

These are some books and atlases that you may find useful.

Books and Atlas:

Atlas of the Heavens	Antonin Becvar	1962
Telescope and Techniques An introduction to Practical Astronomy	CR. Kitchin	1995 QB43.2.K555 1995
Sky and Telescope's Pocket Sky Atlas	Roger W. Sinnott	2006
The Cambridge Double Star Atlas	James Mullaney	2009
The Cambridge Atlas of Herschel Objects	James Mullaney	2011
Sky Atlas 2000.0 Deluxe	Wil Tirion and Roger W. Sinnott	1985
Sky Atlas 2000.0 Desk	Wil Tirion and Roger W. Sinnott	1985
Sky Catalogue 2000.0 Vol 1 Stars	Alan Hirshfeld and Roger W. Sinnott	1985
Sky Catalogue 2000.0 Vol 2 double stars Variable Stars and nonstellar objects	Alan Hirshfeld and Roger W. Sinnott	1985 Q86.S54
Burnham's Celestial Handbook Vol 1 ,2,3	Robert Burnham Jr.	1978
Star-Hopping	Robert Garfinkle	1995 QB65.G37 1994
Deep-sky Companions: The Messier Objects	Stephen O'Meara	1998 QB65.O44 1997
The Cambridge Star Atlas	Wil Tirion	2001
The Next Step Finding and Viewing Messier's Objects	Ken Graun	2005 QB851,G73 2005
Observing Handbook and Catalogue of Deep-Sky Objects	Christian B. Luginbuhl and Brian A. Skift	1990 QB64.L84

Formulas for Telescope Observations

Limiting Visual Magnitude

$$\text{Mag.} = 7.0 + 5 * \text{Log}(\text{aperture diameter in CM})$$

Dawes' Limit (Limiting optical resolution of telescope)

Dawes' Limit in arc seconds

$$= 11.6 \text{ arc seconds} / \text{aperture diameter in CM}$$

Magnification of eyepiece

$$X = \text{Focal length of telescope in mm} / \text{Focal length of eyepiece in mm}$$

Visual resolution of eyepiece in arc seconds (smallest item in eyepiece)

$$X \text{ (in arc seconds)} = 120 \text{ arc second} / \text{Magnification}$$

Apparent field of view of eyepiece True field is from the Manufacturer

$$X \text{ (in degrees)} = \text{True field of view of eyepiece} / \text{Magnification power}$$

Exit Pupil of eyepiece

Exit Pupil of eye is 6.5 mm

$$\text{Exit Pupil (in mm)} = \text{aperture diameter (in mm)} / \text{Magnification power}$$

This is a list of objects that are used at Lick to observe for public groups.

* means not for regular public viewing and maybe faint or unusual.

!Comment		GALAXIES				
*Galaxies	00 00 00	00 00 00	2000	Galaxies*****		
M32	00 42 41.9	40 51 57.2	2000	Dist. 2.2MLY		
M31	00 42 44.3	41 16 09.4	2000	Andromeda Dist. 2.2MLY		
M77	02 42 40.8	-00 00 48.4	2000	Seyfert 2 Dist. 52MLY		
M81	09 55 33.2	69 03 55.1	2000	Dist. 12MLY		
M82	09 55 52.2	69 40 48.8	2000	Dist. 12MLY		
M87	12 30 49.4	12 23 28.0	2000	Dist. 50MLY		
NGC_4565	12 36 21.1	25 59 13.5	2000	Dist. 25MLY		
M104	12 39 59.4	-11 37 22.9	2000	Sombrero Dist. 40MLY		
M64	12 56 43.9	21 41 00.1	2000	Black Eye Dist. 24MLY		
M51	13 29 52.4	47 11 40.8	2000	Whirlpool Dist. 35MLY		
M101	14 03 12.5	54 20 53.1	2000	Pinwheel Dist. 25MLY		
M102	15 06 29.5	55 45 47.2	2000	Dist. 40MLY		
NGC_6503	17 49 26.5	70 08 39.6	2000	Dist. 17MLY		
*Sgr_dwarf	18 55 03.1	-30 28 42	2000	Sgr dwarf galaxy		
NGC_7331	22 37 04.3	34 24 58.5	2000	Dist. 45MLY		
!Comment		GLOBULAR CLUSTERS				
*Globular	00 00 00	00 00 00	2000	Globular Cluster*****		
M53	13 12 55.3	18 10 09.0	2000	Dist. 65KLY		
M3	13 42 11.2	28 22 31.6	2000	Dist. 35KLY		
M5	15 18 33.8	02 04 57.7	2000	Dist. 26KLY		
M13	16 41 41.4	36 27 36.9	2000	Dist. 25KLY		
M10	16 57 09.0	-04 05 57.6	2000	Dist. 14.3KLY		
M92	17 17 07.3	43 08 11.5	2000	Dist. 26KLY		
M15	21 29 58.4	12 10 00.6	2000	Dist. 33KLY		
M2	21 33 27.0	-00 49 23.7	2000	Dist. 37.5KLY		
!Comment		PLANETARY NEBULAE				
*Planetary	00 00 00	00 00 00	2000	Planetary Nebulae*****		
NGC_2392	07 29 10.8	20 54 42.5	2000	Eskimo Dist. 3KLY		
*ngc_2438	07 41 50.5	-14 44 07.7	2000	part m46 Dist. 2.9KLY		
NGC_3242	10 24 46.1	-18 38 32.6	2000	Ghost of Jupiter Dist. 2.5KLY		
NGC_6210	16 44 29.5	23 47 59.7	2000	Turtle Dist. 6.5KLY		
*M97	17 14 47.7	55 01 08.5	2000	Owl Dist. 2.6KLY		
NGC_6543	17 58 33.4	66 37 59.5	2000	Cat's Eye Neb. Dist. 3.2KLY		
*NGC_6572	18 12 06.4	06 51 13.0	2000	Emerald		
M57	18 53 35.1	33 01 45.0	2000	Ring Neb. Dist. 2.3KLY		
*PK_064+5.1	19 34 45.2	30 30 58.9	2000	Campbell star (red)		
*NGC_6818	19 43 58.0	-14 09 13.4	2000	Little Gem		
NGC_6826	19 44 48.5	50 31 30.3	2000	Blinking Neb. Dist. 2.2KLY		
*M27	19 59 36.4	22 43 15.8	2000	Dumbbell Dist. 800LY		
NGC_7009	21 04 10.8	-11 21 48.2	2000	Saturn Dist. 3.9KLY		
*NGC_7027	21 07 02.0	42 14 10.2	2000	proto-planetary Dist. 3KLY		
NGC_7662	23 25 53.6	42 32 06	2000	Blue Snowball Dist. 3.8KLY		

!Comment			GALACTIC NEBULAE	
*Nebulae	00 00 00	00 00 00	2000	Galactic Nebulae*****
M1	05 34 32.0	22 00 52.1	2000	Crab Dist. 6.3KLY
M42	05 35 17.3	-05 23 28	2000	Orion Dist. 1.8KLY
M20	18 02 23	-23 01 48	2000	Trifid Dist. 7.6KLY
M8	18 03 37	-24 23 12	2000	Lagoon Dist. 5.1KLY
M17	18 20 45	-16 10 23	2000	Omega or Swan Dist. 5.7KLY
M16	18 18 48	-13 49 00	2000	Eagle Dist. 7KLY
!Comment			OPEN CLUSTERS	
*Open_clust	00 00 00	00 00 00	2000	Open clusters*****
NGC_457	01 19 40	58 17 18	2000	Dist. 9KLY
NGC_869	02 19 06	57 09 0	2000	h Persei Dist. 6.5KLY
NGC_884	02 22 00	57 08 0	2000	chi Persei Dist. 7.5KLY
M45	03 47 24	24 07 0	2000	Pleiades Dist. 440LY
M38	05 28 43	35 51 18	2000	Dist. 4.2KLY
M37	05 52 19	32 33 12	2000	Dist. 4.6KLY
M35	06 09 06	24 21 0	2000	Dist. 2.8KLY
M46	07 41 42	-14 49 0	2000	Dist. 5.4KLY
M44	08 40 24	19 41 0	2000	Beehive Dist. 577LY
M67	08 51 18	11 48 00	2000	Dist. 2.25KLY
M23	17 57 00	-18 59 0	2000	Dist. 4.5KLY
M17	18 20 26	-16 10 36	2000	Open cluster part Dist. 5.7KLY
M11	18 51 00	-06 16 0	2000	Wild Duck Dist. 6KLY
*NGC_7789	23 57 24	56 42 30	2000	Dist. 6KLY
!Comment			OTHER GOOD STUFF	
*Misc.	00 00 00	00 00 00	2000	Miscellaneous*****
Aldebaran	04 35 55.2	16 30 33.5	2000	Dist. 65LY
Rigel	05 14 32.3	-08 12 50.9	2000	Dist. 770LY
Betelgeuse	05 55 10.3	07 24 25.4	2000	Dist. 640LY
Capella	05 16 41.4	45 59 52.8	2000	Dist. 42LY
Capella	05 16 41.4	45 59 52.8	2000	Dist. 42LY
Sirius	06 45 08.9	-16 42 58.0	2000	Dist. 8.6LY
Procyon	07 39 18.1	05 13 30.0	2000	Dist. 11LY
Pollux	07 45 19.0	28 01 34.3	2000	Dist. 34LY
Regulus	10 08 22.3	11 58 02.0	2000	Dist. 77LY
Spica	13 25 11.6	-11 09 40.8	2000	Dist. 262LY
Arcturus	14 15 39.7	19 10 56.7	2000	Dist. 37LY
Antares	16 29 24.5	-26 25 55.2	2000	Dist. 604LY
Vega	18 36 56.3	38 47 01.2	2000	Dist. 27LY
Altair	19 50 47.0	08 52 06.0	2000	Dist. 17LY
Deneb	20 41 25.9	45 16 49.2	2000	Dist. 3.2KLY
Fomalhaut	22 57 39.0	-29 37 20.1	2000	Dist. 25LY
Albireo	19 30 43.3	27 57 34.8	2000	Dist. 380LY
Epsilon_Lyra	18 44 20.3	39 40 12.5	2000	double double Dist. 180LY
T_Lyrae	18 32 20.1	36 59 55.6	2000	Carbon star Dist. 2KLY v8
Mu_Cephei	21 43 30.5	58 46 48.2	2000	Red supergiant
*Cyg_X-1	19 58 21.7	35 12 05.8	2000	Black hole Dist. 7.5KLY
*Barnard	17 57 48.5	04 41 36.2	2000	vis 9.54 Dist. 6LY
*Kepler-16	19 16 18.2	51 45 26.8	2000	Dist. 196LY
*PG_1718+481	17 19 38.2	48 04 12.2	2000	Dist. 2996MLY vis 14.6
*7C1821+6419	18 21 57.2	64 20 36.2	2000	Dist. 1035MLY vis 14.2
*3C273	12 29 06.7	02 03 08.7	2000	Dist. 584MLY vis 12.9
*4c29.45	11 59 31.8	29 14 43.8	2000	Dist. 1457MLY vis 14.4
*HS0624+6907	06 30 02.5	69 05 03.8	2000	Dist. 1254MLY vis 14.4
*PG1634+706	16 34 29.0	70 31 32.4	2000	Dist. 3507MLY vis 14.7
*HD_157881	17 25 45.2	02 06 41.1	2000	high proper motion v7.6

!Comment	DOUBLE STARS					
*Double_star	00 00 00	00 00 00	2000	Double Stars*****		
*hip_207	00 02 36.0	66 05 56.2	2000	sep 15"		5.9-7.3
55_PSC	00 39 55.6	21 26 18.6	2000	sep 6.5"		5.4-8.7
*eta_Cas	00 49 06.3	57 48 54.7	2000	sep 12"		3.4-7.5
alpha_Psc	02 02 02.8	02 45 49.5	2000	sep 1.9"		4.2-5.2
gamma_AND	02 03 54.0	42 19 47.0	2000	sep 9.8"		2.3-4.8
iota_Tri	02 12 22.3	30 18 11.0	2000	sep 3.9"		5.3-6.9
*eta_PER	02 50 41.8	55 53 43.8	2000	sep 28"		3.9-8.6
32_ERI	03 54 17.3	-02 57 09.9	2000	sep 6.8"		4.8-6.1
omega_Aur	04 59 15.4	37 53 24.9	2000	sep 5.4"		5.0-8.0
*bet_ORI	05 14 32.3	-08 12 05.9	2000	sep 9.4"		0.1-6.7
lambda_Ori	05 35 08.3	09 56 03.0	2000	sep 4.4"		3.6-5.5
8_MON	06 23 46.1	04 35 34.3	2000	sep 13"		4.5-6.5
20_Gem	06 32 18.6	17 47 03.6	2000	sep 20"		6.3-6.9
38_Gem	06 54 38.6	13 10 40.2	2000	sep 7"		4.7-7.7
*hip_35210	07 16 36.8	-23 18 56.1	2000	sep 27"		5.0-5.8
iota_CNC	08 46 41.8	28 45 35.6	2000	sep 31"		4.2-6.6
gamma_Leo	10 19 58.4	19 50 29.3	2000	sep 4.4"		2.2-3.5
*iota_Leo	11 23 55.5	10 31 46.2	2000	sep 1.5"		4.0-6.7
*88_LEO	11 31 44.9	14 21 52.2	2000	sep 15"		6.4+8.4
2_CVn	12 16 07.5	40 39 36.7	2000	sep 11"		5.8-8.1
24_COM	12 35 07.8	18 22 37.4	2000	sep 20"		5.2-6.7
epsilon_BOO	14 44 59.2	27 04 27.2	2000	sep 2.8"		2.5-4.9
xi_BOO	14 51 23.4	19 06 01.7	2000	sep 7"		4.7-7.0
zeta_CrB	15 39 22.7	36 38 09.0	2000	sep 6.3"		5.1-6.0
lambda_Oph	16 30 54.8	01 59 02.1	2000	sep 1.5"		4.2-5.2
alpha_Her	17 14 38.9	14 23 25.2	2000	sep 4.6"		3v-5.4
*omi_oph	17 18 00.7	-24 17 12.9	2000	sep 11		5.4-6.9
rho_Her	17 23 40.9	37 08 45.4	2000	sep 4.1"		4.6-5.6
95_HER	18 01 30.4	21 35 44.8	2000	sep 6.3"		5.0-5.1
70_Oph	18 05 27.4	02 29 59.3	2000	sep 1.6"		4.2-6.0
59_Ser	18 27 12.5	00 11 46.0	2000	sep 3.8"		5.3-7.6
*omi_Dra	18 51 12.0	59 23 18.0	2000	sep 34"		4.9-7.9
beta_Cyg	19 30 43.3	27 57 34.8	2000	sep 34"		3.1-5.1
pi_Aql	19 48 42.1	11 48 57.1	2000	sep 1.4"		6.1-6.9
*eps_SGE	19 37 17.4	16 27 46.1	2000	sep 89"		5.7-8.0
gamma_Del	20 46 39.5	16 07 27.4	2000	sep 9.6"		4.5-5.5
*41_aqr	22 14 18.0	-21 04 28.4	2000	sep 5"		5.7-7.2
delt						

Red and/or white Flashlights



Roll over image to zoom in



2 VIDEOS

Ask Rufus

Does it have different lighting modes?

Is its beam distance as advertised?

How durable is it?

Ask something else

COAST PX20 Dual Color 400 Lumen LED Flashlight

[Visit the Coast Store](#)

4.6 ★★★★★ (1,339)

Amazon's Choice

100+ bought in past month

Limited time deal

-15% **\$20⁶⁰**

Typical price: \$24.32

prime One-Day FREE Returns

Get a \$100 Gift Card: Pay \$0.00 ~~\$20.60~~ upon approval for Prime Visa. No annual fee.

May be available at a lower price from [other sellers](#), potentially without free Prime shipping.

Special Feature	Lightweight
Color	Black
Power Source	Battery Powered
Light Source Type	LED
Material	Aluminum

About this item

- **DUAL COLOR:** White and Red beams all in one. Red light preserves night vision. Great for versatile work during the night and day.
- **BULLS-EYE SPOT BEAM OPTIC:** Consists of an extremely bright, centered 'hot spot' and a very consistent transition halo to increase the effective

Tools & Home Improvement › Safety & Security › Flashlights › Handheld Flashlights



VIDEO



R1 Low-Lumen Mini Red Flashlight - Zoomable, Dim Red Light, Perfect for Close-Range Reading and Viewing Star Charts While Stargazing in Astronomy, Night Vision - Batteries Not Included

[Visit the METII Store](#)

4.4 ★★★★★ (42) | [Search this page](#)

Amazon's Choice

100+ bought in past month

\$12⁹⁹

✓ **prime** One-Day

FREE Returns ▾

30-day refund/replacement ▾

Special Feature Adjustable Focus

Color Red



4 VIDEOS



Roll over image to zoom in

🌟 Ask Rufus

Does it affect night vision if used briefly?



Upgraded Red Flashlight, Bright White & High/Low Power Red Light Options with Memory, Zoom Lens, Portable Waterproof LED Small Torch for Aviation, Astronomy, Night Vision

[Visit the METII Store](#)

4.5 ★★★★★ (532) | [Search this page](#)

Amazon's Choice

400+ bought in past month

Limited time deal

-15% \$16⁹⁹

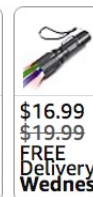
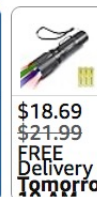
Typical price: \$19.99 ●

✓ **prime** One-Day

FREE Returns ▾

30-day refund/replacement ▾

Color: **RRW**





Roll over image to zoom in



VIDEO

Ask Rufus

Can its beam distance be adjusted?

Is it suitable for nighttime hiking?

Does it have any waterproof capabilities?

Ask something else



Honoson 10 Pieces Red Light Flashlight LED Single Mode Torch 1 Mode Scalable Red Lens Filter Flashlight for Night Astronomy Aviation Observation Beach Turtle Safe

Brand: Honoson

4.5 ★★★★★ (948)

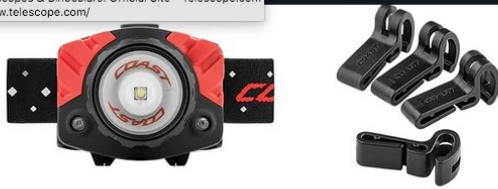
\$25⁹⁹ (\$2.60 / count)

FREE Returns

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Number of Items: 10

10 \$25.99 (\$2.60 / count)	1 \$7.99 FREE Delivery Tomorrow	2 \$9.99 (\$5.00 / count) \$11.99 FREE Delivery Tomorrow
3 \$13.99 (\$4.66 / count) FREE Delivery Tomorrow	4 \$18.99 (\$4.75 / count) FREE Delivery Thursday	6 \$22.99 (\$3.83 / count) FREE Delivery Tomorrow
16 \$39.99 (\$2.50 / Count) FREE Delivery		



INCLUDED

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7 VIDEOS

Coast FL85 615 Lumen Dual Color Pure Beam Focusing LED Headlamp with Twist Focus Hinged Beam Adjustment, Hard Hat Compatibility and Reflective Strap, Red

[Visit the Coast Store](#)

4.5 ★★★★★ 482 ratings

50+ bought in past month

\$27⁶⁰

Get Fast, Free Shipping with [Amazon Prime](#)

[FREE Returns](#) ▼

Get a \$80 Amazon Gift Card instantly upon approval for the Amazon Store Card. No annual fee.

Special Feature	Night Vision, Reflective
Color	Red
Power Source	Battery Powered
Light Source Type	LED
Material	Nylon

About this item

- **TWIST FOCUSING OPTIC:** The simple Twist Focusing system goes from an Ultra View Flood Beam to Bulls-Eye Spot Beam.
- **DUAL COLOR:** The FL85 includes white and red LED light options. The red LED light preserve night vision.
- **ADDITIONAL FEATURES:** Reflective strap for added visibility, hinged beam light adjustment, and hard hat compatibility (clips included).
- **SPECS:** Light Output: 615 lumens (high), 330 lumens (med), 96 lumens (low). Runtime: 2.15 hours (high), 3.45 hours (med), 13 hours (low). Beam Distance: 183 meters (high), 139 meters (med), 77 meters (low).

➤ [See more product details](#)

🗉 [Report an issue with this product or seller](#)



12 Pack Ultra Bright Red LED Keychain Flashlight, Red Keychain Flashlight for Night Observation

Brand: RaySoar
4.5 ★★★★★ (72)

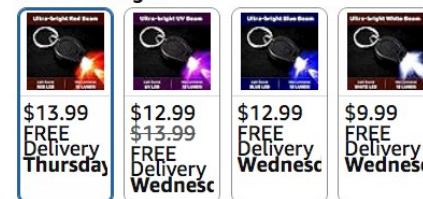
\$13⁹⁹

✓prime

FREE Returns ▾

Get a \$60 Amazon Gift Card instantly upon approval for the Prime Store Card. No annual fee.

Color: Red Light



Color	Red Light
Material	Plastic
Theme	Animal
Special Feature	Lightweight
Included Components	Bulb included, Batteries included

About this item

- Ultra Bright Red LED Keychain Flashlight: The red keychain LED flashlight offers 12 lumens red LED light. Red light is the helpful tools for night observation, you can observe the animals behavior without disturbing

★ Ask Rufus

Can its red light mode disturb night vision?

Are batteries easily replaceable?

Is it water resistant or waterproof?

Ask something else



POWXS Rechargeable AA Lithium Batteries USB, 3300mWh Super Capacity 2H Fast Charging 1.5V Lithium Ion Double A Batteries with 2 in 1 Micro USB Cable

Visit the POWXS Store
4.4 ★★★★★ (262) | Search this page

-20% \$19¹⁹ (\$4.80 / Count)
List Price: \$23.99

✓prime Two-Day
FREE Returns
[Unlock a \\$100 Amazon Gift Card](#) upon approval for Prime Visa.

Number of Batteries	4 AA batteries required. (included)
Brand	POWXS
Battery Cell Composition	Lithium Ion
Recommended Uses For Product	Emergency Lamp, Children's toys, Electric toothbrush, TV Remote, Emergency lights, LED Candle, Radi... See more
Unit Count	4.0 Count

- About this item
- **【High Efficiency AA Lithium Battery】** Includes 4x USB rechargeable AA lithium batteries, 3300mWh super capacity and 1.5V steady output, ultimate power for your high-drain devices.
 - **【Ultra Long Lasting】** POWXS 1.5V rechargeable Lithium AA batteries adopt high-energy lithium

Roll over image to zoom in

Ask Rufus

Can they be charged via usb cable?

Do they leak or corrode over time?

Are they suitable for high drain devices?

Ask something else

Map from Atlas of the Heavens

Cassiopeia

Blue Snowball

