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Five-Color Photometry of Bright Stars

*Braulio Iriarte, Harold L. Johnson, Richard I. Mitchell, and Wieslaw K. Wisniewski

Astronomers have long agreed on the need for more accurate apparent magnitudes of the naked-eye stars. These are, in general, the stars for which other kinds of information are most complete. But as far as brightnesses are concerned, until fairly recently the best available data were still the visual measurements made some 70 years ago at Harvard and Potsdam observatories.

Excellent as this old work was by the standards of its time, the Harvard and Potsdam photometric catalogues of stars failed to meet most later needs. At best, the probable error of an individual observation was nearly ±0.1 magnitude, and in the Harvard work there were large systematic errors depending on spectral type, amounting to several tenths of a magnitude for faint red stars. Furthermore, astronomers felt a growing need for measurements of star colors as well as brightnesses.

By the 1940's, improvements in photoelectric photometry provided much more powerful methods. With care and a good sky, stars could be measured to an accuracy of about ±0.01 magnitude. By inserting standardized color filters in the photometer, it became possible to measure ultraviolet, blue, and yellow magnitudes of stars. In particular, the filter types used by H. L. Johnson, W. W. Morgan, and D. H. Harris, III, became adopted generally, and served to define the new U, B, and V magnitude system.

> **EDITORIAL COMMENT**
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> Eight years ago we published a list of the 50 brightest stars, compiled by Harold L. Johnson from photoelectric measurements (see August, 1957, page 470). Now Dr. Johnson and his colleagues present (on pages 25-31) a greatly enlarged new listing of magnitudes and colors for 1,325 stars, including those easily visible to the naked eye north of declination −50°.
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> The new **V** values are essentially visual magnitudes, but of far greater precision than in any extended lists available up to a few years ago. Good photographic (blue) magnitudes for bright stars can be obtained by adding the V values to the **B − V** color indexes in the catalogue. Other color data there range from ultraviolet to infrared.

The U magnitudes refer to ultraviolet starlight of around 3600 angstroms wavelength. The blue magnitudes, **B**, have an effective wavelength of 4300, and may be considered as "photographic" magnitudes. They contain no ultraviolet light short of 3800 angstroms, approximately, in order to minimize the difficulties in comparing and combining the results of different observers. Finally, the V magnitudes refer to yellow light of about 5400 angstroms, and are in effect visual magnitudes. They average about 0.1 magnitude brighter than the Harvard visual values.

More recently, photoelectric measurements of stars have also been made in the R (red) and the I (infrared) systems, corresponding to around 7000 and 9000 angstroms, respectively. At still longer effective wavelengths are other kinds of magnitudes, determined with lead sulfide cells: J (12,500 angstroms or 1.25 microns), K (2.2 microns), and L (3.6 microns).

Having so many kinds of accurate stellar magnitudes has greatly widened the concept of star color. Fifty years or more ago, when astronomers were limited to visual and photographic methods, the *color index* of a star meant merely its photographic magnitude minus its visual magnitude: $CI = m_p - m_v$. This index is about 0.0 for white stars (spectral type *A*0), about +1.0 for orange stars (*K*0), and +2 or more for very red stars. For many practical purposes today, we can regard the difference B − V as equivalent to the traditional color index.

Similarly, the difference between any two magnitudes for the same star provides another color index. The catalogue that accompanies this article lists U − V, B − V, V − R, and V − I indexes. For the first star in the table, 33 Piscium, these are +1.91, +1.04, +0.77, and +1.32;

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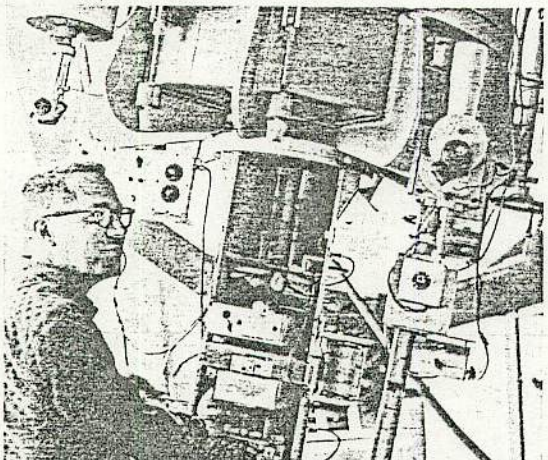
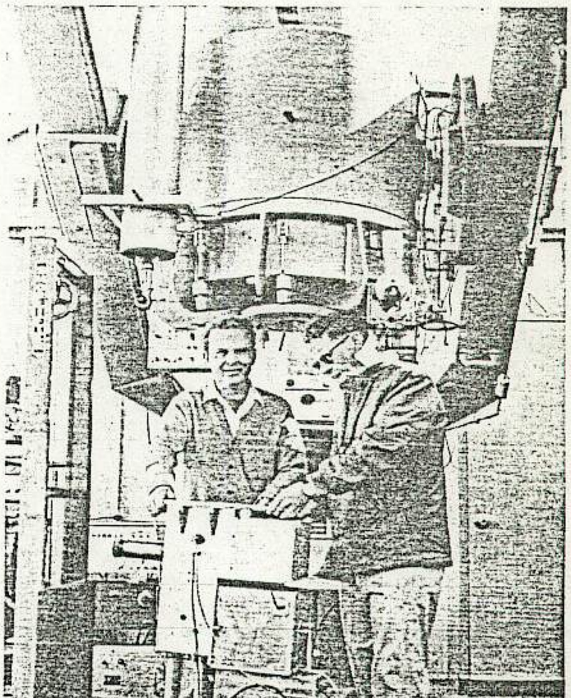
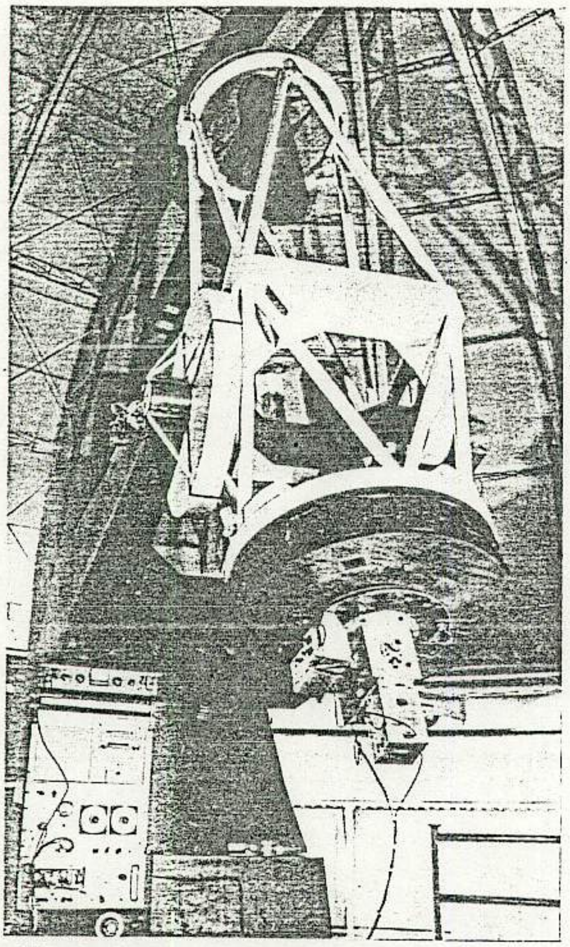
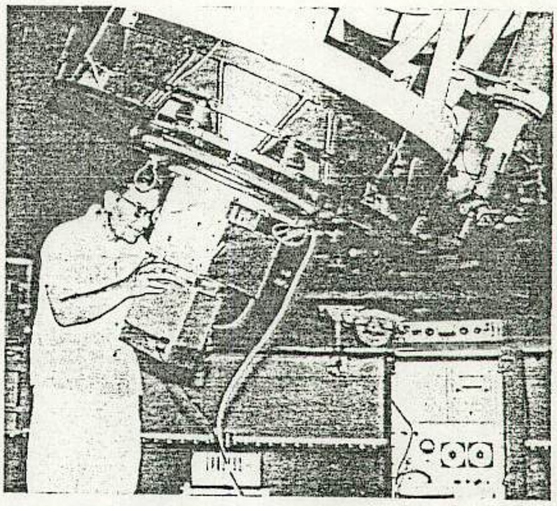




Views of the 28-inch Cassegrain reflector at the Catalina station (see *Sky and Telescope* for January, 1964). In David Steinmetz's photograph above, James R. Percy services the bolometer. At right W. K. Wisniewski (left) and Mr. Steinmetz prepare to attach the lead sulfide infrared photometer to the telescope; photograph by Dennis Milon.





Views of the 40-inch Cassegrain reflector at Mexico's National Astrophysical Observatory, located in the village of Tonantzintla, state of Puebla, 80 miles east of Mexico City. Above, Braulio Iriarte places a star in the diaphragm of the photoelectric photometer. At left, the instrument's fork mounting is seen, together with the photometer, and electronic control panel (lower left).

adding the first two of them to the V magnitude (4.61) of 33 Piscium gives U = 6.52 and B = 5.65 for this star. Subtracting the last two indexes from V gives R = 3.84 and I = 3.29. Thus 33 Piscium (a giant star of spectral class *K*1) appears progressively brighter as we consider its magnitudes from ultraviolet to infrared.

Systematic photoelectric measurement of all these kinds of magnitudes for all naked-eye stars is an enormous task that is still unfinished. The situation until recently was aptly characterized by some remarks in R. O. Redman's address on modern astronomical photometry (*Observatory, 81,* 49-57, 1961).

He said: "My only complaint, as a potential user, is that for quite good astrophysical reasons *UBV* measurements have been very much concentrated in special regions, *e. g.* in clusters, and that not enough brighter stars in general have been measured in this system. My hard-hearted colleagues tell me that I must make the measurements myself, but anyone who has tried this type of photometry in the usual English sky will understand why I have a certain reluctance to undertake such work. At present there are more bright stars with first class magnitudes and colours in the southern sky than in the north, thanks to the Cape Observatory [in South Africa]."

We are fortunate that the southwestern United States and much of Mexico have a climate admirably suited for photoelectric photometry, because of the large proportion of extremely clear nights and general freedom from high-level cloudiness.

During the last two years, staff members of the Lunar and Planetary Laboratory (University of Arizona) and astronomers of the Observatorio Astrofisico Nacional (Tonantzintla, Mexico) have participated in a cooperative program of photoelectric photometry of the brightest stars.

Beginning on page 25, we present photoelectric measurements of more than 1,300 bright stars in five broad wavelength bands—U, B, V, R, and I. The stars selected are those brighter than 5.0 on the Harvard visual system. The catalogue is complete to this limit for all of the sky north of declination −30°, and almost complete between −30° and −50°. A few stars fainter than 5th magnitude have also been included.

Collection of Data

The photoelectric observations on which this catalogue is based began in January, 1963, with the 21-inch reflector of the Lunar and Planetary Laboratory in Arizona's Catalina Mountains, 8,250 feet above sea level. That same July, our 28-inch telescope at 8,450 feet came into use on this program. In January, 1965, just two years later, we completed the measurements at this station, in latitude 32° north. At Tonantzintla (7,500 feet elevation, latitude 19° north), observations were begun in February, 1963, and have continued through this May.

Lunar and Planetary Laboratory staff members who took part in the observing included Harold L. Johnson, Richard Mitchell, David Steinmetz, Kent Underwood, Michael Wirick, and Wieslaw K. Wisniewski. The Tonantzintla observations were made by Braulio Iriarte, E. E. Mendoza, and Dr. Johnson.

Descriptions of our UBV and UBVRI photometers have been published in several places, for example in Chapter 7 of *Astronomical Techniques* (edited by W. A. Hiltner, University of Chicago Press, 1962), and *Communications* of the Lunar and Planetary Laboratory (*1,* 73, 1962). The Catalina photometer contains the original 1P21 photomultiplier tube and filters that defined the UBV system.

The Tonantzintla photometer uses a 7102 photomultiplier. Because of the red sensitivity of this tube, a special filter had to be added to cut the red leaks of the B and V filters. U measurements could not be made.

An important aspect of our program is the automatic data collection system, made possible by a highly routine observ-

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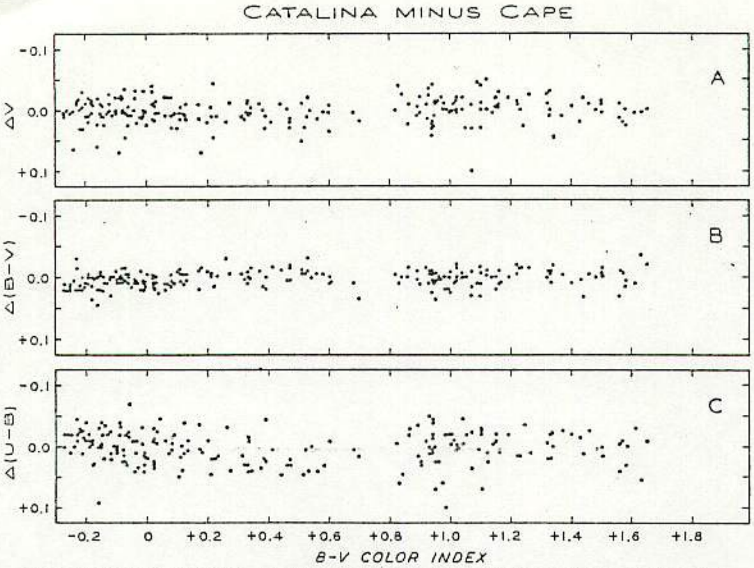


Comparisons of Catalina measurements and Cape of Good Hope photometry (from Royal Observatory *Bulletin 64*) for stars between declinations −10° and +6°. In each case the ordinate is the difference Catalina minus Cape.

ing procedure. Beforehand, an IBM card is punched for each star, listing an identification number, the right ascension and declination, spectral type, and visual brightness. (For a faint star, a finder chart may be pasted on the unused portion of the card.) At the time of observation, the identification and coordinates are punched from the card into a paper-tape record. On this tape are then punched the photometric measures of the star, the sky background brightness, and the time. Finally, the observer characterizes the observation as good or bad by means of push buttons.

The tape records from several nights are converted to IBM cards, which are fed into a computer. This computer is programmed to correct the observations for atmospheric extinction and to convert them to the standard UBVRI system. Many astronomers now use computers to reduce their photometric observations.

Some Further Comments

The original UBV system is defined by northern stars, many of which cannot be reached by Southern Hemisphere observers. Therefore our new UBV measurements, extending to declination −50°, provide additional checks on the photometry in the southern sky.

Recently the Cape Observatory published two lists of UBV magnitudes for most of the bright southern stars (in *Bulletin 64* of the Royal Observatory, and in a mimeogram entitled *Photometry from 1961 to 1963*). Both lists are internally consistent and are close to the original UBV system. The accompanying charts comparing Cape and Catalina data show the mutual consistency of these two series. This comparison is made for equatorial stars that were observed at approximately equal altitudes from Arizona and South Africa.

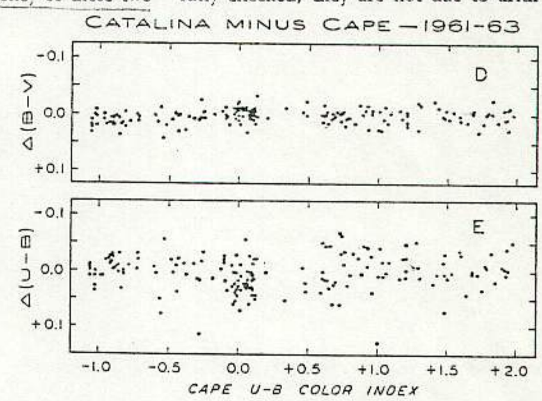
However, for the bluest stars, the Cape B − V values (chart B) tend to be more negative than values in the Johnson-Morgan standard system. The Tonantzintla comparison (chart F) confirms this systematic effect for stars from declinations −30° to −50°. The effect is clearest in chart D, in which the Catalina values are compared with those from the Cape mimeograms, this time the B − V differences being plotted against U − B values.

From chart D comes a simple rule for the correction of the Cape B − V color indexes: If U − B is negative, apply −0.015 (U − B) to the Cape B − V value. If U − B is positive, no correction is applied.

This precept is the only correction needed for the Cape southern photometry. Although the systematic effect seems to come from a difference in the ultraviolet transmissions of the B (blue) filters, no corrections seem needed for the Cape U − B measures, since they fit the U − B system reasonably well.

It should be remembered that the new Catalina-Tonantzintla observations do not define the UBV system. Its formal definition is the data for 108 standard stars, published by Johnson and Harris in the *Astrophysical Journal, 120,* 196, 1954.

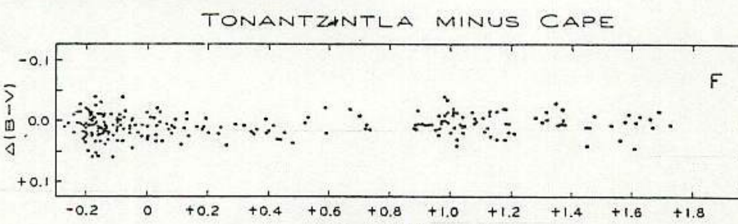
According to the new data, Vega (B.S. 7001) is 0.04 magnitude brighter than the standard value. Perhaps the star is variable. Such differences have been carefully checked; they are not due to arithmetic errors, and instead may represent statistical uncertainty, with some contribution from stellar variability.



Cape of Good Hope data compared with Catalina measurements as a function of the color U − B, for stars in the declination zone −10° to +6°. The ordinate in each case is the difference Catalina minus Cape.

The precision of measurement can be evaluated in two ways. The repeatability of the measures of nonstandard stars gives the internal probable error of an observation; comparison with independent data furnishes the external error.

Here are the probable errors of a single observation of each type at Catalina, in units of ±0.001 magnitude: V, 17; U − V, 20; B − V, 9; V − R, 16; V − I, 16. The corresponding probable errors for a single



Comparison of Mexican color indexes and Cape values for stars in the declination zone −30° to −50°, well south of the equator. The ordinate is the difference Tonantzintla minus Cape.

Tonantzintla observation are 35, —, 20, 23, 23. (The dash is used because ultraviolet measurements were not made at Tonantzintla, as pointed out previously.)

One of the authors (Johnson) has studied the absolute calibration of the new observations, and his detailed results will appear in the *Communications* of the Lunar and Planetary Laboratory.

All stars have been observed on three or more nights, unless noted otherwise. The tabulated magnitudes and color indexes are weighted means, the individual observations being weighted in inverse proportion to the air mass traversed by the star's light.

For measures south of declination −30°, some Catalina data have been averaged with Tonantzintla data, and some Tonantzintla observations of stars north of −30° have been averaged with Catalina measures.

Parentheses around a V magnitude in the table indicate a Cape Observatory value used instead of a Tonantzintla one. Because of time variations in the yellow-light extinction at the Mexican station during this work, the Tonantzintla V magnitudes are affected by systematic effects depending on the right ascensions of the stars, and the weight of such a Tonantzintla observation is about a quarter of a Cape one.

Some 70 references were searched to collect the spectral data. W. P. Bidelman of the University of Michigan helped greatly by reading our preliminary list, contributing a number of his own spectral classifications, and providing additional references.

The Arizona–Tonantzintla Catalogue

Magnitudes and Colors of 1,325 Bright Stars

THE stars are listed by their numbers (B.S.) in the Yale University Observatory *Catalogue of Bright Stars* (1964). These are the same numbers used in the *Harvard Revised Photometry*, published in 1908 as Vol. 50 of the *Annals* of Harvard Observatory.

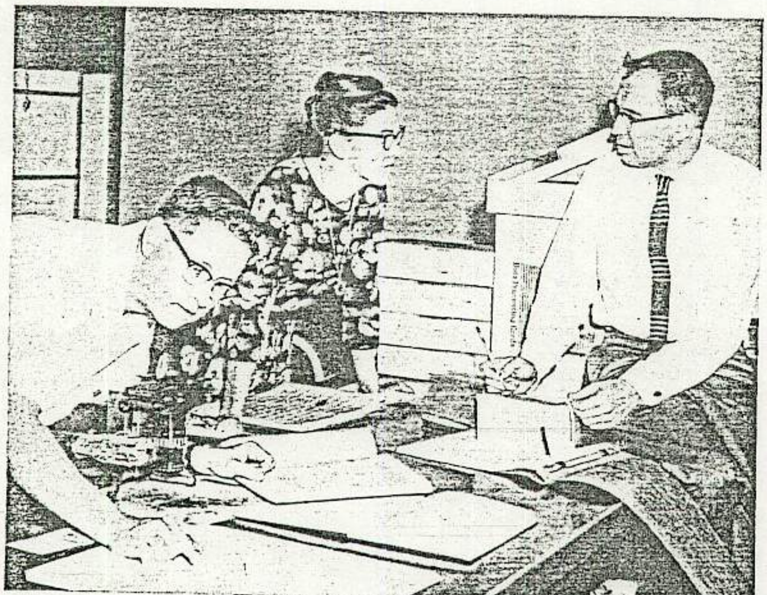
An asterisk following the B.S. number indicates a note at the end of the catalogue; *W* (weak) indicates a single observation; *S*, a standard star; *V*, a variable star whose range exceeds 0.08 magnitude, usually with additional information in a note; *D* (double or multiple), two or more neighboring stars measured as one, if the magnitude difference is less than 5.

The star names are given in the next column. Because this table is a computer printout, only capital Roman letters were available to represent the familiar Greek-letter names (see key list). Thus the second star, Alpha Andromedae, appears as ALF AND. In a case such as B.S. 253, UPS 1 CAS is to be read Upsilon[1] Cassiopeiae. In this column there are some blanks, for stars that have neither Bayer letters nor Flamsteed numbers.

ALF	Alpha	α	NU	Nu	ν
BET	Beta	β	XI	Xi	ξ
GAM	Gamma	γ	OMI	Omicron	o
DEL	Delta	δ	PI	Pi	π
EPS	Epsilon	ϵ	RHO	Rho	ρ
ZET	Zeta	ζ	SIG	Sigma	σ
ETA	Eta	η	TAU	Tau	τ
THE	Theta	θ	UPS	Upsilon	υ
IOT	Iota	ι	PHI	Phi	ϕ
KAP	Kappa	κ	CHI	Chi	χ
LAM	Lambda	λ	PSI	Psi	ψ
MU	Mu	μ	OMG	Omega	ω

Following the right ascension and declination of each star for epoch 1960 are given the V magnitude and the U − V, B − V, V − R, and V − I indexes, as explained above.

The final column lists spectral types and luminosity classes, whenever possible in the Yerkes (Morgan-Keenan) system. The Roman numeral I indicates a supergiant star, II a bright giant, III a normal giant, IV a subgiant, and V a main-sequence (dwarf) star. When Yerkes classifications are not available, spectral types are taken from the Mount Wilson *General Catalogue of Radial Velocities*. Suffixed letters in the Mount Wilson types have these meanings: *m*, metallic-line star; *n*, broad lines; *nn*, very broad lines; *p*, peculiar; *e*, with emission lines.



Much of the work on this program is not done at night. At left, David Steinmetz is consulting a catalogue and star maps to prepare finding charts for later use at the telescope. Kathryn Sheffer and Richard Mitchell discuss some observing data received from Tonantzintla, Mexico. Lunar and Planetary Laboratory photograph by Dennis Milon.

B.S. NOTES ON INDIVIDUAL STARS

215 Eclipsing var. V spread of our three measures is 0.14 mag.

264 Novalike var. Our two measures differ by 0.10 mag. in V.

403 Algol-type var. Observed outside of eclipse.

424 *Polaris*, Cepheid var. Mean of three observations.

493 A single Catalina observation has been averaged with three BVRI ones from Tonantzintla.

681 *Mira*. Data in table refer to epoch JD 2,438,675, near time of minimum light. Other observations near maximum, at JD 2,438,473, give: V = 3.42; U − V = 2.52; B − V = 1.68; V − R = 2.15; V − I = 4.02. Visual range about 2.0 to 10.1.

1144 Tonantzintla BVRI measures combined with Johnson's published UBV.

1151 See note to 1144.

1155 Previously suspected var. Our four measures show a V spread of 0.12 mag.

1172 See note to 1144.

1180 *BU Tauri*, irregular var. V spread of our measures is 0.09 mag. See note to 1144.

1239 Algol-type var. Our three measures have a V spread of 0.11 mag.

1414 See note to 1144.

1496 Previously suspected var. Our three measures show a V spread of 0.09 mag.

1547 See note to 1144.

1567 Ellipsoidal-binary var. Our three measures show a V spread of 0.07 mag.

1612 Algol-type var. Observed outside of eclipse.

1781 See note to 1144.

1845 *CE Tauri*, semiregular var. Our three measures show a V spread of 0.11 mag.

1868 Eclipsing var. Mean of five measures.

2061 *Betelgeuse*, semiregular var. Epoch is JD 2,438,317.

(Continued on page 31)

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THE ARIZONA-TONANTZINTLA CATALOGUE—MULTICOLOR PHOTOMETRY UBVRI

B.S.	NAME	R.A. (1960)	DEC.	V	U-V	B-V	V-R	V-I	MK SP.
3	33 PSC	0 3.3	-5 56	4.61	1.91	1.04	0.77	1.32	K1 III
15	ALF AND	0 6.3	28 52	2.06	-0.58	-0.11	-0.02	-0.12	B8p
21	BET CAS	0 7.0	58 56	2.28	0.45	0.34	0.31	0.52	F2 IV
25 W	EPS PHE	0 7.4	-45 58	(3.87)	.	0.99	0.75	1.27	K0 III
27	22 AND	0 8.2	45 51	5.04	0.66	0.40	0.41	0.70	F2 II
39	GAM PEG	0 11.2	14 58	2.86	-1.08	-0.21	-0.08	-0.31	B2 IV
45 S	CHI PEG	0 12.5	19 59	4.80	3.50	1.58	1.33	2.45	M2 III
48 V	7 CET	0 12.7	-19 9	4.46	3.61	1.66	1.40	2.54	gM1
63	THE AND	0 15.0	38 28	4.61	0.13	0.06	0.08	0.09	A2 V
68	SIG AND	0 16.2	36 34	4.50	0.13	0.06	0.08	0.08	A2 V
74	IOT CET	0 17.4	-9 3	3.55	2.39	1.22	0.85	1.44	K2 III
99 W	ALF PHE	0 24.3	-42 31	(2.38)	.	1.09	0.81	1.40	K0 III
100 W	KAP PHE	0 24.3	-43 54	(3.92)	.	0.18	0.14	0.22	A7 Vn
125WV	ETA SCL	0 25.9	-33 14	4.84	.	1.62	1.59	2.97	M5
123 D	LAM CAS	0 29.5	54 18	4.74	-0.45	-0.10	0.01	-0.11	B8
130	KAP CAS	0 30.7	62 43	4.16	-0.67	0.13	0.15	0.22	B1 Ia
153	ZET CAS	0 34.7	53 41	3.66	-1.07	-0.18	-0.06	-0.28	B2 V
154	PI AND	0 34.7	33 30	4.36	-0.71	-0.16	-0.04	-0.16	B5 V
163	EPS AND	0 36.4	29 6	4.39	1.34	0.87	0.68	1.19	G8 IIIp
165	DEL AND	0 37.2	30 39	3.30	2.77	1.30	0.92	1.58	K3 III
168	ALF CAS	0 38.2	56 19	2.22	2.30	1.17	0.79	1.38	K0 II-III
179	XI CAS	0 39.8	50 18	4.81	-0.76	-0.10	-0.00	-0.12	B2 V
180	MU PHE	0 39.4	-46 18	(4.58)	.	0.96	0.75	1.27	G8 III
188	BET CET	0 41.6	-18 12	2.00	1.88	1.00	0.72	1.24	K1 III
193	OMI CAS	0 42.5	48 4	4.50	-0.59	-0.06	0.05	-0.00	B2 V
194	PHI CET	0 42.2	-10 50	4.75	1.84	1.00	0.74	1.24	K0 III
215 V	ZET AND	0 45.2	24 3	4.06	1.99	1.12	0.84	1.44	K1 II
219 D	ETA CAS	0 46.6	57 37	3.43	0.62	0.58	0.50	0.86	G0 V
224	DEL PSC	0 46.6	7 22	4.44	3.39	1.51	1.17	2.04	K5 III
226	NU AND	0 47.6	40 52	4.52	-0.72	-0.15	-0.03	-0.18	B5 V
244		0 50.6	60 54	4.83	0.65	0.53	0.48	0.77	F8 V
248	20 CET	0 51.0	-1 21	4.78	3.49	1.57	1.23	2.14	M0 III
253	UPS 1 CAS	0 52.6	58 46	4.84	2.48	1.22	0.92	1.53	K2 III
254 V	GAM CAS	0 54.3	60 30	2.41	-1.21	-0.11	0.09	0.00	B0 IV:e
265	UPS 2 CAS	0 54.2	58 58	4.64	1.66	0.96	0.77	1.27	G8 III-IV
269	MU AND	0 54.5	38 17	3.87	0.27	0.12	0.15	0.23	A4 III
271	ETA AND	0 55.1	23 13	4.39	1.64	0.95	0.73	1.21	G8 III-IV
280	ALF SCL	0 56.7	-29 34	4.27	-0.70	-0.16	-0.03	-0.16	B8 IIIp
285		1 2.9	86 3	4.27	2.54	1.21	0.88	1.48	K2 III
294	EPS PSC	1 0.9	7 41	4.28	1.67	0.97	0.78	1.31	K0 III
322 D	BET PHE	1 4.3	-46 56	(3.30)	.	0.89	0.71	1.23	G8 III
334	ETA CET	1 6.6	-10 24	3.43	2.35	1.15	0.84	1.41	K3 III
335 D	PHI AND	1 7.2	47 1	4.25	-0.41	-0.07	0.05	-0.00	B7 V
337	BET AND	1 7.5	35 25	2.04	3.53	1.57	1.24	2.24	M0 III
343	THE CAS	1 8.6	54 56	4.36	0.30	0.17	0.19	0.26	A7 V
351	CHI PSC	1 9.3	20 49	4.66	1.84	1.03	0.76	1.30	G8 III
352	TAU PSC	1 9.5	29 53	4.51	2.10	1.10	0.82	1.40	K0 III-IV
360	PHI PSC	1 11.5	24 22	4.66	1.87	1.03	0.75	1.28	K0 III
370	NU PHE	1 13.4	-45 45	(4.95)	.	0.59	0.49	0.85	F8 V
382	PHI CAS	1 17.5	58 1	4.99	1.18	0.68	0.63	1.20	F0 Ia
383	UPS PSC	1 17.3	27 3	4.76	0.13	0.03	0.08	0.13	A3 V
390	XI AND	1 20.0	45 19	4.90	2.05	1.08	0.81	1.34	K0 III-IV
399	PSI CAS	1 23.1	67 55	4.74	1.97	1.03	0.77	1.29	K0 III
402	THE CET	1 22.0	-8 23	3.59	1.99	1.06	0.76	1.33	K0 III
403 V	DEL CAS	1 23.2	60 2	2.69	0.28	0.13	0.15	0.24	A5 V
417	OMG AND	1 25.3	45 12	4.83	0.41	0.42	0.41	0.64	F4 IV
424DV	ALF UMI	1 55.7	89 5	2.04	0.97	0.59	0.50	0.81	F8 Ib
429 V	GAM PHE	1 26.6	-43 31	(3.40)	.	1.56	1.26	2.24	K5 II
434	MU PSC	1 28.0	5 57	4.83	2.95	1.38	1.06	1.60	K4 III
437	ETA PSC	1 29.3	15 8	3.62	1.69	0.97	0.71	1.20	G8 III
440	DEL PHE	1 29.6	-49 17	(3.94)	.	0.98	0.75	1.26	K0 III-IV
442	CHI CAS	1 31.3	59 2	4.72	1.76	1.00	0.77	1.30	G8 III
458	UPS AND	1 34.4	41 12	4.11	0.60	0.54	0.46	0.75	F8 V
464	51 AND	1 35.5	48 26	3.59	2.70	1.29	0.96	1.61	K3 III
477	TAU AND	1 38.2	40 23	4.94	-0.50	-0.09	-0.01	-0.07	B8 IV
483		1 39.3	42 26	4.97	0.70	0.61	0.53	0.86	G2 V
489	NU PSC	1 39.3	5 17	4.44	2.92	1.36	1.06	1.77	K3 III
493 *	107 PSC	1 40.3	20 4	5.28	1.29	0.83	0.68	1.11	K1 V
496 V	PHI PER	1 41.1	50 29	4.06	-0.96	-0.04	0.18	0.20	B2pe
509	TAU CET	1 42.2	-16 9	3.50	0.95	0.72	0.62	1.09	G8 Vp
510	OMI PSC	1 43.3	8 57	4.26	1.64	0.96	0.74	1.23	G8 III
531	CHI CET	1 47.6	-10 53	4.65	0.36	0.33	0.28	0.44	F2 IV
539	ZET CET	1 49.5	-10 32	3.72	2.21	1.14	0.80	1.35	K2 III
542	EPS CAS	1 51.5	63 28	3.38	-0.77	-0.15	-0.03	-0.15	B3 IV:p
544	ALF TRI	1 50.8	29 23	3.44	0.57	0.49	0.42	0.70	F6 IV
545/6	GAM ARI	1 51.3	19 6	3.88	-0.17	-0.04	0.01	-0.04	B9 V /A1p
549	XI PSC	1 51.5	2 59	4.63	1.64	0.94	0.73	1.20	K0 III
553	BET ARI	1 52.4	20 37	2.64	0.23	0.13	0.12	0.18	A5 V
555	PSI PHE	1 52.0	-46 30	(4.40)	.	1.59	1.73	3.24	M4 III
558	PHI PHE	1 52.7	-42 42	(5.11)	.	-0.07	0.02	-0.04	B9
569	LAM ARI	1 55.6	23 24	4.79	0.37	0.28	0.29	0.45	F2 IV
574		1 55.6	-47 36	(4.83)	.	0.88	0.70	1.15	G4
575	48 CAS	1 58.6	70 42	4.54	0.22	0.16	0.19	0.27	A4 V
580	50 CAS	1 59.9	72 13	3.98	0.02	-0.01	0.07	0.06	A1 V
585	UPS CET	1 58.1	-21 16	4.00	3.45	1.56	1.26	2.29	M1 III
590	4 PER	1 59.6	54 18	5.04	-0.40	-0.08	0.03	-0.01	B8 V
595/6	ALF PSC	2 0.0	2 34	3.82	-0.07	0.02	0.09	0.08	A2p
602	CHI PHE	2 0.1	-44 54	(5.14)	.	1.48	1.22	2.11	M0
603/4	GAM AND	2 1.4	42 8	2.10	2.13	1.21	0.94	1.63	K3 II+A
612	NU FOR	2 2.7	-29 29	4.69	-0.65	-0.16	-0.03	-0.18	A0 V Si
617 S	ALF ARI	2 4.9	23 16	2.00	2.27	1.15	0.84	1.48	K2 III
618		2 5.8	58 14	5.71	0.61	0.61	0.61	1.11	A1 Ia
620	58 AND	2 6.1	37 40	4.83	0.26	0.12	0.15	0.21	A4 V
622	BET TRI	2 7.2	34 48	3.00	0.30	0.16	0.15	0.22	A5 III
648	19 ARI	2 10.9	15 6	5.69	3.54	1.56	1.23	2.20	M0 III
649	XI 1 CET	2 10.9	8 40	4.37	1.49	0.88	0.67	1.16	G8 II
664	GAM TRI	2 14.9	33 40	4.01	0.04	0.03	0.04	0.03	A0 V
681 V	OMI CET	2 17.3	-3 9	8.71	1.30	1.57	4.37	7.81	gM6e
696	10 PER	2 22.4	56 27	6.30	-0.33	0.28	0.39	0.57	B2 Ia
699	65 AND	2 22.9	50 6	4.70	3.43	1.53	1.15	2.02	K4 III
707 D	IOT CAS	2 25.7	67 13	4.52	0.19	0.13	0.16	0.22	A5p
708	RHO CET	2 24.0	-12 28	4.89	-0.06	-0.02	-0.01	-0.04	B9 V
718 S	XI 2 CET	2 26.0	8 17	4.28	-0.19	-0.06	0.04	0.00	B9 III
721	KAP ERI	2 25.5	-47 53	(4.24)	.	-0.13	-0.03	-0.16	B5 III
740	SIG CET	2 30.2	-15 25	4.74	0.44	0.44	0.41	0.68	F5 IV-V
749 D	OMG FOR	2 32.1	-28 24	4.89	-0.15	-0.05	0.02	-0.05	B9
753 S		2 33.9	6 42	5.82	1.76	0.97	0.85	1.37	K3 V
779	DEL CET	2 37.4	0 9	4.06	-1.09	-0.21	-0.07	-0.27	B2 IV
788	12 PER	2 39.7	40 2	4.92	0.73	0.59	0.50	0.80	F9 V
789		2 38.3	-43 4	(4.74)	.	0.08	0.10	0.11	A2 V
794	IOT ERI	2 39.1	-40 2	(4.10)	.	1.01	0.79	1.35	K0 III
799	THE PER	2 41.5	49 4	4.13	0.50	0.49	0.46	0.76	F7 V
801	35 ARI	2 41.1	27 32	4.67	-0.75	-0.13	-0.01	-0.14	B3 V
804 D	GAM CET	2 41.2	3 4	3.47	0.17	0.10	0.11	0.16	A2 V
811	PI CET	2 42.2	-14 2	4.25	-0.59	-0.14	-0.01	-0.15	B7 V
813	MU CET	2 42.8	9 57	4.28	0.39	0.31	0.31	0.50	F0 IV
818	TAU 1 ERI	2 43.2	-18 44	4.46	0.48	0.48	0.43	0.70	F6 V
824	39 ARI	2 45.5	29 5	4.52	2.14	1.11	0.80	1.38	K1 III
825		2 46.5	56 55	6.26	1.40	0.87	0.82	1.58	A5 Ia
834	ETA PER	2 47.8	55 44	3.79	3.59	1.69	1.23	2.12	K3 Ib
838	41 ARI	2 47.6	27 6	3.63	-0.48	-0.10	-0.00	-0.11	B8 V
840	16 PER	2 48.0	38 9	4.24	0.43	0.35	0.30	0.52	F2 III
841	BET FOR	2 47.4	-32 34	(4.45)	.	0.98	0.76	1.30	G6 III
843	17 PER	2 49.0	34 54	4.54	3.50	1.56	1.19	2.18	K5 III
850	TAU 2 ERI	2 49.2	-21 10	4.77	1.51	0.90	0.70	1.17	K0 III
854	TAU PER	2 51.4	52 36	3.95	1.20	0.75	0.63	1.07	gG1 COMP.
874	ETA ERI	2 54.5	-9 3	3.87	2.11	1.12	0.79	1.37	K1 III-IV
875 S		2 54.6	-3 52	5.17	0.13	0.08	0.11	0.18	A1 V
879	PI PER	2 56.2	39 30	4.70	0.18	0.06	0.10	0.14	A2 V
882	24 PER	2 56.6	35 1	4.94	2.53	1.25	0.89	1.53	K2 III
896	LAM CET	2 57.6	8 45	4.70	-0.57	-0.12	-0.02	-0.14	B5 III
897/8	THE ERI	2 56.8	-40 28	(2.90)	.	0.13	0.15	0.22	A3 V
911	ALF CET	3 0.2	3 56	2.52	3.57	1.63	1.35	2.51	M2 III
915	GAM PER	3 1.9	53 21	2.94	1.16	0.70	0.61	1.06	G8III:+A3:
919	TAU 3 ERI	3 0.6	-23 47	4.07	0.27	0.17	0.13	0.22	A4 V
921 V	RHO PER	3 2.6	38 41	3.39	3.38	1.67	1.78	3.39	M4 IIIa
932	.	3 7.5	74 15	4.87	0.07	0.03	0.08	0.07	A0 V
936 V	BET PER	3 5.6	40 48	2.15	-0.44	-0.06	0.07	0.04	B8 V
937	IOT PER	3 6.2	49 28	4.07	0.77	0.59	0.54	0.83	G0 V
941	KAP PER	3 6.8	44 42	3.81	1.81	0.98	0.75	1.25	K0 III
947	OMG PER	3 8.7	39 28	4.64	2.13	1.11	0.83	1.39	K0 III
951	DEL ARI	3 9.3	19 35	4.37	1.89	1.03	0.77	1.28	K2 III
963	ALF FOR	3 10.3	-29 9	3.85	0.57	0.52	0.46	0.77	F8 IV
972	ZET ARI	3 12.6	20 54	4.89	-0.03	-0.02	0.08	0.05	A0 IV
984	ZET ERI	3 13.9	-8 58	4.80	0.32	0.23	0.23	0.34	A7m
985		3 16.4	65 31	4.84	-0.92	-0.14	-0.02	-0.14	B2 Ve
991		3 16.2	34 5	4.82	3.06	1.49	1.05	1.81	K2 II
996	KAP CET	3 17.3	3 13	4.84	0.89	0.69	0.56	0.93	G5 V
999		3 17.9	28 55	4.46	3.33	1.54	1.17	2.05	K4 III
1002	32 PER	3 18.8	43 11	4.94	0.11	0.06	0.07	0.08	A3 V
1003	TAU 4 ERI	3 17.7	-21 54	3.70	3.43	1.62	1.57	3.04	gM3
1008	e ERI	3 18.3	-43 13	(4.26)	.	0.72	0.62	1.02	G5 V
1017	ALF PER	3 21.5	49 43	1.80	0.88	0.48	0.45	0.78	F5 Ib
1030	OMI TAU	3 22.7	8 53	3.60	1.51	0.90	0.67	1.12	G8 III
1034		3 25.2	48 55	5.00	-0.69	-0.13	0.00	-0.09	B3 V
1035		3 25.8	59 48	4.20	0.18	0.41	0.37	0.76	B9 Ia
1038	XI TAU	3 25.0	9 36	3.74	-0.42	-0.08	-0.00	-0.10	B8 V
1040		3 26.7	58 45	4.55	0.46	0.56	0.55	1.06	A0 Ia
1044	34 PER	3 26.5	49 22	4.68	-0.68	-0.10	0.01	-0.09	B3 IV
1046 D		3 26.9	55 19	5.13	0.08	0.01	0.09	0.09	A1 V
1052	SIG PER	3 27.7	47 52	4.37	2.89	1.35	1.07	1.81	K3 III
1066	5 TAU	3 28.7	12 48	4.09	2.16	1.13	0.76	1.31	K0 II-III
1069	36 PER	3 29.5	45 56	5.33	0.41	0.42	0.40	0.63	F4 III
1070	17 ERI	3 28.6	-5 13	4.73	-0.36	-0.09	0.01	-0.07	B8 V
1084 S	EPS ERI	3 31.0	-9 36	3.73	1.46	0.89	0.73	1.20	K2 V
1087	PSI PER	3 33.6	48 5	4.28	-0.61	-0.04	0.11	0.10	B5e
1088	TAU 5 ERI	3 32.0	-21 46	4.28	-0.47	-0.12	0.01	-0.11	B8 V
1101	10 TAU	3 34.8	0 17	4.28	0.65	0.57	0.50	0.82	F8 V
1106	y ERI	3 35.7	-40 24	(4.58)	.	1.04	0.84	1.41	K0 III
1122	DEL PER	3 40.1	47 40	3.03	-0.62	-0.12	0.04	-0.07	B5 III
1129		3 42.5	63 14	4.79	1.06	0.81	0.73	1.27	A1+G2 III
1131	OMI PER	3 41.8	32 10	3.83	-0.70	0.05	0.13	0.13	B1 III
1134	DEL FOR	3 40.7	-32 4	(5.00)	.	-0.15	-0.05	-0.20	B5n
1135	NU PER	3 42.5	42 27	3.77	0.72	0.42	0.41	0.67	F5 II
1136	DEL ERI	3 41.3	-9 54	3.54	1.57	0.92	0.73	1.22	K0 IV
1138		3 45.0	70 46	5.43	0.20	0.09	0.10	0.12	A m
1142	17 TAU	3 42.5	23 59	3.69	-0.52	-0.13	-0.01	-0.11	B6 III
1144 *	18 TAU	3 42.8	24 44	5.65	-0.44	-0.08	0.02	-0.05	B8 V
1145	19 TAU	3 42.8	24 22	4.29	-0.57	-0.12	-0.01	-0.10	B6 V
1148	GAM CAM	3 46.1	71 13	4.66	0.08	0.03	0.14	0.18	A3 IV
1149	20 TAU	3 43.5	24 16	3.86	-0.47	-0.08	0.04	-0.03	B7 III
1151 *	21 TAU	3 43.6	24 26	5.76	-0.27	-0.04	0.05	0.01	B8 V
1155 V		3 45.8	65 24	4.48	4.01	1.89	1.71	3.13	M2 IIa
1156	23 TAU	3 44.0	23 50	4.18	-0.47	-0.06	0.07	0.04	B6 IVnn
1162	PI ERI	3 44.2	-12 14	4.42	3.65	1.62	1.31	2.37	gM2
1165	ETA TAU	3 45.1	23 59	2.86	-0.45	-0.10	0.04	-0.00	B7 III
1172 *		3 45.9	23 18	5.45	-0.40	-0.08	0.04	-0.02	B8 V
1173	TAU 6 ERI	3 45.1	-23 22	4.23	0.42	0.42	0.39	0.61	F3 V
1178	27 TAU	3 46.8	23 56	3.60	-0.45	-0.09	0.02	-0.03	B8 III
1180 V	28 TAU	3 46.8	24 1	5.05	-0.36	-0.08	0.06	0.00	B8p
1189/90		3 47.1	-37 45	(4.26)	.	-0.01	0.02	-0.02	B9+B8
1195	z ERI	3 48.0	-36 19	(4.16)	.	0.95	0.71	1.21	G5 III
1203	ZET PER	3 51.6	31 46	2.86	-0.69	0.10	0.16	0.25	B1 Ib
1204		3 53.9	62 58	5.02	-0.26	-0.09	0.05	-0.02	B9 V
1211/2	32 ERI	3 52.3	-3 4	4.45	1.11	0.68	0.58	0.98	A1 V/G5III
1213	TAU 8 ERI	3 52.0	-24 44	4.64	-0.61	-0.13	-0.03	-0.17	B5 V
1220	EPS PER	3 55.2	39 54	2.89	-1.18	-0.18	-0.06	-0.24	B0.5 V
1228	XI PER	3 56.4	35 41	4.06	-0.92	0.01	0.15	0.15	O7
1231	GAM ERI	3 56.2	-13 37	2.94	3.54	1.60	1.26	2.26	M1 III
1239 V	LAM TAU	3 58.5	12 23	3.41	-0.74	-0.12	-0.02	-0.12	B3 V

MSS-025

THE ARIZONA-TONANTZINTLA CATALOGUE—MULTICOLOR PHOTOMETRY UBVRI

B.S.	NAME	R.A. (1960)	DEC.	V	U-V	B-V	V-R	V-I	MK SP.
1240	TAU 9 ERI	3 58.3	-24 7	4.66	-0.53	-0.14	0.02	-0.10	A p
1242		4 1.1	59 4	5.07	0.99	0.49	0.51	0.90	F0 II
1251	NU TAU	4 1.0	5 53	3.91	0.08	0.03	0.09	0.09	A1 V
1256	37 TAU	4 2.3	21 58	4.37	2.02	1.07	0.80	1.33	K0 III
1261	LAM PER	4 3.6	50 15	4.29	-0.02	0.02	0.09	0.11	B9 V
1273	48 PER	4 5.8	47 36	4.04	-0.60	-0.06	0.13	0.11	B3 Vp
1298	OMI 1 ERI	4 9.9	-6 56	4.05	0.47	0.33	0.32	0.48	F2 II-III
1302	DEL HOR	4 9.5	-42 6	(4.92)	.	0.35	0.35	0.56	F0
1303	MU PER	4 12.0	48 19	4.14	1.59	0.95	0.77	1.31	G0 Ib
1306	52 PER	4 12.2	40 23	4.71	1.66	1.01	0.79	1.36	G5 Ib+A2
1309	46 TAU	4 11.4	7 37	5.28	0.37	0.36	0.36	0.55	F3 V
1311 D	47 TAU	4 11.8	9 10	4.83	1.32	0.80	0.64	1.10	gG5
1318 D	39 ERI	4 12.5	-10 21	4.85	2.33	1.17	0.85	1.42	K2 III+G2V
1320	MU TAU	4 13.4	8 48	4.30	-0.56	-0.05	0.06	0.00	B3 V
1324	B PER	4 15.2	50 12	4.65	0.10	0.05	0.15	0.19	A2
1325	OMI 2 ERI	4 13.5	-7 40	4.42	1.27	0.82	0.68	1.13	K1 V
1326	ALF HOR	4 12.7	-42 24	(3.85)	.	1.11	0.86	1.45	K1 III
1327		4 16.9	65 3	5.28	1.31	0.81	0.65	1.08	G5 III
1329	OMG TAU	4 14.9	20 29	4.93	0.34	0.25	0.25	0.36	A m
1346	GAM TAU	4 17.5	15 32	3.64	1.77	0.99	0.73	1.20	K0 III
1347	41 ERI	4 16.4	-33 54	(3.55)	.	-0.11	-0.01	-0.12	A p
1350	53 PER	4 18.6	46 25	4.86	-0.56	-0.03	0.09	0.04	B6 III
1373	DEL TAU	4 20.6	17 27	3.76	1.82	0.99	0.73	1.20	K1 III
1380	64 TAU	4 21.7	17 21	4.81	0.27	0.15	0.17	0.24	A7.5 V
1387	KAP TAU	4 23.0	22 12	4.23	0.27	0.12	0.16	0.21	A7 V
1389	68 TAU	4 23.2	17 50	4.29	0.12	0.04	0.09	0.10	A3 V
1392	UPS TAU	4 23.9	22 43	4.29	0.39	0.25	0.27	0.41	A8 Vn
1393	43 ERI	4 22.5	-34 7	(3.94)	.	1.48	1.17	2.00	M1 III
1394	71 TAU	4 24.0	15 31	4.51	0.41	0.25	0.27	0.42	F0 V
1396	PI TAU	4 24.3	14 37	4.70	1.71	0.98	0.72	1.23	G8 III
1409	EPS TAU	4 26.3	19 6	3.53	1.89	1.01	0.73	1.23	K1 III
1411	THE 1 TAU	4 26.2	15 52	3.85	1.63	0.93	0.71	1.17	G9 III
1412	THE 2 TAU	4 26.4	15 47	3.41	0.34	0.18	0.19	0.28	A7 IVn
1414 *	79 TAU	4 26.6	12 58	5.00	0.34	0.22	0.20	0.28	dA6n
1427		4 28.2	16 7	4.78	0.32	0.17	0.17	0.24	A6 Vn
1437	45 ERI	4 29.9	-0 8	4.90	2.76	1.32	0.94	1.61	K3 II-III
1444	RHO TAU	4 31.6	14 46	4.65	0.33	0.25	0.24	0.36	A8 Vn
1453	UPS 1 ERI	4 32.0	-29 51	4.50	1.72	0.99	0.75	1.28	gG6
1454	58 PER	4 33.9	41 11	4.27	2.02	1.22	0.97	1.65	G5 Ib-II+A
1457	ALF TAU	4 33.6	16 26	0.86	3.50	1.55	1.22	2.15	K5 III
1458	88 TAU	4 33.5	10 4	4.26	0.30	0.18	0.19	0.28	A m
1463	NU ERI	4 34.3	-3 26	3.92	-1.09	-0.21	-0.10	-0.29	B2 III
1464	UPS 2 ERI	4 34.0	-30 39	(3.81)	.	0.97	0.75	1.24	K0 III
1473	90 TAU	4 35.9	12 26	4.27	0.26	0.13	0.13	0.19	A6 Vn
1479	SIG 2 TAU	4 37.0	15 50	4.69	0.31	0.16	0.17	0.25	A5 Vn
1481 D	53 ERI	4 36.3	-14 23	3.85	2.11	1.09	0.82	1.39	K2 III
1496 V	54 ERI	4 38.7	-19 45	4.33	3.40	1.61	1.55	2.95	gM4
1497	TAU TAU	4 39.8	22 53	4.29	-0.71	-0.14	-0.03	-0.16	B3 V
1502	ALF CAE	4 39.3	-41 56	(4.44)	.	0.36	0.34	0.55	F2 V
1520	MU ERI	4 43.5	-3 20	4.02	-0.76	-0.16	-0.05	-0.19	B5 IV
1542	ALF CAM	4 50.1	66 17	4.29	-0.85	0.03	0.12	0.12	O9.5 Ia
1543	PI 3 ORI	4 47.7	6 54	3.19	0.45	0.46	0.42	0.68	F6 V
1544	PI 2 ORI	4 48.5	8 51	4.35	0.04	0.01	0.06	0.06	A0 V
1547 *	97 TAU	4 49.0	18 47	5.10	0.34	0.22	0.22	0.34	dA5n
1552	PI 4 ORI	4 49.1	5 32	3.67	-0.96	-0.15	-0.02	-0.17	B2 III
1560	OMG ERI	4 50.9	-5 31	4.39	0.40	0.23	0.32	0.49	A9 IV
1567 V	PI 5 ORI	4 52.2	2 23	3.73	-1.01	-0.19	-0.05	-0.24	B2 III
1568 D	7 CAM	4 54.1	53 42	4.47	-0.05	-0.02	0.10	0.09	A1 V
1570	PI 1 ORI	4 52.7	10 6	4.66	0.16	0.08	0.11	0.14	A0 V
1577	IOT AUR	4 54.4	33 6	2.67	3.29	1.54	1.06	1.88	K3 II
1580	OMI 2 ORI	4 54.1	13 27	4.06	2.26	1.15	0.88	1.50	K2 III
1592 D	4 AUR	4 56.6	37 50	4.94	0.06	0.05	0.07	0.11	A0 V
1601	PI 6 ORI	4 56.5	1 39	4.46	2.93	1.41	1.00	1.71	K2 II
1603	BET CAM	4 59.9	60 23	4.03	1.56	0.92	0.69	1.15	G0 Ib
1605 V	EPS AUR	4 59.1	43 46	3.00	0.86	0.54	0.55	0.99	F0 Iap
1611	64 ERI	4 58.1	-12 36	4.78	0.43	0.27	0.28	0.42	F0 IV
1612 V	ZET AUR	4 59.7	41 1	3.75	1.59	1.23	1.11	1.98	K5 II+B
1617	PSI ERI	4 59.5	-7 14	4.79	-0.94	-0.19	-0.09	-0.27	B2 V
1620	IOT TAU	5 0.7	21 32	4.65	0.32	0.16	0.17	0.26	A7 V
1621		4 59.7	-20 7	4.91	-0.20	-0.05	0.04	-0.02	B9
1637	9 AUR	5 3.5	51 33	5.00	0.33	0.34	0.33	0.52	F0 V
1638	11 ORI	5 2.3	15 21	4.68	-0.15	-0.05	0.05	0.03	B9p
1641	ETA AUR	5 3.7	41 11	3.19	-0.85	-0.18	-0.03	-0.20	B3 V
1652 D	GAM CAE	5 2.9	-35 32	(4.54)	.	1.18	0.91	1.56	K5
1654	EPS LEP	5 3.8	-22 25	3.19	3.24	1.46	1.11	1.92	K5 III
1657 W	66 ERI	5 4.8	-4 42	5.16	-0.25	-0.06	0.01	-0.09	B9
1663	ETA 2 PIC	5 4.0	-49 38	5.00	.	1.45	1.19	2.11	M2 III
1666	BET ERI	5 5.9	-5 8	2.78	0.25	0.12	0.15	0.23	A3 III
1676	15 ORI	5 7.4	15 33	4.81	0.51	0.32	0.32	0.51	F2 IV
1679	LAM ERI	5 7.2	-8 48	4.27	-1.10	-0.19	-0.07	-0.27	B2 IV
1689	MU AUR	5 10.7	38 26	4.90	0.28	0.19	0.19	0.29	A m
1696	IOT LEP	5 10.4	-11 54	4.43	-0.49	-0.09	-0.02	-0.12	B8 V
1698 D	RHO ORI	5 11.2	2 50	4.44	2.34	1.19	0.84	1.43	K3 III
1702	MU LEP	5 11.1	-16 15	3.29	-0.49	-0.11	-0.01	-0.13	B9 IIIp
1705 D	KAP LEP	5 11.4	-13 0	4.36	-0.46	-0.09	0.01	-0.08	B8 V
1708	ALF AUR	5 13.8	45 58	0.06	1.28	0.81	0.61	1.04	G8 III:+F
1713	BET ORI	5 12.6	-8 15	0.15	-0.66	-0.03	0.03	-0.00	B8 Ia
1726	16 AUR	5 15.5	33 20	4.54	2.54	1.27	0.97	1.68	K3 III
1729	LAM AUR	5 16.4	40 4	4.70	0.75	0.60	0.52	0.83	G0 V
1735	TAU ORI	5 15.7	-6 53	3.59	-0.58	-0.12	-0.02	-0.13	B5 III
1743	OMI COL	5 16.1	-34 56	(4.82)	.	0.99	0.74	1.29	K0 IV
1756	LAM LEP	5 17.7	-13 13	4.29	-1.26	-0.25	-0.12	-0.40	B0.5 IV
1762 D		5 18.8	-21 16	4.71	-0.15	-0.05	0.06	0.02	A0 V
1765	22 ORI	5 19.7	-0 25	4.72	-0.96	-0.17	-0.06	-0.23	B2 IV
1770 D	23 ORI	5 20.8	3 31	5.00	-1.02	-0.15	-0.05	-0.22	B1 V
1781 *		5 21.8	-0 1	5.68	-1.11	-0.21	-0.08	-0.27	B2 V
1784	29 ORI	5 22.0	-7 50	4.13	1.67	0.96	0.72	1.22	G8 III
1788DV	ETA ORI	5 22.5	-2 26	3.32	-1.10	-0.18	-0.09	-0.29	B0.5 V
1789	25 ORI	5 22.6	1 49	4.95	-1.13	-0.21	-0.05	-0.27	B1 V:pe
1790	GAM ORI	5 23.0	6 20	1.63	-1.09	-0.21	-0.09	-0.31	B2 III
1791	BET TAU	5 23.8	28 35	1.66	-0.62	-0.13	-0.01	-0.09	B7 III
1810	114 TAU	5 25.2	21 54	4.89	-0.91	-0.14	-0.04	-0.19	B3 V
1811 D	PSI ORI	5 24.7	3 3	4.61	-1.14	-0.22	-0.08	-0.31	B2 IV
1829	BET LEP	5 26.5	-20 47	2.81	1.31	0.82	0.65	1.09	G5 III
1839 D	32 ORI	5 28.6	5 55	4.20	-0.69	-0.13	-0.03	-0.17	B5 IV
1843	CHI AUR	5 30.1	32 10	4.77	-0.09	0.35	0.37	0.64	B5 Iab
1845 V	119 TAU	5 29.8	18 34	4.35	4.27	2.06	1.75	3.20	M2 Ib
5	HD 36395	5 29.5	-3 41	7.97	2.68	1.47	1.44	2.58	M1 V
1852 V	DEL ORI	5 30.0	-0 20	2.21	-1.27	-0.21	-0.07	-0.28	O9.5 II
1855 S	UPS ORI	5 30.0	-7 21	4.63	-1.33	-0.26	-0.06	-0.32	B0 V
1861		5 30.6	-1 38	5.35	-1.12	-0.19	-0.04	-0.22	B1 V
1862	EPS COL	5 29.8	-35 31	(3.86)	.	1.12	0.82	1.42	K0
1865	ALF LEP	5 31.0	-17 51	2.58	0.47	0.19	0.22	0.43	F0 Ib
1868 V	VV ORI	5 31.4	-1 12	5.35	-1.09	-0.19	-0.07	-0.26	B1 V
1876	PHI 1 ORI	5 32.6	9 28	4.42	-1.12	-0.15	0.01	-0.16	B0 IV
1879/80	LAM ORI	5 32.9	9 54	3.39	-1.17	-0.18	-0.04	-0.20	O8
1887		5 33.0	-6 2	4.77	-1.25	-0.23	-0.11	-0.36	B0 V
1892 D	42 ORI	5 33.4	-4 52	4.60	-1.13	-0.19	-0.06	-0.24	B2 III
1893	THE ORI	5 33.3	-5 25	6.72	-0.86	0.00	0.33	0.54	B0.5 V
1895	THE 1 ORI	5 33.3	-5 25	5.13	-0.95	-0.01	0.23	0.41	O6p
1896	THE ORI	5 33.3	-5 25	6.70	-0.74	0.08	0.31	0.51	O9.5 V:
1897	THE 2 ORI	5 33.4	-5 27	5.07	-1.03	-0.08	0.15	0.16	O9.5 Vp
1899 D	IOT ORI	5 33.5	-5 56	2.76	-1.30	-0.23	-0.06	-0.28	O9 III
1901 W	45 ORI	5 33.7	-4 53	5.25	0.43	0.25	0.28	0.42	gF0
1903 V	EPS ORI	5 34.2	-1 14	1.70	-1.21	-0.19	-0.01	-0.19	B0 Ia
1907	PHI 2 ORI	5 34.7	9 16	4.08	1.64	0.95	0.75	1.31	G8 IIIp
1908		5 34.8	11 1	5.90	3.53	1.60	1.19	2.13	K5 III
1910	ZET TAU	5 35.3	21 7	3.03	-0.84	-0.18	-0.00	-0.09	B2 IVp
1931 D	SIG ORI	5 36.7	-2 37	3.83	-1.26	-0.24	-0.04	-0.26	O9.5 V
1934	OMG ORI	5 37.1	4 6	4.59	-0.88	-0.11	0.05	-0.05	B3 IIIe
1937	49 ORI	5 36.9	-7 14	4.81	0.23	0.14	0.15	0.21	A4 IV
1946 D	126 TAU	5 39.0	16 31	4.85	-0.76	-0.12	-0.01	-0.13	B3 IV
1948/9	ZET ORI	5 38.7	-1 58	1.74	-1.26	-0.21	-0.06	-0.27	O9.5 Ib
1956	ALF COL	5 38.2	-34 6	(2.63)	.	-0.15	-0.01	-0.11	B8 Ve
1963	51 ORI	5 40.4	1 28	4.89	2.24	1.18	0.88	1.49	K0 III
1983	GAM LEP	5 42.8	-22 28	3.58	0.51	0.48	0.45	0.72	F6 V
1995	TAU AUR	5 46.4	39 11	4.52	1.64	0.94	0.72	1.22	G8 III
1998	ZET LEP	5 45.1	-14 50	3.56	0.16	0.08	0.13	0.16	A3 V
2004	KAP ORI	5 45.9	-9 41	2.06	-1.18	-0.18	-0.03	-0.21	B0.5 Ia
2010	134 TAU	5 47.3	12 38	4.90	-0.21	-0.07	0.03	-0.03	B9 IV
2011	UPS AUR	5 48.3	37 17	4.73	3.55	1.62	1.34	2.42	gM1
2012	NU AUR	5 48.7	39 8	3.97	2.24	1.13	0.82	1.38	K0 III
2018		5 48.8	32 7	6.22	3.83	1.76	1.55	2.94	M3 III
2029	XI AUR	5 51.5	55 42	4.98	0.17	0.05	0.09	0.12	A2p?
2034	136 TAU	5 50.8	27 36	4.61	-0.01	-0.02	0.04	0.05	B9.5 V
2035	DEL LEP	5 49.6	-20 53	3.79	1.70	0.98	0.79	1.36	G8+ III
2040	BET COL	5 49.5	-35 47	(3.10)	.	1.15	0.85	1.43	K2 III
2047	CHI 1 ORI	5 52.1	20 17	4.40	0.69	0.60	0.52	0.83	G0 V
2056	LAM COL	5 51.7	-33 49	(4.88)	.	-0.17	-0.06	-0.22	B5 V
2061 V	ALF ORI	5 53.0	7 24	0.69	3.92	1.86	1.60	3.05	M2 Iab
2077	DEL AUR	5 56.3	54 17	3.73	1.90	1.00	0.75	1.26	K0 III
2084	139 TAU	5 55.5	25 58	4.83	-0.99	-0.07	0.05	-0.06	B1 Ib
2085	ETA LEP	5 54.6	-14 10	3.69	0.34	0.32	0.31	0.48	F0 IV
2088 V	BET AUR	5 56.6	44 57	1.90	0.06	0.02	0.09	0.08	A2 V
2091 V	PI AUR	5 57.0	45 57	4.25	3.55	1.72	1.68	3.16	M3.5 II
2095 D	THE AUR	5 57.0	37 13	2.63	-0.26	-0.08	0.01	-0.04	B9.5p V
2106	GAM COL	5 56.1	-35 17	(4.35)	.	-0.21	-0.07	-0.23	B3 IV
2113		5 58.0	-3 4	4.52	2.43	1.22	0.93	1.60	K2 III
2120	ETA COL	5 57.9	-42 49	(3.94)	.	1.13	0.82	1.40	K0 III
2124 D	MU ORI	6 0.2	9 40	4.14	0.30	0.16	0.20	0.27	A m
2128	3 MON	5 59.9	-10 35	4.94	-0.70	-0.12	-0.02	-0.11	B5 IV
2134	1 GEM	6 1.7	23 16	4.15	1.39	0.87	0.68	1.13	gG5
2135	CHI 2 ORI	6 1.6	20 9	4.63	-0.38	0.29	0.32	0.54	B2 Ia
2155	THE LEP	6 4.3	-14 57	4.67	0.05	0.05	0.10	0.09	A1 V
2159	NU ORI	6 5.3	14 46	4.42	-0.82	-0.15	-0.05	-0.22	B3 V
2198	69 ORI	6 9.8	16 8	4.92	-0.71	-0.12	-0.02	-0.16	B5 V
2199	XI ORI	6 9.6	14 13	4.48	-0.83	-0.17	-0.06	-0.21	B3 V
2209	22 CAM	6 14.4	69 20	4.79	0.02	0.03	0.08	0.07	A0 V
2216 V	ETA GEM	6 12.4	22 31	3.30	3.28	1.62	1.50	2.81	M3 III
2219	KAP AUR	6 12.8	29 31	4.35	1.83	1.01	0.78	1.33	G8 III
2227	GAM MON	6 12.9	-6 16	3.96	2.74	1.31	0.96	1.60	K3 III
2238	2 LYN	6 16.1	59 2	4.47	0.04	0.01	0.08	0.06	A2 V
2240 W	9 GEM	6 14.5	23 45	6.25	0.04	0.46	0.47	0.88	B3 Ia
2244		6 13.9	-13 42	5.01	-0.33	-0.09	0.03	-0.02	B8 V
2256	KAP COL	6 15.1	-35 8	(4.36)	.	0.98	0.73	1.24	G8 III
2282	ZET CMA	6 18.8	-30 3	3.02	-0.87	-0.13	-0.01	-0.19	B2.5 V
2286	MU GEM	6 20.5	22 32	2.86	3.52	1.66	1.54	2.92	M3 IIIa
2294	BET CMA	6 20.9	-17 56	1.98	-1.20	-0.24	-0.11	-0.35	B1 II-III
2296	DEL COL	6 20.7	-33 24	(3.84)	.	0.88	0.67	1.14	G1
2298/9	EPS MON	6 21.7	4 37	4.29	0.31	0.20	0.20	0.31	A5 IV /dF4
2308 V	BL ORI	6 23.2	14 45	6.32	5.93	2.33	1.80	3.12	C6,2
2343	NU GEM	6 26.6	20 14	4.14	-0.63	-0.14	-0.02	-0.13	B7 IV
2344	10 MON	6 26.0	-4 44	5.04	-0.94	-0.18	-0.11	-0.27	B2 V
2356-8	BET MON	6 26.9	-7 0	3.76	-0.89	-0.16	-0.01	-0.16	B3 Vpe
2361	LAM CMA	6 26.7	-32 33	(4.47)	.	-0.18	-0.07	-0.24	B5
2385	13 MON	6 30.7	7 22	4.50	-0.17	-0.00	0.09	0.13	A0 Ib
2387	XI 1 CMA	6 30.2	-23 23	4.35	-1.23	-0.25	-0.10	-0.35	B0.5 IV
2392		6 30.9	-11 8	6.26	1.87	1.11	0.77	1.24	Ba II
2414	XI 2 CMA	6 33.4	-22 56	4.54	-0.06	-0.04	0.05	0.04	A0 V
2421	GAM GEM	6 35.4	16 26	1.91	0.07	-0.00	0.07	0.06	A0 IV
2427	PSI 2 AUR	6 36.5	42 32	4.79	2.56	1.24	0.90	1.50	K3 II-III
2429	NU 2 CMA	6 34.9	-19 13	3.92	2.06	1.05	0.78	1.29	K1 IV
2443	NU 3 CMA	6 36.1	-18 12	4.40	2.21	1.16	0.84	1.44	K1 II-III
2450		6 37.4	-14 6	4.82	3.18	1.50	1.02	1.77	K3 III
2451	NU PUP	6 36.5	-43 10	(3.16)	.	-0.12	0.00	-0.07	B8 III
2456	15 MON	6 38.8	9 55	4.66	-1.31	-0.24	-0.09	-0.31	O7
2467		6 39.8	6 23	6.37	-0.97	-0.04	0.08	0.02	O6
2470 D	12 LYN	6 42.7	59 29	4.87	0.15	0.08	0.12	0.16	A2n
2473	EPS GEM	6 41.5	25 10	2.98	2.87	1.40	0.95	1.57	G8 Ib
2478	30 GEM	6 41.7	13 16	4.49	2.33	1.16	0.86	1.45	K1 III

MSS-025

THE ARIZONA-TONANTZINTLA CATALOGUE—MULTICOLOR PHOTOMETRY UBVRI

B.S.	NAME	R.A. (1960)	DEC.	V	U-V	B-V	V-R	V-I	MK SP.
2484	XI GEM	6 43.0	12 56	3.34	0.47	0.42	0.40	0.63	F5 IV
2491	ALF CMA	6 43.4	-16 40	-1.45	-0.03	-0.01	0.00	-0.03	A1 V
2506	18 MON	6 45.8	2 27	4.43	2.16	1.11	0.78	1.33	K0 III
2527		6 54.3	77 2	4.54	3.04	1.36	1.02	1.72	K4 III
2538 *	KAP CMA	6 48.3	-32 28	(3.96)	.	-0.24	-0.07	-0.27	B2 Ve
2540	THE GEM	6 50.2	34 1	3.61	0.25	0.11	0.11	0.18	A3 III
2560 D	15 LYN	6 53.6	58 29	4.35	1.39	0.85	0.66	1.09	G5 III-IV
2564 D	38 GEM	6 52.4	13 14	4.65	0.38	0.31	0.32	0.52	F0 Vp
2571	15 CMA	6 51.8	-20 10	4.82	-1.17	-0.21	-0.11	-0.33	B1 IV
2574	THE CMA	6 52.3	-11 59	4.07	3.12	1.44	1.10	1.89	K3+ III
2580	OMI 1 CMA	6 52.5	-24 8	3.92	3.74	1.72	1.15	1.97	K3 Iab
2585	16 LYN	6 54.7	45 9	4.90	0.07	0.04	0.05	0.07	A2 V
2590 D	PI CMA	6 53.9	-20 5	4.67	0.42	0.36	0.37	0.57	gF2
2596	IOT CMA	6 54.4	-16 59	4.39	-0.74	-0.06	0.05	-0.00	B3 II
2608		6 55.2	-48 40	(4.94)	.	1.69	1.48	2.66	M3
2618	EPS CMA	6 57.1	-28 55	1.50	-1.13	-0.21	-0.08	-0.29	B2 II
2646	SIG CMA	7 0.1	-27 53	3.43	3.59	1.72	1.32	2.32	M0 Iab
2648	19 MON	7 0.9	-4 11	5.01	-1.12	-0.20	-0.06	-0.24	B1 V
2650 V	ZET GEM	7 1.7	20 38	4.15	1.74	0.97	0.73	1.17	G1.5 Ib
2653	OMI 2 CMA	7 1.4	-23 46	3.01	-0.94	-0.11	0.01	-0.08	B3 Ia
2657	GAM CMA	7 1.9	-15 34	4.11	-0.57	-0.11	-0.01	-0.11	B8 II
2693	DEL CMA	7 6.8	-26 20	1.80	1.20	0.67	0.52	0.85	F8 Ia
2697	TAU GEM	7 8.6	30 20	4.42	2.67	1.26	0.94	1.57	K2 III
2701	20 MON	7 8.2	-4 10	4.91	1.82	1.03	0.78	1.31	K0 III
2702	A PUP	7 7.5	-39 35	(4.82)	.	-0.20	-0.07	-0.22	B3 V
2714	DEL MON	7 9.8	-0 26	4.15	0.03	0.00	0.08	0.09	A0 IV
2740	1 PUP	7 11.4	-46 42	(4.48)	.	0.34	0.32	0.54	F0 V
2745 V	27 CMA	7 12.6	-26 17	4.65	-0.85	-0.16	0.02	-0.08	B3 IIIpe
2748 V	L 2 PUP	7 12.3	-44 35	5.09	.	1.55	2.72	5.09	M5e
2749	OMG CMA	7 13.2	-26 42	3.82	-0.88	-0.14	0.03	-0.07	B3 IVe
2751		7 15.5	49 32	5.04	0.17	0.08	0.15	0.21	A3 III-IV
2762		7 13.6	-48 13	(4.75)	.	-0.10	-0.01	-0.09	B8
2763	LAM GEM	7 15.8	16 37	3.59	0.21	0.11	0.12	0.17	A3 V
2764		7 14.9	-23 15	4.78	3.58	1.69	1.28	2.24	gM0
2766		7 15.0	-27 49	4.60	3.53	1.60	1.47	2.73	gM3
2773	PI PUP	7 15.7	-37 1	(2.70)	.	1.62	1.24	2.15	K5 III
2777 D	DEL GEM	7 17.7	22 3	3.52	0.40	0.34	0.34	0.53	F0 IV
2781 V	29 CMA	7 17.0	-24 30	4.95	-1.15	-0.15	-0.09	-0.21	O7f
2782	TAU CMA	7 17.1	-24 53	4.48	-1.11	-0.19	-0.03	-0.15	O9 III
2787		7 16.9	-36 40	(4.61)	.	-0.08	0.10	0.05	B3 Ve
2812		7 20.4	-18 57	4.96	-0.43	-0.06	0.06	0.03	B8
2818	21 LYN	7 23.7	49 18	4.63	-0.04	-0.02	-0.01	-0.06	A1 IV
2821	IOT GEM	7 23.2	27 53	3.79	1.89	1.03	0.76	1.27	K0 III
2827	ETA CMA	7 22.5	-29 13	2.41	-0.77	-0.07	0.07	0.02	B5 Ia
2845	BET CMI	7 25.0	8 22	2.90	-0.37	-0.09	0.03	-0.04	B7 V
2852 S	RHO GEM	7 26.5	31 52	4.17	0.29	0.32	0.34	0.53	F0 V
2854	GAM CMI	7 26.0	9 1	4.29	2.97	1.43	1.07	1.87	K3 III
2864	6 CMI	7 27.6	12 5	4.54	2.67	1.29	0.88	1.52	K2 III
2874		7 28.1	-22 56	4.83	0.44	0.25	0.26	0.53	A5 Ib
2878	SIG PUP	7 28.0	-43 13	(3.23)	.	1.53	1.21	2.13	K5 III
2881		7 29.1	-30 52	(4.64)	.	0.93	0.67	1.14	G1 Ib
2890/1	ALF GEM	7 32.0	31 59	1.58	0.04	0.03	0.07	0.06	A m+A3 III
2905	UPS GEM	7 33.5	26 59	4.06	3.49	1.54	1.22	2.14	M0 III
2906		7 32.4	-22 13	4.46	0.58	0.51	0.50	0.79	F5 V
2922	p PUP	7 33.8	-28 17	4.61	-0.52	-0.12	-0.03	-0.14	B8
2930	OMI GEM	7 36.5	34 41	4.92	0.51	0.40	0.38	0.61	F3 III
2937	I PUP	7 35.9	-34 53	(4.52)	.	-0.10	-0.02	-0.09	B8 V
2943	ALF CMI	7 37.2	5 20	0.35	0.47	0.43	0.41	0.66	F5 IV-V
2944 D	m PUP	7 36.6	-25 16	4.69	-0.43	-0.10	0.01	-0.07	B8
2946	24 LYN	7 39.7	58 48	4.99	0.17	0.08	0.19	0.24	A3 III
2948/9		7 37.2	-26 42	3.81	-0.74	-0.17	-0.04	-0.19	B6 V /B7 V
2961	d 1 PUP	7 38.0	-38 13	(4.84)	.	-0.19	-0.08	-0.24	B3 n
2970	ALF MON	7 39.4	-9 27	3.92	1.91	1.02	0.76	1.28	K0 III
2973	SIG GEM	7 40.9	29 0	4.28	2.10	1.12	0.90	1.48	K1 III
2974		7 39.3	-31 34	6.61	1.98	1.13	0.86	1.51	G0 Ia
2985 D	KAP GEM	7 42.0	24 30	3.56	1.62	0.92	0.71	1.16	G8 III
2990	BET GEM	7 42.9	28 7	1.13	1.87	1.00	0.75	1.25	K0 III
2993	1 PUP	7 41.9	-28 18	4.58	3.64	1.63	1.29	2.26	gK5
2996	3 PUP	7 42.2	-28 51	3.95	0.17	0.18	0.26	0.48	A3ep II
3003	81 GEM	7 43.8	18 37	4.85	3.24	1.47	1.14	1.98	K5 III
3017	c PUP	7 43.8	-37 53	(3.60)	.	1.73	1.35	2.35	cK
3034	OMI PUP	7 46.4	-25 50	4.51	-1.08	-0.06	0.15	0.13	B0 V:pe
3045	XI PUP	7 47.6	-24 45	3.35	2.41	1.25	0.88	1.43	G3 Ib
3046	Q PUP	7 47.2	-46 59	(4.69)	.	1.04	0.76	1.33	K0 III
3055	P PUP	7 48.0	-46 16	(4.10)	.	-0.18	-0.07	-0.24	B0.5 III
3067	PHI GEM	7 51.1	26 52	4.99	0.21	0.09	0.13	0.18	A4 V
3080	a PUP	7 50.8	-40 28	3.73	1.79	1.04	0.81	1.37	G5 III
3084	b PUP	7 51.2	-38 45	(4.48)	.	-0.19	-0.07	-0.23	B3 V
3089		7 51.9	-49 30	(4.62)	.	-0.21	-0.13	-0.34	B2 III
3090	J PUP	7 52.2	-48 0	(4.23)	.	-0.14	-0.02	-0.14	B1 Ib
3102	11 PUP	7 55.1	-22 47	4.20	1.16	0.72	0.60	0.97	F8 II
3113		7 56.1	-30 14	(4.78)	.	0.16	0.20	0.35	A2 V
3131		7 58.1	-18 17	4.60	0.15	0.08	0.16	0.22	A3 V
3141	28 MON	7 59.2	-1 17	4.67	3.27	1.49	1.16	1.99	K4 III
3145		8 0.2	2 27	4.37	2.56	1.24	0.97	1.64	K2 III
3165	ZET PUP	8 2.2	-39 53	2.25	-1.34	-0.29	-0.06	-0.27	O5 f
3173	27 LYN	8 5.5	51 37	4.84	0.05	0.05	0.11	0.12	A2 V
3185 V	RHO PUP	8 5.8	-24 11	2.82	0.63	0.44	0.37	0.58	F6 IIp
3188	ZET MON	8 6.6	-2 52	4.32	1.71	0.98	0.72	1.18	G2 Ib
3192	16 PUP	8 7.3	-19 7	4.40	-0.75	-0.15	-0.02	-0.16	B5 V
3206		8 8.2	-47 14	4.24	.	-0.25	-0.11	-0.29	B3n
3207	GAM VEL	8 8.3	-47 13	(1.82)	.	-0.27	-0.02	-0.16	WC7+O7:
3211	19 PUP	8 9.4	-12 49	4.72	1.73	0.95	0.73	1.21	K0 III
3225	h 1 PUP	8 9.9	-39 30	(4.44)	.	1.60	1.20	2.10	cK
3226		8 10.0	-42 52	(4.74)	.	0.18	0.25	0.47	A3
3237	r PUP	8 12.0	-35 47	(4.82)	.	-0.10	0.11	0.02	B3ne
3243	h 2 PUP	8 12.6	-40 14	(4.43)	.	1.17	0.85	1.48	K2
3249 S	BET CNC	8 14.3	9 19	3.52	3.26	1.48	1.13	1.91	K4 III
3270	q PUP	8 17.1	-36 32	(4.44)	.	0.25	0.23	0.35	A5 V
3275	31 LYN	8 20.1	43 19	4.25	3.46	1.55	1.19	2.08	K5 III

B.S.	NAME	R.A. (1960)	DEC.	V	U-V	B-V	V-R	V-I	MK SP.
3282	w PUP	8 19.8	-32 56	(4.82)	.	1.44	1.01	1.75	M0 III
3294 D	B VEL	8 21.2	-48 21	(4.82)	.	-0.16	-0.04	-0.16	B1 V
3314		8 23.7	-3 46	3.89	-0.08	-0.04	0.03	-0.02	A0 V
3323	OMI UMA	8 27.0	60 51	3.36	1.38	0.85	0.68	1.10	G4 II-III
3403	PI 2 UMA	8 36.7	64 28	4.61	2.34	1.17	0.88	1.50	K2 III
3407	c VEL	8 33.5	-49 49	(5.00)	.	1.31	0.97	1.65	K0
3410	DEL HYA	8 35.5	5 51	4.17	0.02	-0.00	0.04	0.04	A0 V
3418	SIG HYA	8 36.7	3 29	4.43	2.48	1.20	0.87	1.43	K2 III
3426	e VEL	8 36.2	-42 51	(4.13)	.	0.11	0.16	0.32	A9 II
3438	BET PYX	8 38.5	-35 10	(3.98)	.	0.92	0.67	1.15	G5 III
3441	9 HYA	8 39.9	-15 48	4.87	2.02	1.08	0.81	1.34	K1 III
3445	b VEL	8 39.3	-46 30	(3.82)	.	0.71	0.64	1.24	F2 Ia
3449	GAM CNC	8 41.0	21 37	4.66	0.03	0.02	0.07	0.06	A1 V
3452	n VEL	8 39.9	-47 11	(4.76)	.	0.11	0.21	0.41	A5 II
3454 S	ETA HYA	8 41.1	3 33	4.30	-0.94	-0.20	-0.06	-0.25	B3 V
3459	31 MON	8 41.7	-7 5	4.60	1.34	0.84	0.65	1.09	G2 Ib
3461	DEL CNC	8 42.4	18 18	3.93	2.08	1.08	0.78	1.32	K0 III
3468	ALF PYX	8 42.0	-33 2	(3.70)	.	-0.21	-0.07	-0.23	B2 II
3475	IOT CNC	8 44.3	28 54	4.02	1.81	1.03	0.74	1.23	G8 II
3477	d VEL	8 42.9	-42 30	(4.06)	.	0.87	0.64	1.13	sgG5
3482 D	EPS HYA	8 44.7	6 34	3.39	1.06	0.68	0.61	0.99	G0 COMP.
3484	12 HYA	8 44.5	-13 24	4.32	1.53	0.90	0.70	1.16	G8 III
3485 D	DEL VEL	8 43.6	-54 34	(1.94)	.	0.04	0.05	0.09	A0: V
3487		8 44.6	-45 53	(3.90)	.	0.01	0.06	0.19	A0 III
3492	RHO HYA	8 46.3	6 0	4.37	-0.10	-0.05	0.05	-0.02	A0 V
3518	GAM PYX	8 48.8	-27 34	4.00	2.65	1.27	0.95	1.61	K4 III
3527	f VEL	8 49.2	-46 22	(5.10)	.	-0.21	-0.06	-0.23	B0 III
3547	ZET HYA	8 53.3	6 6	3.10	1.81	1.01	0.72	1.21	G8 III
3556	DEL PYX	8 53.8	-27 32	4.89	0.27	0.12	0.14	0.19	A3 V
3569	IOT UMA	8 56.5	48 12	3.15	0.27	0.19	0.21	0.29	A7 V
3572	ALF CNC	8 56.3	12 1	4.26	0.28	0.13	0.16	0.20	A m
3576	RHO UMA	8 59.0	67 47	4.76	3.42	1.54	1.44	2.70	M3 IIIb
3579		8 58.0	41 57	3.97	0.48	0.43	0.41	0.62	F5 V
3591	w VEL	8 58.6	-41 6	(4.45)	.	0.66	0.56	0.96	F8 III
3594	KAP UMA	9 0.9	47 19	3.61	0.01	-0.01	0.09	0.10	B9n
3612		9 4.0	38 37	4.56	1.85	1.04	0.74	1.24	G8 Ib-II
3614	c VEL	9 2.8	-46 56	(3.74)	.	1.20	0.82	1.42	K2 III
3616 D	SIG 2 UMA	9 6.9	67 18	4.83	0.54	0.50	0.45	0.73	F7 IV-V
3619	15 UMA	9 6.1	51 46	4.48	0.38	0.27	0.26	0.37	A m
3624	TAU UMA	9 7.7	63 41	4.69	0.51	0.35	0.33	0.47	A7 m
3628	KAP PYX	9 6.3	-25 42	4.56	3.47	1.59	1.23	2.14	gM0
3634	LAM VEL	9 6.5	-43 16	(2.20)	.	1.62	1.24	2.19	K5 Ib
3654		9 9.6	-44 43	(4.99)	.	0.25	0.30	0.52	B3 Ia
3662	18 UMA	9 13.3	54 11	4.84	0.25	0.17	0.26	0.36	A5 V
3665	THE HYA	9 12.3	2 29	3.88	-0.19	-0.07	0.01	-0.05	B9.5 Vp
3682	1 VEL	9 14.1	-38 24	(4.93)	.	1.11	0.80	1.37	K2
3684		9 14.1	-37 15	(4.62)	.	0.47	0.39	0.67	F3 IV-V
3690 D	38 LYN	9 15.3	36 59	3.83	0.10	0.05	0.14	0.17	A2 V
3705	ALF LYN	9 18.6	34 34	3.14	3.48	1.55	1.21	2.12	M0 III
3706	26 HYA	9 17.8	-11 48	4.81	1.55	0.93	0.74	1.21	G8 III
3709	27 HYA	9 18.5	-9 23	4.79	1.62	0.94	0.68	1.12	G8 III-IV
3718	THE PYX	9 19.7	-25 48	4.72	3.69	1.64	1.39	2.47	M1 III
3731	KAP LEO	9 22.3	26 21	4.46	2.54	1.23	0.90	1.52	K2 III
3733	LAM PYX	9 21.5	-28 39	4.68	1.55	0.91	0.70	1.18	gG7
3748	ALF HYA	9 25.6	-8 29	1.96	3.20	1.47	1.04	1.81	K3 IIIa
3749	G HYA	9 25.4	-22 9	4.68	2.30	1.13	0.86	1.43	gK3
3751		9 31.5	81 30	4.29	3.20	1.47	1.10	1.84	K3 III
3757	23 UMA	9 28.4	63 14	3.67	0.42	0.33	0.34	0.52	F0 IV
3759	TAU 1 HYA	9 27.1	-2 36	4.60	0.46	0.45	0.40	0.63	F6 V
3765	EPS ANT	9 27.6	-35 47	(4.50)	.	1.44	1.02	1.77	M0 III
3771	24 UMA	9 31.0	70 0	4.56	1.11	0.77	0.64	1.06	G2 IV
3773	LAM LEO	9 29.4	23 9	4.31	3.43	1.54	1.19	2.10	K5 III
3775	THE UMA	9 30.2	51 52	3.20	0.52	0.46	0.44	0.71	F6 IV
3786 D	PSI VEL	9 29.2	-40 18	3.60	0.30	0.37	0.37	0.59	F2 IV
3787	TAU 2 HYA	9 30.0	-1 1	4.56	0.20	0.11	0.14	0.20	A3 III
3799	26 UMA	9 32.1	52 14	4.50	0.04	0.00	0.09	0.09	A2 V
3800	10 LMI	9 31.8	36 35	4.54	1.56	0.92	0.70	1.15	G8 III
3809		9 32.6	39 48	4.81	1.76	0.99	0.75	1.28	K0 III
3815	11 LMI	9 33.4	36 0	5.40	1.22	0.77	0.62	0.99	G8 IV-V
3834		9 36.4	4 50	4.68	2.78	1.33	1.03	1.76	K3 III
3836	H VEL	9 35.3	-49 11	(4.36)	.	0.17	0.16	0.26	A5
3845	IOT HYA	9 37.8	-0 58	3.89	2.78	1.32	0.97	1.64	K3 III
3849	KAP HYA	9 38.4	-14 9	5.05	-0.72	-0.14	-0.06	-0.22	B5 V
3852	OMI LEO	9 39.0	10 5	3.50	0.70	0.50	0.39	0.63	A2+F6II-III
3858	I HYA	9 39.4	-23 24	4.78	-0.70	-0.12	0.02	-0.07	B3ne
3871	THE ANT	9 42.4	-27 35	4.78	0.85	0.52	0.48	0.79	F7 V
3873	EPS LEO	9 43.6	23 58	2.98	1.27	0.81	0.66	1.06	G0 II
3881	15 LMI	9 46.0	46 12	5.10	0.70	0.63	0.53	0.87	G1 V
3888	UPS UMA	9 48.2	59 14	3.82	0.39	0.29	0.34	0.50	F2 IV
3894 D	PHI UMA	9 49.4	54 16	4.59	0.11	0.03	0.12	0.11	A3
3903	UPS 1 HYA	9 49.6	-14 40	4.08	1.56	0.93	0.68	1.15	G8 III
3905	MU LEO	9 50.5	26 12	3.90	2.59	1.22	0.91	1.49	K2 III
3912	m VEL	9 50.1	-46 22	(4.57)	.	1.19	0.83	1.46	G6
3950	PI LEO	9 58.1	8 14	4.68	3.50	1.61	1.39	2.49	M2 III
3970	UPS 2 HYA	10 3.2	-12 52	4.58	-0.37	-0.09	-0.01	-0.09	B8 V
3974	21 LMI	10 5.0	35 27	4.49	0.26	0.19	0.18	0.25	A7 V
3975	ETA LEO	10 5.2	16 58	3.53	-0.25	-0.04	0.12	0.13	A0 Ib
3980	31 LEO	10 5.8	10 12	4.36	3.20	1.45	1.09	1.86	K4 III
3981	ALF SEX	10 5.9	-0 10	4.49	-0.11	-0.04	0.07	0.02	A0 III
3982	ALF LEO	10 6.2	12 10	1.35	-0.47	-0.12	0.00	-0.09	B7 V
3994	LAM HYA	10 8.6	-12 9	3.61	1.92	1.00	0.75	1.23	K0 III
4023	q VEL	10 13.1	-41 55	(3.84)	.	0.07	0.03	0.05	A2 V
4031	ZET LEO	10 14.5	23 37	3.44	0.51	0.31	0.32	0.50	F0 III
4033	LAM UMA	10 14.7	43 7	3.46	0.08	0.03	0.09	0.08	A2 IV
4054	40 LEO	10 17.6	19 41	4.78	0.47	0.45	0.43	0.67	F6 IV
4057/8	GAM LEO	10 17.8	20 3	1.98	2.14	1.15	0.86	1.48	K0 IIIp
4069	MU UMA	10 20.0	41 42	3.04	3.48	1.59	1.27	2.24	M0 III
4072		10 21.3	65 46	4.98	-0.22	-0.06	0.06	-0.01	A0p
4080	r VEL	10 20.6	-41 27	(4.83)	.	1.11	0.81	1.38	K1 III
4090	30 LMI	10 23.7	34 0	4.73	0.42	0.25	0.26	0.40	F0 V

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THE ARIZONA-TONANTZINTLA CATALOGUE—MULTICOLOR PHOTOMETRY UBVRI

B.S.	NAME	R.A. (1960)	DEC.	V	U-V	B-V	V-R	V-I	MK SP.
4092		10 23.7	-6 51	5.58	3.40	1.51	1.25	2.19	M0 III
4094	MU HYA	10 24.2	-16 38	3.79	3.29	1.48	1.11	1.94	K4 III
4100 D	BET LMI	10 25.6	36 55	4.20	1.55	0.90	0.69	1.15	G8 III-IV
4104	ALF ANT	10 25.3	-30 52	(4.24)	.	1.43	1.10	1.89	M0 III
4112	36 UMA	10 28.1	56 11	4.84	0.50	0.52	0.48	0.75	F8 V
4119	BET SEX	10 28.3	-0 27	5.09	-0.67	-0.13	-0.03	-0.18	B6 V
4132		10 30.9	40 37	4.74	0.31	0.23	0.19	0.28	A7 IV
4133	RHO LEO	10 30.7	9 31	3.85	-1.09	-0.13	-0.04	-0.21	B1 Ib
4163 V	U HYA	10 35.6	-13 11	4.92	8.48	2.75	1.80	3.08	C7,3
4166	37 LMI	10 36.5	32 11	4.70	1.37	0.81	0.66	1.05	G3 II:
4167 D	p VEL	10 35.6	-48 1	(3.84)	.	0.31	0.26	0.42	F0p
4216 D	MU VEL	10 45.1	-49 13	(2.68)	.	0.88	0.69	1.18	G5 III
4232	NU HYA	10 47.6	-15 59	3.10	2.51	1.24	0.91	1.55	K3 III
4247	46 LMI	10 51.1	34 26	3.82	1.98	1.04	0.83	1.37	K0 III-IV
4248	OMG UMA	10 51.7	43 24	4.71	-0.11	-0.05	0.07	0.03	A1 V
4259/60	54 LEO	10 53.5	24 58	4.32	0.03	0.02	0.08	0.09	A1 V
4273	IOT ANT	10 54.8	-36 55	(4.58)	.	1.02	0.75	1.28	G5 III
4287	ALF CRT	10 57.8	-18 5	4.06	2.06	1.09	0.78	1.33	K0 III
4293		10 58.3	-42 1	(4.39)	.	0.12	0.14	0.21	A2 IV
4295	BET UMA	10 59.4	56 36	2.38	-0.04	-0.01	0.08	0.04	A1 V
4299	61 LEO	10 59.8	-2 16	4.74	3.54	1.62	1.30	2.27	K5 III
4300	60 LEO	11 0.2	20 24	4.41	0.08	0.04	0.08	0.06	A1 V
4301	ALF UMA	11 1.3	61 58	1.80	2.01	1.07	0.81	1.39	K0 III
4310	CHI LEO	11 3.0	7 33	4.62	0.41	0.33	0.32	0.49	F2 III-IV
4335	PSI UMA	11 7.4	44 43	3.01	2.26	1.15	0.82	1.41	K1 III
4343	BET CRT	11 9.7	-22 36	4.48	0.10	0.03	0.09	0.12	A2 III-IV
4357	DEL LEO	11 12.0	20 45	2.57	0.21	0.11	0.16	0.19	A4 V
4359	THE LEO	11 12.1	15 39	3.34	0.05	-0.01	0.08	0.05	A2 V
4362	72 LEO	11 13.1	23 18	4.60	3.51	1.66	1.49	2.80	gM2
4368	PHI LEO	11 14.6	-3 26	4.47	0.36	0.21	0.27	0.38	A7 III-IV
4371	75 LEO	11 15.2	2 14	5.17	3.39	1.51	1.27	2.21	M0 IIIb
4374/5	XI UMA	11 16.0	31 46	3.79	0.64	0.59	0.52	0.87	G0 V
4377	NU UMA	11 16.3	33 19	3.49	2.95	1.40	1.06	1.76	K3 III
4380	55 UMA	11 17.0	38 24	4.79	0.15	0.12	0.14	0.16	A2 V
4382	DEL CRT	11 17.3	-14 34	3.56	2.10	1.11	0.83	1.43	G8 III-IV
4386	SIG LEO	11 19.1	6 15	4.06	-0.19	-0.07	0.01	-0.06	B9 V
4392	56 UMA	11 20.6	43 42	4.98	1.80	0.98	0.72	1.18	G8 II
4399 D	IOT LEO	11 21.8	10 45	3.94	0.49	0.43	0.40	0.62	F2 IV
4405 D	GAM CRT	11 22.9	-17 28	4.08	0.31	0.21	0.23	0.34	A5 V
4434	LAM DRA	11 29.1	69 33	3.85	3.59	1.62	1.32	2.31	M0 III
4450	XI HYA	11 31.0	-31 38	3.54	1.65	0.94	0.70	1.19	G7 III
4456 S	9CAB LEO	11 32.6	17 1	5.95	-0.30	-0.16	-0.07	-0.26	B3 V
4468	THE CRT	11 34.7	-9 35	4.70	-0.24	-0.08	0.03	-0.04	B9 V
4471	UPS LEO	11 34.9	-0 36	4.30	1.75	1.01	0.73	1.25	G9 III
4494	OMI HYA	11 38.2	-34 31	(4.70)	.	-0.07	0.02	-0.03	B8
4496	61 UMA	11 38.9	34 26	5.31	1.03	0.78	0.59	0.95	G8 V
4514	ZET CRT	11 42.7	-18 8	4.70	1.71	0.98	0.71	1.19	G8 III
4517	NU VIR	11 43.8	6 45	4.05	3.28	1.49	1.23	2.25	M1 III
4518	CHI UMA	11 44.0	48 0	3.72	2.33	1.17	0.87	1.48	K0 III
4527 D	93 LEO	11 45.9	20 26	4.51	0.83	0.56	0.51	0.87	G5III-IV+A
4534	BET LEO	11 47.0	14 48	2.13	0.16	0.08	0.06	0.07	A3 V
4540	BET VIR	11 48.6	1 59	3.59	0.67	0.56	0.46	0.74	F8 V
4546	B CEN	11 49.1	-44 57	(4.45)	.	1.29	0.94	1.61	K4 III
4550 S	GMB 1830	11 50.7	38 0	6.45	0.92	0.75	0.66	1.10	G8 Vp
4552 D	BET HYA	11 50.6	-33 41	(4.28)	.	-0.10	0.02	-0.06	B9 IV
4554	GAM UMA	11 51.7	53 55	2.44	0.04	0.00	0.05	0.02	A0 V
4589	PI VIR	11 58.8	6 50	4.67	0.23	0.13	0.16	0.20	A4 V
4608	OMI VIR	12 3.2	8 57	4.11	1.64	0.99	0.74	1.23	G8 III
4618		12 6.0	-50 26	(4.46)	.	-0.11	-0.09	-0.26	B6 III
4621	DEL CEN	12 6.3	-50 30	2.63	.	-0.09	0.04	-0.08	B2 Ve
4623	ALF CRV	12 6.3	-24 30	4.00	0.30	0.33	0.32	0.49	F2 V
4630	EPS CRV	12 8.1	-22 24	2.98	2.82	1.34	0.93	1.58	K3 III
4638	RHO CEN	12 9.6	-52 9	(3.96)	.	-0.14	-0.10	-0.26	B4 V
4660	DEL UMA	12 13.5	57 15	3.33	0.15	0.08	0.07	0.06	A3 V
4662	GAM CRV	12 13.7	-17 19	2.57	-0.45	-0.10	-0.02	-0.11	B8 III
4689	ETA VIR	12 17.9	-0 27	3.90	0.09	0.02	0.08	0.07	A2 V
4695	16 VIR	12 18.3	3 32	4.97	2.34	1.18	0.88	1.49	K1 III
4697	11 COM	12 18.7	18 1	4.74	1.81	1.01	0.76	1.29	G8 III
4707	12 COM	12 20.5	26 4	4.80	0.77	0.50	0.47	0.79	A5+G5 III
4716	5 CVN	12 22.2	51 47	4.80	1.50	0.87	0.68	1.12	G7 III
4732		12 24.4	-51 14	(4.81)	.	-0.17	-0.11	-0.26	B5 Vn
4737	GAM COM	12 24.9	28 29	4.37	2.28	1.13	0.83	1.35	K1 III-IV
4743	SIG CEN	12 25.9	-50 1	(3.91)	.	-0.20	-0.11	-0.30	B2 V
4757 D	DEL CRV	12 27.8	-16 18	2.94	-0.14	-0.05	-0.05	-0.09	B9.5 V:n
4775	ETA CRV	12 30.0	-15 58	4.31	0.39	0.37	0.38	0.57	F0 IV
4785	BET CVN	12 31.8	41 34	4.29	0.65	0.61	0.54	0.85	G0 V
4786	BET CRV	12 32.3	-23 11	2.64	1.53	0.88	0.61	1.05	G5 III
4787	KAP DRA	12 31.8	70 0	3.89	-0.71	-0.14	0.05	-0.03	B7p
4789	23 COM	12 32.9	22 51	4.81	-0.01	-0.00	0.07	0.05	A0 III
4802	TAU CEN	12 35.5	-48 19	(3.85)	.	0.05	0.05	0.09	A2 V
4813	CHI VIR	12 37.2	-7 47	4.66	2.59	1.23	0.88	1.49	K2 III
4817	1 CEN	12 37.7	-39 46	(4.64)	.	-0.08	-0.01	-0.10	A p
4819 D	GAM CEN	12 39.3	-48 45	(2.16)	.	-0.01	0.03	0.03	A0 III
4825/6	GAM VIR	12 39.6	-1 14	2.73	0.34	0.36	0.29	0.48	F0 V
4828	RHO VIR	12 39.9	10 27	4.88	0.12	0.09	0.08	0.10	A1 V
4831	m CEN	12 40.3	-48 36	(4.66)	.	1.07	0.75	1.32	K1
4846 V	Y CVN	12 43.3	45 39	4.86	9.16	2.55	1.75	3.12	C5,4
4848		12 44.1	-56 16	(4.64)	.	-0.16	-0.11	-0.32	B3 IV
4883	31 COM	12 49.8	27 45	4.94	0.91	0.68	0.52	0.87	G0 III
4888	e CEN	12 50.8	-48 44	(4.31)	.	1.34	0.98	1.73	K5
4889	n CEN	12 51.2	-39 58	(4.26)	.	0.22	0.21	0.34	A7 III
4898	MU 1 CRU	12 52.2	-56 58	(4.02)	.	-0.19	-0.14	-0.41	B5 Ve
4902	PSI VIR	12 52.3	-9 19	4.80	3.16	1.59	1.56	2.83	M3 III
4905	EPS UMA	12 52.3	56 11	1.78	-0.02	-0.03	-0.02	-0.06	A0p
4910	DEL VIR	12 53.6	3 37	3.38	3.37	1.59	1.55	2.88	M3 III-
4914/5	ALF CVN	12 54.1	38 32	2.84	-0.43	-0.10	-0.04	-0.12	F0 V /Ap
4920	36 COM	12 57.0	17 38	4.79	3.49	1.57	1.33	2.29	M1 III
4931 D	78 UMA	12 59.0	56 35	4.94	0.38	0.37	0.34	0.55	F2 V
4932	EPS VIR	13 0.2	11 10	2.84	1.68	0.94	0.65	1.09	G8 IIIab
4940	f CEN	13 4.0	-48 16	(4.70)	.	-0.14	-0.05	-0.19	B5 V

B.S.	NAME	R.A. (1960)	DEC.	V	U-V	B-V	V-R	V-I	MK SP.
4942	XI 2 CEN	13 4.6	-49 42	(4.26)	.	-0.20	-0.08	-0.28	B2 V
4954	41 COM	13 5.3	27 51	4.82	3.32	1.45	1.18	1.99	K5 III
4963 D	THE VIR	13 7.9	-5 20	4.37	-0.00	-0.01	0.04	0.04	A1 V
4979		13 9.8	-37 35	(4.84)	.	0.69	0.57	0.94	dG3
4983	BET COM	13 10.0	28 5	4.26	0.67	0.58	0.48	0.77	G0 V
5017	20 CVN	13 15.8	40 47	4.73	0.50	0.30	0.25	0.40	F0 II-IIIp
5019	61 VIR	13 16.3	-18 5	4.74	0.98	0.71	0.58	0.94	G6 V
5020	GAM HYA	13 16.7	-22 58	2.98	1.60	0.92	0.63	1.09	G8 III
5026		13 18.2	-52 32	5.48	.	-0.14	-0.08	-0.23	B5 III
5028	IOT CEN	13 18.3	-36 30	2.73	0.05	0.02	0.06	0.05	A2 V
5054	ZET A UMA	13 22.3	55 8	2.27	0.01	0.02	0.06	0.03	A2 V
5055	ZET B UMA	13 22.3	55 8	3.95	0.22	0.13	0.13	0.18	A m
5056 V	ALF VIR	13 23.1	-10 57	0.96	-1.18	-0.25	-0.09	-0.32	B1 V
5062	80 UMA	13 23.6	55 11	4.03	0.24	0.15	0.18	0.24	A5 V
5068	69 VIR	13 25.3	-15 46	4.75	2.16	1.10	0.79	1.32	K1 III
5072	70 VIR	13 26.5	14 0	4.97	0.99	0.71	0.61	0.97	G5 V
5080 V	R HYA	13 27.5	-23 5	4.98	2.31	1.52	2.99	5.37	M7e
5089 D	d CEN	13 28.7	-39 13	3.88	2.21	1.18	0.84	1.43	G8 III
5095	74 VIR	13 29.9	-6 3	4.69	3.56	1.60	1.44	2.61	M2+ III
5105	78 VIR	13 32.1	3 52	4.94	0.02	0.02	0.06	0.04	A p
5107	ZET VIR	13 32.7	-0 24	3.38	0.20	0.12	0.07	0.13	A3 Vn
5110		13 33.0	37 23	5.01	0.45	0.39	0.41	0.71	F2 IV
5112	24 CVN	13 32.9	49 13	4.70	0.23	0.12	0.11	0.13	A4 V
5127 D	25 CVN	13 35.7	36 29	4.83	0.32	0.23	0.28	0.40	A7 III
5132	EPS CEN	13 37.3	-53 16	(2.29)	.	-0.24	-0.15	-0.40	B1 V
5154	83 UMA	13 39.2	54 53	4.65	3.60	1.64	1.39	2.51	M2 III
5168	1 CEN	13 43.4	-32 51	(4.23)	.	0.38	0.34	0.55	F0 V
5185	TAU BOO	13 45.4	17 39	4.49	0.53	0.49	0.40	0.65	F7 V
5190	NU CEN	13 47.1	-41 29	(3.40)	.	-0.22	-0.11	-0.33	B2 IV
5191	ETA UMA	13 46.0	49 31	1.86	-0.85	-0.18	-0.07	-0.26	B3 V
5192 *	2 CEN	13 47.1	-34 15	4.21	2.92	1.49	2.14	4.01	sgM6
5193	MU CEN	13 47.2	-42 17	2.97	.	-0.17	0.04	-0.06	B2 V:pne
5200	UPS BOO	13 47.5	16 0	4.07	3.39	1.52	1.20	2.07	K5+ III
5210/1	3 CEN	13 49.5	-32 48	(4.31)	.	-0.15	-0.04	-0.17	B5 Vp/B9 V
5217		13 51.1	-53 11	5.92	.	0.02	0.06	0.06	B5 V
5219		13 50.1	34 38	4.75	3.59	1.64	1.52	2.79	gM2
5221 D	4 CEN	13 50.8	-31 44	(4.72)	.	-0.16	-0.03	-0.16	B5 III
5226	10 DRA	13 50.3	64 55	4.65	3.44	1.58	1.58	2.95	gM3
5231	ZET CEN	13 53.0	-47 6	(2.54)	.	-0.24	-0.13	-0.34	B2 IV
5235	ETA BOO	13 52.8	18 36	2.68	0.81	0.58	0.45	0.74	G0 IV
5248	PHI CEN	13 55.8	-41 54	(3.82)	.	-0.21	-0.13	-0.34	B2 IV
5249	UPS 1 CEN	13 56.2	-44 37	(3.86)	.	-0.21	-0.13	-0.35	B2 V
5260	UPS 2 CEN	13 59.2	-45 24	(4.34)	.	0.57	0.49	0.84	F7 I-II
5264	TAU VIR	13 59.6	1 44	4.27	0.23	0.09	0.14	0.20	A3 III
5285	CHI CEN	14 3.5	-40 59	(4.35)	.	-0.20	-0.10	-0.33	B2 V
5287	PI HYA	14 4.1	-26 29	3.28	2.16	1.12	0.87	1.42	K2 III
5288 *	THE CEN	14 4.3	-36 10	(2.05)	.	0.96	0.76	1.29	K0 III-IV
5291	ALF DRA	14 3.3	64 34	3.66	-0.12	-0.05	-0.03	-0.10	A0 III
5299		14 6.3	44 3	5.27	3.25	1.58	1.85	3.51	.M4-4.5 III
5304	12 BOO	14 8.6	25 17	4.83	0.61	0.54	0.44	0.73	F8 IV
5313		14 10.2	2 36	5.02	-0.56	-0.12	-0.08	-0.21	B9p
5315	KAP VIR	14 10.8	-10 5	4.21	2.79	1.32	1.07	1.82	K3 III
5328/9	KAP BOO	14 12.1	51 58	4.41	0.30	0.20	0.17	0.29	F2 V/A7 IV
5338	IOT VIR	14 13.9	-5 49	4.09	0.54	0.51	0.49	0.77	F7 III-IV
5340	ALF BOO	14 13.8	19 23	-0.06	2.52	1.24	0.98	1.64	K2 IIIp
5350	IOT BOO	14 14.7	51 33	4.75	0.26	0.20	0.15	0.24	A7 V
5351	LAM BOO	14 14.9	46 16	4.18	0.13	0.08	0.02	0.05	A0p
5354	IOT LUP	14 16.8	-45 53	(3.56)	.	-0.18	-0.09	-0.24	B3 IV
5359	LAM VIR	14 16.9	-13 11	4.53	0.21	0.13	0.10	0.13	A8m
5361	A BOO	14 16.3	35 42	4.81	1.98	1.06	0.76	1.29	K0 III
5367	PSI CEN	14 18.1	-37 42	(4.04)	.	-0.02	0.01	-0.03	A0 IV
5370 V	20 BOO	14 17.8	16 29	4.85	2.64	1.23	0.89	1.49	K3 III
5378	a CEN	14 20.6	-39 20	(4.41)	.	-0.18	-0.10	-0.27	B3 V
5381	51 HYA	14 20.8	-27 35	4.75	2.86	1.31	0.97	1.64	K5 III
5395	TAU 1 LUP	14 23.6	-45 2	(4.55)	.	-0.15	-0.09	-0.21	B3 III
5396 D	TAU 2 LUP	14 23.6	-45 12	(4.34)	.	0.43	0.42	0.77	F1
5404	THE BOO	14 23.8	52 2	4.07	0.51	0.50	0.43	0.68	F7 V
5409	PHI VIR	14 26.1	-2 3	4.82	0.95	0.74	0.58	0.95	G2 III
5429	RHO BOO	14 30.1	30 33	3.59	2.74	1.30	0.92	1.57	K3 III
5430	5 UMI	14 27.6	75 52	4.25	3.14	1.44	1.06	1.81	K4 III
5435	GAM BOO	14 30.5	38 29	3.02	0.31	0.20	0.14	0.22	A7 III
5440	ETA CEN	14 33.0	-41 59	(2.30)	.	-0.21	-0.09	-0.27	B1.5 V:ne
5447	SIG BOO	14 32.9	29 55	4.49	0.30	0.38	0.34	0.53	F2 V
5453	RHO LUP	14 35.2	-49 15	(4.04)	.	-0.15	-0.08	-0.20	B5 V
5469	ALF LUP	14 39.3	-47 13	(2.29)	.	-0.21	-0.08	-0.25	B1 V
5471	b CEN	14 39.5	-37 37	(3.99)	.	-0.16	-0.09	-0.25	B3 V
5475/6	PI BOO	14 38.8	16 35	4.54	-0.36	-0.04	0.07	0.05	B9 IIIp/Am
5477/8	ZET BOO	14 39.3	13 53	3.78	0.11	0.05	0.05	0.04	A2 III
5485	c 1 CEN	14 41.2	-35 0	(4.04)	.	1.34	1.01	1.74	K5 III
5487	MU VIR	14 40.9	-5 29	3.89	0.37	0.39	0.40	0.61	F3 IV
5489	c 2 CEN	14 42.5	-35 1	(4.91)	.	0.03	0.07	0.08	A0n
5490	34 BOO	14 41.7	26 42	4.82	3.56	1.62	1.56	2.77	gM3
5502	OMI BOO	14 43.4	17 8	4.59	1.75	0.98	0.73	1.21	K0 III
5505/6	EPS BOO	14 43.2	27 15	2.37	1.70	0.97	0.77	1.29	K1: III:+A
5511	109 VIR	14 44.2	2 4	3.74	-0.04	-0.00	0.07	0.05	A0 V
5526	58 HYA	14 47.9	-27 48	4.41	2.87	1.38	1.06	1.82	gK4
5528	OMI LUP	14 49.0	-43 25	(4.32)	.	-0.15	-0.04	-0.16	B6 III:
5531	ALF 2 LIB	14 48.7	-15 53	2.74	0.26	0.15	0.17	0.21	A m
5544 D	XI BOO	14 49.6	19 16	4.54	1.07	0.78	0.63	1.06	G8 V
5563	BET UMI	14 50.8	74 19	2.07	3.25	1.47	1.10	1.87	K4 III
5570	16 LIB	14 55.1	-4 10	4.49	0.38	0.33	0.31	0.48	F0 IV
5571	BET LUP	14 55.9	-42 58	(2.67)	.	-0.21	-0.09	-0.26	B2 IV
5576	KAP CEN	14 56.5	-41 57	(3.12)	.	-0.20	-0.07	-0.24	B2 V
5586 V	DEL LIB	14 58.8	-8 22	4.92	-0.11	-0.00	0.07	0.08	A0
5589 V	RR UMI	14 56.9	66 5	4.58	3.19	1.59	1.83	3.54	M5 III
5600	OMG BOO	15 0.3	25 10	4.82	3.33	1.50	1.19	1.98	K4 III
5601	110 VIR	15 0.9	2 15	4.40	1.92	1.04	0.80	1.34	K0 III
5602	BET BOO	15 0.4	40 33	3.50	1.68	0.97	0.65	1.10	G8 III
5603 V	SIG LIB	15 1.7	-25 8	3.26	3.63	1.69	1.53	2.82	M4 III
5605/6	PI LUP	15 2.4	-46 54	(3.88)	.	-0.17	-0.10	-0.21	B5 IV

MSS-025

THE ARIZONA-TONANTZINTLA CATALOGUE—MULTICOLOR PHOTOMETRY UBVRI

B.S.	NAME	R.A. (1960)	DEC.	V	U-V	B-V	V-R	V-I	MK SP.
5616	PSI BOO	15 2.7	27 6	4.55	2.57	1.23	0.93	1.58	K2 III
5625		15 6.0	-42 43	5.80	.	-0.12	-0.07	-0.20	B7: Vnn
5626 D	LAM LUP	15 6.1	-45 8	(4.04)	.	-0.20	-0.08	-0.22	B3 V
5634	45 BOO	15 5.5	25 1	4.93	0.41	0.43	0.36	0.60	F5 V
5646/7	KAP LUP	15 9.1	-48 35	(3.71)	.	-0.03	-0.03	-0.05	B9 V
5651	e LUP	15 10.1	-44 21	(4.81)	.	-0.14	-0.09	-0.25	B3 III
5652	IOT LIB	15 9.9	-19 38	4.54	-0.46	-0.09	-0.04	-0.13	A p
5660	1 LUP	15 12.2	-31 22	(4.90)	.	0.38	0.37	0.68	F0 I
5681	DEL BOO	15 13.9	33 28	3.48	1.63	0.96	0.73	1.24	G8 III
5683 D	MU LUP	15 15.7	-47 44	(4.26)	.	-0.07	-0.00	-0.05	B8n
5685 S	BET LIB	15 14.9	-9 14	2.61	-0.48	-0.11	-0.04	-0.13	B8 V
5686 W	2 LUP	15 15.3	-30 1	4.32	2.17	1.09	0.81	1.37	gK0
5695	DEL LUP	15 18.7	-40 30	(3.21)	.	-0.22	-0.11	-0.33	B2 IV
5705	PHI 1 LUP	15 19.3	-36 7	(3.55)	.	1.54	1.19	2.06	K5 III
5708 D	EPS LUP	15 20.0	-44 33	(3.36)	.	-0.17	-0.10	-0.26	B3 IV
5712	PHI 2 LUP	15 20.6	-36 43	(4.53)	.	-0.16	-0.03	-0.17	B5 V
5733	MU BOO	15 23.0	37 31	4.32	0.35	0.31	0.32	0.46	F0 IV
5735	GAM UMI	15 20.8	71 59	3.05	0.16	0.05	0.11	0.17	A3 II-III
5736		15 24.7	-36 38	5.41	.	-0.16	-0.09	-0.26	B5 V
5744	IOT DRA	15 24.0	59 6	3.31	2.39	1.16	0.78	1.38	K2 III
5747	BET CRB	15 26.2	29 15	3.66	0.40	0.30	0.19	0.23	F0 p
5764	ZET LIB	15 30.7	-16 44	5.47	.	-0.14	-0.09	-0.26	B2 Vnn
5774 D	NU 2 BOO	15 30.3	41 1	5.02	0.18	0.07	0.15	0.19	A2n
5776 D	GAM LUP	15 32.5	-41 3	(2.77)	.	-0.20	-0.15	-0.37	B2 Vn
5777	37 LIB	15 32.0	-9 56	4.60	1.88	1.02	0.75	1.28	K1 IVa
5778	THE CRB	15 31.3	31 30	4.13	-0.68	-0.13	-0.05	-0.16	B7nn
5780 W		15 32.2	-9 4	5.12	.	-0.11	-0.04	-0.16	B7 IV:
5781 D	d LUP	15 33.1	-44 50	(4.54)	.	-0.16	-0.16	-0.36	B5 IV
5787	GAM LIB	15 33.3	-14 39	3.91	1.77	1.03	0.73	1.28	G8 III-IV
5788/9	DEL SER	15 32.9	10 39	3.79	0.38	0.26	0.22	0.33	F0 IV
5793 V	ALF CRB	15 33.0	26 51	2.27	-0.06	-0.02	0.09	0.05	A0 V
5794	UPS LIB	15 34.6	-28 0	3.56	2.98	1.39	1.00	1.71	K5 III
5797	OMG LUP	15 35.3	-42 27	(4.32)	.	1.43	1.01	1.71	M0 III
5812	TAU LIB	15 36.2	-29 39	3.65	-0.86	-0.17	-0.12	-0.32	B2.5 V
5820	PSI 1 LUP	15 37.2	-34 17	(4.66)	.	1.00	0.66	1.12	G5
5825	g LUP	15 38.4	-44 32	(4.63)	.	0.44	0.35	0.55	F5 IV-V
5838	KAP LIB	15 39.6	-19 33	4.71	3.55	1.58	1.26	2.21	K5 III
5839	PSI 2 LUP	15 40.1	-34 35	(4.74)	.	-0.14	-0.10	-0.26	B6 V
5842 D	IOT SER	15 39.8	19 48	4.53	0.06	0.06	0.04	0.03	A1 V
5849 D	GAM CRB	15 41.0	26 25	3.85	-0.05	-0.01	0.01	-0.01	A0 IV
5854 S	ALF SER	15 42.3	6 33	2.65	2.41	1.17	0.81	1.37	K2 III
5859		15 43.4	5 34	5.50	0.07	0.04	0.06	0.05	A0 V
5867	BET SER	15 44.3	15 33	3.64	0.15	0.07	C.06	0.09	A2 IV
5868	LAM SER	15 44.5	7 29	4.44	0.70	0.61	0.51	0.83	G0 V
5879	KAP SER	15 46.9	18 16	4.11	3.55	1.60	1.30	2.27	M1 III
5881	MU SER	15 47.5	-3 19	3.53	-0.14	-0.03	0.00	-0.05	A0 V
5883	CHI LUP	15 48.4	-33 30	(3.94)	.	-0.03	-0.01	-0.08	A p
5885	1 SCO	15 48.6	-25 38	4.69	-0.80	-0.06	0.01	-0.09	B2.5 Vn
5889	DEL CRB	15 47.9	26 12	4.62	1.17	0.80	0.63	1.05	G5 III-IV
5892	EPS SER	15 48.8	4 36	3.70	0.25	0.16	0.08	0.13	A m
5899	RHO SER	15 49.5	21 6	4.78	3.40	1.52	1.22	2.09	K5 III
5901	KAP CRB	15 49.7	35 47	4.82	1.87	1.00	0.76	1.25	K0 III-IV
5902	LAM LIB	15 51.0	-20 3	5.00	.	-0.01	0.01	-0.04	B3 V
5903	ZET UMI	15 45.4	77 55	4.32	0.08	0.04	0.07	0.08	A3 V
5904 D	2 SCO	15 51.2	-25 13	4.59	-0.74	-0.07	-0.02	-0.11	B2.5 Vn
5906		15 51.5	-24 25	5.35	.	-0.02	0.01	-0.01	B6 V
5907		15 51.6	-23 52	5.39	.	-0.04	0.01	-0.04	B2 Vnn
5908	THE LIB	15 51.5	-16 37	4.15	1.84	1.01	0.72	1.24	K0 III-IV
5914	CHI HER	15 51.3	42 34	4.63	0.58	0.58	0.48	0.80	F9 V
5915 D	47 LIB	15 52.7	-19 16	5.89	.	-0.02	0.02	-0.01	B5 V:
5928	RHO SCO	15 54.4	-29 6	3.85	-1.02	-0.20	-0.10	-0.30	B2 V
5933	GAM SER	15 54.6	15 47	3.87	0.44	0.48	0.47	0.72	F6 V
5941	48 LIB	15 55.9	-14 10	4.87	-0.26	-0.09	-0.06	-0.11	B pe
5944	PI SCO	15 56.4	-26 0	2.92	-1.08	-0.19	-0.09	-0.29	B1 V
5947 S	EPS CRB	15 55.9	27 0	4.15	2.51	1.23	0.89	1.52	K3 III
5948 D	ETA LUP	15 57.5	-38 18	(3.40)	.	-0.24	-0.13	-0.34	B2 V
5953	DEL SCO	15 58.0	-22 31	2.33	-1.00	-0.10	-0.04	-0.17	B0 V
5960		15 56.8	54 52	4.95	0.30	0.26	0.24	0.37	F0 IV
5962	ETA NOR	16 0.3	-49 7	(4.64)	.	0.91	0.66	1.14	G4
5967		16 0.7	-38 30	(4.88)	.	-0.15	-0.07	-0.20	B7 IV:
5971	IOT CRB	15 59.8	29 58	4.97	-0.27	-0.07	-0.00	-0.09	A0 II-IIIp
5972	PI SER	16 0.6	22 55	4.83	0.12	0.07	0.10	0.11	A3 V
5977/8	XI SCO	16 2.2	-11 16	4.17	0.48	0.47	0.37	0.61	F5 IV
5980 W	DEL NOR	16 3.7	-45 4	(4.72)	.	0.22	0.21	0.34	A7m
5982	UPS HER	16 1.6	46 9	4.75	-0.44	-0.13	-0.02	-0.12	B9p
5984/5	BET SCO	16 3.1	-19 42	2.55	-0.90	-0.08	-0.00	-0.10	B0.5 V/B2V
5986	THE DRA	16 1.1	58 40	4.06	0.59	0.51	0.46	0.71	F8 IV-V
5987	THE LUP	16 4.0	-36 42	(4.22)	.	-0.19	-0.09	-0.26	B2 Vn
5993	OMG 1 SCO	16 4.4	-20 34	3.99	-0.86	-0.04	0.07	-0.03	B1 V
5997	OMG 2 SCO	16 5.0	-20 46	4.33	1.36	0.85	0.63	1.07	gG2
6018	TAU CRB	16 7.5	36 35	4.76	1.89	1.02	0.77	1.31	K0 III
6023	PHI HER	16 7.5	45 2	4.27	-0.35	-0.07	0.00	-0.09	B9p
6027 D	NU SCO	16 9.7	-19 22	4.02	-0.60	0.04	0.10	0.13	B2 V
6028	13 SCO	16 9.8	-27 50	4.58	-0.89	-0.15	-0.07	-0.23	B2.5 Vn
6031	PSI SCO	16 9.8	-9 58	4.92	0.19	0.09	0.09	0.11	A2 V
6056	DEL OPH	16 12.2	-3 36	2.74	3.55	1.60	1.29	2.32	M0.5 III
6070	d SCO	16 15.8	-28 31	4.77	0.01	0.02	0.08	0.03	A0 V
6072 W	GAM 2 NOR	16 16.8	-50 4	(4.01)	.	1.06	0.77	1.35	G8 III
6075	EPS OPH	16 16.2	-4 36	3.23	1.73	0.99	0.70	1.19	G9 III
6081	OMI SCO	16 18.2	-24 5	4.57	1.52	0.84	0.85	1.69	A5 II
6084 V	SIG SCO	16 18.8	-25 30	2.89	-0.56	0.14	0.20	0.32	B1 III
6092 S	TAU HER	16 18.5	46 24	3.89	-0.71	-0.15	-0.10	-0.27	B5 IV
6093	SIG SER	16 20.0	1 7	4.82	0.36	0.34	0.28	0.43	F0 V
6095	GAM HER	16 20.2	19 15	3.76	0.47	0.27	0.27	0.42	A9 III
6103	XI CRB	16 20.5	30 59	4.85	1.77	0.97	0.73	1.19	K0 III
6104	PSI OPH	16 21.7	-19 56	4.50	1.87	1.03	0.78	1.28	K0 III
6112/3	RHO OPH	16 23.2	-23 21	4.63	-0.33	0.22	0.36	0.67	B3 IV/B3 V
6115 W	EPS NOR	16 24.2	-47 28	(4.96)	.	-0.07	0.05	0.01	B3: V
6117	OMG HER	16 23.6	14 7	4.59	-0.07	-0.02	0.06	0.02	A1p
6118 V	CHI OPH	16 24.7	-18 22	4.43	-0.48	0.29	0.45	0.68	B2 Ve
6129	UPS OPH	16 25.6	-8 17	4.63	0.22	0.16	0.13	0.21	A m
6132	ETA DRA	16 23.4	61 36	2.74	1.61	0.91	0.61	1.07	G8 III
6134 V	ALF SCO	16 27.0	-26 21	0.89	3.17	1.83	1.56	2.79	M2 I
6141	22 SCO	16 27.7	-25 2	4.79	-0.86	-0.07	-0.06	-0.20	B2 V
6143 W	N SCO	16 28.8	-34 37	(4.23)	.	-0.17	-0.04	-0.19	B2 IV
6146 V	g HER	16 27.3	41 58	5.01	2.69	1.53	2.52	4.75	M6- III
6147	PHI OPH	16 28.8	-16 32	4.27	1.63	0.92	0.65	1.09	G8 III
6148	BET HER	16 28.5	21 35	2.77	1.63	0.94	0.64	1.11	G8 III
6149 D	LAM OPH	16 28.9	2 4	3.83	0.03	0.01	-0.00	-0.02	A1 V
6153	OMG OPH	16 29.8	-21 23	4.45	0.24	0.12	0.12	0.15	A p
6159	29 HER	16 30.7	11 34	4.85	3.33	1.48	1.19	2.05	K4 III
6161	15 DRA	16 28.0	68 51	5.01	-0.16	-0.06	0.04	0.01	B9 IV
6165	TAU SCO	16 33.4	-28 8	2.82	-1.27	-0.25	-0.11	-0.36	B0 V
6166	H SCO	16 33.7	-35 11	(4.15)	.	1.59	1.21	2.20	Ma
6168	SIG HER	16 32.8	42 31	4.20	-0.12	-0.02	0.03	0.02	B9 V
6175	ZET OPH	16 35.0	-10 29	2.57	-0.82	0.02	0.10	0.06	O9.5 V
6212 D	ZET HER	16 39.8	31 40	2.81	0.86	0.66	0.54	0.85	G0 IV
6220	ETA HER	16 41.5	39 0	3.50	1.53	0.92	0.67	1.15	G7 III-IV
6237		16 44.5	56 51	4.84	0.33	0.39	0.35	0.56	F2 V
6241 W	EPS SCO	16 47.6	-34 13	(2.28)	.	1.17	0.86	1.46	K2 III-IV
6243	20 OPH	16 47.6	-10 43	4.66	0.54	0.48	0.44	0.69	F5 IV-V
6247 V	MU 1 SCO	16 49.2	-38 0	3.02	.	-0.23	-0.12	-0.31	B1.5 V
6252	MU 2 SCO	16 49.7	-37 57	(3.56)	.	-0.22	-0.13	-0.35	B2 IV
6254	52 HER	16 48.1	46 4	4.83	0.10	0.08	0.10	0.11	A2p
6271 W	ZET 2 SCO	16 51.8	-42 18	3.59	2.97	1.36	1.12	1.80	K5 III
6281	IOT OPH	16 52.1	10 14	4.38	-0.40	-0.08	-0.09	-0.17	B8 IV
6299	KAP OPH	16 55.8	9 26	3.19	2.33	1.16	0.83	1.39	K2 III
6315	19 DRA	16 55.8	65 12	4.91	0.45	0.47	0.44	0.71	F6 V
6322 V	EPS UMI	16 49.9	82 7	4.23	1.45	0.90	0.70	1.17	G5 III
6324	EPS HER	16 58.8	30 59	3.92	-0.12	-0.01	-0.01	-0.05	B9.5 V
6334		17 2.1	-34 4	(4.86)	.	0.28	0.28	0.45	B1 Iab
6337		17 1.3	14 9	4.98	3.54	1.59	1.43	2.65	M3 III
6355	60 HER	17 3.5	12 48	4.91	0.18	0.12	0.12	0.14	A3 IV
6378 D	ETA ORH	17 8.0	-15 41	2.42	0.13	0.05	0.06	0.05	A2.5 V
6380	ETA SCO	17 9.3	-43 11	(3.33)	.	0.42	0.36	0.56	F0 IVn
6396	ZET DRA	17 8.7	65 46	3.17	-0.54	-0.11	-0.05	-0.17	B6 III
6406DV	ALF HER	17 12.8	14 26	3.06	2.46	1.45	2.11	4.23	M5: Ib-II
6410	DEL HER	17 13.4	24 53	3.12	0.15	0.07	0.05	0.08	A3 IV
6415 D	41 OPH	17 14.6	-0 24	4.72	2.26	1.15	0.81	1.40	K2 III
6418	PI HER	17 13.7	36 51	3.16	3.10	1.44	0.96	1.68	K3 II
6431 V	68 HER	17 15.8	33 9	4.83	-0.91	-0.15	-0.06	-0.24	B3 +B3
6436	69 HER	17 16.3	37 20	4.66	0.02	0.05	0.09	0.09	A2 V
6445	XI OPH	17 18.6	-21 4	4.38	0.35	0.41	0.37	0.59	F2 V
6446	NU SER	17 18.6	-12 49	4.31	0.06	0.03	0.07	0.07	A1 V
6453	THE OPH	17 19.6	-24 58	3.27	-1.08	-0.22	-0.11	-0.33	B2 IV
6484/5	RHO HER	17 22.3	37 10	4.17	-0.05	0.00	0.02	0.01	A0p /A0 IV
6486	44 OPH	17 23.9	-24 8	4.16	0.40	0.29	0.26	0.38	A9 V
6492	45 OPH	17 24.8	-29 50	4.27	0.47	0.41	0.35	0.52	F5 IV
6493		17 24.5	-5 3	4.54	0.33	0.41	0.36	0.57	F3 V
6498	SIG OPH	17 24.5	4 10	4.33	3.09	1.50	1.08	1.85	K3 II
6508 *	UPS SCO	17 28.0	-37 16	(2.70)	.	-0.22	-0.16	-0.40	B3 Ib
6510 W	ALF ARA	17 28.7	-49 51	(2.94)	.	-0.18	-0.10	-0.34	B2.5 V
6519	51 OPH	17 28.7	-23 56	4.81	-0.04	0.01	0.07	0.08	A0n
6526	LAM HER	17 29.1	26 8	4.41	3.12	1.44	1.06	1.82	K4 III
6527 W	LAM SCO	17 30.9	-37 5	(1.62)	.	-0.18	-0.17	-0.45	B1 V
6536	BET DRA	17 29.5	52 20	2.78	1.63	1.00	0.68	1.16	G2 II
6537 W	SIG ARA	17 32.7	-46 29	(4.58)	.	0.00	-0.01	-0.06	A0n
6546 W	Q SCO	17 33.8	-38 37	(4.28)	.	1.07	0.75	1.30	gK0
6553	THE SCO	17 34.4	-42 58	(1.86)	.	0.41	0.35	0.55	F0 Ib
6554	NU 1 DRA	17 31.4	55 13	4.89	0.29	0.27	0.24	0.37	A m
6555	NU 2 DRA	17 31.5	55 12	4.89	0.27	0.26	0.24	0.36	A m
6556	ALF OPH	17 33.1	12 35	2.07	0.25	C.14	0.14	0.22	A5 III
6561	XI SER	17 35.3	-15 23	3.52	0.36	0.24	0.20	0.33	F0 IV
6567	MU OPH	17 35.7	-8 5	4.63	-0.07	0.12	0.17	0.28	B8 V
6569 W	LAM ARA	17 37.3	-49 23	(4.76)	.	0.41	0.29	0.51	F5
6580 *	KAP SCO	17 39.7	-39 1	(2.41)	-1.08	-0.20	-0.08	-0.30	B2 IV
6581	OMI SER	17 39.2	-12 51	4.24	0.18	0.08	0.09	0.09	A2 V
6588	IOT HER	17 38.3	46 2	3.80	-0.88	-0.18	-0.10	-0.27	B3 V
6595	58 OPH	17 41.0	-21 40	4.86	0.44	0.47	0.39	0.63	F5 V
6596	OMG DRA	17 37.2	68 47	4.80	0.42	0.43	0.41	0.63	F5 V
6603 S	BET OPH	17 41.5	4 35	2.77	2.40	1.16	0.81	1.38	K2 III
6616 V	X SGR	17 45.0	-27 49	4.86	1.57	0.93	0.76	1.31	G9
6623	MU HER	17 44.9	27 45	3.42	1.15	0.75	0.54	0.91	G5 IV
6629 S	GAM OPH	17 45.9	2 43	3.75	0.08	0.04	0.05	0.06	A0 V
6636	PSI DRA	17 42.6	72 10	4.57	0.43	0.43	0.37	0.61	F5 IV-V
6685	89 HER	17 53.8	26 3	5.44	0.65	0.34	0.31	0.52	F2 Ia
6688	XI DRA	17 52.8	56 53	3.75	2.40	1.18	0.85	1.43	K2 III
6695	THE HER	17 54.9	37 15	3.86	2.83	1.35	0.90	1.52	K1 II
S	BARNARD'S	17 56.0	4 37	9.54	3.03	1.74	1.83	3.44	M5 V
6698	NU OPH	17 56.8	-9 46	3.34	1.87	0.99	0.72	1.20	G9 III
6700	4 SGR	17 57.4	-23 49	4.74	-0.08	-0.04	0.03	0.01	A0n
6703	XI HER	17 56.2	29 15	3.71	1.64	0.94	0.71	1.17	G9 III
6705	GAM DRA	17 55.7	51 30	2.23	3.39	1.51	1.16	2.02	K5 III
6707	NU HER	17 57.0	30 12	4.41	0.54	0.39	0.40	0.63	F2 II
6710	ZET SER	17 58.4	-3 41	4.62	0.38	0.39	0.32	0.52	F3 V
6712	66 OPH	17 58.3	4 23	4.59	-0.83	-0.02	0.12	0.09	B2 Ve
6713	93 HER	17 58.3	16 45	4.66	2.51	1.27	0.84	1.46	K0 II-III
6714	67 OPH	17 59.6	2 56	3.96	-0.63	0.02	0.10	0.09	B5 Ib
6723	68 OPH	17 59.7	1 15	4.42	0.06	0.04	0.06	0.06	A1 V
6742 V	W SGR	18 2.4	-29 35	5.09	1.64	0.95	0.75	1.25	G6
6746 W	GAM SGR	18 3.2	-30 26	(2.98)	.	1.02	0.73	1.24	K0 III
6752 D	70 OPH	18 3.4	2 31	4.05	1.35	0.84	0.65	1.11	K0 V
6766		18 5.5	-28 28	4.55	1.71	0.96	0.66	1.18	G p
6770	71 OPH	18 5.4	8 43	4.63	1.72	0.97	0.68	1.18	G8 III-IV
6771	72 OPH	18 5.5	9 33	3.73	0.21	0.12	0.10	0.15	A4 V
6779	OMI HER	18 6.0	28 45	3.83	-0.09	-0.02	0.02	0.01	B9.5 III
6783 W	EPS TEL	18 8.3	-45 58	(4.53)	.	0.99	0.70	1.18	G5 III
6787	102 HER	18 7.1	20 48	4.35	-0.97	-0.15	-0.10	-0.29	B2 V
6789	DEL UMI	17 45.1	86 36	4.35	0.05	0.01	C.03	0.02	A1 V
6812 V	MU SGR	18 11.4	-21 4	3.85	-0.25	0.22	0.28	0.48	B8 Iap

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B.S.	NAME	R.A. (1960)	DEC.	V	U-V	B-V	V-R	V-I	MK SP.
6832 W	ETA SGR	18 15.0	-36 46	(3.10)	.	1.54	1.56	2.88	M3 II
6842		18 15.6	-27 4	4.63	3.45	1.66	1.22	2.14	gK5
6859	DEL SGR	18 18.4	-29 51	2.69	2.89	1.38	1.00	1.68	K2 III
6866	74 OPH	18 18.9	3 21	4.84	1.54	0.91	0.67	1.12	G8 III
6868	106 HER	18 18.6	21 56	4.96	3.58	1.59	1.34	2.34	M0 III
6869	ETA SER	18 19.2	-2 55	3.23	1.60	0.95	0.69	1.19	K0 III-IV
6872	KAP LYR	18 18.5	36 3	4.34	2.36	1.17	0.86	1.41	K2 III
6879 W	EPS SGR	18 21.5	-34 24	(1.84)	.	-0.02	-0.00	-0.01	A0 V
6884	ZET SCT	18 21.5	-8 58	4.67	1.69	0.95	0.70	1.17	K0 III
6895	109 HER	18 22.0	21 45	3.86	2.34	1.17	0.85	1.45	K2 III
6896 D	21 SGR	18 23.0	-20 35	4.80	2.26	1.31	1.09	1.94	K2 II
6897 W	ALF TEL	18 24.0	-46 0	(3.50)	.	-0.19	-0.13	-0.34	B3 III
6913	LAM SGR	18 25.5	-25 27	2.82	1.94	1.04	0.76	1.32	K2 III
6918 V	59 SER	18 25.2	0 10	5.21	0.71	0.50	0.49	0.87	G0+A2
6920 D	PHI DRA	18 21.3	71 19	4.21	-0.43	-0.10	-0.05	-0.16	A0p
6923 D	39 DRA	18 23.3	58 47	4.98	0.13	0.08	0.04	0.05	A1 V
6927	CHI DRA	18 21.8	72 43	3.57	0.44	0.48	0.45	0.75	F7 V
6930	GAM SCT	18 26.9	-14 36	4.71	0.11	0.07	0.08	0.13	A3 V
6945	42 DRA	18 25.9	65 32	4.81	2.32	1.19	0.85	1.48	K2 III
6951 W	THE CRA	18 30.6	-42 21	(4.63)	.	1.01	0.69	1.19	G5 III
6973	ALF SCT	18 33.0	-8 16	3.85	2.87	1.34	0.98	1.65	K3 III
6978	45 DRA	18 31.8	57 0	4.80	1.05	0.61	0.53	0.84	F7 Ib
7001	ALF LYR	18 35.6	38 45	0.00	0.03	0.00	-0.04	-0.07	A0 V
7020 V	DEL SCT	18 40.1	-9 6	4.71	0.51	0.35	0.30	0.48	F3 III-IV
7029 W		18 41.6	-35 41	(4.87)	.	-0.14	-0.14	-0.30	B3 V
7039	PHI SGR	18 43.2	-27 2	3.17	-0.44	-0.11	0.01	-0.10	B8 III
7056	ZET LYR	18 43.4	37 34	4.35	0.35	0.20	0.16	0.24	A m
7061	110 HER	18 43.9	20 30	4.19	0.49	0.47	0.39	0.65	F6 V
7063	BET SCT	18 45.1	-4 48	4.21	1.94	1.09	0.79	1.36	G5 II
7064		18 44.5	26 37	4.84	2.42	1.20	0.88	1.49	K3 III
7066 V	R SCT	18 45.3	-5 44	5.20	3.10	1.46	1.06	1.84	G0Ia-K0pIb
7069	111 HER	18 45.3	18 8	4.36	0.20	0.13	0.10	0.11	A3 V
7106 V	BET LYR	18 48.6	33 19	3.43	-0.57	-0.01	0.13	0.15	B pe
7116	NU 1 SGR	18 51.7	-22 48	4.81	2.70	1.42	1.00	1.69	cK2
7121	SIG SGR	18 52.8	-26 21	2.07	-0.95	-0.22	-0.11	-0.31	B2 V
7125	OMI DRA	18 50.6	59 20	4.67	2.23	1.18	0.90	1.54	K0 II-III
7133 D	113 HER	18 53.0	22 35	4.59	1.28	0.79	0.65	1.10	A5+G5 III
7137		18 52.2	50 39	4.93	1.48	0.90	0.67	1.13	G8 III
7139	DEL 2 LYR	18 53.1	36 50	4.30	3.32	1.67	1.79	3.42	M4 II
7141/2	THE SER	18 54.2	4 9	4.07	0.26	0.17	0.17	0.24	A5 V
7150	XI 2 SGR	18 55.3	-21 10	3.49	2.33	1.18	0.80	1.38	K1 III
7157 V	R LYR	18 54.1	43 54	4.00	3.00	1.59	2.03	3.95	gM5
7176	EPS AQL	18 57.8	15 1	4.01	2.12	1.07	0.76	1.28	K2 III
7178	GAM LYR	18 57.4	32 38	3.23	-0.11	-0.03	-0.04	-0.04	B9 III
7180	UPS DRA	18 54.9	71 15	4.82	2.25	1.15	0.85	1.41	K0 III
7193	12 AQL	18 59.5	-5 48	4.01	2.13	1.08	0.79	1.33	K1 III
7194 D	ZET SGR	19 0.0	-29 56	2.60	0.17	0.08	0.04	0.05	A2 III
7217	OMI SGR	19 2.3	-21 48	3.77	1.87	1.01	0.64	1.18	gG8
7234	TAU SGR	19 4.4	-27 44	3.31	2.33	1.20	0.88	1.48	K1 III
7235	ZET AQL	19 3.6	13 48	2.98	0.03	0.03	0.04	0.04	A0 V:nn
7236	LAM AQL	19 4.1	-4 57	3.43	-0.37	-0.11	-0.03	-0.11	B9: V:n
7254 W	ALF CRA	19 6.7	-37 58	(4.10)	.	0.03	0.04	0.04	A2n
7259 W	BET CRA	19 7.2	-39 24	(4.10)	.	1.18	0.82	1.43	G5
7264	PI SGR	19 7.4	-21 5	2.87	0.57	0.33	0.34	0.59	F2 II-III
7292 D	PSI SGR	19 13.1	-25 20	4.82	0.90	0.56	0.46	0.81	F5
7298	ETA LYR	19 12.4	39 5	4.38	-0.81	-0.14	-0.11	-0.26	B2 IV
7306	1 VUL	19 14.5	21 20	4.77	-0.59	-0.04	0.03	-0.05	B3 IV
7310	DEL DRA	19 12.5	67 35	3.07	1.78	1.00	0.70	1.21	G9 III
7314	THE LYR	19 15.0	38 4	4.37	2.48	1.25	0.87	1.46	K0 II
7328	KAP CYG	19 16.2	53 18	3.76	1.71	0.97	0.63	1.11	K0 III
7340	RHO 1 SGR	19 19.4	-17 55	3.93	0.35	0.22	0.19	0.30	F0 IV
7342	UPS SGR	19 19.4	-16 2	4.61	-0.43	0.10	0.27	0.40	A pe
7352	TAU DRA	19 16.3	73 17	4.45	2.70	1.25	0.90	1.47	K3 III
7358	3 VUL	19 21.2	26 11	5.18	-0.65	-0.12	-0.04	-0.20	B6 III
7371	PI DRA	19 20.4	65 36	4.59	0.06	0.02	0.04	0.01	A2 IV
7372	2 CYG	19 22.6	29 33	4.97	-0.81	-0.09	0.02	-0.12	B3 IV
7377	DEL AQL	19 23.5	3 2	3.36	0.38	0.33	0.26	0.41	F0 IV
7387	NU AQL	19 24.5	0 15	4.67	1.11	0.60	0.51	0.98	F2 Ib
7405	ALF VUL	19 27.0	24 35	4.45	3.35	1.50	1.21	2.18	M0+ III
7417	BET CYG	19 29.1	27 52	3.09	1.75	1.14	0.88	1.54	K3 II: +B:
7420	IOT CYG	19 28.7	51 39	3.79	0.25	0.14	0.14	0.21	A5 V
7426	8 CYG	19 30.3	34 22	4.74	-0.80	-0.13	-0.01	-0.16	B3 IV
7429	MU AQL	19 32.1	7 18	4.44	2.41	1.18	0.86	1.45	K3 III
7437	9 VUL	19 32.8	19 41	4.99	-0.50	-0.07	-0.01	-0.10	B7 V
7440	52 SGR	19 36.3	-24 58	4.59	-0.18	-0.06	-0.02	-0.09	B9
7446 W	KAP AQL	19 34.7	-7 7	4.95	-0.87	0.00	0.10	0.06	B0.5 III
7447	IOT AQL	19 34.6	-1 23	4.36	-0.53	-0.09	0.04	-0.05	B5 III
7462	SIG DRA	19 32.4	69 36	4.69	1.17	0.81	0.65	1.06	K0 V
7469	THE CYG	19 35.4	50 8	4.46	0.38	0.40	0.36	0.56	F4 V
7478	PHI CYG	19 37.8	30 3	4.70	1.74	0.95	0.68	1.16	G8 III-IV
7479	ALF SGE	19 38.3	17 55	4.38	1.20	0.77	0.58	0.95	G0 II
7488	BET SGE	19 39.3	17 23	4.37	1.95	1.05	0.72	1.22	G8 II
7503	16 CYG	19 40.7	50 26	5.94	0.85	0.64	0.45	0.78	G2 V
7504	16 B CYG	19 40.8	50 25	6.19	0.88	0.66	0.44	0.78	G5 V
7525	GAM AQL	19 44.4	10 31	2.71	3.21	1.52	1.07	1.82	K3 II
7528	DEL CYG	19 43.7	45 2	2.87	-0.12	-0.02	0.00	-0.02	B9.5 III
7536	DEL SGE	19 45.6	18 26	3.82	2.37	1.41	1.42	2.72	M2 II:+B:
7546 D	ZET SGE	19 47.2	19 1	5.00	0.16	0.10	0.14	0.20	A3 V
7557	ALF AQL	19 48.8	8 46	0.74	0.31	0.23	0.14	0.27	A7 IV,V
7564 V	CHI CYG	19 49.0	32 49	10.31	.	2.03	5.27	9.14	S10.1e:
7565	12 VUL	19 49.4	22 30	4.96	-0.81	-0.13	-0.01	-0.15	B3 V
7570 V	ETA AQL	19 50.4	0 54	4.30	1.82	1.03	0.75	1.28	G2 Ib
7582 D	EPS DRA	19 48.3	70 10	3.82	1.41	0.89	0.64	1.12	G8 III
7589		19 50.8	46 55	5.63	-1.07	-0.09	0.10	-0.02	O9.5 III
7592	13 VUL	19 51.7	23 58	4.58	-0.19	-0.06	0.02	-0.02	B9.5 III
7595	XI AQL	19 52.3	8 21	4.68	1.95	1.05	0.76	1.33	K0 III
7597	OMG SGR	19 53.4	-26 25	4.70	1.08	0.75	0.59	0.96	dG5
7602	BET AQL	19 53.3	6 18	3.72	1.34	0.86	0.66	1.14	G8 IV
7604	59 SGR	19 54.5	-27 16	4.50	3.03	1.46	1.02	1.75	gK3
7613	22 CYG	19 54.4	38 23	4.95	-0.61	-0.09	0.01	-0.09	B6 III
7615	ETA CYG	19 54.8	34 59	3.93	1.91	1.03	0.75	1.27	K0 III
7618	60 SGR	19 56.6	-26 18	4.82	1.43	0.89	0.65	1.12	gG5
7619 D	PSI CYG	19 54.6	52 20	4.91	0.19	0.12	0.11	0.17	A3 IV
7635	GAM SGE	19 57.0	19 23	3.47	3.51	1.57	1.20	2.12	K5+ III
7650	62 SGR	20 0.2	-27 49	4.59	3.46	1.65	1.87	3.43	M4 III
7653	15 VUL	19 59.5	27 39	4.65	0.34	0.18	0.15	0.24	A m
7678		20 3.1	32 6	5.65	0.09	0.55	0.53	0.94	B1.5 Ia
7685	RHO DRA	20 2.6	67 45	4.50	2.81	1.31	0.93	1.58	K3 III
7708	28 CYG	20 7.9	36 43	4.92	-0.89	-0.12	0.02	-0.09	B3 V
7710	THE AQL	20 9.2	-0 56	3.21	-0.19	-0.07	-0.07	-0.12	B9.5 III
7724	RHO AQL	20 12.4	15 4	4.95	0.10	0.09	0.10	0.10	A2 V
7730	30 CYG	20 12.0	46 42	4.82	0.24	0.10	0.19	0.24	A3 III
7735 V	31 CYG	20 12.4	46 37	3.80	1.70	1.28	0.97	1.73	K2 II +B3V
7736	29 CYG	20 13.0	36 41	4.99	0.12	0.12	0.21	0.27	A2 III
7739		20 13.5	25 28	4.77	-0.91	-0.18	-0.08	-0.27	B3 V
7740	33 CYG	20 12.5	56 27	4.30	0.19	0.11	0.13	0.19	A3 IV,V
7741	22 VUL	20 13.8	23 23	5.17	1.74	1.04	0.74	1.23	G2 Ib
7744	23 VUL	20 14.1	27 41	4.52	2.37	1.26	0.96	1.66	K3 III
7747	ALF 1 CAP	20 15.4	-12 38	4.26	1.89	1.08	0.79	1.32	G3 Ib
7750 D	KAP CEP	20 10.3	77 36	4.39	-0.14	-0.05	-0.01	-0.07	B9 III
7751 V	OMI 2 CYG	20 14.3	47 35	3.98	2.56	1.52	1.20	2.12	K3 Ib-II+A
7754	ALF 2 CAP	20 15.8	-12 40	3.58	1.64	0.95	0.69	1.16	G9 III
7763 V	P CYG	20 16.3	37 54	4.80	-0.16	0.41	0.54	0.80	B p
7767 D		20 16.7	40 36	5.84	-0.68	0.10	0.14	0.15	O8
7770	35 CYG	20 17.1	34 51	5.16	1.13	0.65	0.56	0.99	F5 Ib
7773	NU CAP	20 18.4	-12 53	4.76	-0.15	-0.04	-0.00	-0.07	B9 V
7776	BET CAP	20 18.8	-14 55	3.08	1.06	0.79	0.55	1.05	gK0:+LATE B
7796	GAM CYG	20 20.8	40 8	2.23	1.21	0.67	0.50	0.84	F8 Ib
7806	39 CYG	20 22.3	32 4	4.45	2.87	1.34	1.01	1.68	K3 III
7822 D	RHO CAP	20 26.6	-17 57	4.80	0.42	0.38	0.34	0.54	F2 IV
7834	41 CYG	20 27.8	30 14	4.02	0.59	0.40	0.37	0.60	F5 II
7844	OMG 1 CYG	20 28.9	48 49	4.95	-0.72	-0.09	0.02	-0.09	B2 V
7847	44 CYG	20 29.5	36 48	6.21	1.74	1.00	0.86	1.55	F5 Iab
7850	THE CEP	20 28.9	62 52	4.21	0.33	0.19	0.18	0.23	A m
7852	EPS DEL	20 31.3	11 10	4.04	-0.60	-0.12	-0.02	-0.13	B6 III
7866	47 CYG	20 32.3	35 7	4.63	2.36	1.61	1.30	2.29	K2 Ib+B
7871	ZET DEL	20 33.4	14 33	4.69	0.22	0.11	0.15	0.20	A3 V
7882 D	BET DEL	20 35.7	14 28	3.63	0.52	0.44	0.40	0.64	F5 IV
7884	71 AQL	20 36.3	-1 14	4.33	1.65	0.96	0.68	1.14	G8 III
7891	29 VUL	20 36.7	21 4	4.82	-0.09	-0.02	0.02	-0.02	B9.5 V
7906	ALF DEL	20 37.8	15 46	3.77	-0.25	-0.05	0.03	-0.01	B9 V
7924	ALF CYG	20 40.0	45 8	1.25	-0.12	0.09	0.12	0.22	A2 Ia
7928	DEL DEL	20 41.6	14 56	4.44	0.42	0.32	0.27	0.44	A7p III
7936	PSI CAP	20 43.7	-25 25	4.13	0.47	0.44	0.36	0.56	F5 V
7939	30 VUL	20 43.1	25 8	4.90	2.38	1.20	0.85	1.43	K2 III
7942	52 CYG	20 44.0	30 34	4.22	1.94	1.06	0.78	1.30	K0 III
7947/8	GAM DEL	20 44.8	15 59	3.91	1.36	0.85	0.68	1.16	F8IV-V/K2IV
7949	EPS CYG	20 44.6	33 49	2.46	1.91	1.03	0.72	1.29	K0 III
7950	EPS AQR	20 45.5	-9 39	3.77	0.01	-0.00	0.07	0.07	A1 V
7951	3 AQR	20 45.6	-5 11	4.43	3.61	1.67	1.47	2.78	M3 III
7955		20 44.4	57 26	4.52	0.64	0.54	0.47	0.75	F8 IV-V
7957	ETA CEP	20 44.5	61 41	3.43	1.51	0.92	0.67	1.16	K0 IV
7963 D	LAM CYG	20 45.8	36 21	4.54	-0.61	-0.12	-0.03	-0.14	B5 V
7977	55 CYG	20 47.5	45 58	4.87	-0.02	0.43	0.45	0.76	B3 Ia
7980	OMG CAP	20 49.4	-27 4	4.13	3.47	1.62	1.25	2.19	M1 III
7990	MU AQR	20 50.5	-9 8	4.73	0.42	0.32	0.26	0.41	A8m
7995	31 VUL	20 50.4	26 56	4.61	1.28	0.82	0.68	1.14	G8 III
8001	57 CYG	20 51.8	44 14	4.77	-0.72	-0.14	-0.07	-0.20	B5 V
8020 W		20 54.5	47 16	5.69	0.14	0.46	0.49	0.88	B6 Ia
8028	NU CYG	20 55.7	41 1	3.94	0.02	0.02	0.06	0.07	A0 V
8047	59 CYG	20 58.5	47 22	4.75	-0.98	-0.04	0.13	0.12	B1 IV:e
8060	ETA CAP	21 2.1	-20 1	4.84	0.24	0.18	0.16	0.23	A4s
8075	THE CAP	21 3.7	-17 24	4.07	-0.00	-0.01	0.01	-0.01	A0 V
8079	XI CYG	21 3.5	43 46	3.70	3.45	1.65	1.21	2.11	K5 Ib
8080	24 CAP	21 4.8	-25 10	4.49	3.51	1.60	1.27	2.25	M1 III
8085	61A CYG	21 5.1	38 29	5.25	2.28	1.17	1.02	1.68	K5V
8086	61B CYG	21 5.1	38 33	6.09	2.58	1.36	1.19	2.04	K7 V
8089	63 CYG	21 5.3	47 29	4.56	3.29	1.56	1.17	1.99	K4 Ib-IIa
8093	NU AQR	21 7.4	-11 32	4.52	1.61	0.95	0.69	1.15	G8 III
8097	GAM EQU	21 8.4	9 58	4.67	0.35	0.25	0.25	0.36	F0p
8115	ZET CYG	21 11.2	30 4	3.19	1.76	1.00	0.69	1.18	G8 II
8123 D	DEL EQU	21 12.5	9 51	4.46	0.51	0.52	0.43	0.71	F7 V
8130 D	TAU CYG	21 13.2	37 52	3.73	0.43	0.40	0.36	0.59	F0 IV
8131	ALF EQU	21 13.8	5 5	3.90	0.82	0.52	0.44	0.79	A +gG5
8143	SIG CYG	21 15.8	39 14	4.23	-0.26	0.13	0.16	0.30	B9 Iab
8146	UPS CYG	21 16.3	34 44	4.42	-0.92	-0.10	0.05	-0.03	B2 Ve
8151	THE 1 MIC	21 18.2	-40 59	(4.81)	.	0.02	0.09	0.13	A0 V Cr
8162	ALF CEP	21 17.6	62 25	2.47	0.33	0.21	0.21	0.32	A7 IV,V
8167	IOT CAP	21 20.0	-17 0	4.27	1.47	0.91	0.62	1.10	G8 III
8173	1 PEG	21 20.2	19 38	4.10	2.16	1.12	0.78	1.33	K1 III
8204	ZET CAP	21 24.4	-22 35	3.74	1.60	1.00	0.64	1.06	G4 Ibp
8213	36 CAP	21 26.4	-21 59	4.51	1.52	0.91	0.68	1.16	gG5
8225	2 PEG	21 28.1	23 28	4.55	3.55	1.62	1.25	2.34	M1 III
8232	BET AQR	21 29.5	-5 45	2.85	1.42	0.84	0.61	1.02	G0 Ib
8238	BET CEP	21 28.2	70 23	3.23	-1.17	-0.21	-0.10	-0.32	B2 III
8252	RHO CYG	21 32.5	45 25	4.02	1.46	0.90	0.68	1.18	G8 III
8255	72 CYG	21 33.1	38 21	4.90	2.10	1.09	0.82	1.36	K0 III
8260	EPS CAP	21 34.9	-19 39	4.72	-0.74	-0.16	-0.05	-0.12	B3 V:p
8262 V	W CYG	21 34.5	45 12	5.37	2.87	1.60	2.38	4.49	M4e
8264	XI AQR	21 35.6	-8 2	4.69	0.32	0.19	0.17	0.27	A7 V
8278	GAM CAP	21 37.9	-16 51	3.67	0.53	0.32	0.23	0.36	A8m
8279	9 CEP	21 36.8	61 54	4.75	-0.26	0.29	0.31	0.49	B2 Ib
8288	KAP CAP	21 40.4	-19 3	4.73	1.40	0.88	0.67	1.16	G8 III
8297 V	DS PEG	21 40.3	35 19	6.03	7.48	2.49	1.79	3.19	C6,3
8301	PI 1 CYG	21 40.6	51 1	4.67	-0.81	-0.12	-0.03	-0.16	B3 V
8305 W	IOT PSA	21 42.6	-33 13	(4.32)	.	-0.05	-0.01	-0.04	A0 V Si
8308	EPS PEG	21 42.2	9 41	2.38	3.21	1.53	1.05	1.81	K2 Ib
8309/10	MU CYG	21 42.4	28 34	4.51	0.50	0.49	0.39	0.67	F6 V
8313	9 PEG	21 42.6	17 10	4.31	2.14	1.18	0.80	1.36	G5 Ib
8315 D	KAP PEG	21 42.8	25 28	4.12	0.47	0.44	0.43	0.68	F5 IV

THE ARIZONA-TONANTZINTLA CATALOGUE—MULTICOLOR PHOTOMETRY UBVRI

B.S.	NAME	R.A. (1960) DEC.		V	U-V	B-V	V-R	V-I	MK SP.
8316 V	MU CEP	21 42.2	58 36	4.13	4.69	2.26	2.07	3.81	M2 Ia
8317	11 CEP	21 41.3	71 8	4.57	2.19	1.11	0.84	1.38	K0 III
8322 V	DEL CAP	21 44.8	-16 19	2.81	0.40	0.29	0.24	0.40	A6m
8327		21 43.8	62 17	5.92	-0.33	0.31	0.28	0.45	O9 II
8334	NU CEP	21 44.3	60 56	4.29	0.64	0.51	0.51	0.94	A2 Ia
8335	PI 2 CYG	21 45.3	49 7	4.24	-0.84	-0.12	-0.04	-0.17	B3 III
8353 W	GAM GRU	21 51.5	-37 33	(3.00)	.	-0.10	-0.05	-0.11	B8 III:
8371	13 CEP	21 53.5	56 25	5.81	0.68	0.71	0.68	1.28	B8 Ib
8383 V	VV CEP	21 55.5	63 26	4.90	2.13	1.75	1.70	3.04	M2+ Ia-Iab
8402	OMI AQR	22 1.2	-2 21	4.70	-0.48	-0.07	0.00	-0.05	B8 V
8411 W	LAM GRU	22 3.7	-39 44	(4.44)	.	1.37	1.00	1.78	M0 III
8413	NU PEG	22 3.6	4 51	4.83	3.25	1.46	1.07	1.83	K4 III
8414	ALF AQR	22 3.7	-0 31	2.92	1.77	0.98	0.66	1.13	G2 Ib
8417 D	XI CEP	22 2.6	64 25	4.29	0.43	0.34	0.32	0.46	A m
8418	IOT AQR	22 4.3	-14 4	4.25	-0.34	-0.07	-0.04	-0.13	B8 V
8425 W	ALF GRU	22 5.7	-47 9	(1.73)	.	-0.17	-0.08	-0.14	B5 V
8428	19 CEP	22 3.9	62 5	5.10	-0.76	0.07	0.16	0.19	O9.5 Ib
8430	IOT PEG	22 5.1	25 9	3.76	0.46	0.45	0.39	0.64	F5 V
8431 W	MU PSA	22 6.1	-33 11	(4.49)	.	0.07	0.07	0.12	A2 V
8450	THE PEG	22 8.1	5 59	3.55	0.17	0.08	0.05	0.09	A2 V
8454	PI PEG	22 8.2	32 59	4.27	0.66	0.48	0.39	0.66	F5 II-III
8465	ZET CEP	22 9.5	58 0	3.36	3.27	1.55	1.08	1.86	K1 Ib
8468	24 CEP	22 9.0	72 9	4.79	1.53	0.92	0.69	1.17	G8 III
8469	LAM CEP	22 10.1	59 13	5.04	-0.51	0.23	0.26	0.41	O6f
8485		22 12.2	39 31	4.49	2.82	1.38	1.01	1.74	K3 III
8494	EPS CEP	22 13.4	56 51	4.20	0.33	0.27	0.29	0.44	F0 IV
8498	1 LAC	22 14.2	37 33	4.15	3.06	1.46	1.04	1.75	K3 II-III
8499	THE AQR	22 14.7	-7 59	4.15	1.80	0.99	0.73	1.20	G8 III-IV
8518	GAM AQR	22 19.6	-1 35	3.85	-0.18	-0.05	0.04	0.00	B9 III
8520	31 PEG	22 19.5	12 0	5.02	-0.92	-0.15	-0.04	-0.20	B2 V
8522	32 PEG	22 19.5	28 8	4.81	-0.19	0.00	0.09	0.08	B8 III
8523	2 LAC	22 19.4	46 20	4.56	-0.60	-0.10	-0.01	-0.12	B6 IV
8538	BET LAC	22 22.0	52 2	4.44	1.79	1.02	0.76	1.32	G9 III
8539	PI AQR	22 23.2	1 10	4.64	-0.99	-0.03	0.15	0.15	B1nnek
8541	4 LAC	22 22.9	49 16	4.58	-0.25	0.09	0.14	0.24	B9 Iab
8551	35 PEG	22 25.8	4 31	4.80	1.93	1.05	0.77	1.31	K0 III-IV
8556 W	DEL 1 GRU	22 26.9	-43 42	(3.96)	.	1.02	0.73	1.34	G2
8558/9	ZET AQR	22 26.8	-0 13	3.66	0.37	0.40	0.37	0.61	F2 IV
8560 W	DEL 2 GRU	22 27.4	-43 57	(4.10)	.	1.56	1.73	3.32	M4
8571 V	DEL CEP	22 27.7	58 13	4.34	1.52	0.88	0.74	1.19	G1 Ib
8572 D	5 LAC	22 27.9	47 30	4.37	2.78	1.68	1.39	2.46	M0 Iab+B
8573	SIG AQR	22 28.5	-10 53	4.82	-0.18	-0.06	-0.01	-0.05	A0 IV
8576DW	BET PSA	22 29.2	-32 33	(4.28)	.	0.01	0.02	0.04	A0 V
8579	6 LAC	22 28.7	42 55	4.52	-0.85	-0.11	0.00	-0.11	B2 IV
8585	ALF LAC	22 29.6	50 5	3.77	0.01	0.01	0.02	-0.00	A2 V
8597	ETA AQR	22 33.3	-0 19	4.00	-0.37	-0.09	-0.05	-0.12	B8 V
8613	9 LAC	22 35.8	51 21	4.63	0.35	0.24	0.24	0.38	A7 IV
8622 S	10 LAC	22 37.5	38 50	4.88	-1.24	-0.20	-0.08	-0.29	O9 V
8628	EPS PSA	22 38.4	-27 15	4.16	-0.44	-0.12	-0.05	-0.15	B8 V
8632	11 LAC	22 38.7	44 4	4.46	2.70	1.33	0.93	1.61	K3 III
8634	ZET PEG	22 39.5	10 37	3.39	-0.35	-0.10	-0.03	-0.10	B8 V
8636 W	BET GRU	22 40.3	-47 6	(2.10)	.	1.62	1.91	3.68	M3 II
8641	OMI PEG	22 39.9	29 6	4.79	-0.01	-0.01	0.05	0.04	A1 V
8644 W	RHO GRU	22 41.2	-41 37	(4.84)	.	1.01	0.76	1.41	G5
8650	ETA PEG	22 41.1	30 1	2.95	1.46	0.87	0.64	1.11	G8 II:+F0
8665	XI PEG	22 44.7	11 59	4.19	0.47	0.51	0.44	0.75	F7 V
8667	LAM PEG	22 44.6	23 21	3.95	1.96	1.07	0.75	1.27	G8 II-III
8679	TAU AQR	22 47.5	-13 48	3.98	3.53	1.59	1.18	2.13	M0 III
8684	MU PEG	22 48.1	24 23	3.48	1.61	0.94	0.68	1.15	G8 III
8694	IOT CEP	22 48.2	65 59	3.53	1.96	1.05	0.83	1.34	K1 III
8695WD	GAM PSA	22 50.3	-33 5	(4.46)	.	-0.05	0.02	0.04	A0 V
8698	LAM AQR	22 50.5	-7 48	3.79	3.41	1.65	1.40	2.60	M2 III
8702		22 47.8	82 56	4.73	2.61	1.26	0.94	1.60	K3 III
8709	DEL AQR	22 52.5	-16 2	3.25	0.13	0.06	0.09	0.13	A3 V
8717	RHO PEG	22 53.2	8 36	4.91	-0.01	0.00	0.05	0.03	A1 V

B.S.	NAME	R.A. (1960) DEC.		V	U-V	B-V	V-R	V-I	MK SP.
8720 W	DEL PSA	22 53.7	-32 45	(4.20)	.	0.97	0.74	1.35	G4
8726		22 54.7	49 31	4.94	3.72	1.78	1.34	2.39	K5 Ib
8728	ALF PSA	22 55.4	-29 50	1.16	0.14	0.08	0.11	0.13	A3 V
8729	51 PEG	22 55.4	20 33	5.45	0.85	0.66	0.54	0.88	dG0
8748 W		22 54.8	84 8	4.72	3.13	1.43	1.08	1.81	K4 III
8752		22 58.4	56 43	5.13	2.88	1.55	1.18	2.03	G0 Ia
8762	OMI AND	23 0.1	42 7	3.62	-0.62	-0.09	0.01	-0.07	B6p
8773	BET PSC	23 1.8	3 36	4.52	-0.62	-0.12	-0.02	-0.15	B5pe
8775 V	BET PEG	23 1.8	27 52	2.42	3.62	1.67	1.51	2.83	M2 II-III
8780	3 AND	23 2.4	49 49	4.66	1.94	1.07	0.74	1.31	K0 III
8781	ALF PEG	23 2.8	14 59	2.47	-0.06	-0.03	0.01	-0.01	B9.5 III
8789	86 AQR	23 4.5	-23 58	4.48	1.49	0.90	0.71	1.20	gG9
8795	55 PEG	23 5.0	9 11	4.51	3.53	1.59	1.26	2.28	M2 III
8796	56 PEG	23 5.1	25 15	4.77	2.50	1.35	0.97	1.65	K0 Ibp
8797	1 CAS	23 4.9	59 12	4.88	-0.89	-0.02	0.10	-0.01	B0.5 IV
8808WD		23 6.1	63 26	6.25	-0.61	-0.01	0.05	-0.01	B3 V
8812	88 AQR	23 7.3	-21 23	3.64	2.45	1.23	0.84	1.44	K0 III
8817	89 AQR	23 7.8	-22 40	4.68	1.02	0.65	0.55	0.91	sgG2
8819 D	PI CEP	23 6.6	75 11	4.42	1.27	0.82	0.65	1.08	G2 III
8820	IOT GRU	23 8.1	-45 28	(3.88)	.	1.01	0.75	1.31	K0 III
8830	7 AND	23 10.7	49 12	4.53	0.34	0.30	0.30	0.47	F0 V
8832 S		23 11.3	56 57	5.57	1.90	1.01	0.83	1.33	K3 V
8834	PHI AQR	23 12.3	-6 16	4.23	3.45	1.55	1.28	2.37	M2 III
8841	PSI 1 AQR	23 13.8	-9 18	4.25	2.12	1.11	0.79	1.35	K0 III
8852	GAM PSC	23 15.1	3 4	3.69	1.46	0.91	0.71	1.23	G7 III
8858	PSI 2 AQR	23 15.8	-9 24	4.40	-0.69	-0.14	-0.05	-0.19	B5 V
8860	8 AND	23 15.9	48 48	4.86	3.64	1.67	1.46	2.72	gM2
8863	GAM SCL	23 16.7	-32 45	(4.40)	.	1.15	0.84	1.47	G8 III
8872 D	OMI CEP	23 16.9	67 54	4.76	1.33	0.84	0.65	1.10	K0 III
8880	TAU PEG	23 18.7	23 31	4.60	0.30	0.17	0.20	0.29	A5 IV
8892	98 AQR	23 20.9	-20 19	3.97	2.06	1.10	0.82	1.42	K0 III
8905	UPS PEG	23 23.4	23 11	4.44	0.79	0.61	0.54	0.86	F8 IV
8906	99 AQR	23 24.0	-20 51	4.38	3.29	1.49	1.12	1.93	K5 III
8911	KAP PSC	23 24.9	1 2	4.94	0.00	0.04	0.08	0.04	A2p
8916	THE PSC	23 25.9	6 10	4.30	2.11	1.08	0.80	1.33	K1 III
8923	70 PEG	23 27.1	12 32	4.56	1.69	0.94	0.74	1.19	G8 III
8926 V	AR CAS	23 28.2	58 20	4.94	-0.76	-0.12	0.03	-0.12	B3 V
8937	BET SCL	23 30.8	-38 2	(4.36)	.	-0.09	-0.00	-0.07	A p
8939	101 AQR	23 31.2	-21 8	4.72	0.03	0.04	0.09	0.12	A0n
8949	IOT PHE	23 32.9	-42 50	(4.70)	.	0.11	0.12	0.19	A2 V Sr
8959		23 35.7	-45 43	(4.73)	.	0.09	0.11	0.16	A2 V
8961 V	LAM AND	23 35.6	46 14	3.75	1.74	1.01	0.78	1.35	G8 III-IV
8965	IOT AND	23 36.2	43 3	4.29	-0.39	-0.10	0.02	-0.07	B8 V
8969	IOT PSC	23 37.9	5 25	4.13	0.53	0.51	0.43	0.72	F7 V
8974	GAM CEP	23 37.7	77 25	3.21	1.98	1.03	0.77	1.28	K1 IV
8976	KAP AND	23 38.4	44 7	4.15	-0.30	-0.08	0.02	-0.06	B8 V
8982	104 AQR	23 39.7	-18 2	4.84	1.31	0.81	0.62	1.04	G0 Ib
8984	LAM PSC	23 40.0	1 34	4.49	0.32	0.22	0.19	0.29	A7 V
8988	OMG 2 AQR	23 40.6	-14 46	4.51	-0.17	-0.04	0.03	-0.02	B9.5 V
8997 D	78 PEG	23 42.0	29 8	4.94	1.60	0.95	0.71	1.19	K0 III
9016	DEL SCL	23 46.8	-28 21	4.57	0.00	0.00	0.04	0.02	A0 V
9045 V	RHO CAS	23 52.4	57 17	4.59	2.41	1.26	0.96	1.70	G0 Iap
9064	PSI PEG	23 55.7	24 55	4.65	3.23	1.60	1.46	2.80	M3 III
9066 V	R CAS	23 56.3	51 10	6.75	1.71	1.00	0.72	1.25	M7e
9071 D	SIG CAS	23 56.9	55 32	4.89	-0.90	-0.08	0.05	-0.06	B1 V
9072	OMG PSC	23 57.3	6 39	4.01	0.49	0.41	0.38	0.62	F4 IV
9089	30 PSC	23 59.9	-6 14	4.41	3.47	1.63	1.56	2.97	M3 III
9091	ZET SCL	0 0.3	-29 57	4.98	-0.70	-0.15	-0.05	-0.19	B5 III
9098	2 CET	0 1.7	-17 34	4.56	-0.16	-0.04	0.03	0.00	B9 IV

In the spectral-type column, *Sr* indicates strong strontium lines; *Si*, strong silicon; *Cr*, strong chromium; *COMP*, a composite spectrum; a colon, uncertainty.

B.S. NOTES ON INDIVIDUAL STARS

(Continued from page 24)

2091 Previously suspected var. Our three measures show a V spread of 0.10 mag.

2216 Semiregular var. Our three measures show a V spread of 0.19 mag.

2308 Irregular var.; a carbon star. Epoch is JD 2,438,470; V had increased 0.29 mag. during the preceding 50 days.

2538 Single Catalina observation at low altitude gave as U – V as –1.16.

2650 Cepheid var. Data refer to minimum light.

2748 L_2 *Puppis*, semiregular var.

2781 *UW Canis Majoris*, eclipsing var. Our four measures show a V spread of 0.20 mag.

4163 Irregular var.; a carbon star. Epoch is JD 2,438,450. V spread is 0.7 mag.

4846 Irregular var.; a carbon star. Epoch is JD 2,438,397; faded 0.5 mag. in V in next 50 days.

5080 Mira-type var. Epoch is JD 2,438,526. Visual range is about 4.0 to 10.0.

5192 Single McDonald **UBV** observation averaged with five Tonantzintla **BVRI** measures.

5288 Single Catalina observation at low altitudes gives U – V as +1.92.

5370 Possible new var. Five measures give a V spread of 0.13 mag.

5603 Possible new var. Four measures give a V spread of 0.13 mag.

6084 Beta Cephei-type var. Four measures give a V spread of 0.13 mag.

6134 *Antares*, semiregular var. Four measures show a V spread of 0.11 mag.

6406 Semiregular var. Companion star 6407, spectrum dF8, was included unresolved. Five measures give a V spread of 0.16 mag.

6431 *u Herculis*, eclipsing var. Four measures show a spread in V of 0.21 mag.

6508 Single Catalina observation at low altitude gives U – V as –1.03.

6580 V is combination of Cape and Catalina; colors are means of one Tonantzintla and one Catalina observation, both at low altitude.

6616 See note to 2650.

6742 See note to 2650.

7066 RV Tauri-type var. Epoch of measures is JD 2,438,640.

7106 Eclipsing var. Three measures show a V spread of 0.16 mag.

7157 Semiregular var. Mean of three measures. Epoch is JD 2,438,357.

7564 Mira-type var.; near minimum light. Visual range is about 3.3 to 14.2.

7570 See note to 2650.

8262 Semiregular var. Near maximum light. Epoch is JD 2,438,397. Visual range is about 5.0 to 7.6.

8297 Irregular var.; a carbon star. Epoch is JD 2,438,381.

8316 Semiregular var. Epoch of measures is JD 2,438,316.

8571 See note to 2650.

8775 Irregular var. Mean of five measures showing a V spread of 0.24 mag.

9066 Mira-type var. Epoch is JD 2,438,343. Visual range is about 5.5 to 13.0.

1983 Mar. 13 25th MSS

流星の写真測光 IV.

小笠原 雅弘

写真測光用の比較星としては Arizona-Tonantzintla Catalog (ATCと略す) が用いられるが 5mag.までのデータしかないために 暗い方は SAO の等級 mv を用いねばならないこともある. SAO の mv 等級は さまざまな source-catalog からの寄せ集めであり, 精度がよくないといわれている. そこで ATC と SAO を比べることによって SAO mv 等級の精度を見積った.

(4) B. Iriarte, H.L. Johnson, R.I. Mitchell and W.K. Wisniewski, 1965, Five color photometry of bright stars. Sky Telesc., July, p.21.
は便利で楽しい表を載せている. 全体で11頁, 表の部分は7頁たらずで, 1234個の星の観測光値が並べてある. −50° より北の5.0等以上の星を網羅しているが, 変光星や特殊な星でもっと暗いものがいくつかまざっている. χ Cyg 10.31, Barnard's star 9.54, o Cet 8.71 など. もともと Johnson が昔この雑誌に50個の明るい星の表を出したものの拡張なので, 明るさの点で物足りないが, 統一されたシステムでこれだけの数が集められており, 手に入りやすいという特徴がある. 内容は星の番号 (BS=HR), 星の名前 (Beyer または Flamsteed), 1960年の座標, V, U-V, B-V, V-R, V-I と, スペクトルの MK 分類型である. Vを基準にして他を表わすということで U-B があらわに出ていないのが少し不便かもしれない. 観測に使うときは座標が出ているのは便利だし, S20 の光電管の範囲はこの表だけで済むのもうまい. これだけ連続光の情報が与えられており, スペクトル型で線スペクトルのこともわかるので, 小天文学の楽しみが味わえる. カタログを見る楽しみの一つに注記がある. BS 番号と星名の間に, 標準星とか変光星とか重星とかの印があり, 表の前後に簡単なノートがある. 明るい星の観測プログラムを作るときなどはこの表だけで結構楽しめるのである.

— ATC —

星図星表めぐり 16. 星の明るさと色の星表 近藤雅哀 より

- Catalina Observatory (Arizona-Univ.)
  28 inch - カセグレン鏡
- Mexico National Observatory (Tonant Zintla)
  40 inch - カセグレン鏡

の2台を用いて 1963-1965年にかけて測定されたもので 各個の測光精度は Catalina ±0.017mag (mv), Tonantzintla ±0.035 mag (mv) と発表されている.

この観測のより詳しい結果は H.L. Johnson et al. (1966) UBVRIJKL Photometry of the Bright Stars. にまとめられている.

— SAO カタログ —

SAO より ATC に含まれる星 129個を全天より選び mv 等級を比べた. SAO では mv 等級の source catalog は 10 を越えるが, ~5 mag までは おおよそ 以下の2つの source によっている.

MSS-025

NO.
DATE

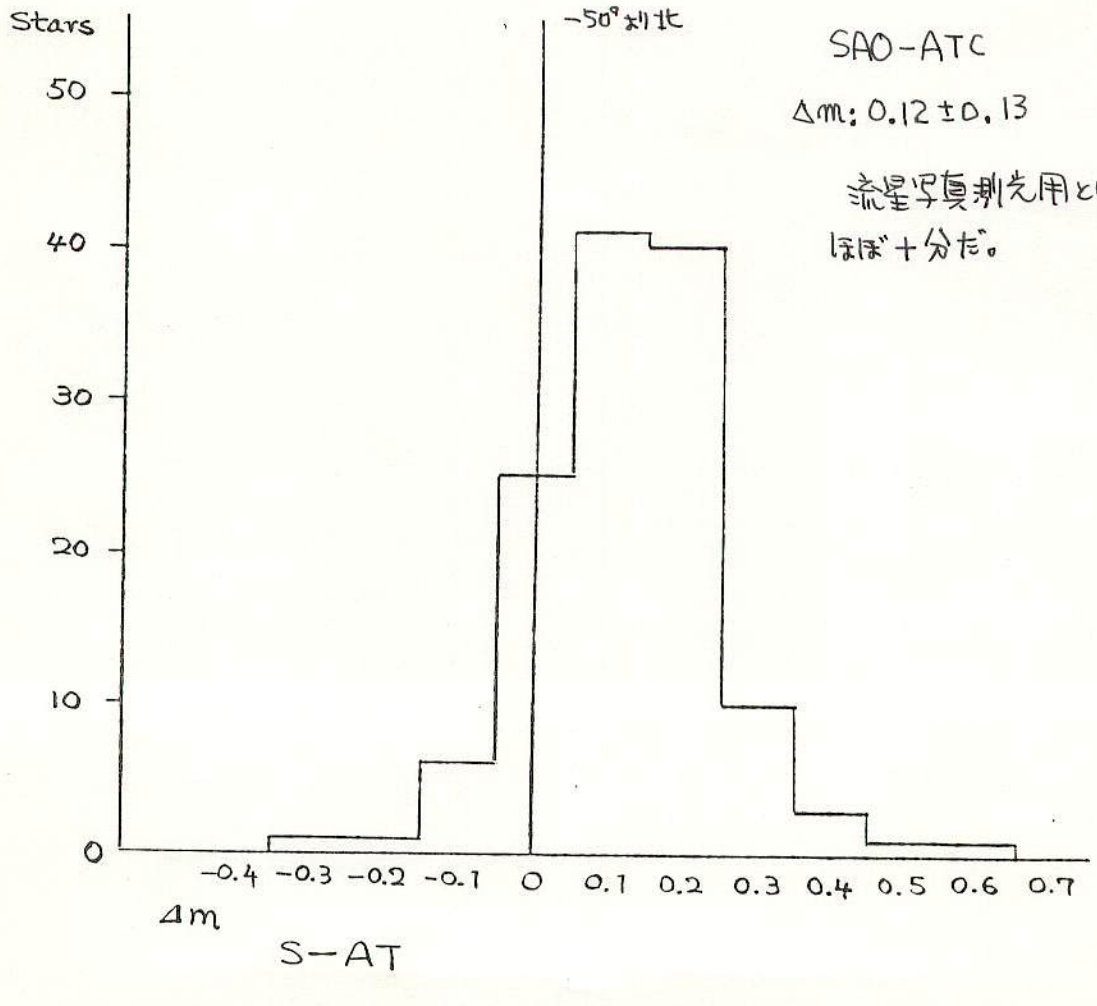
カタログコード

ヘンリー・ドレイパー

H: Henry Draper Catalogue
A. J. Cannon and E. C. Pickering (1918-24)
Ann. Astron. Obs. Harvard College
T: Harvard Photometry or measured at San Luis Argentina (GGC)

Fig. 1 Magnitude Difference

Arizona Tonantzintla — SAO
~5 mag ~9 mag
1200ヶ 26万ヶ



SAO-ATC

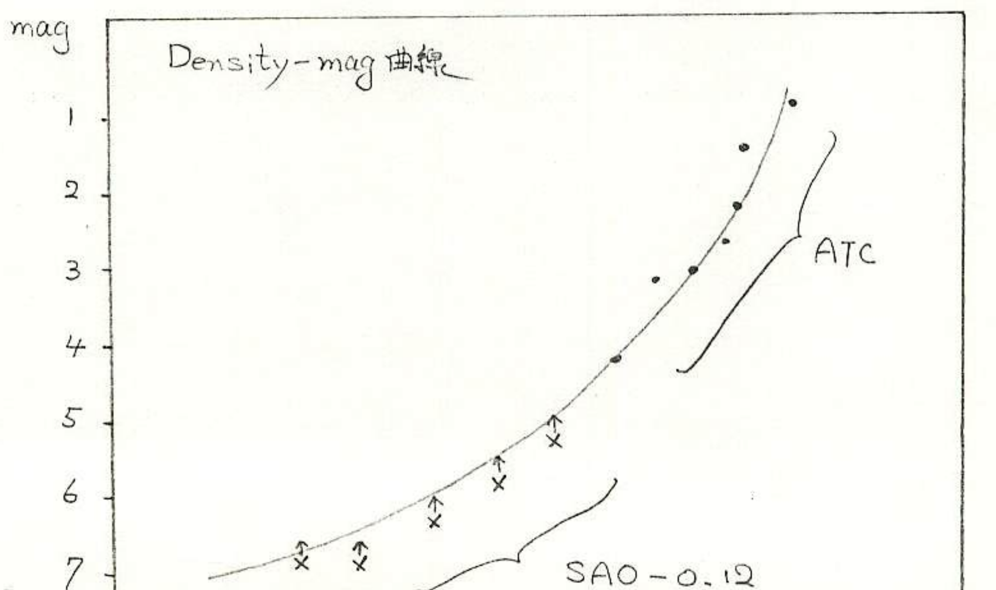
Δm: 0.12 ± 0.13

流星写真測光用としてはほぼ十分だ。

SAO（主にH.T）はATCより平均0.12mag.暗いことがわかった。ATCを正しいものと考えるとSAOの等級誤差は（S.D.）±0.13magと考えられる。

したがって、測光の比較星をATCとSAOから採る場合SAO－0.12として、ATCに準処した等級に直して用いるべきであろう。

なお、これでもSAOでは約10%の星が写真測光のひとつの目安である0.2mag以上の誤差を含むので流星等の等級を決定するには数多く（10個以上）の恒星を用いるのがのぞましい。



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 MSS-025

Volume 47, Number 3, September 1981

Special *Icarus* "Comet" Issue

CONTENTS

The Subject Index for Volume 47 will appear in the December 1981 issue as part of a cumulative index for the year 1981.

O mark — M. Ogasahara

MSS-025

流星痕の色とカラーフィルムの再現性

田口泰雄（信州大OB）

1983.03.13
流星物理セミナー

- サクラカラー400（ニュータイプ）
- フジクローム400
- エクタクローム400
- コダカラー400
- コダカラーII

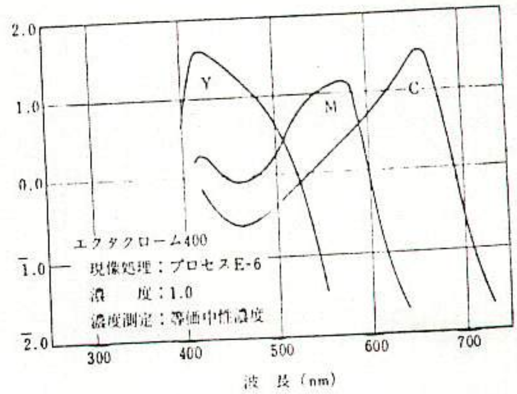
の分光感度曲線

1982 Ori 痕は、写真ではオレンジに写っているが、眼視では青とオレンジが混った色に見えた。

写真の色は赤オレンジ。眼視は青にオレンジ又は緑にオレンジが混った色に見えた。なぜ違って見えたのかを考えている。

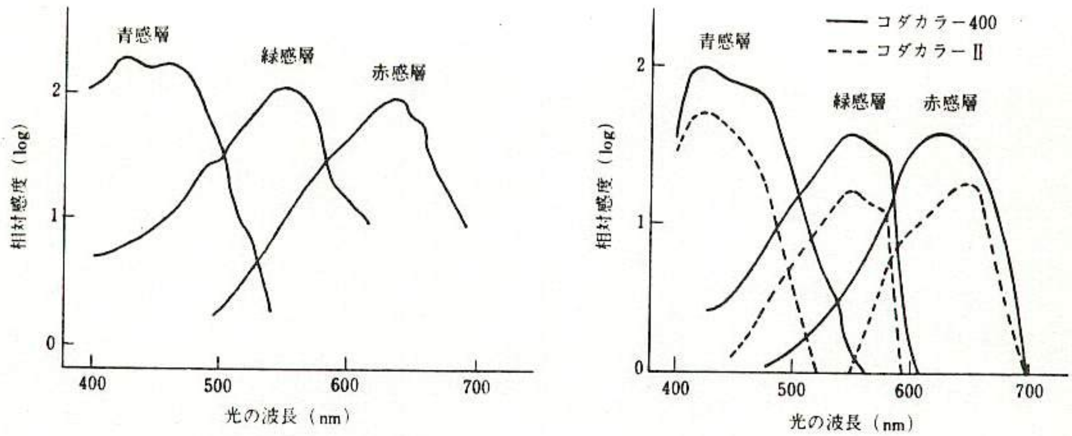
日没10分後の地平線	1/60秒	F5.6
スポットライト照明のサーカス	1/250秒	F2.8
夜の室内	1/30秒	F2.8
ステージショー	1/60秒	F2.8
夜景	1/60秒	F2.8
夜のネオン	1/125秒	F4
ナイター試合	1/125秒	F2.8

現像処理　プロセスE-6，キットにより自家現像処理が可能。



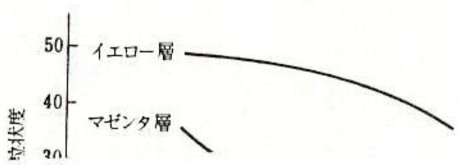
エクタクローム400の分光感度曲線

25-MSS



（a）サクラカラー400新タイプの分光感度　（b）コダカラーフィルムの分光感度

図4　サクラカラー400新タイプとコダカラーの分光感度



たように，分光感度分布をある程度コダカラー400のように中央によせた形とし，異種光源特性を向上させ，タイプGに近似したタイプとしている。しかし，デーライ

タクローム400も，高感度にもかかわらずナチュラルな色再現性は高く評価されよう。フジクローム400はカブリ濃度もエクタクローム400より少なく，ヌケのよいすっきりした画面となるが，最暗部の黒は緑味を帯びる。

ＡＳＡ400という高感度フィルムに対してストロボ照明の機会は少ないが，フジクローム400の場合，肌色再現に関しては，ストロボ光源との合性はよくないようだ。しかし，螢光灯，ミックス光に対しては，他のフィルムより合性はよいといえよう。メーカー推薦の螢光灯に対する補正は表2，また相反則不軌の補正は表1のごとく示されている。

●特性曲線

フジクローム400のE-6処理による特性曲線は図4のごとくで（図5はエクタクローム400），良好なカラーバランスを得ている。図6は今回検討した3種類のフィルムの視覚黒濃度による比較で，フジクローム400とエクタクローム400の階調再現性はほとんど同一で，感度も等しい。得られる最大黒濃度は三者ともほぼ3.0で，カブリ濃度はエクタクローム400がわずかに高い。

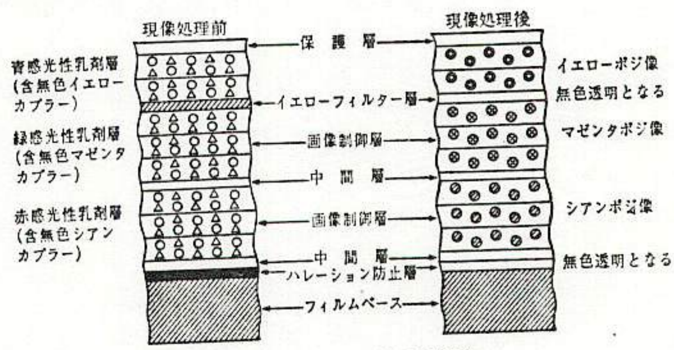


図1　フジクローム400の層構成

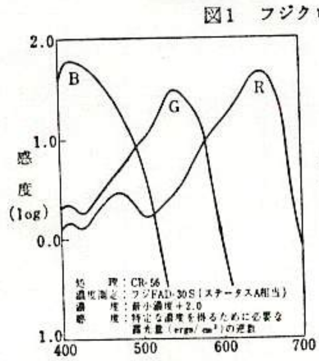


図2　分光感度曲線

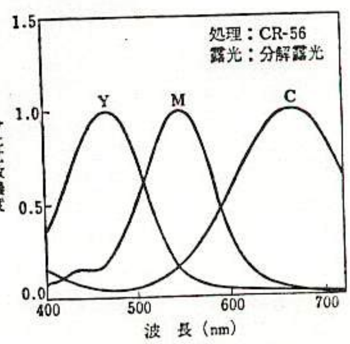
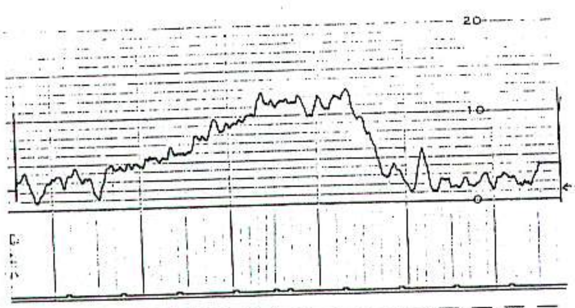


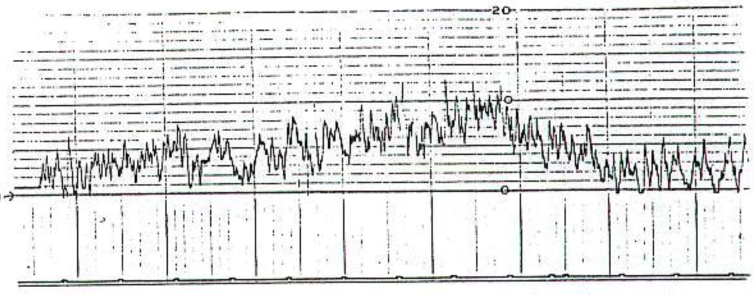
図3　色素の分光濃度

表1　相反則不軌の露出補正

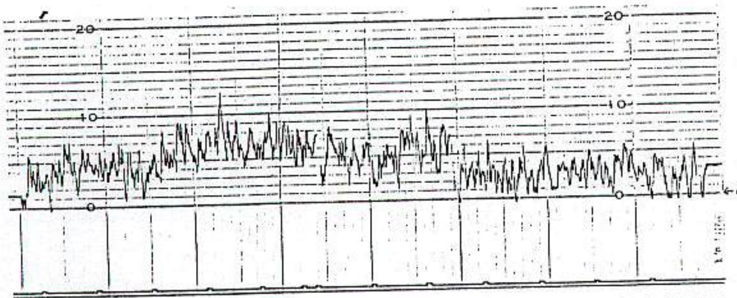
露出時間（秒）	1/1000〜1	4	16	32
色補正フィルター	不要	5C	10C	15C



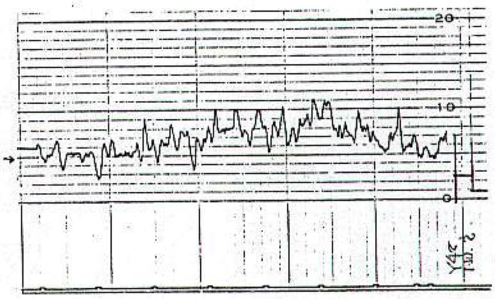
スリット 120×20μ　NO.FILTER　No.1



スリット 20×20μ　Y48. No1.



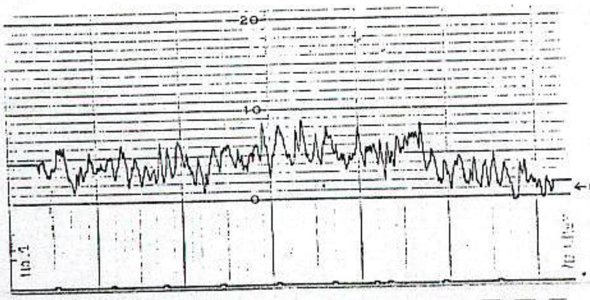
スリット 20×20μ　NO.FILTER　NO2.



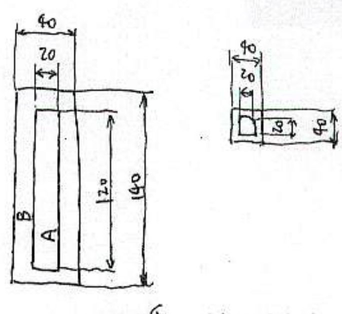
スリット 20×20μ　Y48　No 2.

26 MSS
佐々木道三郎 (日大理)
1982.10.23.
Ori 火球 -5mag
3h14m47s
田口(信州大OB)観測
4色分光写真・処理

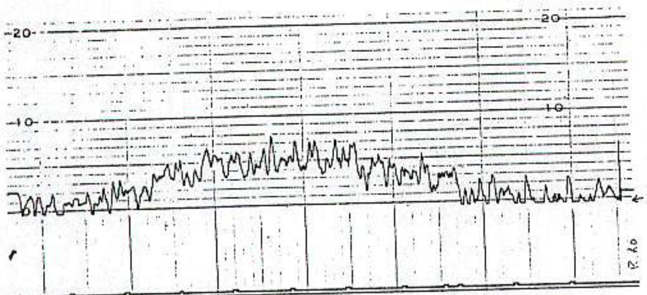
レコーディング 2475



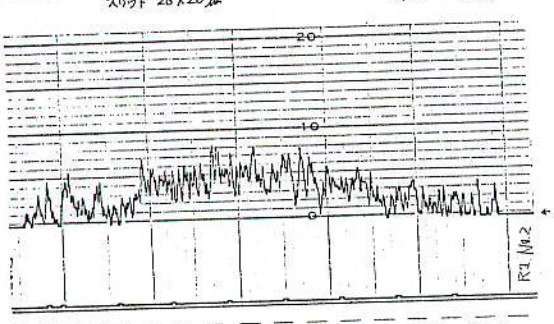
スリット 20×20μ　NO.FILTER　NO.3



スリット B部分に対するA部分の明度



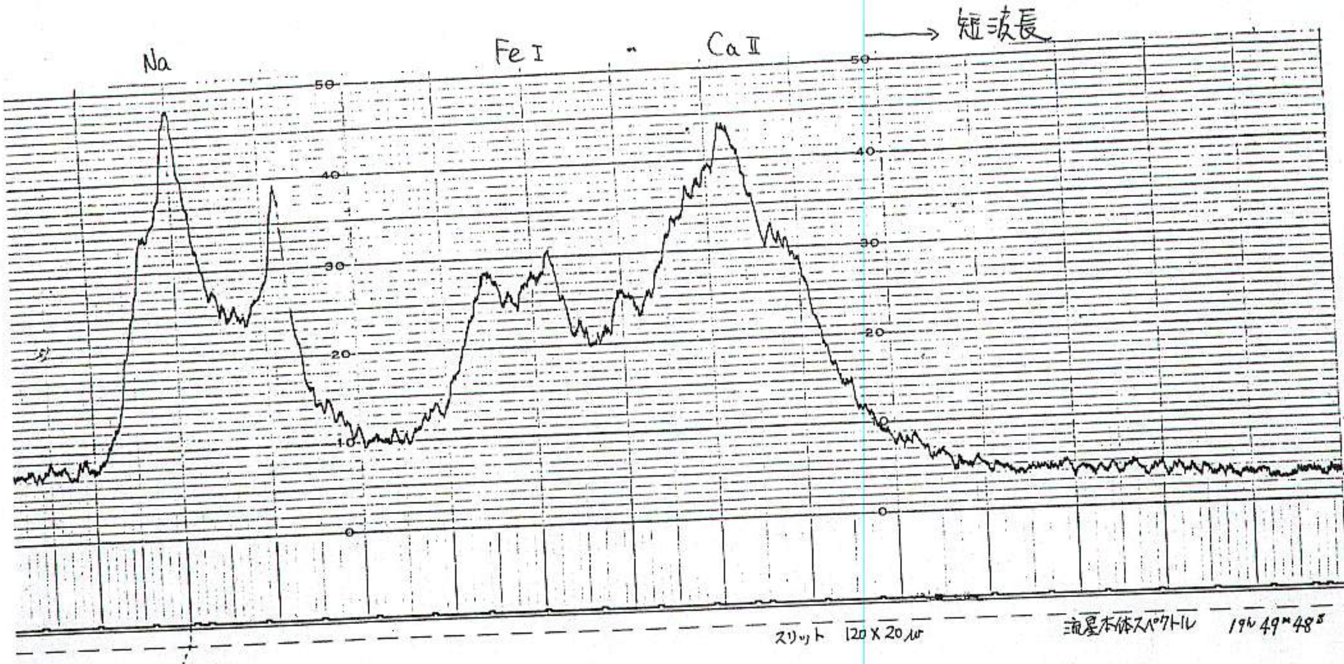
スリット 20×20μ　R60　No.1



スリット 20×20μ　R60　No.2

26th M.S.S' 流星物理セミナー

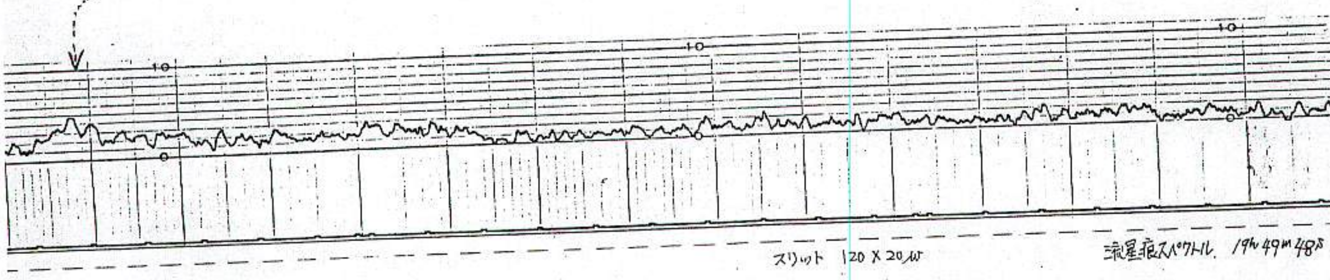
MSS-026



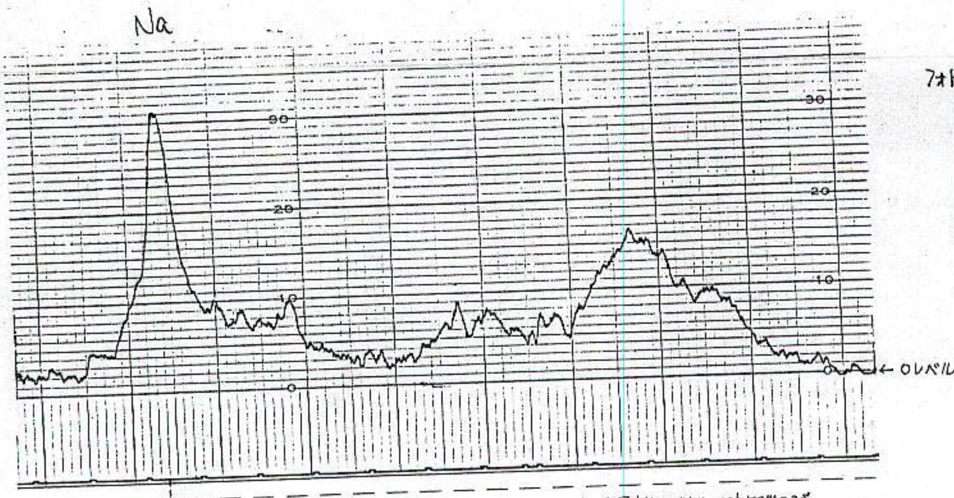
1983
4月2日
短痕 散在

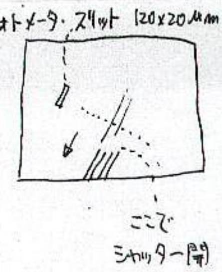
高橋プリズム
トライX

村山氏撮影



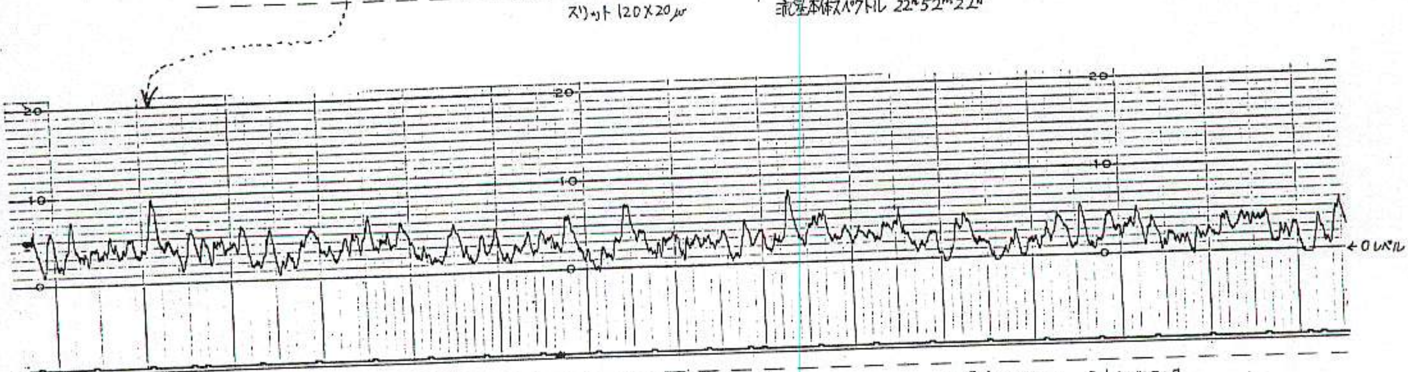
26 MSS





26th. MSS 流星物理セミナー

1983
3月17日
短痕 散在



MSS-026