

KG  
11365  
788

Notes for Readings.



K G 11365.788



'Who seeks will find the good  
only with labor and pains;  
the bad, however, is found by  
every body without seeking'

Democritus

quoted by Charles - A.S.P. 37, 124  
June, 1925 -



KG 11365.788



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# Books used

42	81	1924	July 16	Harvard Summer School	
56	53	"	Dec 5	Classifying the Stars Open Nights	
64	44	1925	Jan 7	Band Club. Solar Eclipse	
66	57	"	Feb 23	College Club. On the Trail of the Eclipse	
152	50	1934	Jan 17	Springfield Co. Club. Exploration of the Cosmos	
73	58	"	Apr 10	Open Nights Early Days at H.C.O.	
147	53	Q. H. S.	"	Phil Soc. Philadelph. The Large Mag. Cl.	
162	65	1934	Sept. 7	Scouts. The Universe of 1934	
164	64	"	Oct. 24	Our Neighborhood	Junior
166	65	"	Nov. 20	The Universe of Today	Three Commanders
168		1934	Dec. 13	Growth & Achievements of Harvard Observatory	Boston
170	66	1935	Feb. 17	Unravelling Stellar Secrets.	Salem
182	57	1939	Oct. 13	Wanderings along the West Coast	A.E.V.S.O. Band Club

158

Magellans











# 1911 Objects of Interest on Northern Sp. Plates (Ly A. J. C.)

Date	No.	Plate	Objct	D.M.	RA	Dec.	Magn.
June 1	1	37142	mc				
" 27	2	37190	Type IV				
" 27	3	37191	Var?				
July 7	4	37197	C.N				
" 11	5	37204	Pc.				
" 25	6	37216	Pc.				
	7	37230	Car O				
	8	"	Ind				
	9	"	B. lines				
	10	37221	H $\beta$ bright				
	11	37256	Var.				
	12	37248	Type				
Sept. 22	13	19053	H $\delta$ + H $\gamma$ h.				
" 27	14	37272	H $\gamma$ + H $\delta$ h.				
" 27	15	37289	C.N				
Oct. 9	16	37302	mt				
"	17	"	ma				
" "	18	"	mt				
" "	19	"	mt				
" "	20	"	mt				
" "	21	"	Ind				
" "	22	37303	Ma?				
" "	23	37304	ma				
" "	24	"	mt				
" "	25	"	ma				
" "	26	"	mc				
" 16	27	AC12627	Septuane				

Var?

Known  $-16^{\circ} 52' 72''$

H $\delta$  and H $\gamma$  bright Known R V Aquilae.

Spectrum of Kiess' Comet.

221 37.3 + 2450.4 BD + 24 4540. Confirm on other plates. 19882. Look near edge.

Known  $+43^{\circ} 35' 71''$ .

RT Cygni. H $\gamma$  & H $\delta$  bright.

Gas. Neb. Known  $+50^{\circ} 28' 69''$ .

DM  $+57^{\circ} 23' 74''$   $21^h 37.9^m + 57^{\circ} 4.7'$  (7.2) 1855)

H $\delta$  & H $\gamma$  bright Star  $21^h 25.0^m + 15^{\circ} 23'$

Known  $+43^{\circ} 35' 71''$   $20^h 15^m 36.0^s + 43^{\circ} 24.1'$  Magn. 7.5-

- Vulpec. Known.

T Cephei Ind.

0, 6, 10.

R Triang. H $\gamma$  and H $\delta$  bright.

$4^h 38.8^m + 20^{\circ} 58'$



1912		Objects of Interest on Foulkner Sp. Plates (Ly A)					
Date	No.	Plate	Objct	D M	RA	Dec.	Magn.
Jan. 24	28	137493	Ind				
	29						
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
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	48						
	49						
	50						
	51						
	52						
	53						
	54						

## Cont. of preceding

- 51 Paige auto at gate. Property of A. J. C.  
 52 Fresh house in Camer Alto " " "  
 53 Image bearing person " " S. I. B.  
 54 Camer Alto Church " " L. C.  
 55 Chiche " " A. J. C.  
 56 Casa Blanca " " L. C.  
 57 Indian woman " " A. J. C.  
 58 Street in Arequipa " " L. C.  
 59 Garden of Santa Bates, made here for A. J. C.  
 60 Patio of Torre house " " "  
 61 Señora Gibbons (wife) " " "  
 62 " " Romana (beauty) property of S. I. B.  
 63 " " <sup>after</sup> <sup>the</sup> <sup>man</sup> made here for A. J. C.  
 64 Llamas in Arequipa " " "  
 65 Llama " " property of L. C.  
 66 Alpaca (green) " " A. J. C.  
 67 Francisco made here for " "  
 68 Song up Inisti property of S. I. B.  
 69 Trip up 0'300 " " "  
 70 S. I. B. on horseback " " "  
 71 Auto carib at Arequipa station. made here for A. J. C.  
 72 Lake Titicaca S. I. B.?  
 73 Balco L. C.  
 74 Women near Lake A. J. C.  
 75 Indian man spring "



## Cont. of preceding

- 76 Indian woman with flat hats S. I. B.  
 77 alpacas en route D 19094. from a slide made at Arequipa  
 78 Vacuñas A. J. L.  
 79 Chuquibambilla. At dining room door made here  
 80 Mrs. Hardy " "  
 81 Auto carol " "  
 82 Cuzco. Made from Mancilla's slide A. J. L.  
 83 " La Merced from Plaza " "  
 84 La Campana Cathedral made here for " "  
 85 Cuzco Cathedral Min. " " "  
 86 San Iago on Corpus Christi day " " "  
 87 Temple of Sun S. I. B.  
 88 Sacsalwama " " "  
 89 Inca Throne S. C.  
 90 Stone carving S. I. B.  
 91 Inca idol " "  
 92 Indian with fallen stone " "  
 93 M. & Saz. H. S.  
 94 P. Aph. Ke 19 AARSO  
 95 Southern Cross D 15266 (best print)

Feb. 2, 1924

Slides used at Colloquium Jan. 26, 1924  
 Harvard's Astronomical Union in Peru.

- 1 Map of S.A. E 11943 H.C.O
- 2 Mt. Harvard, Looking North. A.A. 325
- 3 <sup>shows 8-inch</sup> <sup>Bach</sup> <sup>Meridian</sup> <sup>Photometer</sup> <sup>paper</sup> <sup>hymen</sup>  
 Mount Cactus, Irving Bailey, future Prof. of Wood Structure
- 4 Surf at Mollendo. L.C. A beauty!
- 5 Landing at " "
- 6 Train S.I.B.
- 7 Sacred Demes. S.I.B.
- 8 Petrographic Rocks. Made here from. No. 357
- 9 Misti. Made here from. " 231
- 10 One Paige auto in Yanahuara. Made from neg. at C.O.
- 11 Arequipa Cathedral. Mancilla. Permal A. J.C.
- 12 " Portales " " "
- 13 " Bridge over Chile S.I.B.
- 14 " station from Carmo Alto. ?
- 15 " " showing Misti D 16138 H.C.O
- 16 The Bruce building. S.I.B.
- 17 " Boyden " "
- 18 Orion as it sets at Arequipa. Made here from J.C. No number
- 19 Region of Icaro. A.A. V.S.O. Re 25. Used upside down
- 20 Southern Cross from Norton's Star Chart. H.C.O. No number
- 21 Southern Cross (photo) D 15466 H.C.O
- 22 " Carmo B 21439 " "
- 23 M.W. in Sag. A.A. V.S.O. Re 1
- 24 Prof. Bailey at Bruce. Made here from A. J. C. neg.
- 25 Mr. Campbell " A.A. V.S.O. C6



Shin Used at H.C.O. Jan 26, 1923

- 26 w Centauri D 6568 H.C.O.
- 27  $\eta$  Carinae A 11943. From Mount Baker. Lovely!
- 28 Rich Sag. up E 11987
- 29 *Galactia* pole E 11991
- 30 Large Cloud D 11788
- 31 " " Br. line objects marked. No number
- 32 Distribution of Spectral Class O E 11547
- 33 Small Cloud D 11892
- 34 " " Variables marked Kd 2 Aa VSO
- 35 13 inch Mydum Aa VSO C 31
- 36  $\times$  Carinae Sp D 18102 H.C.O.
- 37  $\gamma$  Puppi D 5348 A.C. many
- 38 H.R. 4830 " D 19086 H.C.O. Br. + dark H $\beta$
- 39 Br. lines in *Scorpius* " D 19126 "
- 40 Sliding Roof. Backs C 8 Aa VSO
- 41 Spectra near  $\eta$  Car. L no Aa VSO.
- 42 Densities known by Sp Kd 14 "
- 43 Sp. my. Women B5 3234 H.C.O.
- 44 Mining + San Cristobal. Property of A.J.C.
- 45 Observatory Roses " " L.C.
- 46 Jaralá in mountain " " "
- 47 " near heliot. Made here for A.J.C.
- 48 Servants. Maria & Fortunata. Property of A.J.C.
- 49 Women cleaning up grounds Made here for A.J.C.
- 50 Acquisita station showing steps. Property of L.C.

H $\delta$  light. Known.









## Notes

Saha

On a Physical Theory of Stellar Spectra.

See Russell Nature vol. 83, pp. 227, 252, 281

• Summary of work of H.C.O.

Russell thinks the principal diff. arise from variation in a single phys. variable in the stellar atmosphere, and many converging lines of arg. show this is the temp.

Table follows showing decreas. temp. from Class PC to H+R

Ionized atoms, atom which has lost one electron.

Lockyer called them "proto" elements and the Sun is more than as substance as this.

Due to the atom wh. has lost one electron as the result of the high temp. prevailing in the stars, and acquires a net positive charge.

See Fowler's Baherian Lecture  
Phil. Trans. Vol. 214

Calcium "j" line appears in max. int. from the very stage when the star begins its effective life. There is no trace of the H line at the lowest stages. This first begins to appear at the H<sub>2</sub> stage, showing that calcium has just begun to be ionized. The "j" line completely disappears at the B stage, showing that here all calcium has been ionized. The H line reaches its max. int. at the G stage, then steadily diminishes, showing that a second step in ionization has begun. It disappears completely at the O stage.



Saha (cont.)

Orisap. of Balmer lines from a certain class  
therefore does not mean that  $H\gamma$  is absent  
from the class, but rather that the stimulus  
is not suff. great to bring out the lines  
lying within range of obs.

If these arg. are correct, we are not  
justified in speaking of a star as a  
 $H\gamma$ , HeI, or Carbon star, thereby suggesting  
that these elements form the chief ingredients in  
the chemical comp. of the star.

The proper conclusion - that under the stimulus  
prevailing in the star, the particular elements are  
excited to radiation of their characteristic lines, while

other elements are either ionized, or the  
stimulus is too weak to excite the  
lines by which we can detect these elements.

"A star of large mass would rise more rapidly  
through the first stages and fall more slowly  
through the denser stages than a star of  
small mass."



Russell

## Properties of Matter

Ash. Soc. Pacific

Dec. 1921

33, No. 196.

Atom

atoms composed of electrons all alike & carrying  
negative elec. charges, grouped about a  
central nucleus wh. is very small  
& has a positive charge equal to  
sum of all those of these electrons  
so that atom as a whole is  
electrically neutral

(further elucidation of arrangements of atoms)

## Schemin

The obj. prism was employed by Fraunhofer  
in 1823 for his obs. of spectrum of sun  
thus the oldest form of spectrum slit sp.

The parallel rays (coming from stars infinitely  
distant) fall upon a prism and after  
leaving the prism the rays.

Every one of the diff. rays which make up the  
composite beam of the star forms an image  
of the slit and the sp. is merely a succession  
of these images.

Objective prism will have the full ap-  
of obj. if all light is to be used  
Sp. however - must be reduced.



16

Fraunhofer

Denkschriften der Münchener Akademie

1814-1815

He mapped 576 lines from A to G in  
solar spectrum.

Wollaston

Philosoph. Trans. 1802  
p. 378

"Appropinquavit Sidera" in letter of Fraunhofer?

Secchi

Sugli Spettri primitivi de' corpi celesti  
XXV 1872 March 24



Clusters

Bailey remarked that if all clocks were stopped a photograph of one of the clusters in 5 or 15 minutes set matters straight again so accordant are the light curves of the variables known from the past 20 years' observation.

Early  
Photography  
Stars

Began	1850	W. Bond	Daguerreotype
Weggen	1857	G. "	Wet plate
"	1881	Drapier	Wet Van Day

Doublet made in 4 parts  
 Superficial 3 single lenses give flat field  
 Lens of longer focus + meridian magnification  
 Short let. for MW fields.

Peru

Population 1876 2 678 000  
 later 3 500 000

57% Indian  
 15% white  
 2 1/2% African  
 1% Mongolian  
 3 1/2% Cross breeds.

Loans of 1867, 70, 72 cancelled but Peru  
 in payment thereof, ceded for 66 years,  
 all the state railways and the houses  
 up to 3 million lbs.



## Eclipses

Once in 22 yrs. the moon passes bet. - E. of S.  
and casts a shadow on the E. & moves  
rapidly from W to E.

Rutherford

"Man, the servant and interpreter of nature, lives by the laws of nature and by his own."

"that it may be clear that all learning is linked with all learning and that we see one nature while with one mind we pursue different studies"

Science Oct. 22, 1926

Public Orator Cambridge

degrees for Holdsworth

"Rutherford, whom he termed a high priest of natural science, cleaver of atoms, the flower of Rutherfordism - our colleague and friend, Sir Ernest Rutherford"



Sun

Prominences on fiery clouds

100000 more 400000 miles high.

Coronal halo of "glory"

From remotest times considered one of the most beautiful of nat. phenomena

pearly tufts  
streamers radiating from sun's disk, sometimes curved & interlarded.

At poles sharply defined streamers

In 1878, two coronal streamers passed 5006 degrees  
9,000,000 miles from Sun

What is corona?

Meteoric, cometic matter, ejected from Sun?

Says "reputation"  
18 years "13 days."

## Eclipses

Width  
Diameter167 miles greatest  
7<sup>m</sup> 5-8 sec "

Moon wants 2100 miles an hour.

Earth moves 1040 " " at Eq.

around at Eq. } 1060 miles  
 primary shadow } an hour  
 at rate of }

## Eruption:

Predicted in 1911 that images of stars photo in field  
 sun seen, sun would be blue found in their  
 normal pos, but sh. disp. away from S -  
 because their rays, in pass, the star far,  
 field of the S - would be bent from  
 their straight line course.

Displacement <sup>stars</sup> ~~stars~~  $0''.87$

Rays " " should be deflected  $1''.75$   
 B. " time as far by  $\frac{1}{2}$   $1''.75$

Lick 60 - to stars measured,  
 $1''.74$



24

## Eclipses

Old Subjects

1. Accurate time of contacts for checking pos. of moon
2. Intra-mercurial planets
3. Nature of surroundings

New Emission

Wallal

15-foot Emission  
 A pair of lines 5 miles in ap.  
 15 feet in focal l.

## Eclipses

Totals since 1900

1900	(1)	South Sea
1901 May 17	(2)	Indian Ocean, Sumatra
1902		No total
1903 Sept 20		Indian Ocean
1904 Sept 8		Pacific O. N. W. Australia
1905 Aug 25-30		Labrador, Spain Egypt
1906		No total
1907 Jan. 13		Central Asia
1908 Jan. 3		Pacific. Marshall Is. Faint Is.
1909		Central Ech. Near N. Pole.
1910 Aug 8		Pacific O. Tasmania.
1911 Apr. 28		Pacific O. Nassau Is. Beh. Aust. + Panama
1912 Oct. 9		Guilö. Brazil
1913		No total.



Eclipses Total emb.

1914 Aug. 20 Greenland, Russia, Persia <sup>Iran</sup>

1915 No total

1916 Venezuela, Guadaloupe, Azores.

1917 No total

1918 June 8 Washington, Oregon, Colorado

1919 Aug 28 Tacna, La Paz, Brazil  
S. Africa

1920 No total

1921 Sept. 30 near S. Pole.

1922 Sept. 20 Indian O. Australia 90 miles <sup>Campbell</sup> beach

1923 Sept. 10 Calif. Mexico

1924 No total

1925 Jan 24 New England

## Eclipses

- 1890 Central Indian O.
- 1891 none
- 1892 S. Pacific
- 1893 Apr. 15 S. A. Paraguay
- 1894 Indian O
- 1895 none
- 1896 Aug. 8. China, Japan
- 1897 none
- 1898 Feb. 11 <sup>Allahabad</sup> India, Central Af.
- 1899 none



Stars

Peak abs. brightness

58 Persei      4 29.8 +41 4      Gap for -4.2 m.h. m.  
 Certainly imp. on I 38088.

46 Aur.      6 17.2 +49 20      K2 p 95 -3.6.  
 I 37500 no. 77      K2

Recent M.C. plates M C 20207  
 show bright lines on spaces

E. P. Lewis

29

Science Nov. 23, 1923

## The Contribution of Astronomy to Civilization

It is impossible to determine uniform abs. motion through space by any optical methods

Veloc. of light is the same for all observers, regardless of their rel. veloc. or direction of motion.

Either the motion produces a change of length in an apparatus, <sup>or a change in direction of light rays</sup> or that the perceptions of space and time are different for observers moving relatively to each other.

Einstein's earlier assumption:

Nothing absolute in our meas. of space and time intervals but they will be diff. for two observers moving w. uniform veloc. with respect to each other.

Mass of a body is not constant but varies w. the speed, so that mass is also relative.

With no objects, or only one object in the universe, space would be meaningless.

With the appearance of two objects at a measurable distance apart, space is created, but this distance is not the same for diff. observers.



E. P. Lewis

With no objects, or one obj. subject to no internal changes, time would be meaningless, there would be no past, no future, only an eternal present. If changes take place on one obj. moves w. ref. to another, time is created, but the rate of flow of that time will appear ~~to be~~ diff. to an observer in another moving system.

Minkowski first called attention to the fact that space & time are inseparable.

In a gravitational field, space is not Euclidean, but curved.

The earth moves ar. the S. not because it is attracted by a force, but because the law of inertia constrains it to move along the geodesic lines in the curved sp. surr. the sun.

Einstein obtains a law of grav. ident. w. that of Newton at a dist. from matter, but introduces a small corrective term in the immediate neighborhood of large masses.

Einstein's theory

(exactly accounts for the anomalous rotation of the major axis of the orbit of Mercury.

(Predicts a deflex. of light waves passing by Sun which is double that demanded by Newtonian

Any kind of a clock runs more slowly in a strong grav. field. An atom emitting light vibrates is a clock, hence we may infer that the atoms in the solar atmosphere emit light waves of smaller frequency and greater wave length than the same atoms on the earth.



Chemistry - McBain Science Nov. 30, 1923

Pure science is study, and incessant effort to understand, testing every idea by the teststone of truth. Science presents the chief requirement of character. This must be reinforced by enthusiasm and imagination.

It is really surprising to see how diff. it is to liberate our minds from preconceived notions.

The whole material universe appears to be built up from perhaps only 2 constituents arranged to form from them 100 elements and these are combined in acc. w. immutable laws.

The real world is not the world of material prosperity or lack of prosperity. The real world is the world of mind and discerning, of art, literature, emotion and passion. These are the things which give color and texture to experience. Sullivan in "Aspects of Science" emphasizes that Scientific research is thoroughly human, tentative, imaginative and comparative. In science we find a sense of unlimited possibilities, of adventure and of exultant hope.



# Kuh Wilson Report for 1922

Kapleyn. John ashoring over its feet from  
footing among the intricacies of the stellar  
universe. Before him all efforts to make  
order out of seeming chaos had been in vain.

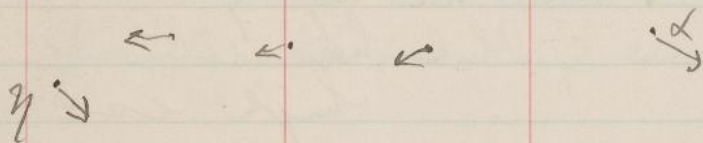
The vast mass of stars had yielded  
no sign of larger relationship and the  
constitution of the Galaxy was a sealed  
mystery.

Kapleyn's dis. of the two star streams  
pointed the way

Now for some time that stars near each other  
seemed to be com. as comrades to be  
seen together in two & three

Drifters

"Gregarious tendency"



All but 4 or 5 going same way.



Jenus

Solar

1543 Copern. published  
De Revolutionibus Orbium  
Coelestium

1610 Galileo obs. Sat. of Jupiter, a small  
solar system  
At least two systems in the vicinity  
of almost exactly similar formation

Cosmogony thus had its origin

In Solar system

8 great planets

900+ minor "

orbits all nearly circ.

all apprx. in one plane

all rev. in same direction

Exceptions

Neptune's one sat. has retrograde motion

Uranus 4 " orbits highly inclined

Saturn 9 " Phoebe has retro motion and  
high ecc.

Jup. " " 2 outermost retrograde

Pallas has inc.  $34^{\circ} 43'$

Vesta inc.  $34^{\circ} 33'$

Mercury  $7^{\circ}$

## Binary stars

Fully  $\frac{1}{3}$  of the stars and prob. more are binaries

Ratio of masses of binaries vis. to us is near unity.

Ratio of mass of S & Jup. is .00085  
 " " " " Earth-moon " 0.012387.

Thus the very def. uniformity of arrangement in our system is very diff. from the def. arrangement outside.

Special neb.

Other uniformities are the special neb.

A nucleus with two arms emerging from opp. points, with similar curvature.

Very general.



Jeans.

neb.

- (1) Disp. Orion
- (2) Planetary 150
- (3) Ring poss. ellipsoidal shells seen in prof.
- (4) Ellip. Eloquent, lenticular & spindle

Spins, have great veloc. in space

Androm. neb. 300 kms a second  
 neb. 4594 revs. 1180 " "  
 1068 " 1120 " "

General an. veloc. is about 20 times that of rotation

Veloc. rotation  
 4594 330 kms. a sec.

Orion & Triad neb. almost at rest rel. to stars of the system.

Plan. rad. veloc. up to 65 km.  
 almost at rest.

Spiral arms concen. to poles of the MW.  
 plane " in galax. plane.

Our system in shape of cone or wheel  
 with edges being the MW

H. G. C. 7662 par.  $0''.023$ , diam  $19 \times$  hept. orbit.

Clusters

1. Glob. about 100

Prac. eq. to one hemisphere



Jan. 1, 1924 —

A. S. P. Dec. 1923, p. 284  
van Maanen

Abs. mag.

3 fl. stars of very large p.m. found by brief

abs. magn.  $+1.3$

Two faint plan. neb. Dumbbell & Helical  
central stars  $+8.8$

$+11.2$

Av. resid. rad. vel. Me. stars is found  
to decrease on advan. sp. type & increasing  
period the largest slow. comp. mainly 5  
types here to here, periods about 200 days

o Ceti

A.S.P. Dec. 1923

Aitken's articles

Also from H. W. ref.

Abs. lines max. v. of recession assumes  
max. of light.

B. lines. Max. v. of recession at min. of light.

Sharp b. lines at min. over low temp.  
lines, esp. of iron.

X Cyg. when mag. 12 radiates  
19000 times as much energy as sun  
but of same frequency but only 230  
times as much vol. of mag. 4.3

From a change of light of 1320 times the  
total rad. changed but 1.7 times thus  
showing the rapid shift of energy into  
the vis. sp. or vis. of light.



Perseus  
Chimius

Primal race! Their clay who shall <sup>show</sup> ~~know~~  
They built, they reared, they died - is all we know

"We feel that Babel's tower could scarce surpass  
In rude wild majesty this wondrous mass  
That for Chaldea's sons in Egypt's king's  
Sent their bold genius home in spirit wings  
For change, between each nation seems the tie  
Of hundred creeds, of acts and murders many"

To correlate the forgotten grandeur, the wonder  
and paths of the unknown past,

Xavier Le Maistre "Voyage autour de ma Chambre"

The most brilliant stars have never been  
those which I contemplate with the most pleasure,  
but the faintest ones, those which lost in immeasurable  
distance, appear only as barely perceptible points  
have always been my favorite stars

Mt. Hamilton	4100	ft high
Wh. Wilson	5600	" "



# Lectures before Summer School July 16, 1924

at H.C.O.

1. Discovery of Comet (Cablegram)
2. Halley's Comet H7 (H.C.O.)
3. Plan of Solar System G (H.C.O.) (E 12219)
4. Mars F22 A.A.V.S.O.
5. Jup. & Saturn H5 (D 19090)
6. Jup. F14 A.A.V.S.O.
7. Saturn G (H.C.O.) (G 11)
8. Full Moon F (H.C.O.) (D 12853)
9. Moon, (Copernicus) E 25 A.A.V.S.O.
10. Moon, (Plato) E 31 A.A.V.S.O.
11. Solar eclipse diagram D 30 A.A.V.S.O.
12. Island Villa Hotel, Catalina, H.C.O.
13. Camp Wrigley
14. Rehearsal
15. "Where is the Sun?"
16. "Yes, we have no Corona"
17. Solar Eclipse, 1899 E 2 (H.C.O.)
18. Einstein Plate. H5
19. Eclipse Track Jan. 24, 1925. (E 12325) (H.C.O.)
20. Hick Obs. Winter Scene. A (H.C.O.) (A.3)
21. 36" Telescope, Hick Obs. B 10 (H.C.O.)
22. 100" Hooker Telescope <sup>Dome in Winter</sup> H.S. (D 19353)
23. Mt. Wilson 100" Reflector H.S. A 33
24. Herschel & Sister A 16 A.A.V.S.O.
25. Star field showing Nebulosity H.S.
26. Orion Ke 28 A.A.V.S.O.
27. Orion Neb. H.S. (D 19088)



28. Pleiades H.S. (A 2186) H.C.O.
29. Ring Neb. H 57 A.A.V.S.O.
30. Spiral Neb. H 33 A.A.V.S.O.
31. Network Neb. H.S.
32. Filamentary Neb. Cygnus. H.S.
33. Dumbbell Neb. H 13 A.A.V.S.O.
34. Hercules Star Cluster H.S. (D 19122) H.C.O.
35. Solar Spectrum A.J.C.
36. Spectra of Secchi's stellar types N<sub>8</sub> (H.C.O.)
37. Capella & Sun N<sub>10</sub> (H.C.O.)
38. Spec. Nova Aquil. 1918 L 69 A.A.V.S.O.
39. Harw. Obs. H.S.
40. Prof. Pickering, C (E 7618) (H.C.O.)
41. Plate Carrier 16" Telescope B (E 10263) (H.C.O.)
42. N. A. Neb. H 59 A.A.V.S.O.
43. Location of Arequipa
44. Landing at Mollendo. H. L. Campbell
45. Railway train 23
46. Sand Dune
47. Arequipa & El Misti H.S. (D 19388)
48. Distant view of southern station. 27
49. Summer scene at station.
50. Bruce dome H.S.
51. Prof. Bailey at telescope H.S.
52.  $\eta$  Carinae H.S. (A 11943) (H.C.O.)
53. Southern Cross (D 19323) (H.C.O.)
54. Southern Cross with Coal-Sack H.S. (H.C.O.)
55. Portion of Milky Way H.S.



56. South American Lady 64.  
 57. Indian Women  
 58. Servants  
 59. Peruvian Fuel 61 L. Campbell  
 60. 13" Boyden C7 A.A.V.S.O.  
 61. Bright line stars in Scorpius (D 19126) (H.C.O.)  
 62. Spectra  $\eta$  Carinae L 20 A.A.V.S.O.  
 63. Spectrum  $\beta$  Aurigae L 8 A.A.V.S.O.  
 64. Distance & luminosity H.S. (E 12355) (H.C.O.)  
 65. Spectra H.S. (D 19055) (from D 18915) H.C.O.  
 66. Arequipa Street Scene with llamas. A.J.C.  
 67. Llama "English Lady" 13 L. Campbell  
 68. Railway Sedan  $\nabla$  (H.C.O.)  
 69. Indian boats  
 70. Indian women & ~~lady~~ lady  
 71. Llamas. (D 19094)  $\nabla$  (H.C.O.)  
 72. Arequipa Street Scene - Church  
 73. Stone wall, curved. 115  
 74. Ruins of stone wall 54.  
 75. Inca throne 162 L. Campbell  
 76. Indian & ruins  
 77. Dark Neb. (S-shaped) H.S.  
 78. Horses Head Neb. M (D 18910) (H.C.O.)  
 79. Rholph Neb. K $\epsilon$  19 A.A.V.S.O.  
 80. The Great Dipper Neb of And I





Mars.

1610 Galileo

1638 Fontana glimpses of dusky markings

1659 Huygens Syrtis Major  
first drawing  
Rotation 24 hours

1666 Cassini 24<sup>h</sup> 40<sup>m</sup>

1719 Maraldi polar caps

1777 Herschel  
varying of caps due to seasons.

Analogy bet Mars & the Earth is perhaps by  
far the greatest in the Solar system.

Considerable but moderate atmosphere

1830-9 Beer & Mädler  
maps.  
lat & lon

1870 P. w. Lohr - chart.  
"the miniature of our Earth"

## Mars

47

all that makes our own world so well fitted  
 to our needs - land & oceans, fresh & brackish  
 rain & ice & sunny & misty & clear

1877 A. Hall 2 satellites

Schiaparelli  
 number of straight dark lines  
 Canals - Channels

1879 saw the Canals darker

1882 doubling of several others  
 geometric character

1886 Perrotin & Schaller saw the Canals.

1892 W. H. Pickering & Dwyers at Arequipa saw  
 over 40 minute black points at junction of canals.  
 'lakes'

'Canals' crossing the ocean.

1894 Lowell  
 changing tints of the seas and canals  
 crossing them indicate thin blue areas  
 of vegetation.  
 reddish other areas = deserts.



48 Mars

1915 M. H. P.

Canals a front of dark veg.  
supported by water artificially drawn from air  
or fog might be localized

1918 M. H. P.

function of canals to furnish an <sup>extra</sup> ~~extra~~ form  
ocean & to give by evap. during the  
Marsian summer a ~~extra~~ supply of water.

Water from the melting caps depos. in  
3 main depressions, then evaporated &  
carried by aerial circ. along curved lines.

The storm clouds which in that rare almost  
should condense at night would thus carry  
the water and deposit in the elongated marshes  
which we see and call Canals

Canals not only show double track shifts  
than pos. 150 miles  
on M. H. P.'s chosen track theory they should shift more

If intelligence is present, the method according to M. H. P.  
is not wild. with construction of water ways but  
some form of atmospheric control

Mars

1924

Nearer than for 120 years.  
Nearer than ever before

Air & water

Martian Spring - fresh melting

1894 acc. to Lowell, 1. polar cap about 2000  
miles across. Decreased at rate  
of 100 sq. miles a day.

Changes seasonal

Clouds

1922 Shipley photo - a large wh. cloud  
obscuring pt. for 4 days.

Atmosp.  $\frac{1}{5}$  -  $\frac{1}{7}$  as dense as Earth's.

Cracks produced by volcanic action



Mass. See A.S.P. June 1921  
Slipher.

Water polar caps waxing & waning  
bluish belt

Lines of water vapor in Spectrogram

Temp.  $48^{\circ}$  Lowell.

Mean of Earth  $60^{\circ}$

1. Existence of polar caps melt gradually in  
Martian summer, bordered by a dark band
2. Surfaces divide into reddish ochre &  
dark bluish-green areas, the former  
fully in excess.
3. The bluish-green, formerly supposed blue  
water, are lined by dark markings or spots  
permanent in pos.
4. The dark markings undergo change,  
increasing in Martian summer.
5. The existence of a net-work of dark  
linear markings, but canali, & small dark  
spots, etc. & areas

Mars.

6. The canals ~~then~~ intersect and  
do not continue to run this one straight  
course.

7. That clouds occur

Q. Mars' observers always see the same thing?



# Plates of Pec. Objects

AC7819      22 + 75      Ring smashed

B32817      Comet?

B10528      Spurious objects      Chamber of Horrors

B23822      Wide, long sp. Meteor?

I34287      Comet?      ~

I34293      "      similarity to I3K387  
Birkham pl.      Sl. 3886.

B16900      Mystery

New

M 78591

Nebula 18 10.7  $+10^{\circ} 5'$  (Wynne 1855)  
See M 78591

Hf strongest. Chief neb. lines very weak  
but might show up better on B plates  
M F plates do not show this region well.

Looked up for var. by L.D.W. none found.

See even of M 78591

If really near should be meas. for  
accurate pos.  
See chart pl. I 23739.

See letter of Merrill Feb. 28, 1925  
Humeson Sept. 28 "

See B 53286 (17 39 -26.0) for Merrill's hyper line star  
HP very hyper. H & less hyper.

M 77992 same region HP 155h.  
HP does not show well on M F plate.

M 710637  $5^{\circ} 30' +26$  Jan. 17, 1926  
Pec. sp. Shows N sup. on A. If star on  
other plates A star visible. Also not on  
A 7 925 946 taken Jan. 15 20 1926  
A peculiar defect probably due to  
same as other plates



Journal B.A.A. 37 m. 8  
1923-24

## Dante's Astronomy

The orderly course of the stars appeared to  
as they had done to Plato,  
"the unperturbed to the perturbed"

A line in Lucretius poet calls this harmony  
of nature,

"The excess which comes from the heat of  
the world and straining enters our  
heart"

he sees the shadow of night sweeping over  
the wide plains of earth,

"the little threshing-floor over which we  
gravel so fiercely"

"The Love that moves the sun and the other stars"

H. B. 837

Plates for spec. spectra in my list.

M. F. 1044 7

R<sub>0</sub>M. F. 8697 18 16.1 +21.24  
Char. 126089

M. F. 8684 18 40 +7.5

Class R<sub>0</sub> meas. in A 6179.



# Classifying the Stars. Open Night. Dec. 5, 1924

(Spent about 15 min)

H.C.O. E 12157	Astronomy	Chaco
A.A.S.O. Kc 22	Ursa Major.	
" " 28	Orion	
" M 33	Pages of	Almagest.
" H 5	E.L.P.	
L 3310 H.C.O.	13. mch.	
H.S.	Sun spot.	
A.A.S.O. Dg	" Prime (col.)	
" F 22	Mars	
" 125	Saturn	
H.C.O. D 12853	Field home	(port)
A.A.S.O. F 25	Moon, Copernicus	
	Southern Cross.	
H.C.O. M 4	Cygnus	
A.A.S.O. Kc 20	Ophi.	
H.S. G 114	Lectus	
A.A.S.O. H 13	Quadrant	
" H 25	Rainbow	
H.S.	Herb	
"	Pine Spectrum	
A.A.S.O. M 10	Reverend of P. Lewis	
A.J.C.	Cal. sp.	
<del>A.A.S.O.</del> M 12	Worm	
A.J.C.	Solar sp. H. H. H. H.	
A.A.S.O. L 91	Solar sp. + Iron	



H.C.O. 210	Capella & Sun
QARSO L8-	Sp. 2 stars
A.J.C.	Acquas (Cpl.)
J.J.B.	"
L.C.	Slama
A.J.C.	Alpacas
J.J.B.	Scuro Ruman
A.J.C.	Hydian 8000
J.J.B.	Lahn Reticum (Cpl.)
QARSO. Keig	o oph.
H.C.O. H11942	" Cam
QARSO L20	Sp. near " Cam
H.C.O. E5634	Hippes Sp.
<del>C.H.P.</del>	Lupulatus
H.C.O. E12480	H.D. 91-99
H.S. E12482	" Page
" E12420	Mrs. Draper
H.C.O. R1565	3 Am. Luns double
QARSO H62	Helunt tub
" " H37	N.A. tub.
" " H46	Orin tub
H.S.	Sp. " "
A.J.C.	" Cam. colors etc.
H.C.O. D11108	Irora Sap
H.S. D13114	Daniel's Plant
QARSO C72	Lich Spectrotype
H.C.O.	Hooker tub. in double
QARSO H406	tub in Androm

53 slides.



58 Enter in any new list published  
See Schenck's letter of Feb. 23, 1924

Errata in H.D.

DM

H.D.			For	Read
✓ 155860	17 9.1	+49 53		2604 O.K. on east top
✓ 211208	22 10.5	+54 3	3821	2821 O.K. on east
224837	23 56.0	+52 36	2581	3581 wrong on east
✓ 68273 <sup>8th</sup>			Plum. 1.92	Errata in H.P. See letter <sup>Shaw in letter</sup>
✓ 217223		DM for -74 3	read -74 36	for Plum <u>69.8</u> near <u>9.8</u>





## Eclipses

At any one pt. on E. total of sun vis. in an average once in  $3\frac{1}{2}$  centuries.

Moon's shadow about 5000 miles long  
can not be more than 170 miles wide

From moon 2100 miles on horizon

At equator on E moon 1040 miles horizon  
4500 " 735 " "

At " moon's shadow passes obs. at

$$\begin{array}{r} 2100 \\ - 1040 \\ \hline 1060 \end{array}$$

In Britain

$$\begin{array}{r} 2100 \\ 735 \\ \hline 1365 \end{array}$$

Days =  ~~$18\frac{1}{3}$  days~~ from  
184.  $10\frac{1}{3}$  or  $11\frac{1}{3}$  days.

927 June 29 total at Liverpool

H. f. in its history never yet vis.  
by total eclipse in 1925

June 16, 1886 last ecl. vis. H. f. Pen or H. f.  
2024 next " " " " " "

Flash sp. lasts only a second

"Heliosaurus" from June 8, 1918 Sunspot max.  
Sept. 21, 1922 " min.

Corona

Minute particles of matter driven from  
by light pressure & other rays.

Photo electric effect

Bright lines green coronium  
violet lines blue red.

Venus, Mercury & Jupiter some disk of H. f.  
of Sun  
H. m. Altair  
Vega



Eclipses

morning, London &amp; N. Europe

July 28, 1851

G. P. Bond went to

Europe

First photo. made a daguerotype

1927 June 29

England

Liverpool &amp; Durham

Matthew Arnold

Who cares?

"They tell us, said Matthew Arnold that when  
a candle burns, the oxygen and the nitrogen  
of the air combine with the carbon in the candle  
to form carbonic acid gas - Who cares"



# Solar Eclipsing

Band Asph. Club, Jan 7, 1925

- 1 Full Moon H.C.O.
- 2 Innerish Eclipse H.S.
- 3 Picking at knifelh Aug A.A.V.S.O.
- 4 Torch-beavers E12020
- 5 E21 Corona
- 6 " Chabot Obs. Layer
- 7 Luman craters H.S.
- 8 "
- 9 Old Swiggitt - filament story
- 10 Eclipses of Sun + Moon H.S.
- 11 Sunspot D65 A.A.V.S.O.
- 12 " " D34 "
- 13 Solar eclips. Pama D68 "
- 14 " " " D84 "
- 15 " " 1918 D49 "
- 16 " sp. col. A.J.C.
- 17 Flash " L57 "
- 18 Nova Apr. E11226 H.C.O.
- 19 Einstein Pl. Wallah H.S.
- 20 Cal. glass "roy"
- 21 Lake Louise A.J.C.
- 22 Mr. M. Campbells "
- 23 Lick Obs. B14 A.A.V.S.O.
- 24 Mt. W. " B12 "
- 25 Saland Villas a.J.C.

- 26 Foy's painting on road to Camp A.J.C.  
 27 Approach to Camp. A.J.C.  
 28 Camp Wujley "  
 29 Scene " "  
 30 Mining pits "  
 31 Shadow bands "  
 32 Women obs. "  
 32a " " Spain 1870  
 33 Scene at Camp A.J.C.  
 34 Whewer's Sun "  
 35 Jes. why have no Corona to-day. A.J.C.  
 36 40-gh. Lick Et. Eusebia C77 a.c.v.s.o.  
 37 " " " C76 "  
 38 Miller's Corona in cloud A.J.C.  
 39 " " D68 A.C.V.S.O.  
 40 " " A.J.C.  
 41 " " "  
 42 Eclipse track H.S.  
 43 " " H.F.  
 44 Corona E21



# College Club

Feb. 23, 1925

## On the Trail of the Eclipse

1. Field Work D 12853 H.C.O
2. Crater P 19488
3. Mineral D 12240
4. Camera Eclipse E 12230 H.S.
5. Partial & Total By Trail
6. Orbit of Planets E 12219 H.S.
7. Corona marked 1868 in pencil
8. Eclipses A.J.C.
9. Eclipses H.S.
10. " Stars "
11. Clouds. Henry's. A.J.C.
12. Sunspots D 19 A.A.V.S.O
13. Eclipse prom. D 68 "
14. " " D 9 "
15. Birds " "
16. Lake Louise A.J.C.
17. Victoria H.S.
18. Eclipse party during eclipses A.J.C.
19. Lake B 14 A.A.V.S.O.
20. Mr. M. Campbell thru L A.J.C.
21. Strober tel in winter D 19353
22. Island Villa A.J.C.
23. Camp "
24. Rehearsal "
25. Where is Sun "
26. Yes, no ~~transits~~ coronas
27. Costumes Spanish Eclipse
28. " Calatonia



- 29 40 ft. ab Eumenada. C77 a.e.v.s.o  
 30 " " " " layer C76 "  
 31. Miller's cornu D70 "  
 32 Eclipse part 1825 H.S. ?  
 33 Planets & stars " " E12503  
 34 Maxima in eclipse E12508 H.S.  
 35 Whole eclipse at Merid. a.f.c.  
 36 Crescent during partial E12465  
 37 Moon's vel. L.C.  
 38 Whole eclipse in Chabron a.f.c.  
 39 Diamond ring " " L.L.  
 40. Eclipse R.S. Group E12504 L.L.  
 41. Total Corona, Chabron  
 42. Solar sp. a.f.c.  
 43. Flash " L57 a.e.v.s.o.  
 44. Cygnus m.c.  
 45. Sun's surface L26 "  
 46. H.C.O. H.S.  
 47. E.C.P. A5- H.H.V.S.O.  
 48. Aegypsa a.f.c.  
 49. Sun's surface S.S.B.  
 50. Corona 1905-D14 a.e.v.s.o.  
 51. " Wallah D78 "  
 52. Drum bell H.13 "  
 53. y. Cam H.1943 H.S.  
 54. Neb Work H.62 a.e.v.s.o.  
 55. P oph H.19 "  
 56. Arm's hub D 1908 H.S.O.  
 57. Eclipse 1889 E2 "



Apr. 15, 1925

Extension H.D.

No. stars classified.

M 78130	4184
8113	1456 ✓
7840	1567 ✓
8387	1700 ✓
8396	1200 1300
8399	1125 1250
8400	3050 ✓
7824	875 ✓

H.D.  
 Small about  
 2300 pages of letters  
 135 Index  
 100 Remarks

7896	150 ✓	17090	
		<del>8400</del> 3050	4184
		<del>8382</del> 3000 ✓	
		8309 500 ✓	3000

53285	201 ✓
7972	322 ✓
53297	150 ✓
53276	350 ✓
7948	17 ✓

2	3640
	3050
2	0590

no. classified  
 to Oct. 1, 1925  
 in H.D.E.

53202	229
53184	139 ✓
53135	275 ✓
	17090

classified Oct. 1, 1925 - Sept. 30, 26

M 78309	1475
M 78110	200
A. G. Jones 50-59	5127
	6802





Secchi Comptes Rendus T. 57 (1863)

Rutherford Am. Journal Vol. 35, p. 77 (1862)

H. C. Vogel Astr. Nach. Bd. 84, 113, 1874  
3 classes

1891 Pickering suggested that close double  
stars could be detected from spectrum.

Brighter star generally 2<sup>nd</sup> type  
Fainter " " 1<sup>st</sup> type

then sp. of 2<sup>nd</sup> type, w. strong  
hydrogen lines

Fraunhofer Leber and Wicks Fraunhofer  
referred to in Encyclopaedia

Franke's papers translated by J. S. Ames.

Mollastini

Mollastin  
reads June 24, 1802 Phil. Trans. 1802

If a beam of s. light be admitted into dark room by a crevice  $\frac{1}{20}$  of an inch broad, and received on a piece of flint-glass, the beam is seen to be sep. into the 4 colors red, yellowish green, blue & violet. Labeled the lines A, B, C, D & E from red to violet.

line H bounded red band is somewhat confused.  
 " B both red & green perfectly distinct (to base)  
 D & E the two limits of white " " D & E?  
 C limits of green & blue not so clearly marked  
 D & E distinct dark lines (faint) on each  
 side of C.

Helmholtz's Pop. Lectures

See "Becker" for his mistaken notion  
about lyric spectrum

Trans. Bar. Acad. 1823 or near  
Franklin's obj. perispectiva



Oct. 13, 1925

Series of Oct. 9

Upper atmosphere at height of 60 miles or more  
may be helium, though at earth's surface, the air  
contains only a minute fraction of a per cent of  
this useful gas.

Early Days at Harvard Observatory.  
Open nights, Apr. 10, 1924

H.C.O.	D 20	Donet House
"	C 29	M.C. Bank
Q.A.R.S.O.	G 45	Emich 1843
H.C.O.	A 41	H.C.O. newspaper
"	B 16	15 - inch
"	F 55	Innocent's Drawing
"	M 63	And helb "
"	M 24	One " "
"	G 73	Drawing of 14 ypr
"	G 74	" " " " "
"		Jenny Lind
Dr. Menzel		Melior <del>2</del>
H.C.O.		Price of Wals 1855
Q.A.R.S.O.	G 36	Donet's lunch <del>Quint</del>
H.C.O.	H. 109	" " head
I 12	J 12	G. Buss's photo 1857
Q.A.R.S.O.	C 1	15 - inch
H.C.O.	G 60	Satin Lomel
Bank Club	© 17	Phases rings
H.C.O.	C 31	Woolock
"	C 5	E.C.P.
"	G 13	Phurber
"	C 25	Kiss. Draper
"	G 33	Woman 1887
"	K 11	hora Sgc
Bank Cl.	© 18	Solan Sp. col
H.C.O.	K 60	Stella " col.
Q.A.R.S.		3 hours of 1/2 p.

H.C.O 413 3 species  
 " 411 Prim. hel. (Horn)  
 H.S. Sp. 14 " " sp.  
 H.C.O 414 Aud. m.  
 H.S. Sp. 11 " " sp.  
 A.J.C. S. Cross (Horn)  
 " Total colpic  
 H.C. 415 - M. Wilson 1889  
 A.J.C. Horned on the W  
 " " " 1889  
 H.C.O 421 H. Horn  
 A.J.C. Cactus "  
 L.C. Landing at Malanda  
 A.J.C. Sand dunes  
 " Acropora  
 L.C. Clams  
 H.C.O 423 Acropora  
 " 424 " "  
 A.J.C. S. Cross  
 A.C. 425 O.K. 8 w. C.  
 H.C.O 425 S.J.B  
 " H3 4 Aug. "  
 " 422 " " sp.  
 " 46 L. Ing. Clams  
 " 418 L. Ing. "  
 H.S. 414 S. Ing. " res.  
 A.C. 425 O.K. 8 p. oph  
 A.J.C. S. Cross (Horn)  
 H.S. 425 H.C. 425  
 A.C. 425 O.K. 8 p. oph



## monograph. References.

Hewitt

Wollaston Phil Trans. 1802.

Fraunhofer See also Harpe's *Scientific Memoirs II*. Trans. J. S. Ames.Denkschriften der Königl. Akademie der Wissenschaften zu  
München V. 193-226, 1817Schumacher's *Astronomische Abhandlungen* Heft II, pp. 13-45, 1823

Edinburgh Phil Journal IX, I, 1823, 1824

J. Herschel

Ritchie's American Journal 35 (1863) p. 71

Sun, Jovian, Jupiter, Mars, Capella, p. Gen & Or. Aldebar, & Lemo. Arcturus  
p. Per. Sirius, Castor, & Procyon, p. Per. p. U. S. Maj. 5 U. S. Maj. 8 U. S. Maj.  
5 U. S. Maj. (2 U. S. Maj. 2. 5. 5 Or. & U. S. Maj. also in this)

Draper Proc. Am. Academy XIX, p. 231

Huggins Phil. Trans. 1864 1. 428

first attempt to photo. sp. 1863

## Monograph. Ref.

75

H.C.  
Vogel J. N. 84, No. 2000, p. 113.  
Class. sp.

1869  
See J. N. no. 1963 about *Stellaris* in One vol.  
J. Herschel  
Lord Rosse & Winlock also saw this line

A. N. 1864 p. 245-  
Huggins Proc. No. 136, 1872

Attempt to classify acc. to phase of development.  
Heipuls + T Cor. Class 0 stars, Mid stars  
under a div. of 2<sup>nd</sup> type -

Secchi C. R. Tome 57 (1863)  
Sugli Spettri prismatica de Corpi celesti.  
XXV. 1872 March 24.

(1863)  
Dustynum 3 groups. Exam 24 first stars.  
1. Many lines & bands & most nearly resembling sun  
Capella,  $\beta$  Cen.  $\lambda$  Or. etc.  
2. Series white stars -  
3.  $\lambda$  Virg. Rigel. White stars without lines.



Huggins

1862

sent a line to Royal Soc.

Royal Soc. Proc. XII, 484

On the basis of some of the Fixed Stars  
diagrams of Sirius, Betelgeuse & Aldebaran  
stated that they obs. sp. of 4 stars.

On the day when this paper was read, but some  
little time after it was sent in, news arrived that  
similar obs. had been made by Ruchardt.

A very little later similar work was done by  
Seeliger & Vogel.

Aug. 29, 1864. Nebula in Draco.

Secchi C.R. 57,71 date July-Dec, 1863

Exam sp. 35 slats

White slats have in gen a small  
number of interruptions

D line in yellow & red slats  
Inferred sodium to exist

Said he was working upon a cat. showing  
the nature of these spectra.

In Miss Cleck's Hist. of Astronomy  
refers to

Report British Assoc. 1868, p. 166  
for place of publ. of Secchi's orig. Classif.



Proc. Amer. Acad. XIX, p. 231

May 1883 to May 1884

Drafter

11-inch with corrected half l. 2x inches

May 29, 1872 Two photos. of sp. of Vega.

1. Exp. 3 min

No slit &amp; no lenses

2. " 30 sec.

The photos. showed no lines.

Aug. 1, 1872, Vega showing four lines.

1879 While in England he abt. some Wraith &amp; Mainwaring's dry plates.

Plates up to 1876 by collodion process.

Aug. 6 1879  $\alpha$  Lyrae45<sup>m</sup> Exp.

Sun

Daylight

Jupiter &  $\alpha$  Lyrae

&amp; Bores

Sept. 2<sup>+</sup> 1879.

Mars

&amp; Auriga

&amp; Scorpion

&amp; Aquila

{ Two sp. very much alike.

1880  
End of July ~~1879~~  
11 - inch ready for work

Comet b

neb. in Orion

Measurements of  $\lambda$ 's published.

Measure made in spring of 1883 at H. C. O.

1880  
x Aug. July 29, ~~1879~~  
Fine picture

x Lyrae Aug. 22, 1880

With the McLean spectroscopic eye piece  
x Lyrae shows a line near D which may  
be D<sup>3</sup>.



8 - with Bache.

Fresh place Aug. 4, 1885 Trail in Pale.

Fresh sp-pl. Oct. 27, 1885 22.1+90 Lender

2nd " " " 22.8+50 Lender 3 Exp.

Very good. Portion might be printed for  
monograph.Magn. of A stars 8.0 DM can be classified  
8.5 " " " " affixG5 No. 68m 137028 6.60 plm  
7.38 plj.K2 31 " " 6.80 plm  
7.87 plj.Ma 9 " " 6.87 plm  
1.35 plj.

# Secchi 1867 Catalogo delle Stelle

81

no. ~~List~~ of stars whose <sup>di cui</sup> sp. were obs. Si è determinato lo spettro Luminoso  
 di cui <sup>Magdenich</sup> ~~Magdenich~~ <sup>Chem. 1508.</sup> ~~Chem. 1508.~~ 68.2

Aedrimeda	15	Lera	7
Antinous	6	Luciola	3
Aquan	8	<sup>mosea</sup> Musca	3
Aquila	7	(Ofuico) Ophiuch	6
Arct	3	Orin	9
Cetus	13	Urs May	7
Bilancia (Libra?)	2	Urs. Min	5
Borles	10	Peg.	14
Canis Maj	7	Piscus	15
Canis Min	3	Pisc. Aqu.	1
Cepheus	7	Piscis	2
Cassio	8	Sagittari	6
Equuleus	4	Scorpi	3
Perseus	8	Serpenti	3
Cygnus	14	Laureus	13
Cochini (Auriga?)	10	Tremp	5
Cor. Bor.	4	Vrijo	6
Corvus	4		78
Delph	5		186
Draco	11		264
(Ercule) Hercules	15		
Eridanus	6		
Gemini	6		
Hydra	5		
Leo	10		
Lepus	7		
Lervini (Cor Cordi)	1		
	186		

Miss Clarke states  
 that 4000 stars were  
 passed in review by her  
 comb. inf. 11 &



S. S. S.

x And 001046

R And 001838

H Cass 004047

W Cass 004858

S Cass 011272

J Can 043065

R Orinis

H R And 051532

R Lynceis 065355

✓ R Scl 070122

✓ R Cass Min 070714 R or S?

✓ T' Scl 074323

2 R Cru 125057

S Lupi 144646 a

? R in Lib 151723

✓ J Sag 191017

✓ 193449 R Cyg

R Cancri

H. D 35155-

S Uly Maj

63733

R Cam

121447

172814

T' Scl

Ind.

On 1 plate

000451	SS Can.	093178	f Dra.
002546	T Pha	094023	RR Hy
010621	X Pise	101058	Z Can
010240	U And	101060	Su can
011041	UX And	102456	VZ Vel
011556	W Pha	102646	RT hel
021558	S Per	103270	RZ Can
022000	R Echi	104628	RS Hy
022260	S Hor	113639	RU Vir May
025751	T Hor	120012	SU Virg
032916	R T En	120905	T Virg
034625	U Eri	131283	U Oct
044660	T Dor	132202	V Virg
045307	R Om	134237	AN Can
051247	T Pict	134459	UX Can
053538	S Z Can	140113	f Boo
060443	RR Can	144342	RY Can
062564	R T Can	145254	Y Lup
063444	Al Can	145442	Al Can
063942	RV Pup	150018	RT Lib
065111	f Mon	150215	T T Lib
070109	V Can Min	151520	S Lib
071201	RR Mon	152123	T U Lib
072404	R X Mon	153947	R X Lup
073723	S Zen	155037	RU Lup
083019	U Can	155229	f Cor Bo
091866	R W Can	155823	RZ Scor

54



Ind 1 plate emb.

164012 UV Herc  
 164153 TV An  
 176627 RT Herc  
 172049 RR Arae  
 172060 RU Arae  
 173543 RU Scn  
 174135 SV Scn  
 175119 RY Her  
 175647 TT Arae  
 175938 RR Cen  
 181244 RY "  
 181949 TT Lel  
 181944 RX Cen  
 182345 J Cen  
 182732 J Sgr  
 183225 RX Her  
 184142 RZ Cen  
 190529a RZ Cen  
 183922 AE Her  
 184243 RM Lyr  
 185522a ST Sgr  
 190048b RU Lel  
 190049 U Lel  
 190142 RZ Cen  
 190529a V Lyr  
 190721 ZM Sgr  
 190817 TT X Sgr  
 190818 RX Sgr

191033 RY Sgr  
 191331 SW Sgr  
 191319 S Sgr  
 192046 SW Lel  
 192118 AN Sgr  
 193245 J Lel  
 193444 BO Sgr  
 193742 TV Sgr  
 194348 JU Cyg  
 195308 RS Cyg  
 195763 RR Per  
 200212 SY Cyg  
 200812 RU Cyg  
 200860 SU Per  
 200904 WZ Cyg  
 201152 X Lel  
 201130 SX Cyg  
 202954 ST Cyg  
 203422 RU Vul  
 203429 R Mic  
 204318 V Del  
 205782 TT Oct  
 210516 Z Cap  
 210903 RR Aqu  
 211642 W Mic  
 210382 X Cap  
 210803 RR Cyg  
 211642 W Mic

Mid 1 plate

220613	J Peg
222129	R R Peg
223462	T Tuc
233957	J Cass
235265	R Tuc
235209	V Cit
235325	J Peg 7

54  
25  
28  
7  
11 4 done in 1 plate

Doubtful, knix

201376 SZ Ceph See MCG 443



86 Md.

Stars with large enough number of plates to discuss

V Sculp	7
S "	9
T Cass	11
R Lri	8
U Ari	16
R Pict	9
I Lep	6
T Col	9
U Ar	7
U Or	9
X Aur	8
X Mon	8
X Mon	8
L2 Pup	8
S E Mon	21
R Can	12
R L Mon	8
R Leo	11
S Can	
R U Mon	9
X Can <sup>114441</sup>	
R Can	8
T U Mon	10
R Virg	12
R Hydrae	40

but nearly all in 94

also X plates?

RW Hyd	10
W Hyd	8
R Can	7
R Can	11
R S Virg	7
V Boo	11
S Cor Mon	10
RS Lib	8
T Mon	32
A Sen	9
U Sen	6
R S Sen	17
R R Sen	14
R V Sgr	7
X Oph	28
R Ayl	26
X Cyg	39
R T Cyg	10
R U Sgr	14
R T Sgr	9
T Mon	13
I Cep	32
S Gen	11
R Rys	8
V Cab	10

M Peg	8
S Peg	7
R Peg	20
R Cas	19
M Cas	8
F Cas	7



88

Mdh.

Found at H.C.O. by spectrum

V Sculpt-	Ad Aur	Sm Hya
SS Cass.	RV Pup	Rm Hya
S Ser	X Her	G Boo
S Tyc	T Vol	RS Vir
S Phr	V Can Min	TU Cen
U Lue	W Pup	Ry Cen
U Z And	R Cha	D Lup
W Phe	X Ues May	Y Lup
U Per	W Can	T T Lit
T Eri	R M Can	Rm Lib
D Hor	RS Vel	RS Lit
R Lri	L Can	RU Lit
R Hor	R T Vol	TU Lit
W Eri	R Z Can	S Ues Her
R X Tan	W X Vel	R X Lup
R Cas	RU Vel	X Cor Hor
R Pic	RS Cen	RU Lup
T Lep	W Cen	L Cor Hor
S Pic	L Her May	U Ser
T Pic	D U Vir	X Arae
T Col	ST Can	L Arae
S Z Aur	U Cen	G Arae
R Col	U Cen	RS Ser
X Aur	RS Her May	RR Ser
RR Aur	U Can Min	SV Arae

RT Sen  
 Am Sen  
 J oph  
 Sm Sen  
 RR Arac  
 S Oct  
 B L Sen  
 SY Dra  
 RU Sen  
 RZ Arac  
 M Par  
 U Arac  
 V Arac  
 TT Arac  
 RR Cook  
 A Par  
 R Y Cook  
 183322  
 TU Lyr  
 T Tel  
 AX Cook  
 R Y Tel  
 RR Say  
 AX Say  
 J Cook

U Cook  
 QZ Her  
 SV Tel  
 ST Say  
 RU Tel  
 h Tel  
 J M Say  
 JX Say  
 RX Say  
 AG Say  
 RZ Cook  
 J Y Say  
 SM Say  
 M Sagitta  
 TT Say  
 SM Tel  
 AU Say  
 BO Say  
 TT Par  
 RT Cyp  
 M Tel  
 X Lyl  
 RR Say  
 RU Say  
 RS Lyl

RR Par  
 SY Lyl  
 RT Tel  
 M Z Lyl  
 RT Say  
 X Tel  
 AU Cyp  
 TT Mic  
 U Mic  
 R Mic  
 V Del  
 U Par  
 S Lul  
 TT Oct  
 X Mic  
 J Z Pay  
 M Mic  
 V Mic  
 X Lul  
 J Lul  
 R Gru  
 V Pay  
 V Oct  
 AZ Pay  
 X Lyr



RT Apr  
 T Gm  
 S Gm  
 S Lac  
 Jy And  
 Jy Apr  
 R Lnc  
 S Phe  
 Jy Peg  
 Jy Cass.

mid class spectrum

160 discerned from

o Ceti

Notes

H $\beta$  light C1419 Sept. 13, 1888  
 C1420  
 C1441 Sept 28 "

Find plate in H & K light.

H $\beta$  light. ~~measures~~ Measures of J. M. B.

1888 Sept 13 J. D. 10894  
 C1419, 1420

1897 Nov 17 J. D. 14246 mag. 3.1 phase

C10726 10741 10753-4259, mag 3.1

4569 mag (3.0) 4571 4571 4573  
 11447 11448 11455 11456 11460 11466

11467 11468 11473 11474 11475

1898 11481 11482 11485 11488 11489

mag 11492 11496 11498 11513 11515

11526 11517 11524 11525 11529 4594 mag 2.9

11533 11538 11540 11558 11559 4605 mag 3.2

~~12138 12145 12142 16708 16710~~

16717 16718 16721 16722 16723

16724



92

o Cete

Nov. 16, 1906 J.D. 17531, mag. 3.0

C 16708 orb.

H $\beta$  h.H $\gamma$  h.H $\delta$ , n, u.s. H $\epsilon$  h.

16710 iso.

"

"

"

"

"

4227 > 4077  
H+K strong.

before max.

16723

C 16724, 5. Dec. 19, 1906.

J.D. 17564, mag. 2.2. just after max

H $\beta$  h. also H $\delta$  & H $\gamma$  have brightened

4227 fainter than 4077

H+K fl.

o Ceti.

May, 1896. C 8769, 70, 8788, 8816 2 pr.  
 & C plates. On all, the ly d. line is H $\gamma$ , H $\delta$  are  
 double, with strongest comp. to violet.  
 H $\beta$  n.s.

C 8788 H $\gamma$  bent up double  
 J. D. mag. 3.4 at max.

Look for this doubling effects at other max.

May, 1896. -97 T. D.  
 13913 no certain change  
 C 9803 13922  
 mag. 3.9 9833 good pl. no trace of H $\beta$ .

C 9984 T. D. 13957 1897 Feb.  
 mag. 4.0

Dark line to V. of H $\gamma$  is strong.  
 3852.90

C 10064 T. D. 13983, ft. with very diff.



94 Oct.

May 1898.

C 11448, P 14569 magn. 2.8 ph - 3

1907 Q 17106 J. D. 17880  
 17107 "

Dark band on side of star & H $\gamma$  is  
 strong.

H $\beta$  barely seen b. magn. 3.2

o Ceti

Notes Bright  $H\beta$  seen in Harvard plates  
 1888 Sept.  $H\beta$  mod. bright <sup>pg.</sup> (mag. 2.8)

1897 Br. but not very strong? 3.0

1898 Fairly strong 2.8

1906 strong 2.1

1907 barely seen 3.1

The brightness of  $H\beta$  seems to depend on the mag.  
 At mag. 3.0 barely seen, at mag. 2.1 strong.



96 Oct.

Oct 1898

56 C plates taken  
 C 11447 - C 11760  
 1898 Oct. 6 - 1899 Feb. 9

- 11447 H $\beta$  h. H $\gamma$  1.5 ~~H $\gamma$~~   
 48 "  
 11460 " 3 n o c h. 3905 h. strong  
 line of faint & clear H $\alpha$ . 4009. be not  
 very strong  
 " T.D. 14572 from date of map  
 " Br. line to red of H $\gamma$  & H $\delta$
- 11574 1 pin. H $\beta$  h. very fl.  
 11575 " almost gone
- 11585 H $\alpha$  very narrow. 3850 = 0.8 (3905)  
 11610 Br. <sup>band</sup> line to r. of H $\alpha$  is strong  
 11633 Strong h. line to red of H $\alpha$ .  
 11654 K narrow dark

C116'61 Br. line to red of H + K

3850 = 1.1 3905

11714 Br. on both sides of H

3850 nearly = H $\gamma$



Sirius

## The Companion

Mag. in Sirius led Bessel to predict a companion.

1862 disc. visually by Alvan Clark son of elder,  
while testing the 18-inch of Dearborn Obs.

Mag. Sirius -1.6  
" comp 8.5

1 : 10 000 in brightness

Calc. of orbit showed mass of comp =  $\frac{1}{2}$  Sun =

$\frac{1}{2}$  Sirius  
Larger mass & of. mag. showed it was expected.

1914 Adams phot. sp. w. 60-mil

Feo on Hg.

Temp. about 8000°; 2000° above sun

$\therefore$  brightness per unit surface being higher than sun  
there must be a small rad. surface  $\therefore$  high density

Existing a radiating atom in strong grav. field  
would have its vibrations retarded, & hence  
& increased

Eddington in 1924 calculated the shift of the lines  
the 20 km per sec. on assump. of

Temp 8000°

Dens. 53000

Rad. 19600 km

Adams finds shift of 23 km per sec.!

Sirius emb.

Value of grav. at surface of comp =  
35000 times Earth's

Eddington explains that the planets have been stripped of much of their electrons and thus the density approaches that of the atomic nuclei.

H. S. G. notes

Smaller than Jupiter.

Density 50,000 times Earth.

4,000 times lead.

1 cubic inch weighs more than a ton.

Bayliss

8.42 = 10 mag. fainter than Sirius comparing Harvard  
Kaiser. for measures at Lick  
Publ. A.S.A. 8, 77 1934



R 2 Sept. Layish velox.

0.25- miles per second

P.M. Barnard's star 10.3"

Moving cluster  
Star in Dipper, including Sirius

Variable

Algal in Head of Medusa, the Demon Star  
of the Arabs normally about 3 <sup>rd</sup> mag.  
loses 2/3 of its light over in 68.8 hours  
change completed in 12 hrs.



Secchi

C.R. 64, 346  
276C.R. 65, 979 speaks of the columnar-like & these  
but not of bright hydrogenDec-9, 1867 70 etc. C'est l'un des spectres les plus  
curieux que présente l'observation du ciel. Autre rare stars  
(except Algol) having 5 same type

A.N. 1737 1867 Nov. 27-29

Did he see bright H?

H $\delta$  before in visible for visible

C.R. 57, 1863 p. 71

Note sur les spectres prismatiques des corps célestes

Secchi

Planets

35 stars

speaks of varieties of sp.  
but does not def. from the 3 classes

Pickering

Miss Charles Hisk. Cash p. 379 states that E.C.P.  
first seen the br. line in Oct. towards  
the close of 1886. When published?

Dec. 11, 1885 photo. 8-m. m.

Ann. Report. Met. Soc. 1887.



Novae. Obs. 41, 1918, p. 388

1572 Tycho thought Nova "celestial matter"  
close to M. W. reflected light

1785 Herschel.  
In laboratories of the universe  
this form of expanding (planetary) nebulae  
may rush together and unite in a  
new body.  
Perhaps Nova of 1572 might possibly be of  
such a nature.

1865 Zöllner, representative of a feeble  
luminous body cooling has formed a central  
fissure in crust.

1890 Wilson  
Lumpkin this Nova stars with highly  
eccentric orbits and very long periods.

1889 Croll Collision theory.

Huggins on near approach making tidal waves.

Boyer entrance into a planetary  
system of a dark star with  
enormous velocity.  
Smaller planets reduced to vapors

"Star and nebula" theory <sup>Seeley</sup> Monah <sup>Hale</sup>  
Passage of dark bodies through a nebula  
1876 Nova Cygni nebulae.  
1888 Sp. Nova Cygni obs. at H.G.O. Blue planet  
1903 " Nova Gem " by Perini " "  
1907 " Nova Perini Wolf Rayet type. (Hartmann)  
1914 Nova Aur. & Per. " " " M. K. Holm

Nuclei of plan. neb. are Wolf Rayet stars.



" We've did a flying star apperance  
but a last star followed

Obs. 41, 1918 p. 304.

In the second book of Pliny's Nat. Hist  
about A.D. 79, Pliny states that stars are  
suddenly born in the sky brief.

The above mentioned Hipparchus, who has been  
sufficiently proved in that he has shown  
all other stars the kinship of the stars to  
man.

Cat. 134 B.C. Ptolemy's cat. 127-151 A.D.

He pointed out many which are in a good world  
be present hours, to enumerate the stars for pointing  
and to mark out the bear bodies by name  
etc.

Cephoid

See Contrib. M. M. 53, 1918  
for changes in sp.

Obs. 36, (1913) 57

Term first applied by Miss Cleche

Nova (fish) Obs. 33, 1910, p. 253

Some think same as *Chinia nova* in Serpinnoticed to move. Hipparchus conjectured  
that when stars move inAlgol vari (denig-) <sup>Obs.</sup> 31, 1908 p. 32910 from  $\frac{1}{50}$  to  $\frac{1}{3}$  of sun, the densest ring of  
shock front.



Nova Aph. 1604.

First seen 9 or 10 Oct.

Kepler 17 "

Mars, Jup. & Saturni were near and the Nova is  
said to have exceeded all of them.  
No change before it disappeared in west  
At end of Dec 1604, it was less br. than  
Arcturus but exceeded Antares.

Nova 1572 (Tycho's.) obs. in England

Obs. 17, 1894 p. 113

Annals of Reign of Queen Eliza. 1572  
Camden mentions this Nova.

Tycho found it much less sit. at a far  
greater dist. than the Moon.

Properties of Matter H. N. Russell A.S.P. 33, 275

Shapley. A.S.P. 33,

X All stars, (1) increase in light faster than decrease  
 component  
 (2) Change in sp. type & mag.

Theory of passing thru neb. fields would account  
 for light curve resembling a comb, series of  
 impulses.

Imp. stars in Orion are dwarfs.



R Cor.

At min. enhanced lines of titanium seen  
(probably) starting as emission line.

H Carmine, T Lame, R Cor best. mark present  
on line due to rim.

Merrill A.S.P. 36, 05

~~Red stars~~ Bluish stars moving along  
Red " almost twice as fast  
Yellow " or. intermediate speed

M-type stars have higher speeds than  
even the non-var. red stars.  
Esp. high speeds of stars or. per. of about  
200 days & spec. of an utmost. division  
of M constitutes a great diff. from  
many of or. yet prominent.

Novae

Sundmark A.S.P. 35, 98

See also  
A.S.P.  $\overline{32}$ , 219, 235  
314

78 Novae recorded.

48 cum ex. galactic system

22 in Neb. Cloud.

$\overline{33}$ , 207  
A.N. No. 518  
P.Q.  $\overline{30}$ , 62

other species, 6 Novae  
2 Neb. wh. spire 2 "

Novae occur at borders of MW clouds.

Mean star density of Nova fields is 20  
whereas highest MW density is 60

Nova Cy 2 was projected against a dark  
lane.

Novae rel. to that part of MW where the  
distant center of our stellar system  
evidently is situated

Nova Comae T is now a faint.

Discussion of no. of Novae & Nebulae etc.



Novae

Cause

Sp. veloc. of N much less small

Galac mch. doubtless high vel  
 & this dimension amount to several  
 light years.

A slope pass. through would require  
 cent of thousands of years.

Double star sys. enter & mch. and  
 approaching each other

or a sun or its planets entering  
 a neb.

Novae Feb. 3.

Changed abs. magn. from +4.4 to -7.5 in  
 3 days.

Temp. before brightening at max.

July =	7300
July =	8000
August	8000

June 12, 1918 July 6600

Therfore increase of abs. magn. much less than  
 caused by increase in size. The forces  
 moving out or. veloc. at least 600 km/sec.



~~Nova Cyg 3~~

Nova Persei 2. nebula

expanding in all directions  
Probably pre-existent and with a period  
of two stars pulsating for the obs. angular  
velocity when converted into miles per sec.  
on the basis of the minimum possible dist.  
separating us from the star, was so enormous  
that we cannot believe we were witnessing  
the actual translation of material particles.  
The more reasonable is the hypothesis  
(Kaplitz) that the apparent motion was  
due to the great mass of light radiating  
from the star.

Nova Per. increased in light fully  
60000 fold (12 magn) in less than 5  
days.

MW novae

= 1.4 to 11 mag.

In spirals

14 - 21

Novae in spirals at least 40 times as  
distant as in MW.



Sestini

Cont. of stars obs. by Secchi Jan p. 81

Catalogo Spettiale delle Stelle Rosse Principali

Schj. No. 11. mag. 6.

12

16

17

In primo loco 19 o Ceti

1867 27 Nov. - 13 Dec.

On Dec. 13 he speaks of "le linee lucide  
sono <sup>mag.</sup> più larghe e vive del lato  
del rosso.

Questa stella è meritamente ora più  
che mai da dirsi mirabile, le  
righe si possono contare.

In fine loco 2 Ceti

" " 3 Puz

Schj. 23

26

31

33

34

Sch.

36

38

39

41

43

44

45

46

48

49

50

51

54

58

59

60

63

Lupinus

66 &amp; Om

67

78

83

85

87

89

90

91

96

107

&amp; Lami

Sch. 117

119

120

123

Orbis n.° 1

Sch. 124

127

128

132

136

137

138

141

143

149

152

158

159

160

161

162

163

Lupinus 167 &amp; Bort

168

171

173

175 &amp; Lupi



Chem 1878.68.2

Mich. Library

Secchi - Spettro Prismatici - 1868.

Sch. 178	Sch. 254
179 R Com Ber.	260
185	262
In fine 191 X Scopia	B Peg
199 X Ercle 17.8 + 14	266
200	267
207	273
211	276
213	277
214	280
220	
222	
224	
225	Feb. 19 20 <sup>m</sup> + 50.6
227	Annulus sub Lyra
228	Feb di Lira
229	
230	
232 X ey	
234	
238	
242	
247	
249	
252 mag 8 1/2	
253	

Severino Angelo

born June 29, 1818 at Reggio

Mar. 3, 1833 entered Society of Jesus

Chair of Physics in College Loretta

1844 commenced his theol. studies

1847 exiled to England, Stroudham College  
where he was ordained priest.

From there he went to America, Georgetown College  
where he taught mathematics. This he commenced  
to specialize in astronomy. (Facts happen thus later)

1848 became de Vico's successor as Director Obs.  
and Prof. Obs. at College of Rome.

1852 found the Obs. at College of Rome.

1878 died.



Sun 2h 4m stable lecture

Sun spots may be 3 or 4 per cent more heat than during min.

Spots are only symptoms of the greater activity of sun.

Actually lower earthly temps. are recorded at sun spot max.

Abbott.

Value of solar constant increases with inc. sunspot activity.

Value of solar constant declines steadily in a long quiescent period of solar activity.

Sun is a star. Star or. small irreg. fluctuates in its radiation due possibly to solar radiation being unequal in diff. directions.





Joy's plate from 1916 J.D. 1179 to 1922 J.D. 365  
 Notes from Joy's paper. 1921 J.D. 4450

The outstanding features of the spectrum depend  
 for the most part upon the magn. of the star  
 as well as upon the phase.

Max. sp. M5-6 strong titan. ox. bands  
 sharp hyd. emiss. lines.

B<sub>2</sub> lines of hyd. have max. width at or soon  
 after max. light. They are acc. by ft.  
 emiss. lines of ionized iron.  
 The app. of most of the other h. lines is delayed  
 for 3 or 4 months until the star has reached  
 fainter magnitudes.

At about 8<sup>th</sup> mag. the h. lines of the comp. begin  
 to be seen & its comb. sp. gives the combined  
 a curious distorted effect, esp. noted at bands.

Bands merge as h. diminishes and absorption  
 lines fade until at min. only a few can be  
 seen.

Certain lines of chromi, calc. & vanad. seem  
 much persistent.

Cal. ~~4226~~ undergoes tremendous change  
 4226  
 reaching a width of 25 Å at min.

o Cch (Cmh.)

sharp hyd. emis. disp. at mag. 8.5  
and reappear at about same " in sun.

Silicium emis 3805 & 4103 see. near  
max but low temp. 4571 is not seen  
until mag. 8.5 is reached at about  
phase 80 days after max.

all h. emis disap. at min. or very soon after

Phases are based upon maxima  
det. from mean elements of Highland

$$\text{Max} = 2421184 + 330^d$$

See Cmh. 264 A. P. J. 58, 241, 1823  
for typ. the stars.

Plates taken at Max.

1916

1917

1918

1919

1920

21

22

23

24 25



Oct.

Rel. Type &amp; mag.

Mean Type	Mean Mag
5.2	3.1
6.3	3.7
6.9	4.6
7.6	5.5
8.1	6.4
8.4	7.7
9.0	8.9

Sp. rel. changes in 4000-4200 at min. than at max.

The sp. falls off low v. due to the shift of energy on red at lower temp. and there is a large amt. of absorp. due to the greatly inc. strength and wk. of titan. ox. bands.

These two amt. together mean min. to produce weak cut. of from 4200 to 6200.

Light of star cut down by inc. abs. titan. ox.

o Ceti

Abs. lines.  $\left\{ \begin{array}{l} 4202 \\ 4376 \\ 4308 \text{ very strong at min} \\ 4254 \\ 4274 \\ 4226 \end{array} \right.$

4215 - decreases at min.

Emission lines first noticed by E.C.P. in 1887  
Ann. Report of Photog. Study Section Sp.  
1887  
Rep. Volume 36, 32, 1887.

M stars having h. hyd. (with <sup>of Mica Tho</sup> variation)

M. B. 10<sup>h</sup> 234M. B. 16<sup>h</sup> 906

6 dwarf

Comp. Castor

" 0<sup>2</sup> Erid.

In Cephe

5 Bm 1985

Giants Bm 5650

H. D. 42474

C.Dm. - 33016843

At min. no h. hyd. at about 7<sup>th</sup> mag.  
There is a sudden app. of hyd. emission  
first H $\delta$ , soon after H $\gamma$ . Meas. with about  
a minute after greatest light. Both disappear  
together near mag. 8.0.  
H $\beta$  & H $\gamma$  seen & meas. at each max (!)  
Appear at max & vanish 3 or 4 mos. after  
at about 6.5.



$H\beta$  and  $H\gamma$  seen in strength  
They appear about 1 mo. after max.  
of  $\lambda$  about same time as  $H\beta$  &  $H\gamma$ .

$H\delta$  &  $H\epsilon$  on 2 plates only at phase  
49777 days.

Weakness of  $H\epsilon$ ,  $H\delta$ ,  $H\gamma$ ,  $H\beta$ , are expl. by local  
absorp. as exp. by them.

Lick Bull. 70, 131 1922  
A.S.P. 32, 234 1920

Campbell found in 1898  $H\gamma$  &  $H\delta$  were <sup>made of 13 components</sup> triple  
central maximum changing  
1910 Wright found  $H\gamma$  double with triple

Lick Bull. 6, 60 (1910)

Bn. lines (long taken)

3905 Si 3852 ?  
4030 Mn.

4103 Si

4202 Fe

4206 Fe

On one plate even with the greatest  
dispersion used with a single prism  
the lines of hydrogen as well as others  
are quite sharp although they may  
not be strictly monochromatic.

Strongest to line  
 $H\delta$ ,  $H\gamma$ ,  $4202$ ,  $4216$ ,  $4221$ ,  $4308$ ,  $4376$ ,  $4171$

Lick Br. lines Rowland's scales

$H\alpha$			
3770.83	$H\alpha$	4249.49	
3797.96	$H\alpha$	4258.45	He
3835.65	$H\gamma$	4281.64	He
3852.90		4308.10	He
3889.33	$H\gamma$	4340.64	$H\gamma$
3905.82	Si	4372.74	
3907.83		4376.09	He
3938.57		4427.48	He
3970.30	H	4434.16	
4006.84		4458.95	
4030.75	Mn	4461.47	
4101.89	$H\delta$	4461.75	He
4103.15	Si (broad?)	4482.27	He
4119.75		4489.23	He
4122.92		4511.66	Indium
4138.75	He+	4521.50	
4166.00		4533.95	
4170.81		4571.31	Arg
4173.63	He+	4578.96	
4178.98	He+	4584.05	He+
4202.18	He	4561.49	$H\beta$
4206.86	He	4923.95	He+
4216.35	He	5018.62	He+
4229.47			
4233.49	He+		



Oct. Adams JF

Fe

Complete band at 4608-4621

Dark lines

Ab. lines

IA 4291

I 4144

4202

4376

4427

II 4005

4045

4063

4071

4250

4271

4284

4308

4325

4383

4404

4415

III 4266

82

4408

IV 4092

4109

4115

4116

4126

Fe

II 4329

4350

4395

Ca I 4497

II 4257

4274

Mn I 4030

4033

4034

Ca I 4226

Ca I 4318

Cr II 4289

Ti II 4289

4314

Sn II 4077

4215

Sn I 4607

In I 4571

Typical Me Plais

Cont. 264, A. P. J. 58, 241, 1923

o Ceti M5 to M9 acc. to fog

veloc. curve resembles light curve.  
 Max. pos. veloc. occurs at max. & the  
 greatest veloc. of approach at min. of light.  
 Opp. to Cepheids where max. v. of approach  
 occurs at max. of light.

Enlarged lines found in faint M. stars  
 only chiefly & their low density. They may  
 well occur in the extreme tenuity of the atmosphere  
 of o Ceti.

Low temp. h lines appear when diff. in v. is greatest  
 & disappear near min. when the diff. is zero.

max. 1923 H  $\gamma$  > H $\delta$



*O Ceti:*  
for

	Sub		
Mag. Max.	H $\delta$	H $\gamma$	H $\beta$
2.9 - 3.1	65-	75-	40
3.4 - 3.6	50	40	15-
3.7 - 3.8	45-	35-	6
4.7	35-	30	2

Spec. Type

Max

2.9

3.1

3.4

3.5

3.6

3.7

3.8

4.7

Type

5-

6

5-

6

6

7

7

7

abs. mag. normal max = -0.8

Mass bet. 1 + 10 times Sun?

Mag. Comp 9.6

1923

Hamilton 1925

Oct

H. D. 50138 has similar hyd. lines  
while H. D. 16114 has lines of ionized  
iron

abs. mag. comp. is +6.0

The only early type dwarf star known  
in this spectrum

Notes on C plates

C15403 Feb. 2 '05

Fine dark lines bet. H & K.

C15380 H $\gamma$  split, fainter dr.  
Jan. 28, '05

C16654 H $\gamma$  by trend.  
Long series of h. hyd. in violet.

C8826 Feb. 10, 1896.

Hyd. double, strongest dr.

C8788 Jan 20, '96.

H $\gamma$  H $\gamma$  double strongest ~~to~~ to violet.

C11460 Oct. 9, 1898. Bright lines bet H & K.

C8769 ~~meridian~~ Jan. 18, 1896. doubling of hyd

C9888 Dec 31, 1896 hyd double.

C1575 Nov. 15, '98, good of the hyd. lines.

(encl. 136)



Lager Braker

Stjernb. & Erde XVII, 1904-5, p. 529

Island of Hven

Once the eyes of the whole educated world were directed  
to this small island, this place was the ~~very~~ center  
of astr. knowledge that the new the obs. astr. which  
had slumbered since classical ages, was reborn  
here

Building, half castle, half Obs.

Lager Braker (Danish)

Born Dec. 14, 1546

At 13 entered Univ. Copenhagen  
Solar eclipse of 1560, recorded & described time  
considered it possible

1572 Nov. 11, saw new star (B Cass)

Opp. p. 528.

Picture of Uraniburg (castle)  
might do for slides.





Harvard Var. Stars.

- |    |                  |                 |
|----|------------------|-----------------|
| 1. | $\gamma^1$ Orion | <u>05-3005a</u> |
| 2. | $\kappa$ Puppis  | <u>075612</u>   |
| 3  | $R$ Ursae        | 163172          |





Magellanic Clouds.

Spring 1904 comp. of 2 photos

H.C. 79

57 near Small Cloud, am

See H.C. 60, No. 4.

In 1904 autumn 16 and plates.

extremities no. of our class

Plates taken within 2 or 3 days of each other  
showed that the periods of many were shorter969 from as no. dec. adding 23 previously known  
23 all but one in the cluster H.C. 104 & 362.

992 in Small Cloud,

H.C. 82 Large Cloud am 152 near vein

808 near front

It is worthy of notice that in Table VI. (60, 100)  
the brighter variables have the longer periods.Those having longest per as rep. in this run as  
those whose per are a day or two.

Coal Sack again  
Plates

M.F. 10443 Check again marked

Sp. plate

(M.F. 2203

8006, 7823,

1337624

Some plates with focus

I 35679 Nov. 20, 1908 1850 +2.3

I 35679 Nov. 17 1908 1852 +3.5

I 35697 " 24 " 1858 -2.1

I 35694 " 22 " 1852 -0.5

I 35683

I 35706

Sp. too poor.



Olet:

Notes on Plates.

C11633 Excellent of wide end.  
 Br. hyd from  $H\gamma$  to  $H\alpha$  (m)  
 3905-5 3850 sh—  
 $H\epsilon$  reversed to red, Dec 8, 1898.

Do other plates show higher  $H\epsilon$ ?

C11579  $H\gamma$ ,  $H\beta$ , widely double. Real?  
 Nov. 20, 1898.

C11563  $H\beta$  faintly br. Nov. 12, 1898  
 $H\epsilon$  narrow dark line, the same position  
 as the higher  $H\epsilon$  on C11633.

C11661 Dec. 23, 1898  
 $H\epsilon$  br. also R light to red.

C11714 Jan. 11, 1898  
 $H\epsilon$  br. also R in edges.

C11544 Nov. 4, 1898  
 $H\beta$  br. other fr. br. lines not high. as we see.  
 $H\gamma$  +  $H\epsilon$  (same as in R Ayl?)

Eros

See Russell's Manual

Found Aug. 13, 1898 with  
 names Eros the world egg which Hermes or Juno  
 laid in the bosom of Chaos, and which was the  
 origin of all created beings

Names D I,

Dignia?

Pluto Chandler

Eros with name Dec 29, 1898

See H. C. 34

36

58

Eros marked as 10215 1893  
 10321

B 16108 June 4, 1896  
 16157 " 5 "



Zoology.

From the hyena also, acc. to Pliny, come 79  
medicinal substances

the smelly - forgetting <sup>use</sup> on present of the oil of the wolf  
lives the wisdom of the kangaroo, the thyroid  
of the sheep and much else for which potency  
with similar smelly skins.





140

See letter to  
Dr. Shapley  
Dec. 21, 1929

Pannekoek  
Requies for H.D.E.

5 <sup>h</sup> - 6 <sup>h</sup>	0° to -10	Orion
mf 7816 7821 7901 8004 (10.4-57)		
10 10 to 11 25	-55° to -63°	Carnie H.D.E. cuts off stars and
7863 11.0-58 7922 11.0-58		M <sub>x</sub> -1.6. B 3 quite unimpaired
11 20 to 12 10	-60 to -65	Extending from " "
7863 11.0-58		
12 30 13 20	-56 to -62	B Cassiopeia " " "
7915 8008 12.7-56		
12 50 14.0	-60 to -65	m. Cassiopeia: at stick greatest decl.
7878 14.3-58		only brightest stars in H.D.E.
17 50 18 10	-20 to -28	1 ch Sag group. Below half way and limit H.D.E.
several at Bloemfontein		
18 0 18 30	-12 to 21	2nd " " " " " "
8002 18.5-16 8030 18.5-10 8078 18.5-11		
18 30 19.0	-5 to -10	Scutum only brightest stars in H.D.E.
nothing		
16 0 16 40	-40 to -60	Norma Cloud. probably groups of very faint stars
16.8-41 minimum plates		
5 <sup>h</sup> 0 to 6 0	+10 to -10	Orion group - Centaur - faint stars of -12 mag
5.0 0° 8312 6.0 0° 8316		cloud condensing of A stars and H. group
5.3 0 8215		Monoceros region. Below in central
6 40 7 40	0 to -30	stream of galaxy.
7.2 -16° 7832		
6.1 -29 7838		
7.5 -21 7832		
405		
7.7 -26 7846		
8.2 -29 7889		





## Bowen on Heber's Lines

A.S.P. 39, no. 231 Oct. 1907

Ident.	Source	Design
7325	O II	<sup>2</sup> D - <sup>2</sup> P
6583.6	N II	<sup>3</sup> P <sub>2</sub> - 'D
6548.1	N II	<sup>3</sup> P <sub>1</sub> - 'D
5006.84	O III	<sup>3</sup> P <sub>2</sub> - 'D
4958.91	O III	<sup>3</sup> P <sub>1</sub> - 'D
4363.21	O III	'D - 'S
3728.91	O II	<sup>4</sup> S - <sup>2</sup> D <sub>3</sub>
3726.16	O II	<sup>4</sup> S - <sup>3</sup> D <sub>2</sub>

4686 is He II

Probably ident.

3426 N IV

3346 O IV

3313

3342

3445

3759

agree in pos. with 4 of the <sup>5</sup> strongest O III lines

the first line being obscured by a hydrogen line





Southern Africa

See Journal Astr. Soc. South Africa  
Vol. 2, No. 4

de Sitter on the motions of the spirals

3 spirals moving towards us rel. 30 km/sec.  
Also our sun has rotational motion around center  
of our galactic system about 300 km/sec.  
If we accept that, it means that these three  
exceptions disappear. Only Einstein's theory of relativity  
can help explain. (Negres on)

Fromberg

O47 pm atomic no. 8

nucleus on 8 surrounding electrons  
with each electron in the atom, sp. OI  
One electron expelled OII also highest temp.

How much energy is required to drive out one or more  
electrons from atom

Characteristic lines in certain neb. OIII - has electrons expelled  
doubly ionized O47 pm atom.

Greaves. Stellar Temperatures Green and

A small group of B0 to B2 stars temps lower  
than A0 star nearly same temp as sun  
Stars on our sky color fall in the group.  
Possibly faint stars at enormous distances.

Notes from  
Journal S. A. L. (cont.)  
Vol. 2

Aslan

Eclipses of 1922? May 19

A man went to cable office during totality and  
asked them a cable sent at night rate.  
It is suggested that he was a Hertsmann

...  
(...)

...  
...

...  
...



146

H. H. Turner

## References and notes

Seismological  
Importance of quakes

Observing - Oct. 1930

p. 275, 276

~~Machin B. Oct. B. C.~~

Observing Oct. 1930

obituary notice York. by H. H. Turner

The Oxford Magazine Oct. 16, 1930

Nature Dyson

Science London Series

# List of Slides H.S. (made England Jan 1933)

- 1 Eclipse Corona Day
- 2 Part
- 3 " good. Shows Freyberg
- 4 Telescopes at King
- 5 Caldes " "
- 6 Cross Eclipse Day
7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27.
10. Corona - large extending whole
11. Colorado Sp. fishes
12. Sp. Neb. Orion
13. Earth & Moon
14. Moon P 5 - H.S.
15. Perseus & Delphos objects 1932 EA Delphos?
16. Planet X Pluto P 58 H.S.
17. Orbit Pluto P 62 showing orbit Halley's Comet (good)
18. Lowell 40" Reflector by Alvin Clark
19. Meless Horn
20. Quadruple Meless Oct. 15 10 M 20
21. Sp. Meless M 4 (on best)
22. all sp. " Millmann's
23. Great Neb. Orion Neb. Nebula H. greenish
24. 7 Can Bailey's best
25. Pelican N. 7. Horn
26. Ring in Lyra M 25
27. M 4 (Lundmark) M 17 cradle



H. S. Lick

28. M<sub>W</sub> Sp. M<sub>W</sub> 12 Harms  
 29. Cluster M<sub>W</sub> 22 Cl. 6  
 30. W 1754 A 11988  
 31. Lyell Census Vais M<sub>W</sub> F 169, 187  
 32. M<sub>W</sub> F marked upris 7 obs. V 21  
 33. Frequency Vais for high flow galac. lat.  
 34. Large Cloud G 41  
 35. Large & Small Clouds G 48  
 36. Hubble's Cluster in And. Neb. G 125  
 37. Spiral M 101 G 28  
 38. Types of Spirals M<sub>W</sub> M<sub>W</sub> G 38  
 39. Cloud Neb. G 9  
 40. Double Spiral G 52  
 41. Field of Small Spirals G 53  
 42. Limited in Pegasus G 56 (several Neb.)  
 43. Dist. of Galaxies G 71  
 44. Bruce Plates Neb. Survey  
 45. Star Counts (Bok?)  
 46. Spiral Neb. M.S.C. 4594 G 113  
 47. G's Blm 775  
 48. Nebulae Sp. Group Shift - Sp 53  
 49. Relative Speed ~~to~~ to declination  
 50. Spiral M 51 G 115

# Slides used at Philosophical Society paper, April

|                        |  |    |
|------------------------|--|----|
| H.S. T <sub>4</sub> 1. | Group with El. Misti                         | 1  |
| H.C.O. B123. L         | 24-mil at Bloemfontein                       | 2  |
| " J6                   | The Two Magel. Clouds                        | 3  |
| " Q.J.C.               | S. Cross D 18323                             | 4  |
| H.S.                   | Large Cloud                                  | 5  |
| "                      | Cluster " "                                  | 6  |
| "                      | 30 Dorados                                   | 7  |
| "                      | Spectra 30 Dorados (new slide)               | 8  |
| H.C.O. N31. L          | Scorpius Cluster (mag. neg.)                 | 9  |
| " Q.J.C.               | Dish. O stars                                | 10 |
| " H.S.                 | " B "  | 11 |
| "                      | Clustered region                             | 12 |
| " new                  | Typed slide Members of Large Cloud           | 13 |
| " new                  | Large Cloud & Comp. region                   | 14 |
| "                      | Typed slide Dish. types in Cloud & Field     | 15 |
| "                      | Life Ins. Dish. in Cloud & Region near Cloud | 16 |
| H.C.O. A68             | Turn of 60" at Bloemfontein                  | 17 |



Meteor shower 1933 carried back

Chinese record shower 585 A.D. Sept 23 (O.S.) = Sept. 25 (N.S.)  
carried forward to 1850, would be Oct. 13.0

Hence

|                          |                 | $\div 6.512$ | error  |
|--------------------------|-----------------|--------------|--------|
| 585                      |                 |              |        |
| 1841                     | <sup>1486</sup> | 192.87+      | 0.13-  |
| 1348                     | <sup>79</sup>   | 12.12        | 0.12   |
| $\frac{1348}{6.5} = 207$ | 1920            |              |        |
|                          | <sup>6</sup>    | 0.92         | 0.08   |
|                          | 1926            |              |        |
|                          | <sup>7</sup>    | 1.075-       | 0.075- |
|                          | 1933            |              |        |

"This table is curious, if not convincing" M. J. Fr

$$\frac{1348}{207} = 6.512$$

Science Nov. 23, 1934  
Prof. Lewis (U. of Cal.)

hypothesis suggested that matter in comets is composed  
chiefly of iron and nickel like the metallic meteors, and that  
it was superficially attacked by cosmic rays. To produce  
the meteor. sp. by the earth's crust

Herschel 1738-1822

Halley 1656-1742

Messier 1642-1727

Euler, Clairaut, & Lebmber geometris

Lagrange 1736-1813

Laplace 1749-1827

Flamsteed

Royal Obs. 1675-

Bradley 1692-

1718 Halley announced that Sirius, Aldebaran, Betelgeuse & Arcturus had shifted their quarters since Ptolemy.



Slides used in Springfield Jan 17, 1934  
College Club

Explanation of the Acronyms

- 1 Orbits of Planets H.C.O. 916
- 2 Milky Way " 1260
- 3 Spectra in Pex. H.S. 957
- 4 Saturn 960 H.C.O.
- 5 Mars Bond Club
- 6 Halley's Comet " "
- 7 S.M.W. H.S. 1221
- 8 M.W. in Sqn. H.C.O. 113
- 9 Globulars & Moreau in Sqn. A.J.C.
- 10 M. 3 A.A.V.S.O. K 38
- 11 Van Stan Obs. H.C.O. 219
- 12 M.W. Van Stan fields H.C.O. K78
- 13 Herschel & Quairn A.A.V.S.O. 6216
- 14 60 inch H.C.O. B131
- 15 8 oph. Bond Club \* 13
- 16 Luth S Bag " K30
- 17 Pleiades with neb. Bond Club N8 (broken)
- 18 Dippers (A.J.C.)
- 19 Helix neb. A.A.V.S.O. H62
- 20 H. A. neb. " H37
- 21 Pelican N. 7
- 22 Arcturus H.C.O. 923
- 23 S. Cass. A.J.C.
- 24 Temple Sun
- 25 Indian woman in cage.



- 26 Llama  
 27 1/- with Draper H.C.O. 1312  
 28 Solan sp. A. f. C.  
 29 y Argus H.S. N 35-  
 30 Sp. " H.C.O. L 20  
 31 H. l. 90-91 " Q 35  
 32 Roger " Q 36  
 33 Schupin Cl. N 31 b  
 34 Dist. O slans A. f. C.  
 35 Large Mg. Cl. H.S.  
 36 Vanalors " H.S.  
 37 Specula " (Life minimum)  
 38 Oak Ridge furnace "  
 39 Acad. Nth. Bond Club. H.S.-  
 40 Sp. " " Sp 11 H.S.  
 41 Bush nch. Oven " N, greenish  
 42 Sp. " " Sp. 14 "  
 43 Spirit in Draper H.C.O. m27  
 44 " " Acad. m. edge Bond Club N 31  
 45 Spirit in Vryd H.C.O. M25 (As octon ter us?)  
 46 Eddington under Sitter " C 38  
 47 La Penzen H.S. Q2  
 48 Salan eilepie A.C.V.S.O. D 68  
 49 " " Chabot A. f. C.  
 50

(about 50 min)

(Ah and, I should have had one of our observers)  
 at Gray Me, Aug. 1932  
 569 H.C.O. report like clinic the distribution of external Salaries among M.W.



## History of H.C.O.

H.C.O. 1815

H.C. Bond went to England & visited Greenwich Obs.  
and drew plans of foundation etc.  
Ash. Raz. Road

magnetic &amp; meteorological

Dana House 1835

Cupola erected for the large Reflector

March 1893 sudden app. of a comet of surpassing size  
and splendor - could be seen only a short time  
after sunset

Hon. Abbott Lawrence then  
addressed by Hon. John Pickens, Prof. Pierce, Hon. William  
Appleton & Hon. S. C. Ellet

Hon. David Sears \$5000 for loan  
provided \$20000 could be raised

Mrs. T. Mahan to prepare 2 object glass 15" with  
the most perfect of its kind that the art of man has ever produced  
its enormous magnitude

Sawmuhren Hill a favorite resort

Dec. 1846 object glass received  
annulid June 23-24, 1847

Saline

During of mining: its transportation  
 & the salinized <sup>Hydrius</sup> Sept. 19 1848, during addition to the  
 solar system ever made in the continent of America ←  
 During 7 years preceding 1846, no salaries paid

Cashland 12 acres  
 \$ 83.00

1841

Selecting the glass. Write on edges of the 2 glasses.  
 Harvard College. W.S. J.C. May 15, 1846  
 on a point of a diamond  
 William S. J. C.  
 John? Grant

1847 July 15 M27 Doublet length to be  
 resolved

1847 Sept. To Pres. Everett

You will rejoice with me that the great nebula  
 in Orion has yielded to the power of our magnificent  
 telescope



Salm

Mimes & Enceladus showing themselves <sup>as described</sup> for a short  
time & then hastening to their habitual concealment

Enceladus Chas. L.

Van Houten in 1907

Saguerre-type H. A. I. CX/IX Appendix

vega.

If it should prove successful when applied  
to stars of less brilliancy than Vega the advantages  
would be incalculable

Rings of Saturn in a fluid state or  
 composed of particles of matter susceptible  
 of independent change of place.  
 Appendix H.A. I. page CLV

H.A. I.

Zone ob.

H.A. II

Saturn

Zone ob.

H.A. III

Comet 1858

Donati

IV. <sup>Part</sup> Cat. Polar Stars

V. Neb. Orion

V. Zone  
 VII. Solar Spots



158 Magellan 1480-1521 Aug. <sup>journey started</sup> 10, 1519

The Southern sky

from Magellan's Voyage around the World by

Antonio Pigafetta

(James Stevenson Robertson)

p. 89.

The Antarctic Pole is not so clear as the Arctic. Many small stars clustered together are seen, which have the appearance of two clouds of mist.

When we were in the midst of that open expanse, we saw a cross made of four extremely bright stars standing toward the north these stars being ~~placed~~ exactly placed with regard to one another.

p. 249 quotation from Eden or Amerigo Vesputi (spelling in general not copied)  
Here we saw a marvelous order of stars, which ~~in the midst of them~~ represented this figure and saw manifestly two clouds of sea-moak beyond moving about the place of the pole continually rising and now falling.

About these appeareth a marvelous cross in the midst of four smaller stars which compasseth it about. This cross is so "fayre and beautiful" that none eyles hearely "ghe" may be compared to it.

Marco Polo 1254-1324



S. Com. p. 10.

Pigafetta p. 285.

Note says S. Com just obs. by the Arabian  
Portuguese pilots perhaps called them at  
just Clouds after paper  
(Moto p. 66. No. 2

Magellan 1480 - 1521

Aug. 10, 1519 his fleet sailed.

Faleiro, a Portuguese astronomer fled to Spain  
aided him but stayed behind having lost  
his horoscope and found that the journey would  
prove fatal.

Magellan killed at Mactan Apr. 27, 1521

He had already traversed the seas that ran  
to the eastward from Spain so he circumnavigated  
the globe.

|                     |                 |             |               |             |
|---------------------|-----------------|-------------|---------------|-------------|
| H.C. 19             | Apr. 28, 1897   | Magel Cloud | 5th 1/2 hr    | S. D. under |
| 60                  | B. in objects " | "           | July 6, 1901  |             |
| 29 <del>28</del> 27 | Jan 1521        | Small Cloud | 00:575 km     | 48. m. 3    |
| 82                  | 1521            | Large       | June 21, 1904 |             |
| 9.6                 | 543             | Small       | Apr. 12, 1905 |             |



Corsali said in 1517, translated by Eden

Above them (the May. Clouds) appears a  
marvellous cross in the midst of five notable  
stars which compass it about (as doth Charles  
Wayne the north pole) with other stars which  
more with them about xxx. degrees distant from  
the pole and make this Cruise in xxxiiii hours.  
This cross is so faire and beautiful, that none other  
heavenly figure may be compared to it as may  
appear by this figure.

Cross perpendicular  
Allen's Star names p. 189

Coal Sack \$  
"the only spot - an opening into the awful solitude of  
unoccupied space" Fronds.

Cruis dis. by John Herschel.  
"a gorgeous piece of fancy jewellery  
Exquisitely beautiful, Gould.

Apus Bird of Paradise

Dorado Goldfish

Howlegum

Musivocipum

Musca (Fly)

Octans (Octant)

Oct. o. polistum

Pero

Telioscop

Volans (Piscis Volans)



Lesson at Lecture Sept. 7, 1934

The Universe 1934

|              |    |                  |                |             |                       |              |
|--------------|----|------------------|----------------|-------------|-----------------------|--------------|
| a.k.RSO K223 | 1  | Polaris          | H.C.O. J22 9   | Gl. Cluster | H.C.O. 752 57         | Plan.        |
| aj.C.        | 2  | Map S.A.         | 778 30         | Princ. sp.  | " 753 58              | Comet        |
|              | 3  | <del>Cross</del> | aj.C. 31       | Solar       | " 758 59              | Spiral       |
| H.C.O. F23   | 4  | Lunar Apenn.     | 713 31a        | Comp. Spec. | " 719 60              | "            |
| H.C.O. F13   | 5  | Full Moon        | aj.C. 32       | Diaph.      | " 738 61              | Eddington's  |
| " " 48       | 6  | Lunar Faint      | 734 33         | Hel. Orr.   | " 738 61              | Eddington's  |
| aj.C.        | 7  | Eclipsed Sun     | 744 34         | Sp. " "     | H.S. Sp. 11 62        | Sp. and Vol. |
| a.k.RSO D8   | 8  | Pinn.            | H.C.O. 744 35  | Aequiper    | H.C.O. 714 63         | and Vol.     |
| H.C.O. 916   | 9  | Solar Cycle      | aj.C. 36       | Cross       |                       |              |
| " 925        | 10 | Mercury          | a.k.RSO K23 37 | Proxima     | 65 slides             |              |
| " 970        | 11 | Venus            | aj.C. 38       | Differ.     | (including 31a & 21a) |              |
| " 957        | 12 | Mars             | H.S. 35        | 7 Cygnus    |                       |              |
| H.C.O. 961   | 13 | Jupiter          | H.C.O. 722 40  | Sp. " "     |                       |              |
| H.C.O. 931   | 14 | Sat. "           | " 735 41       | H.D.        |                       |              |
| H.C.O. 960   | 15 | Saturn           | " 736 42       | Page "      |                       |              |
| aj.C.        | 16 | Sp. " "          | aj.C. 43       | S. Cross    |                       |              |
| H.C.O. 972   | 17 | Orbits Comets    | " 44           | Lunar       |                       |              |
| " 14.52      | 18 | Halley           | " 45           | " "         |                       |              |
| " " 74       | 19 | Melons           | " 46           | Seneca      |                       |              |
| " " H77      | 20 | Melons           | " 47           | Temple      |                       |              |
| H.C.O. 919   | 21 | Melons           | " 48           | Lake Tit.   |                       |              |
| H.S. 710 21a | 22 | Melons           | " 49           | Glama       |                       |              |
| H.C.O. " 10  | 23 | N.A.             | H.C.O. 776 50  | Blossington |                       |              |
| H. 77        | 24 | P. oph           | " 768 51       | Lunar       |                       |              |
| K29          | 25 | O. oph           | " K27 52       | Vanadium    |                       |              |
| K20          | 26 | Centre MW        | " K4 53        | Method dis  |                       |              |
| H.C.O. I17   | 27 | Planets          | H.S. 54        | L. Mag. Cl. |                       |              |
| " 7. Mono.   | 28 | Trifid           | H.S. 55        | Van. " "    |                       |              |
| aj.C.        |    |                  | H.C.O. 725 56  | Lecture     |                       |              |





# Our Neighborhood

## at Prof. Jewett's, Oct. 24, 1934

|                 |    |                       |            |                               |
|-----------------|----|-----------------------|------------|-------------------------------|
| H.O. 523        | 1  | Movement of Planets   | H.O. 710   | Ing. Neb. Sgr.                |
| Menzel          | 2  | MM (col.)             | H.O. 719   | B.G.C. 2023 & Ori.            |
| H.O. 1552       | 3  | Spirals               | H.O. 778   | Pure sp. formed               |
| aars. 86        | 4  | Sunspots              | A.J.C.     | Solar Spectrum                |
| aars. 123       | 5  | West. Portion of sun. | H.O. 713   | Comp. 3 sp.                   |
| aars. 128       | 6  | Solar prom.           | H.O. 722   | $\eta$ Cas.                   |
| aars. 133       | 7  | Lunar Appearances     | H.O. 734   | Neb. in Ori.                  |
| H.O. 113        | 8  | Moon                  | H.O. 744   | Sp. Neb. in Ori.              |
| aars. 126       | 9  | Comp. size planets    | aars. 123  | P.M. Prof. Cam.               |
| AJC             | 10 | Total eclipse         | A.J.C.     | Motion of Diffuse             |
| Dr. Shapley 130 | 11 | Mars                  | H.O. 752   | Limit of 13 Aur.              |
| Menzel          | 12 | Jupiter               | aars. 1238 | cluster 713                   |
| Menzel          | 13 | Saturn                | H.O. 753   | Sect. of Comae Virgo          |
| AJC             | 14 | Saturn                |            | L.M.C.                        |
| H.O. 152        | 15 | Halley's Comet        |            | Dist. of Uav. in L.M.C.       |
| H.O. 177        | 16 | Bolide                | AJC        | L.M.C. + Comp. reg.           |
| Menzel          | 17 | Hydra slow. colored   | H.O. 728   | Spiral 751 Ori.               |
| H.S. 171        | 18 | Milky Way             | H.O. 719   | Neb. B.G.C. 4565              |
| AJC             | 19 | South. Cross          | H.S. 171   | Sp. 53 shift due to recession |
| H.O. 720        | 20 | Neb. in Cygnus        | H.O. 714   | And. Neb.                     |
| H.O. 721        | 21 | Network Neb. Cyg.     |            | Eddington 1934                |
| AJC             | 22 | Triplet Neb.          | aars. 1241 | 100" tel. Mr. Wilson          |
| H.O. 716        | 23 | North Am. Neb.        | aars. 135  | Argus station                 |
| aars. 120       | 24 | Theta Oph.            | H.S. 735   | $\eta$ Argus                  |
| aars. 119       | 25 | Rho Oph.              |            | The Llama                     |
|                 |    |                       |            | <del>Temple of Sun</del>      |
|                 |    |                       |            | <del>Pitcho Wm.</del>         |

Temple of Sun  
 Potato Woman  
 Indian Women

" Water carrier

H.O. C 38 Eddington + de Sitter

H.S. T 55 Harvard Koppe

H.O. A 68 <sup>not</sup> Boyden, Tamm of 60"

H.S. 30 Dor. in L.M.C.

H.S. T 94 24" Bruce

A 250 B1 H.C.O. Camb.

H.O. A 59 1<sup>st</sup> Plate stack

H.O. T 103 Obly. D. Camb.

H.O. T 110 Oak Ridge, air

H.A. A 61 60" Tel. Oak Ridge

64



The Nurse of Today

Mar. 20, 1934

Hotel Commodore, Boston Medical College, Chas. S. <sup>Speed</sup>

[illegible]

Nov. 20, 1934 cont.

- 57 H.S. 22 La Perouse  
 58 H.C.O. C38 Eddington & de Lattre  
 59 Q.A.S. 131 H.C.O.  
 60 W.S. T58 Bloem. f. m. an  
 61 " T95 T. m. 60  
 62 " Sualer Charn  
 63 " T98 Oak Ridge f. m. an  
 64 " T104 61-mch  
 65 " H.C.O. strong new building & old.



# Growth and Achievements of Harvard Observatory Round Table Boston Dec 13, 1934

|            |                        |  |
|------------|------------------------|--|
| H.C.O. 220 | 1 Dana House           | a.g.c. Solar spectrum                    |
| " C29      | 2 W.C. Bond            | H.C.O. 713 Comp. 3 spec. seen in center  |
| LBA        | 3 Comet 1843           | " 744 spec. 4 b. in Orion                |
| H.C.O. 441 | 4 H.C.O. old newspaper | H.B. 735 $\eta$ Argus                    |
| " B16      | 5 15" Equatorial       | H.C.O. 712a $\eta$ Cassiopeia            |
| F55        | 6 Moon Craters         | " 711 Nov. Sgr.                          |
| Bond Club  | 7 open.                | " 752 $\beta$ Auriga                     |
| H.C.O. 975 | 8 Ring of Saturn       | H.B. Mic. 3 Proper Motion                |
| Bond Club  | 9 Saturn               | H.C.O. 935 H.A.                          |
| HCO 960    | 10 Saturn              | " a2 Mt. Harvard                         |
| 961        | 11 Jupiter             | " a6 Arguipa station                     |
| 764        | 12 Orion Neb.          | H.S. Mic 24 Coal Sack                    |
| H.B. 71    | 13 " "                 | a2 USO Ka 31 Clust. in Her.              |
| a.g.c.     | 14 Jenny Lind          | H.C.O. K83 Light curves of 2 Vars. in M5 |
| Menzel     | 15                     | H.S. L.M.C.                              |
| a.g.c.     | 16 Prince              | a.g.c. Dist. of stars of class O         |
| H.C.O. I79 | 17 Mizar               | Shapley " " Vars. in L.M.C.              |
| " B20      | 18 Zenithal Circ.      | H.C.O. K4 Dis. Var. by Superposition     |
| " C5       | 19 Prof. Pickering     | Llama                                    |
| " 957      | 20 Polar Caps.         | a.g.c. Temple of Sun                     |
| " B18      | 21 12"                 | " Indian                                 |
| " C25      | 22 Mrs. Draper         | " Indians                                |
| " B13      | 23 " " Draper Tel.     | " Senora                                 |
| " A59      | 24 First plate stack   | a2 USO Group Cambridge 1924              |
| " 778      | 25 Spec. formed.       | a.g.c. Cas. 1920                         |

25  
26  
27  
28

H.C.O. 452 Haley's Comet  
 aavo 931 Orbit of Meteor  
 H.C.O. 474 Radiant of Meteors  
 Shapley M28 Meteor Shower  
 " M.W.1 Milky Way  
 Mergel Meteor  
 a.j.c. Feb. m Sgt. (Trifid)  
 aavo 462 Network neb.  
 " H37 D. Ans. Neb.  
 " Ke19 Rho Oph.  
 H.C.O. M53 Coma Vir. Super Galaxy  
 Shapley 9183 Thousand galaxies  
 H.C.O. M14 And. Neb.  
~~LBA~~ Shapley M51 in Cda. (Blue)  
 Shapley F24 Lemaitre  
 H.C.O. C38 Edding tower de Setten  
 Shapley Blomfontein  
 Shapley T94 24" Bruce  
~~H.C.O. 472~~ ~~Shapley~~ S.G. assistant with snake  
 Shapley 61 Turret O. R.  
 LBA H.C.O. Camb.



# Unravelling Stellar Secrets

## Salem Forum

Universalist Church, Salem, Mass. Feb. 17, 1935

Sunday Evening

|             |    |                               |    |                 |
|-------------|----|-------------------------------|----|-----------------|
| L.H.E.      | 1  | Project - Mounting 200-mil    | 29 | Pleides         |
|             | 2  | 11-mil with Persim            | 30 | Keleoids        |
| L.H.G.      | 3  | Leck Obs. (col.) cur          | 31 | Heredid         |
|             | 4  | Wh. Wilson (cur)              | 32 | America         |
|             | 5  | E. C. P.                      | 33 | Theto Oph       |
|             | 6  | H.C.O. 1934 Bentley D.        | 34 | S               |
|             | 7  | Orbit Ridge from              | 35 | S. Cross        |
| Mr. Henry   | 8  | Sun + Promin (col.)           | 36 | Parallax (col.) |
| L.H.G.      | 9  | Various Regis of Venus (col.) | 37 | Perseus         |
|             | 10 | Simple Sun                    | 38 | Dipht           |
|             | 11 | Sun + spot                    | 39 | Acquifera       |
|             | 12 | Plato                         | 40 | Cham            |
|             | 13 | Earth Sun                     | 41 | Jupiter         |
| A.G. V.S.O. | 14 | Prom at Eclipse (col.)        | 42 | Lake Tit        |
|             | 15 | Talot                         | 43 | Bloomfonten     |
| L.H.E.      | 16 | " " col                       | 44 | Sun's Cham      |
|             | 17 | Orbits Planets                | 45 | Pine sp.        |
|             | 18 | Phases of Venus               | 46 | Lens            |
| D.H.M.      | 19 | Mass (col.)                   | 47 | Solar sp.       |
|             | 20 | " (Small)                     | 48 | Shower star sp. |
|             | 21 | Saturn (mic)                  | 49 | C               |
|             | 22 | " phases up                   | 50 | Globular        |
|             | 23 | Halley's Comet                | 51 | Lifist          |
|             | 24 | Orbits Melons                 | 52 | Orion           |
|             | 25 | Radiant Andromeda             | 53 | " " sp.         |
|             | 26 | Great helio                   | 54 | Carnia          |
|             | 27 | Mr                            | 55 | " sp.           |
| L.H.G.      | 28 | Shap Mr (col.)                | 56 | Orion Perseus   |

- |    |             |  |  |
|----|-------------|--|--|
| 57 | hrra Sgr    |  |  |
| 58 | hrra Hrr    |  |  |
| 59 | o oph       |  |  |
| 60 | Large Cloud |  |  |
| 61 | hrra " "    |  |  |
| 62 | hrra " "    |  |  |
| 63 | Spiral form |  |  |
| 64 | " " " "     |  |  |
| 65 | hrra " "    |  |  |
| 66 | hrra " "    |  |  |



## The Universe of So-Dog

March 1, 1935  
Smith College

- |   |                                       |
|---|---------------------------------------|
| 1 L.B.A. Solar System etc.                | 29 H.C.O. #52 Plan                    |
| 2 L.B.A. Field of spiral (Cores)          | 30 J.M. #10000 Sp.                    |
| 3 aarso #1 Sun                            | 31 aarso #10000 Neb                   |
| 4 a.j.c. Temple Sun                       | 32 H.C.O. #110000 Neb                 |
| 5 L.B.A. Other suns                       | 33 aarso #200 Oph                     |
| 6 aarso (22) Pluto                        | 34 H.C.O. #14 S Cross                 |
| 7 <sup>L.B.A.</sup> Michell Total Eclipse | 35 " 26 Aurigae                       |
| 8 Mergel Mars                             | 36 a.j.c. Flame                       |
| 9 a.j.c. Saturn                           | 37 " Potatoes Neb                     |
| 10 H.C.O. #10000 Hally                    | 38 L.B.A. 2 Mag. Cl.                  |
| 11 aarso #911 Orion's belt                | 39 a.j.c. " " " Temp. up              |
| 12 H.C.O. #74 Sharn "                     | 40 a.j.c. O class sp.                 |
| 13 J.M. #128 Melan. hum                   | 41 L.B.A. Vais L.M.C.                 |
| 14 Mergel Col. shun                       | 42 aarso #150 H69 Neb. 4.9.5891 spurs |
| 15 L.B.A. M.W.                            | 43 H.C.O. #125 Light curves L.M.C.    |
| 16 " Shap.                                | 44 a.j.c. Classes in L.M.C. diagram   |
| 17 " Pleiades                             | 45 H.S.M.W.3 Salacia center           |
| 18 H.C.O. #13 Glob. neb                   | 46 L.M.A. Nova Mag. special           |
| 19 a.j.c. Glob. & Nova                    | 47 a.j.c. Sci. Archim                 |
| 20 aarso Nova then sun                    | 48 H.C.O. #14 And. Neb.               |
| 21 a.j.c. Sun sp.                         | 49 H.S. Sp.11 Sp. " "                 |
| 22 " Luns                                 | 50 H.S. #94 24-mil Bloem              |
| 23 H.C.O. #13 3 stars "                   | 51 " #95 Lurech 60-mil                |
| 24 " H.14 Superf. neb                     | 52 " #48 Per. neb. Centaurus          |
| 25 H.C.O. #34 Neb. One                    | 53 L.B.A. Lich (Col.)                 |
| 26 " #44 Sp. " "                          | 54 H.C.O. #28 100-mil Dom             |
| 27 " #2 Argus                             | 55 L.B.A. 200-mil mounting            |
| 28 " #126 Sp. " "                         | 56                                    |





# The Harvard Plate Collection

before the Harvard Librarian  
March 8, 1935

|              |    |                      |                |                       |               |
|--------------|----|----------------------|----------------|-----------------------|---------------|
| H.C.O. A 41  | 1  | old H.C.O.           | A 7.4 30       | R Cygni regni H.S. 59 | Turner 61     |
| B 16         | 2  | 15-inch              | H.C.O. Q 35 31 | H.D. 45 T 131 60      | Peter's Plate |
| C 29         | 3  | M.B. mch             | H.S. B. 146 32 | Lays M. C. 450.9461   | heh head      |
| A 7. C.      | 4  | Salm                 | H.C.O. R 4 33  | Superfretus           |               |
| F 63         | 5  | Imm. Despin          | H.S. 34        | Vaid in L.C.          |               |
| C 5          | 6  | E.C.P.               | H.C.O. K 25 35 | Lighthcums            |               |
| B 9          | 7  | 8-inch               | H.S. 36        | W. Cam. 60-inch       |               |
| A 7. C.      | 8  | Salm sp.             | H.C.O. L 81 37 | Gas - M. 22           |               |
| B 12         | 9  | 11-inch Deep         | QARSO K 7 38   | White Polarizing      |               |
| A 7. C.      | 10 | Plenaris             | H.S. M 1 39    | Dim. Hets             |               |
| L 104 QARSO  | 11 | Sp. "                | H.C.O. K 11 40 | W. S. S.              |               |
| C 25         | 12 | Imm. Despin          | H.S. F 13 41   | Hertzspun & Luyke     |               |
| C 4          | 13 | Dr. "                | " F 24 42      | Le Martin             |               |
| A 59         | 14 | Woman's Corps        | H.C.O. K 52 43 | B. Ann                |               |
| A 5          | 15 | Int. H. mch          | " G 13 44      | Phaeber               |               |
| A 2          | 16 | Int. H. mch          | " G 91 45      | Eros                  |               |
| A 6          | 17 | Argyrea              | L.B.A. mch 46  | M.W.                  |               |
| H.S. T 5-    | 18 | "                    | A 7.4 47       | M.W. in S.            |               |
| " T 32       | 19 | 24-inch Burestin     | H.C.O. K 78 48 | M.W. Vanfulis         |               |
| H.C.O. I 14  | 20 | S. Cross (Comp. mch) | H. 40 49       | Irish mch             |               |
| " I 50       | 21 | P. M.                | L.B.A. 50      | Feet of mch           |               |
| A 7. C.      | 22 | Glama                | " 51           | Donker mch            |               |
| "            | 23 | Temper Sun           | H.S. G 15 52   | M. 51 (ch. pretty)    |               |
| "            | 24 | Polato woman         | H.C.O. D 13 53 | Building              |               |
| H.S. K 35a   | 25 | 2 Can                | " D 8 54       | Starth iron           |               |
| H.C.O. m 126 | 26 | Sp. "                | H.S. T 52 55   | Harvard Koppie (ch)   |               |
| " K 36       | 27 | Temp. Sp.            | " F 22 56      | Snake chain           |               |
| " K 13       | 28 | 8.3 class            | " T 94 57      | 24-inch Bann          |               |
| m 11         | 29 | Sp. J Puf            | " T 95 58      | Turner 61             |               |





Wideman Schrey  
US 2412.90

Ferdinand Magellan  
for Heroes of Amer. History, by Ober  
Born about 1480 in Sabrosa, Portugal

1504 enlisted as volunteer in armada commanded by  
Almeida, 20 vessels to the Indies

1517-17 Magellan and Falerio reach Spain

Feb. 22, 1518 Charles agreed to provide 5 ships, provisions for 2 years  
and furnish at least 250 men  
ships old & battered, ribs as if they had been

1519 ~~Aug 10~~ Sept. 20  
armada of 5 ships, provisions for 2 years and at least 250 men for crews

Magellan in command of flagship the Trinidad 110 tons

Juan de Cartagena San Antonio Largest 120 tons  
in service of Magellan, crew mutinied and returned

Gasper Tiesada Concepcion 90 tons  
Banned at sea before Cebu and Bohol  
Spain with the ship arrived in Seville, May 6, 1521

Luis de Mendoza Victoria 85 tons  
Sept. 8, 1521, at Seville under Juan Sebastian del Cano

João Serrão Santiago 75 tons  
Sept. 8, 1521  
lost in May 1518 when exploring coast of Patagonia

charts, compasses, quadrants, astrolabes, horn glasses, compass needles

Magellan evolved the name "Oceanus Pacificus"

Mactán, island of Cebu, Apr. 26, 1521 Magellan missed Mactán  
was killed by natives on Apr. 27, 1521



Magellan (cont.)  
 John Spence Islands  
 Trinidad sprang a leak.

53 men left aboard Trinidad

47 sailed in Victoria

on Apr. 6, 1522 Trinidad departed for Panama  
 as the hull was captured by a Portuguese fleet.  
 Only 4 survived to reach Spain

Entered harbor of Lidor ("Spiceris") Nov. 8, 1521

Sept. 8, 1522, the Victoria tied up at the mole in Seville  
 on the Guadalquivir  
 18 survivors

Juan Sebastián del Cano was on wheel with  
 honors.

His coat of arms granted him in return consisted of spices  
 2 cinnamon sticks in "saltier proper", 3 nutmegs and  
 12 cloves. Emblazoned above was a golden castle.  
 Crest above globe had motto

"Premier circumdesti me"  
 supported one 2 Malay kings holding a spice tree branch.



## A Neighbour Universe

Gleichen Universe Jan.

May 25, 1938 - On Campus, under the stars

|                        |    |                       |                         |               |                     |
|------------------------|----|-----------------------|-------------------------|---------------|---------------------|
| a.f.c.                 | 1  | Temple Sun col        |                         |               |                     |
| "                      | 2  | Sp. Sun               | acrsd H <sub>2</sub> 30 | Disc. by sup. |                     |
| "                      | 3  | Eclipse Sun           | H.S. 165                | 31            | Dish. run in H.M.C. |
| L.H. a                 | 4  | " part Gray           | H.S. 164                | 32            | Light em "          |
| H.S. P <sub>20</sub>   | 5  | Mars                  | " f. 12                 | 33            | M 13                |
| a.f.c.                 | 6  | Saturn col            | H.S. 164                | 34            | Pulsating star      |
| H.C.O. H <sub>52</sub> | 7  | Hally's Comet         | L.C.                    | 35            | Light em Nor Am     |
| " I 60?                | 8  | MW                    | H.C.O. 26               | 36            | Aeympa              |
| meagel                 | 9  | Col. Stars            | Am. f. L.               | 37            | S. Cross            |
| H.S. G 56              | 10 | Limit in Peg. Stephan | L.C.                    | 38            | Sham                |
| a.f.c.                 | 11 | Cordova               | a.f.c.                  | 39            | Seven Corners       |
| "                      | 12 | Magellan              | "                       | 40            | Dubious             |
| "                      | 13 | " fleet               | "                       | 41            | Lake Titian         |
| "                      | 14 | Two clouds            | "                       | 42            | Dipper              |
| H.S. G 146             | 15 | Large Cloud           | H.C.O. 762              | 43            | 3 Ann               |
| " M 47                 | 16 | 30 Dor.               | H.S. 165                | 44            | Red ships           |
| Bank Club              | 17 | Neb. Ori              | a.f.c.                  | 45            | Dir. Arch           |
| H.S. Sp. 14            | 18 | Sp. " "               | H.C.O. 232              | 46            | Meeting the Prime   |
| a.f.c.                 | 19 | Sp. 30 Dor.           | a.f.c.                  | 47            | Rel. in Cars        |
| acrsd H 62             | 20 | Neb. and neb.         | Bank Club               | 48            | And. Neb.           |
| <del>H.S. G 150</del>  | 21 | Frank Veil Neb.       |                         |               |                     |
| H.S. G 150             | 22 | Christal Area L.M.C.  |                         |               |                     |
| Bank Club              | 23 | Plinius with neb.     |                         |               |                     |
| H.S. G 152             | 24 | Arvis L.M.C.          |                         |               |                     |
| Bank Club              | 25 | G. Oph.               |                         |               |                     |
| " " M 47               | 26 | Dark neb. (feralite)  |                         |               |                     |
| H.C.O. M 47            | 27 | M.A. Neb.             |                         |               |                     |
| H.C.O. M 47            | 28 | Horse head            |                         |               |                     |
| Galaxy                 | 29 | Caroline Bay          |                         |               |                     |

A Roman philosopher said

"The universe is either a confusion or it is unity and order and providence. If the former, why do I desire to live in an accidental combination of things and such disorder? . . . . ."

But if the latter is true, I venerate and am firm"

Quoted by Pres. Conant in his baccalaureate address June 16, 1935.



# Women's Work in Astronomy

Supper Boston Branch A.C.U.W.  
Friday Ev. March 6, 1936 at H.C.O.

|               |                   |                                |                      |
|---------------|-------------------|--------------------------------|----------------------|
| 1             | Mary Samuels      | 29 H.C.O. 71, N. & Neb.        | 57 H.C.O. 275 Blaup  |
| 2 H.C.O. C28  | Carlin Hunt       | 30 OARSOKE, O Oph              | 58 " 287 Yeckes      |
| 3             | Main Institute    | 31 " Kery Oph                  | 59 " 221 Lick        |
| 4 M.H.        | Hawthorne Obs.    | 32 H.C.O. R78 M.W. Vais        | 60 " 28 M.W.         |
| 5             | Lady Huggins      | 33 A.J.L. Sp. Sun              | 61 Torra             |
| 6 H.C.O. 174  | Huggins Obs.      | 34 H.C.O. 113 Blue sp.         | 62 " 146a Vickers    |
| 7 " C5        | E.C.P.            | 35 " 111 Omin Neb              | 63 " 1110 Comapes of |
| 8 H.S. 5621   | Pleierdes         | 36 " 144 " " sp                | French Comapes       |
| 9 A.J.L.      | " sp.             | 37 " C25 Mrs. Draper           |                      |
| 10 H.C.O. C33 | Wynne Observatory | 38 H.S. 135 " Cergus plan      |                      |
| 11 C27        | Mrs. Fleming      | 39 H.C.O. 7 " " sp.            |                      |
| 12 R11        | Wynn Spectrograph | 40 " 35 Draper Cat             |                      |
| 13 OARSO 1624 | " Apr. 3 E.C.     | 41 H.C.O. 126 " Can sp.        |                      |
| 14 H.C.O.     | Argus 1624        | 42 C.H.O. 9. B. Lyn. (etc.)    |                      |
| 15 L.S.       | Lam               | 43 A.J.L. Scarp. cl.           |                      |
| 16 "          | Simple Sun        | 44 A.J.L. 11 5 Pupps           |                      |
| 17 "          | Potatowm          | 45 Y. Main Sep.                |                      |
| 18 A.J.L.     | S. Cross          | 46 A.J.L. Solen                |                      |
| 19 H.S. 9.146 | L.M.C.            | 47 H.C.O. 117 Persus cl.       |                      |
| 20 H.C.O. C7  | Min. Lancel       | 48 " 114 Arch Neb              |                      |
| 21 " K4       | Wain by super     | 49 " 105 H.G. 5194             |                      |
| 22 H.S. 165   | Wain in L.M.C.    | 50 OARSO 169 " 891             |                      |
| 23 " 1652     | Legation "        | 51 H.C.O. 199 Galaxy is (etc.) |                      |
| 24 H.C.O. K37 | Curtis fork E 173 | 52 " 159 Red Shift             |                      |
| 25 " 113      | M 22              | 53 " C38 Eddington's data      |                      |
| 26 " 7        | W. Lm             | 54 " 25 Fresh Plate black      |                      |
| 27 " 140      | Victoria 72nd     | 55 " 277 Cambridge's chart     |                      |
| 28 A.J.L.     | Cygnus Cloud      | 56 H.S. Lick Lurch & note etc  |                      |

28



Wandering on the Wash Coast  
at H.C.O. Friday Ev. Oct. 13, Bond Club & C. L. S. O.  
1939

Following slides from H.S. collection.

F44 Hale  
46 Miller

M 30 Meteor House

M 118 S. Cross.

M 357 7 Can  
41 M 8  
57 Trifid

T 13 Kein going down Mt. Wilson

16 Same scene on " "

21 60-~~ft~~ dome & view

23 100- " in winter

143 Cal. Lick

144 " "

152 Lick

158 Gaffney

169 Mt. Wilson from air

Oct. 13

Dr. Mearns  
Col of Mars, eclipses etc.

H.C.O.

A 34

San Francisco peak

B 70

Lynch 24 - with peak. top

B 72

Lynch 36 - with

G 57

Mars, Mars

1791 Meteor Crater

also numerous later ones from Dr. Whipple's register.

T 185 south of Palomar dome (open)

{ T 184  
 { A 92 Same. Dome at Palomar

(over)



Wanderings on the West Coast. Oct. 13, 1939

Order of slides

1. Golden Gate Fair colored
2. " " "
3. Road up Mt. Hamilton
4. Near top " "
5. Group of astralis
6. Smoke fog
7. 36-inch Repsold
8. Liffitt telescope
9. Sp. nebulae
10. Calipso Wallah 1921 Sept. 28
11. " Campbellville, Cal. 1930 Apr. 28. Annular
12. Road up Palomar
13. G. S. Hale
14. Dome Cal-Tech
15. Michelson
16. 200-inch dome
17. Lucien dome
18. " "
19. Near top 18-inch Schmidt 1936
20. 18-inch on slope
21. Where do you see my little tent?
22. Liffitt
23. Optical shop Cal-Tech
24. 200-inch mirror
25. Hale's Palom Alt.
26. Cook Net
27. " " Weston

Plates cont.

- 28 View Mt. Wilson  
 29 100-mil. Dm  
 30 Mars  
 31 Mg  
 32 View from dome  
 33 Flapstaff 24-mil. Reflector  
 34 13-mil. Lawrence Lowell  
 35 Pluto  
 36 Mars  
 37 Jupiter  
 38 South of Lowell  
 39 Meteor shower  
 40 Meteor crater from air  
 41 Edmundson's marks  
 42 " " "  
 43 San Francisco peaks

Hiale. Memory

- 44 Paris  
 45 Lick group  
 46 Mt. Wilson view  
 47 Miss Young's house  
 48 Whiffles in 200-mil. dome  
 49 A. L. in balcony



C

D plates - 4x5-

217

D 19366 Amer. hel.

D 19323 Southern Cross.

D 6401 Spiral hel.

D 19322 hel. Arch.

D 3322 Venus



X 8127 Pleiades. Names marked  
my note in Lami has fine 'light blue'

X 3861 X Can.  
shiny long vertical end

X 3992 2 Can.  
Comp.

X 8113 X Or. (3 prs.)  
red end

$\mu$  Scorpion X 7721 double. fl. to red  
X 7750 " " " violet  
X 7746 lines orange  
 $\gamma$  Puppis X 6155 1 pr.  
X 8230 2 prs.  
X 8233 " "

Nova Scorpion 3

B 53234 B 53220 July 25, 1922 edge. (before discovery)  
B 53230 July 29, 1922 (Saturday, first)

$\nu$  Puppis X 8199 heavy to red  
X 8205 lines darker

$\rho$  Orion X 7866, good, marked

$\epsilon$  Or X 8119 " "















1





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