LEONIS: THE SKY AWAITS.

Explore • Observe • Question • Discover

THE REAL LEO / SCHEMATIC STAR PATTERN





A SCIENCE MAGAZINE.
A GRAPHIC-NOVEL SPIRIT.
A FIELD GUIDE TO YOUR SKY.

Astronomy, evidence and imagination for grades 6–12. Featuring Leonis artwork, student challenges and a teacher guide.

Fictional character artwork: Galaxius.

The universe rewards curiosity.

Eight missions. One sky. Bring questions, not just answers.

LEONIUS: Throne of the Stars imagines heroes and civilizations beyond Earth. This pack turns that sense of possibility toward real astronomy. The stars are real; Leonis planets, characters and adventures are fiction.

OBSERVED SCIENCE

Facts and measurements from astronomy sources.

TESTABLE MODELS

Simplified representations with stated limits.

LEONIS IMAGINATION

Story artwork and creative questions, clearly labeled.

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Teacher quick start: two 45–60 minute sessions, plus optional supervised observing. Print pages 8–12 for low-ink activities. The website adds a quiz, journal and interactive distance model.

A lion drawn in light.

Leo is one of the 88 officially recognized regions of the sky. Its familiar lion outline is a pattern seen from Earth. The Sickle, a smaller pattern called an asterism, looks like a backward question mark. Regulus sits at its base; Denebola marks the tail.

In northern mid-latitudes, look for Leo on spring evenings. Start with a sky chart set to your location, date, and time, then look for the Sickle and the triangle at the lion's rear. From southern locations the pattern may look rotated. In some seasons or locations Leo is below the horizon or too close to the Sun to see at night.



North up, east left. A teaching schematic, not a local horizon chart. The Sickle is gold; the body and tail are cyan. Line choices and star sizes are illustrative.

DID YOU KNOW?

Same direction does not mean same distance. Most constellation stars are not neighbors or a gravitationally bound group.

DISCUSS: Why might two classmates draw different outlines around exactly the same stars?

Sources: 1; 2 (see page 13).

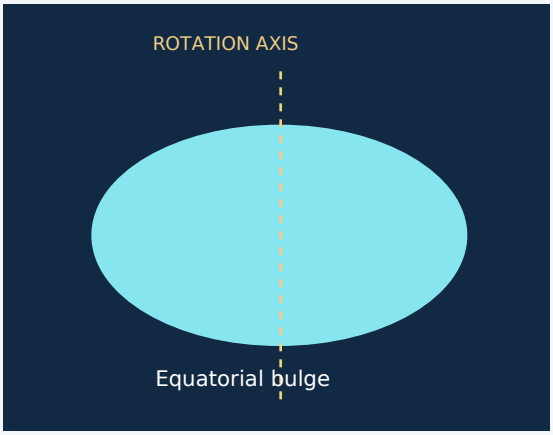
The lion's heart.

Regulus appears blue-white and lies about 79 light-years away. The bright primary is a hot B-type main-sequence star in a multiple-star system. It turns in roughly 16 hours. That fast rotation makes it wider at its equator than at its poles.

Evidence points to a past exchange of material with a companion. The incoming material also carried angular momentum, which can spin a star up. This is a scientific explanation supported by observations, not something astronomers watched happen in real time. Spectroscopy separates light into wavelengths; spectral lines help reveal composition and motion. Interferometry combines telescope light to resolve very small details.

DID YOU KNOW?

A light-year measures distance: how far light travels in one year. Seeing Regulus means receiving light that left it decades ago.



Original explanatory diagram. Shape exaggerated; not a telescope image.

READ THE LIGHT

1. Spectra: composition and motion.
2. Interferometry: small-scale shape.
3. Models: compare predictions with data.

THINK: What evidence would distinguish a rapidly rotating star from a slowly rotating one?

Sources: 3; 4 (see page 13).

One direction. Many depths.

Leo I is a dwarf spheroidal galaxy associated with the Milky Way. It appears in the direction of Leo, far beyond the stars that trace the lion. A galaxy is a physical system of stars and other matter held together by gravity; a constellation is an address on our sky.

A 2021 study inferred a massive central black hole in Leo I from stellar motions and models. This is a useful case study in indirect evidence, not a photograph of the black hole. A black hole has a boundary called an event horizon beyond which light cannot escape. Astronomers test explanations by comparing predictions with measurements.

> **DID YOU KNOW?**
>
> Leo I and the Leo Triplet are different objects. The Triplet includes M65, M66, and NGC 3628, roughly 30–35 million light-years away.

LANDMARK	APPROXIMATE EARTH DISTANCE
Denebola	36 light-years
Regulus	79 light-years
CW Leonis	400 light-years
Leo Triplet galaxies	30–35 million light-years

Scale challenge: using 30 million light-years for the Triplet, about how many times farther away is it than Regulus? Divide, then explain why this is an approximate comparison.

Sources: 1; 5; 6 (see page 13).

A star returns its ingredients.



Hubble assigned-color composite. Credit: ESA/Hubble, NASA, Toshiya Ueta (University of Denver), Hyosun Kim (KASI).

About 400 light-years away, CW Leonis is a dying, carbon-rich red giant wrapped in material it has expelled. Carbon made inside stars can enter interstellar space and become part of later generations of stars and planets. Carbon is central to all known life on Earth; carbon-rich dust is not evidence that life is present around this star.

Hubble reveals shells, arcs, and beams of light in this environment. Comparing images taken years apart helps researchers study change. The picture combines filtered observations with assigned colors, including an infrared channel. It does not show exactly what unaided human eyes would see.

OBSERVATION / INFERENCE: List two features you can see in the Hubble image, then write one explanation you would need more evidence to test.

Sources: 7 (see page 13).

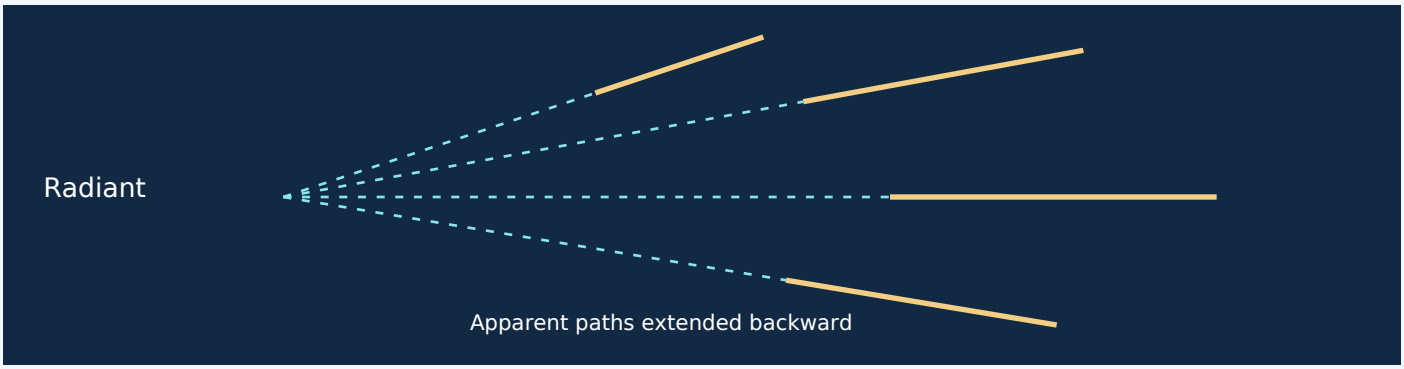
A comet leaves a trail.

The Leonids occur when Earth encounters debris from comet 55P/Tempel–Tuttle. A comet is an icy body that can release gas and dust as it warms near the Sun. A meteor is the streak of light produced as a small piece of space material enters the atmosphere. A meteorite is material that reaches the ground.

Leonid paths appear to spread from a radiant in Leo because of perspective, like parallel railway tracks seeming to meet in the distance. The meteors are nearby atmospheric events, not stars leaving Leo. The shower returns each November; darkness, clouds, moonlight, and debris density affect how many you see.

DID YOU KNOW?

You do not need to stare at Leo. Watch a broad area of dark sky away from the radiant for longer-looking streaks.



Perspective diagram, not physical meteor paths between stars.

OBSERVE: With an adult or club, observe for two equal 10-minute intervals. Record meteors, clouds, and where you looked. Does a zero count prove there was no shower?

Sources: 8; 9 (see page 13).

Can you map Leo?

Observation sheet • Use a town or general area, not a home address.

Observe with an adult or group in a safe location. Never view the Sun through binoculars or a telescope. If Leo is not visible, record why. A chart-based session is valid if labeled as a simulation.

Date:

Local time + time zone:

General location:

Weather / cloud cover:

Visible stars (or none):

Light pollution + reason:

Leo direction / altitude:

Observed sky or simulation?

SKETCH / PHOTO REFERENCE

Label north, the horizon and any uncertain stars. Attach a photo separately if used.

Questions to investigate / what changed since last time?

Sources: 1 (see page 13).

What does the evidence say?

Choose one answer for each question. Teacher key: page 12.

1. What does a light-year measure?

A. Distance B. A star's age C. Brightness

2. Why do Leo's stars form a recognizable outline?

A. They all orbit Regulus B. We see their projected directions from Earth C. They are equally far away

3. Which statement describes the Sickle?

A. A galaxy behind Leo B. A comet's tail C. An asterism resembling a backward question mark

4. Which observation best supports a rapidly rotating, flattened Regulus?

A. Its name means king B. Resolved shape measurements and spectral evidence C. Its position in a comic

5. What supplies the Leonid meteoroids?

A. Debris from comet Tempel–Tuttle B. Stars falling from Leo C. Dust expelled by CW Leonis

6. Where should you look for Leonids?

A. Only directly at Regulus B. Only through a telescope C. Across a broad area of dark sky

7. What does carbon-rich dust at CW Leonis demonstrate?

A. That life has been found there B. That stellar material can enrich space with carbon C. That it is a planet

8. At 1 cm = 5 light-years, how far from the observer is a 79-light-year star?

A. 395 cm B. 7.9 cm C. 15.8 cm

STRETCH: A fictional Leonis world looks blue in an illustration. What would you need to measure before claiming that it has liquid oceans?

Build Leo in three dimensions.

Start with three stars. Extend to the full pattern.

Start with the three-star distance scaffold below, then build the full lion by researching the remaining stars on the map. Work in teams of three or four: a data researcher, model builder, and evidence presenter. Use a cardboard base, ruler, paper stars, string, and tape. Keep all stars the same physical size so size is not confused with brightness.

STAR	DISTANCE (ly)	COLOR / TYPE	AT 1 cm = 5 ly
Regulus	79	Blue-white / B main sequence	15.8 cm
Denebola	36	White / A main sequence	7.2 cm
Zosma	58	White / A main sequence	11.6 cm

1 / MARK THE VIEWPOINT

Place an observer mark O at one end of the base. All distances begin here.

2 / SET THE SIGHTLINES

Use the schematic on page 11 to establish each star’s direction from O. Place a guide screen 3 cm from O, perpendicular to the central viewing direction.

3 / ADD THE DEPTH

Stretch a string from O through each screen mark. Measure the model distance along that sightline and attach the star there. A ruler, tape and an adult helper make this easier.

4 / CHANGE YOUR VIEW

View through O, then from the side. Photograph or sketch both. The pattern changes although the stars stay in place.

5 / COMPLETE THE LION

Research the six additional stars on page 11, cite distances and uncertainties, and choose a smaller scale if your base is too short.

LIMITS: Rounded distances; schematic angles; equal-sized paper stars. These simplifications must appear on the finished model label.

Sources: 2; 10; 11; 12 (see page 13).

Your data. Your model.

Calculate before you construct. Distances are measured from the observer.

STAR	DISTANCE / SOURCE / UNCERTAINTY	MODEL DISTANCE
Eta Leonis		
Algieba		
Adhafera		
Rasalas		
Epsilon Leonis		
Chertan		

Model distance (cm) = distance (light-years) ÷ scale (light-years per cm). Choose one scale for every star. Compare color and apparent magnitude; a smaller magnitude number means a brighter appearance, not necessarily a closer star.

SIGHTLINE GUIDE / SCHEMATIC

For the three-star starter, use these screen coordinates in centimeters relative to its center. X is right/left; Y is up/down. Put the screen 3 cm from O. For a full model, transfer the remaining pattern positions with the same proportional layout.

STAR	X (cm)	Y (cm)
Regulus	+0.288	-0.696
Denebola	-0.768	-0.264
Zosma	-0.432	+0.384

These small offsets deliberately compress the sky pattern. Exact angle reproduction would require measured celestial coordinates. Do not call this a precision sky map.

Make the reasoning visible.

Suggested grades 6–12 • Adapt vocabulary and calculations to your group.

Session 1 (45–60 min): 10 min on the Leo pattern; 15 min reading and image analysis; 15 min quiz and discussion; 5–20 min planning the model.
Session 2 (45–60 min): 15 min checking source data; 25 min constructing; 10–20 min comparing viewpoints and presenting.
Accessibility: offer tactile strings, large labels, a seated viewing point, printed notes, or an indoor simulation instead of night observing.

ANSWER KEY

1. A. It is the distance light travels in one year, not a unit of time.

2. B. The outline is a projection. Stars in a constellation can have very different distances.

3. C. The Sickle is a smaller star pattern within the constellation Leo.

4. B. Instrument measurements can test a physical model; names and stories cannot.

5. A. Earth crosses debris from comet 55P/Tempel–Tuttle, within our Solar System.

6. C. Perspective places the radiant in Leo, but meteors can cross other parts of the sky.

7. B. Carbon is important to life, but its presence alone does not demonstrate life.

8. C. Divide the real distance by the scale: 79 / 5 = 15.8 cm.

ASSESS THE MODEL / 10 POINTS

Award 0–2 points each: credible cited data; correct scale arithmetic; a clear observer point and sightlines; two-view comparison; explanation of limitations and the projection effect.

Stretch answers: Apparent brightness depends on luminosity and distance (and dust). For liquid water, investigate temperature, pressure, stellar energy and atmosphere; artwork alone is not evidence. For assigned-color images, inspect filter/color metadata. A zero meteor count may reflect a short sample, clouds or other observing conditions. Triplet/Regulus comparison: 30,000,000 ÷ 79 ≈ 380,000.

VOCABULARY CHECK: Asterism: a recognizable star pattern. Spectrum: light separated by wavelength. Radiant: the apparent origin of a meteor shower. Parallax: a shift in apparent position between viewpoints. Inference: an explanation drawn from evidence. Ask students to use two terms in their final presentation.

Follow the evidence.

Direct sources for students, teachers and curious readers.

01 / NASA: Celestial Wonders in Leo
https://science.nasa.gov/solar-system/skywatching/night-sky-network/celestial-wonders-in-leo/

02 / IAU: The Constellations
https://iauarchive.eso.org/public/themes/constellations/

03 / Jim Kaler, University of Illinois: Regulus
https://stars.astro.illinois.edu/sow/regulus.html

04 / AAS / Gies et al.: A Companion for Regulus
https://aasnova.org/2020/11/30/a-companion-for-regulus/

05 / McDonald Observatory: Leo I black-hole research (2021)
https://mcdonaldobservatory.org/2021/12/texas-astronomers-discover-strangely-massive-black-hole-in-milky-way-satellite-galaxy/

06 / NASA: Black Holes
https://science.nasa.gov/universe/black-holes/

07 / NASA / ESA Hubble: CW Leonis
https://science.nasa.gov/asset/hubble/cw-leonis/

08 / NASA: Leonids Meteor Shower
https://science.nasa.gov/solar-system/meteors-meteorites/leonids/

09 / NASA: 55P/Tempel–Tuttle
https://science.nasa.gov/solar-system/comets/55p-tempel-tuttle/

10 / IAU astroEDU: What Is a Constellation?
https://astroedu.iau.org/activities/what-is-a-constellation/

11 / Jim Kaler, University of Illinois: Denebola
https://stars.astro.illinois.edu/sow/denebola.html

12 / Jim Kaler, University of Illinois: Zosma
https://stars.astro.illinois.edu/sow/zosma.html

Editorial note: distances are rounded learning values, not a precision catalog. Leo I’s black-hole example describes a published 2021 inference. IAU activities inform the modeling approach; this Leonis pack is independently created and is not IAU-reviewed or endorsed. Source check: September 2026.

SCIENCE IS A WAY OF ASKING BETTER.



NOVA TRINITY / LEONIS FICTION

In Trine: Oceans of Destiny, Nova Trinity defends a living ocean world. In the classroom, begin with a real question: what can measurements tell us about an unfamiliar planet?

DISCUSSION PROMPTS

- What can a picture show? What can it not prove?
- How do we separate observation from inference?
- Which part of your model would you improve next?

Explore the stories
LeonisComics.com

School / club inquiries:
leoniscomics@gmail.com

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