.

α	K	5
β	K	25
γ	K 5 M	29
δ	K	31
ϵ	K	2
ζ	B 8 A	26
η	A	20
ι	A 2 F Pec.	1107
κ	A 3 F	6
λ^1	A 2 F	10
λ^2	F 8 G	15
μ	K	18
ν	G	27
ξ	F Pec.	19
π	K	1116
ρ	F 5 G	22
σ	B 5 A	1111
ϕ	B 9 A	34
χ	K	45
ψ	Mb	33

Pictor.

α	A 5 F	211
β	A 3 F	165
γ	K	168
δ	B 1 A	184
η^1	F 5 G	119
η^2	K 5 M	123

Piscis.

α	A 2 F Comp.	*320*
γ	K	*4114*
δ	K 5 M	*125*
η	G 5 K	*239*
ω	F 5 G	*4238*

Piscis Aust.

α	A 2 F	*4057*
"	A 3 F	1091
β	A	1074
γ	A	1089
δ	K	1090
ϵ	B 8 A	*4007*
"	"	1081
θ	A 2 F	1050
ι	A	1049
μ	A 2 F	1058
τ	F 8 G	1062
υ	K 5 M	1059

Puppis.

ζ	Od	339
ν	B 8 A	203
ξ	G	307
o	*B 2 A*	303
π	K 5 M	258
ρ	F 5 G	341
σ	K 5 M	273
τ	K	212
a	G 5 K	313
b	B 3 A	314
c	K 5 M	299
d^3	B 5 A	288
f	B 8 A	282
h^1	K 5 M	352
h^2	K	358
j	F 8 G	319
k	B 8 A	284
l	A 2 F Pec.	294
q	A 5 F	363
r	*B 3 A*	356
v^1	*B 3 A*	263
v^2	B 3 A	265
w	K	365
A	B 3 A	235
I	F	244
J	B 1 A	317
L^1	A Pec.	246
L^2	Md	247
P	B	309
Q	K	308

Pyxis.

α	B 2 A	390
β	G 5 K	379
γ	K 2 M	396
θ	Ma	431

Reticulum.

α	G 5 K	103
β	K	86
γ	Mb	99
δ	Ma	98
ϵ	K 2 M	106
ι	K 5 M	100
κ	F 5 G	75

Sagitta.

γ	K 5 M	*3466*
δ	Ma Comp.	*3421*
ζ	A	*3424*

Sagittarius.

α	B 8 A	977
β^1	B 8 A	975
β^2	F	976
γ	K	899
δ	K	*3084*
"	"	918
ϵ	A	922
ζ	A 2 F	961
η	Mb	913
θ^1	B 3 A	997
θ^2	A 3 F	998
ι	K	988
λ	K	927
μ	B 8 A Pec.	*3062*
"	" "	907
ν^1	G 5 K	948
ν^2	K	949
ξ^1	A	955
ξ^2	K	956
o	K	*3252*
"	"	963
π	F	*3270*
"	F 2 G	973
ρ	A 5 F	*3319*
σ	B 3 A	*3199*
"	"	950
τ	K	967
υ	*B 8 A* Comp.	*3321*
ϕ	B 8 A	*3157*
"	"	945
ω	G 5 K	991
b	K 2 M	993
c	Mb	1002
f	K	985
h^1	A 3 F	981
h^2	B 9 A	982
A	G 5 K	996
W	F 5 G	896
X	F 8 G	888

Scorpius.

α	Ma Comp.	*2764*
"	" "	829
β	B 2 A	*2690*
"	B 1 A	810
γ	Ma	*2514*
δ	B 1 A Pec.	*2674*
"	B	804
ϵ	K	840
ζ^1	*B 1 A* Pec.	845
ζ^2	K 5 M	850
η	F 2 G	859
θ	F	883
ι^1	F 5 G Pec.	887
ι^2	A 2 F Pec.	892
κ	B 2 A	885
λ	B 2 A	879
μ^1	B 3 A Pec.	842
μ^2	B 2 A	844
ξ	F 8 G	*2688*
o	B 2 A	*2601*
o	A 3 F	821
π	B 2 A	*2671*
"	B 2 A Pec.	802
ρ	B 3 A	*2662*
"	"	800
σ	B	*2738*
"	B 1 A	823
τ	B	*2783*
"	"	834
υ	B 3 A	876
ω^1	B 2 A	*2698*
"	"	813
ω^2	G	*2700*
"	"	815
b	B 3 A	795
k	B 1 A Pec.	857
A	B 3 A	797
G	K 2 M	891
H	Ma	835
N	B 3 A	831
Q	K	881

Sculptor.

α	B 5 A	23
β	B 9 A	1105
γ	K	1100
δ	A	1112
ζ	B 5 A	1121
η	Mb	7

Serpens.

α	K	*2627*
β	A 2 F	*2632*
γ	F 8 G	*2666*
ϵ	A	*2645*
η	K	*3090*
κ	K 5 M	*2636*
μ	A	*2638*
ξ	A 5 F	*2947*
τ^1	Ma	*2563*

Taurus.

α	K 5 M	*797*
"	"	111
β	B 8 A	*978*
δ	K	*750*
η	B 5 A	*618*
"	"	84
θ^1	K	*775*
θ^2	A 5 F	*776*
λ	B 3 A	*657*
ν	A	*665*
ξ	B 8 A	*554*
o	G 5 K	*550*
q	B 5 A	*610*
"	"	81

Telescopium.

α	B 3 A	924
δ^1	B 8 A	934
δ^2	B 5 A	935
ϵ	K	904
ζ	K	925
ι	K	980
λ	B 9 A	954
ξ	Ma	1008

Triangulum.

α	F 5 G	*289*
β	A 5 F	*336*
γ	A	*361*
δ	G	*360*

Triang. Aust.		
α	K 2 M	837
β	F	796
γ	A	756
δ	G	818
ε	K	780
ζ	G	825
Tucana.		
α	K 2 M	1066
β^1	B 9 A	11
β^2	A 2 F	12
γ	F 2 G	1099
δ	B 9 A	1070
ε	B 9 A	1118
ζ	F 8 G	3
η	A 2 F	1114
θ	A 5 F	14
κ	F 8 G	28
ν	Mb	1075
Ursa Major.		
α	K	*1926*
β	A	*1923*
γ	A	*2036*
δ	A 2 F	*2077*
ε	A Pec.	*2191*
ζ	A	*2264*
η	B 3 A	*2338*
θ	F 8 G	*1709*
ι	A 5 F	*1636*
κ	A	*1645*
λ	A	*1810*
μ	K 5 M	*1827*
ν	K	*1961*
ξ	G	*1959*
ο	G	*1558*
π^1	G 5 K	*1580*
π^2	K	*1584*
ρ	Ma	*1638*
σ^1	K 5 M	*1651*
σ^2	F 8 G	*1655*
τ	F 5 G Comp.	*1658*
υ	F	*1753*
χ	K	*2018*
ψ	K	*1941*
g	A 2 F	*2267*
h	F	*1701*
Ursa Minor.		
α	F 8 G	*213*
β	K 5 M	*2500*
γ	A 2 F	*2566*
ε	G 5 K	*2351*
Vela.		
γ	Oa Pec.	347
δ	A	392
κ	B 3 A	435
λ	K 5 M	413
μ	G 5 K	514
ο	B 3 A	383
φ	B 5 A	456
ψ	F 5 G	439
a	A	393
b	F 5 G Pec.	382
c	K	411
d	G 5 K	391
e	A 5 F	378
f	B	398
g	A 2 F	397
i	A 2 F	535
k	F 5 G	424
l	K	423
m	G 5 K	454
n	A 3 F	384
p	F 2 G	485
q	A 2 F	460
r	K 5 M	466
u	B 8 A	450
w	F 8 G	405
x	G	491
z	B 3 A	420
A	B 5 A	374
B	B 2 A	367
C	K	375
H	B 5 A	402
J	*B 5 A* Pec.	465
M	A 5 F	446
N	K 5 M	440
Virgo.		
α	B 2 A	*2263*
"	"	660
β	F 8 G	*2028*
γ	F	*2155*
δ	Ma	*2193*
ε	K	*2208*
ζ	A 2 F	*2294*
η	A	*2088*
μ	F 5 G	*2457*
ν	Ma	*2019*
ο	G 5 K	*2057*
Volans.		
α	A 5 F	412
β	K	373
γ^1	G	242
γ^2	K	243
δ	F 5 G	268
ε	B 5 A	351
ζ	K	302
κ^1	B 9 A	368
κ^2	A	369

An examination of Tables XII and XVII shows that there are 98 stars common to Part I and Part II of this volume. In 71 of them, the classification of Part I, as translated into the notation of Part II by means of Table XV, agrees exactly with the classification of Part II, except that H. P. 1474, ξ Argus, is marked Pec. in Part I, and not in Part II, while the spectroscopic binaries, β Aurigæ and π Scorpii, are called Pec. in Part II, and not in Part I. The spectra of 20 of the stars common to Parts I and II, fall in the successive subdivisions of Part II. For instance, α Arietis is Class K according to Part I, and K 2 M, in Part II; and τ^3 Eridani is A 2 F according to Part I, and A 3 F in Part II. There are 7 stars that differ by more than one subdivision. They are enumerated in Table XXX, in which the first column gives the number of the star in the Harvard Photometry, the second column, the number taken from the first column of Table XVII of this volume,

the third column, the classification of the spectrum obtained by changing the notation of Part I into that of Part II by means of Table XV, and the fourth column, the classification according to Part II.

TABLE XXX.

STARS WHOSE CLASSIFICATION IN PARTS I AND II DIFFER BY MORE THAN ONE SUBDIVISION.

H. P.	No. Part II.	Class. Part I.	Class. Part II.
1025	146	B 1 A	B 3 A
–	148	B 2 A	B 5 A
–	154	B 1 A	B 3 A
1312	219	G 5 K	K 2 M
1368	245	B 2 A	*B 5 A* Pec.
1445	284	B 2 A	B 8 A
	285		B 3 A
3069	911	B 9 A	B

These differences were then investigated by examining the plates taken with the 11-inch Draper telescope, used in classifying these spectra for Part I of this volume, together with the plates taken with the 13-inch Boyden telescope, used for Part II. The result of the examination is given below.

H. P. 1025. Image rather dense on Plate X 3881, from which the classification for Part II was made. Spectrum examined on Plate C 1664, and classified B 2 A.

No. 148, Part II. Image poor on Plate X 3881, and also on Plate C 1664. From the latter plate, the spectrum appears to belong to Class B 3 A.

No. 154, Part II. Image poor on Plate X 3881, and too poor on Plates C 1656 and C 1688 to determine the class with certainty. On Plate C 805 the spectrum appears to belong to Class B 3 A.

H. P. 1312. o^1 Canis Majoris. This spectrum is slightly peculiar in combining characteristics of both Classes G 5 K and K 2 M. See Remark 109, page 97, and Remark 203, page 189.

H. P. 1368. From a study of the X plates, this spectrum has been shown to have two variable bright lines, Hγ and Hβ. See Remark 101, p. 184. Plates C 1665 and C 2512, which were used in classifying the spectrum for Part I, are too poor to determine the class with precision. The line Hβ shows a slight brightness on the edge of greater wave length on Plate C 2512, taken March 3, 1890. This

bright line is so faint that it might be assumed to be a defect, were the nature of the spectrum unknown.

H. P. *1445.* The spectra of H. P. 1445 and 1446 are separated on the X plates, but not on the C plates.

H. P. 3069. The class of this spectrum is very clearly defined on two excellent photographs, X 5103 and X 5930. The uncertainty of the classification in Part I is explained in Remark 38, p. 95.

To illustrate the various types of stellar spectra, enlargements of several of the original negatives have been made by Mr. Edward S. King, and are shown in Plates I, II, and III. In Plates I and II a motion parallel to the lines in the spectrum is given to the negative, as first described in 1887, in the First Annual Report of the Henry Draper Memorial, page 5. Paper prints were made from these enlargements, and mounted so that the ends of the hydrogen line Hγ coincided in the adjacent spectra. The photo-engravings were made from these prints.

Owing to the various photographic processes employed, it appeared to be impossible to represent the relative intensity of different portions of the spectra. This difficulty was increased by the fact that some of the best photographs were taken on isochromatic plates. These plates although sensitive to the green and yellow rays, so that good photographs of this portion of the spectrum may be obtained, are less sensitive than ordinary plates to the rays in the vicinity of Hβ. If then, as in the accompanying illustrations, the portion of the spectrum between wave lengths 3800 and 5000 only is shown, stars photographed on isochromatic plates will appear of a bluer color than if they were photographed on ordinary plates, since the portion of the spectrum of greater wave length will appear relatively faint.

According to the notation adopted in the Draper Catalogue, Harvard Annals Vol. XXVII, the various types of spectra are designated by letters. If we select six typical spectra, B, A, F, G, K, and M, nearly all of the stars may be arranged in a continuous sequence in which each spectrum will be identical with one of these types, or will be intermediate between two of them. These spectra are reproduced in Plate I. The Class according to the Draper Catalogue, and the type according to Secchi are given in the left hand margin, and the name of the star in the right hand margin. A brief description of each spectrum is given below: —

B. I. ϵ Orionis. Enlarged from X 8119, an isochromatic plate, taken November 10, 1896, exposure 106^m. The region of Hβ appears fainter than on ordinary plates, owing to the absorption of rays of this wave length on isochromatic plates. Lines of shorter wave length than Hϵ are lost in the reproduction.

The helium line 4026.4, nearly mid-way between Hε and Hδ, appears more intense than in the original negative. The group of lines visible near Hδ includes, on the side of shorter wave length, the oxygen triplet, 4069.4, 4072.0 and 4075.9, lines 4089.2, and 4096.9; on the side of greater wave length, 4116.2, and the helium lines, 4120.5 and 4144.0. The three most intense lines between Hγ and Hβ are 4471.8, 4649.2 and 4712.8, the first and the last being due to helium.

For a detailed description of this spectrum, see pages 16 and 150.

A. I. α Canis Majoris. Enlarged from X 8094, taken October 28, 1896, exposure 60^m. This spectrum shows the maximum intensity of the lines of hydrogen. The narrow calcium line, K, line 4481.4, and numerous fainter lines are visible. The separation of the calcium line, H, from the hydrogen line, Hε, is not perceptible in this reproduction, although distinctly visible on the original negative. This spectrum is described on pages 23 and 154.

F. I–II. α Carinæ. Enlarged from X 8114, an isochromatic plate taken November 9, 1896, exposure 82^m. This spectrum is intermediate between Secchi's first and second types. The hydrogen lines are less intense and the calcium bands are much wider than in α Canis Majoris. A large number of solar lines are visible. As stated on page 263, 16 lines have been counted on the original negative, between K and H. This spectrum is described on page 156.

G. II. α Aurigæ. Enlarged from X 7984, taken September 11, 1896, exposure 98^m. The wide bands K and H, the band G, and numerous well marked solar lines are seen. This spectrum is described on pages 35 and 158.

K. II. α Boötis. Enlarged from C 6563, taken February 5, 1894, exposure 49^m. The bands K and H appear to reach a maximum in this spectrum. Line 4227.0 is greatly increased in intensity, while the hydrogen lines are very faint. The portion of the spectrum from Hγ to Hβ is brighter than that of shorter wave length than Hγ. This spectrum is described on page 37.

Ma. III. α Orionis. Enlarged from C 1043, taken February 3, 1888, exposure 101^m. The spectrum is faint at the end of shorter wave length, thus causing the red color of stars of this class. Numerous narrow bright lines or bands are seen. It is difficult to decide whether these are due to an increase in light, or to the absorption of the adjacent dark lines. The light diminishes abruptly at 4762 and 4954. This spectrum is described on page 42, and referred to in Remark 211, page 189.

Some of the spectra described in this Volume are peculiar. Six of them are shown in Plate II. All except the first of them, α Cygni, contain bright lines. The notation according to the Draper Catalogue, modified as described on page 139,

is given in the left hand margin, and the name of the star in the right hand margin. A brief description of each spectrum is given below:—

A2F. Pec. α Cygni. Enlarged from C 5929, taken September 2, 1893, exposure 76^m. This spectrum has very narrow lines of well marked intensity. The lines H, and Hϵ are clearly separated on the original negative, on which, also, the fine lines are more conspicuous than on this reproduction. This spectrum is described on page 26, and in Remark 154, page 186. A list of the lines is given in the sixth column of Table VII.

Oa. Pec. γ Velorum. Enlarged from X 8478, taken April 28, 1897, exposure 99^m. This is the brightest star of the fifth type. The illustration shows the wide bright bands at the approximate wave lengths, 4642 to 4670, and 4682 to 4700, and numerous other bright bands, but in general, the dark lines are not clearly reproduced. This is probably due to the lack of contrast between the hazy dark lines and the continuous spectrum. The wave lengths and intensities of the lines in γ Velorum are given in Table XXVII, and a general description of the spectrum is given on page 247.

Od. ζ Puppis. Enlarged from X 6257, taken December 17, 1894, exposure 34^m. This spectrum is described on pages 148 and 231. The wave lengths and intensities of all the lines, except 3783.4, 4608.2, 5202.2 and 5414 are given in Table XXII. All the lines are dark except the bands 4633 and 4688, approximately, which are bright. The spectrum shows no well marked dark lines except those of the two series of hydrogen.

The constitution of this star appears to be unique. No other spectrum has yet been found in which the second series of hydrogen lines is so well shown. A comparison with the spectrum of α Cygni shows which lines belong to the ordinary series of hydrogen. Between the adjacent known hydrogen lines, and somewhat nearer the lines of shorter wave length, the additional lines appear. These belong to the second series.

B. Pec. γ Cassiopeiæ. Enlarged from C 5189, taken November 23, 1892, exposure 50^m. The spectrum is described in Remark 162, page 100. The presence of both bright and dark lines in this spectrum is shown in the illustration, and also the varying intensity of the different bright and dark lines of hydrogen. The line Hβ is bright, dark edges being faintly perceptible in the original negative. The dark line Hγ is broader than the bright line Hγ, and therefore appears on each side of it. The dark Hδ is as conspicuous as the bright Hδ, and the double reversal described in Remark 162, Part I, is visible in the reproduction. The bright Hϵ is but faintly seen, even in the original negative, while the dark Hϵ is strongly marked. Thus

in the successive lines, the dark lines progressively increase, and the bright lines diminish, so that in the first the bright line only, and in the last the dark line only is conspicuous.

In the translation, by Professor Frost, of Professor Scheiner's work, Die Spectralanalyse der Gestirne, page viii, the statement appears "Professor Scheiner does not believe it possible that dark lines exist in the spectrum of γ Cassiopeiæ, as none have ever been seen in numerous photographs taken at Potsdam." He declined to modify this statement even after he had been shown the Harvard photographs. The dark lines in this star are somewhat wide and hazy and it is perhaps on this account that they have been unable to photograph them with the slit spectroscope at Potsdam. This failure is, however, conclusive evidence of the value of spectra taken with an objective prism for work of this class.

B 2 A. Pec. μ Centauri. Enlarged from X 8362, taken February 8, 1897, exposure 60^m. This spectrum is described in Remark 47, page 178. The relations of the dark and bright portions of the hydrogen lines are shown in the illustration. Hβ is wholly bright, for although very faint dark edges were detected on the original negative, they are too indistinct to show in a reproduction. The decreasing bright central portion and the increasing dark underlying portion of the hydrogen lines from Hβ to Hϵ may be seen in the illustration.

This spectrum closely resembles that of γ Cassiopeiæ, although some differences are perceptible. It is inserted partly to show that the dark lines cannot be due to defects, as has been claimed. It is impossible that a large number of lines due to defect should appear in the same places in the spectra of different stars.

Md. o Ceti. Enlarged from C 11496, taken October 23, 1898, exposure 120^m. This spectrum is of the third type, with bright hydrogen lines. Hη, Hζ, Hϵ, Hδ, Hγ and Hβ are seen in the illustration. This spectrum is described on page 45, and referred to in Remark 131, page 98.

In view of the conspicuous character of the bright hydrogen lines in the spectrum of this and other variable stars of long period, it is remarkable that for years, the discovery of these objects at Harvard by means of these lines, was vehemently denied.

Many astronomers have the impression that the definition of spectra photographed with objective prisms is not good. The scale of the enlargements in Plates I and II is insufficient to show a large portion of the lines visible in the original negative. Unless proper precautions are taken, spurious lines appear in enlargements made with a moving plate or cylindrical lens, which are not readily distinguished from true stellar lines. To show the character of the original negatives,

portions of three of them have been enlarged 8.5 times, with the results shown in Plate III. The entire spectrum, on this scale, would be about two metres in length, and accordingly, only the portion from 3910 to 4110 is shown. The three conspicuous lines are K, Hϵ and Hδ. The scale of these enlargements is very nearly that of Angström's charts, or one ten millionth. Comparing these spectra with those of the Sun, it will be seen that we can now obtain photographs of the spectra of the stars which are fairly comparable with those of the Sun taken thirty years ago. The excellent photograph of the normal solar spectrum, taken by Dr. Henry Draper, was published in December, 1872, and was apparently the best photograph of this object published up to that time. A brief description of the three spectra shown in Plate III is given below.

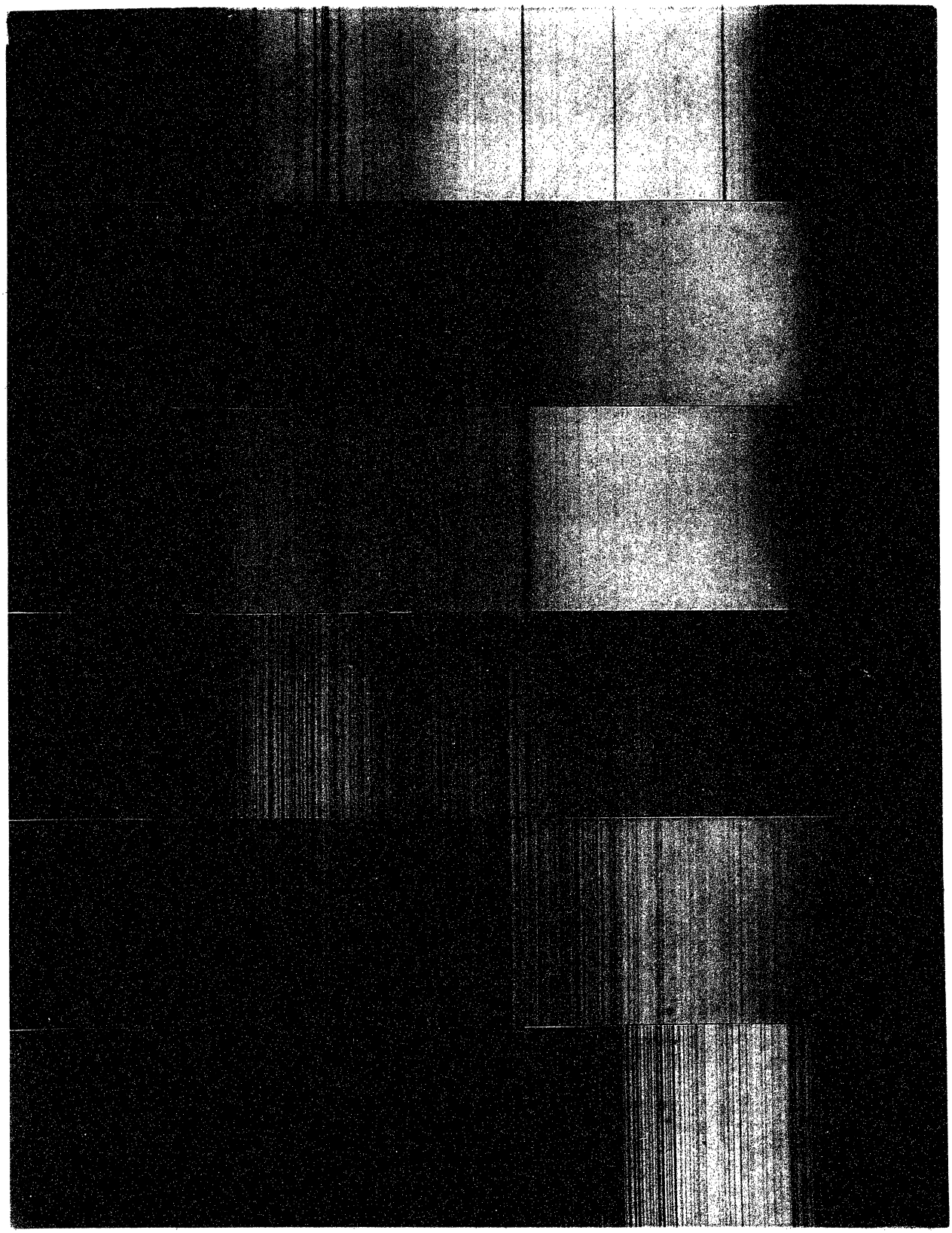
B. I. β Orionis. Enlarged from X 8096, taken October 31, 1896, exposure 60^m. The lines visible, commencing from the left, are 3918.7, 3920.6, 3926.8, K, 3964.6, H, Hϵ, 3994.9, 4009.5, 4026.4, 4075.9, and Hδ. The separation of the calcium line H from the hydrogen line Hϵ, is clearly seen.

A. I. α Canis Majoris. Enlarged from X 8094, taken October 28, 1896, exposure 60^m. This is the same photograph as that used in Plate I. The calcium line H is well separated from the hydrogen line, Hϵ. In the original negative, 14 fine lines can be counted between Hζ and K, 7 between K and H, and 23 between Hϵ and Hδ.

F. I–II. α Carinæ. Enlarged from X 8114, taken November 9, 1896, exposure 82^m. This is the same photograph as that used in Plate I. As compared with α Canis Majoris, a large increase in the number and intensity of the solar lines, and in the intensity of the line K, is seen. The line K is approximately as intense as Hϵ. In the original negative, 21 lines are counted between Hζ and K, 16 between K and Hϵ, and 48 between Hϵ and Hδ.

END OF VOLUME XXVIII.

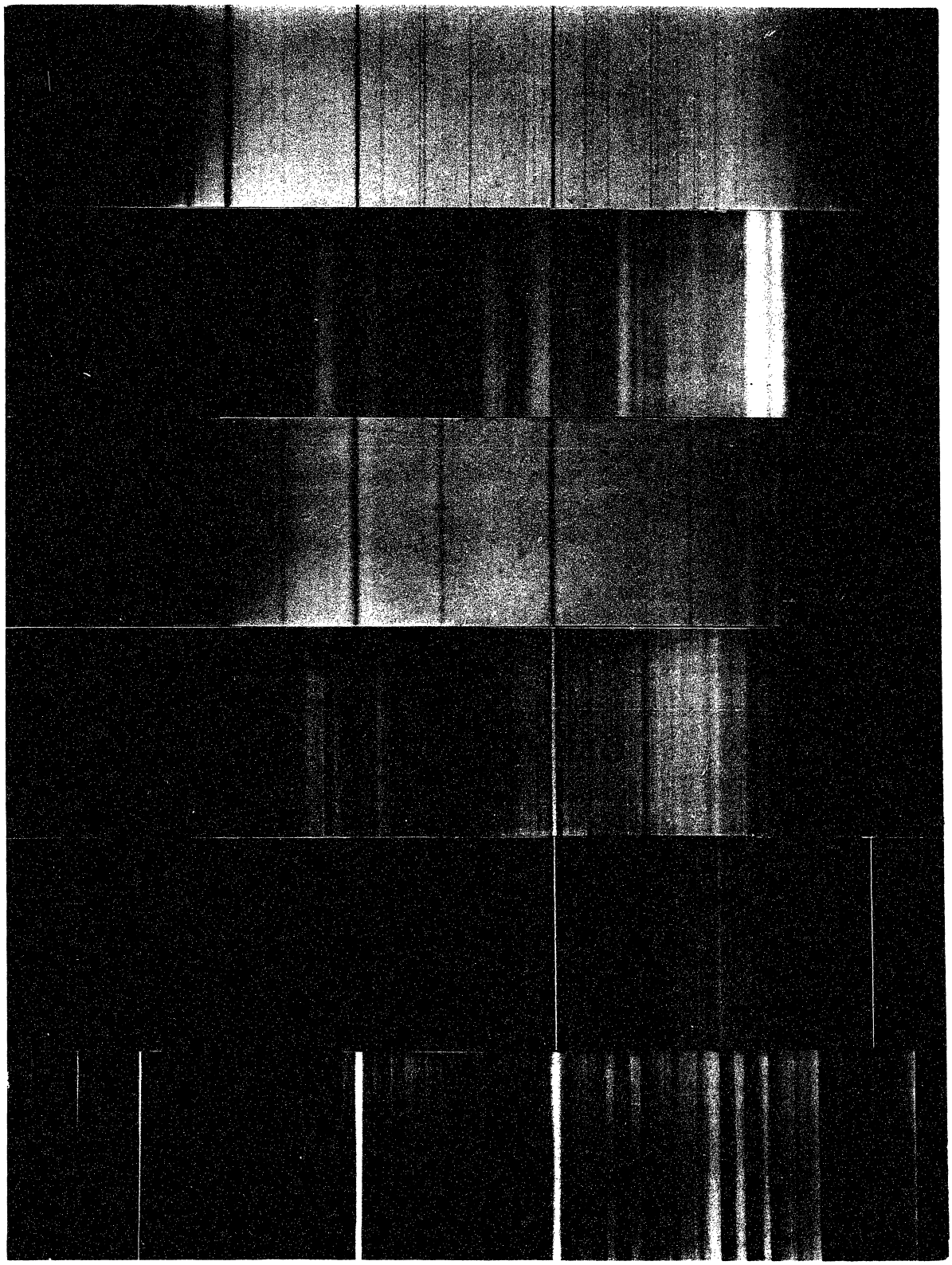
PLATE I.



HELIOTYPE PRINTING CO.

TYPICAL SPECTRA.

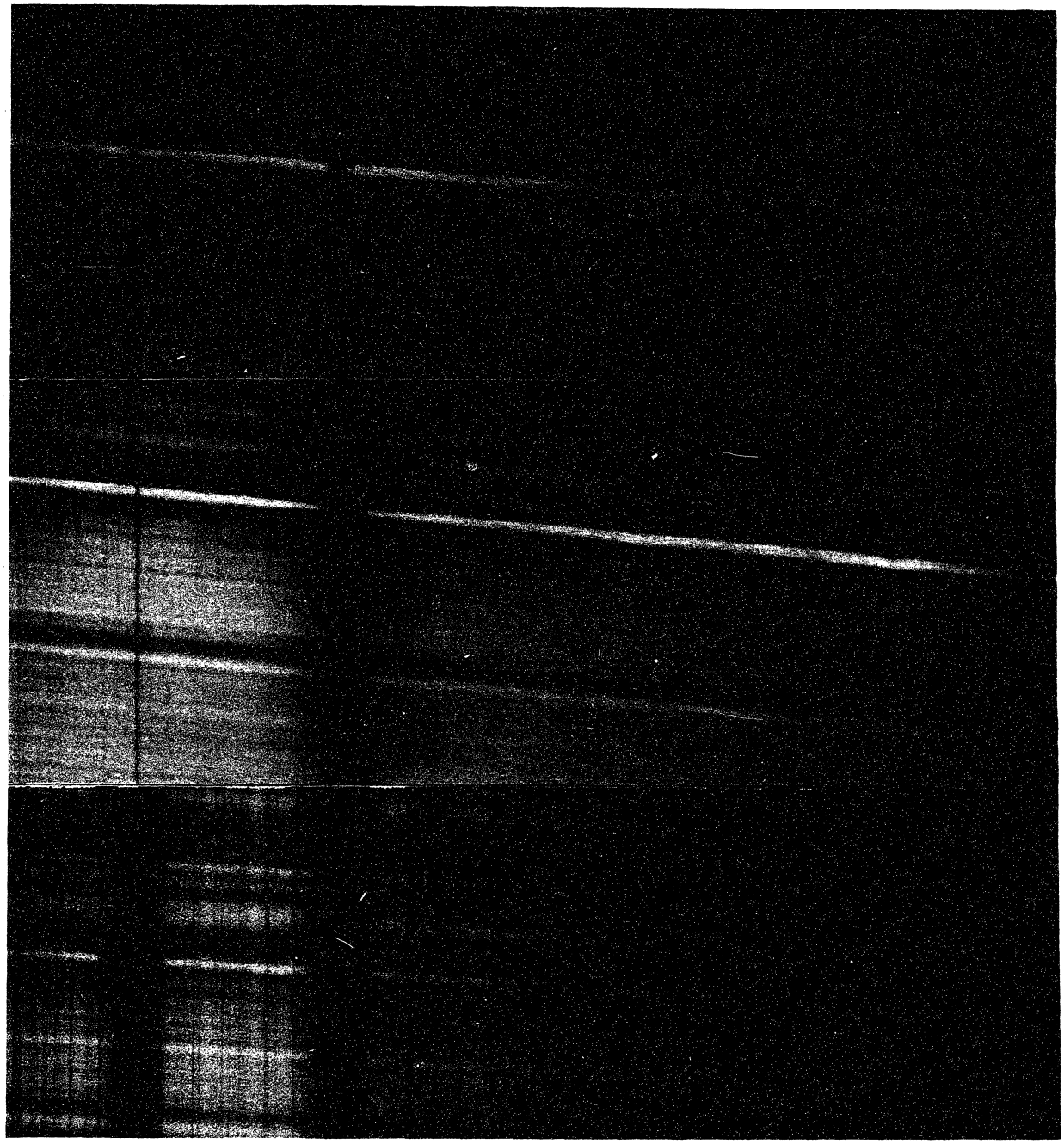
PLATE II.



HELIOTYPE PRINTING CO.

PECULIAR SPECTRA.

PLATE III.



B I — β ORIONIS

A I — α CAN. MAJ.

F I-II — α CARINAE

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DIRECT ENLARGEMENTS.