

The background of the slide is a deep purple space scene. A large, glowing sphere, possibly a planet or a nebula core, is visible in the upper left quadrant. The rest of the background is filled with a dense field of small, distant stars and faint, wispy nebulae.

DARK NEBULAE

Sasha Allen, Gina Cocuzzi, Raine Ducey, Gabrielle Liberman

TABLE OF CONTENTS

01

History Behind
Discovery

02

Description

03

Observations

04

Astronomical
Observatory

05

Artifact

06

Questions

The background is a deep, dark blue space filled with numerous small, bright white stars. A faint, ethereal glow of a nebula is visible, particularly on the right side, adding a sense of depth and cosmic wonder to the scene.

The Coalsack Nebula

01 History Behind Discovery



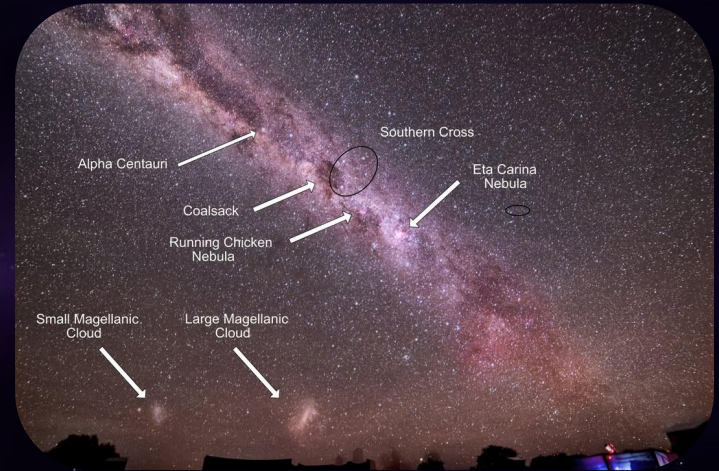
Mythology

Incan mythology

- Created when the god Ataguchu kicked the milky way in a fit of rage
- A piece fell off (Small Magellanic Cloud) and left a mark behind (Coalsack Nebula)
- Called it *Yutu*, a partridge-like South American bird

Aboriginal Australians

- Head of an emu whose body was formed by the Milky Way
- Most well-known Aboriginal constellation



Identification

- First identified by Europeans in 1499 by Spanish explorer Vicente Yáñez Pinzón
- Named *il Canopo fosco* by Italian explorer Amerigo Vespucci a few years after
- Later referred to as the Black Magellanic Cloud
- First formal description of the nebula given between 1511 and 1521 by Italian historian Peter Martyr d'Anghiera
- Historically, all similar dark clouds were called “coalsack”; juxtaposed in 1899 with the naming of the Northern Coalsack Nebula



02

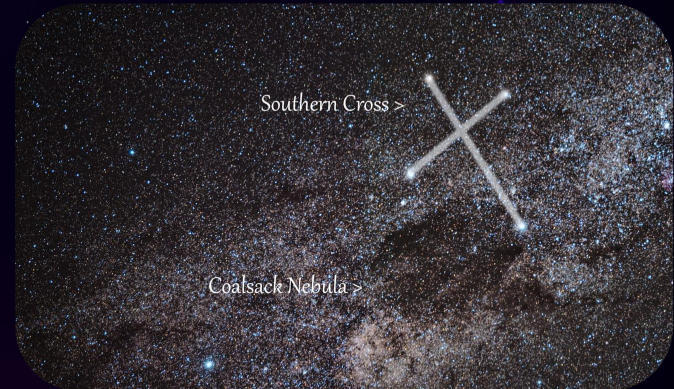
Description

No math!



Description

- One of the most prominent nebulae visible to the naked eye
- Appears as a dark patch in the sky blocking part of the Milky Way
- Located next to the southern cross
- Most easily visible in the Southern Hemisphere in autumn



Description

- Dense cloud of dust particles blocking out nearly all visible light from objects behind it
- Estimated 10% of the brightness of the milky way
- Light that can be seen through appears more red: interstellar reddening
- About 600 light-years away from earth and about 100 light-years across



03

Observations

Nebulae: Past, Present and Future



How it's Observed

Initial
Impressions
Holes in the Milky Way?



E.E. Barnard
Called dark areas "Gegenschein"
(counter glow)



Photography
Tool to study the heavens



So what did we
find?

Dark nebulae are
interstellar dust clouds



Hard to see

Dark, clear skies away from city
lights are needed + Milky Way



Don't be fooled!

ID can be tricky because certain dark
nebulae are close to each other (ex.
The stem of the Pipe Nebula)



Current Observations

The Dark Rift
AKA the Black Llama
"Yacana"

They're observed with infrared telescopes since they're invisible in visible light. The dust inside emits heat radiation which can be tracked.

Tools for Observation

Star nurseries (remember dense dust stars collapsing to form protostars!)

Composed of molecular H

Purpose

Future Observations

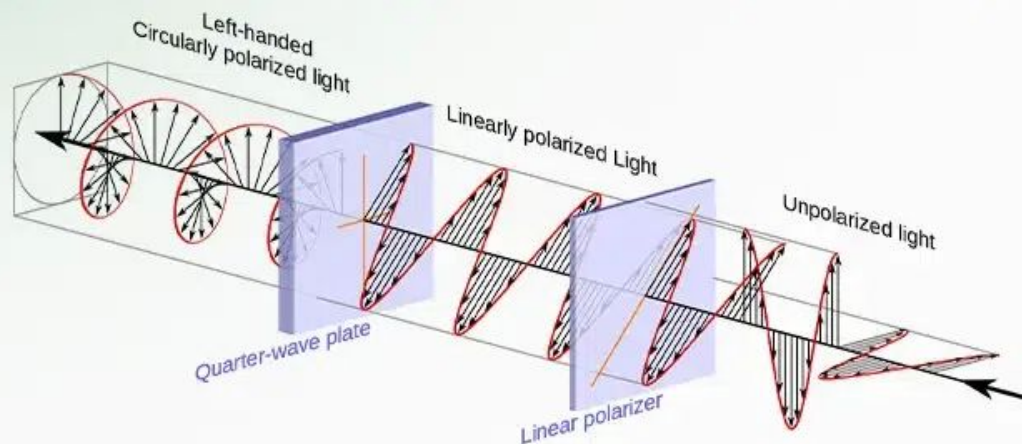
Photograph dark
nebulae to observe
stellar activity →
internal structure, earlier
stages of star birth,
polarization of light
behind stars

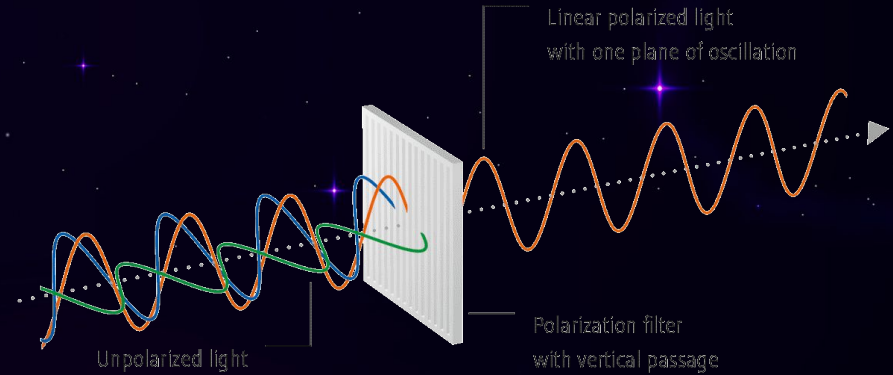
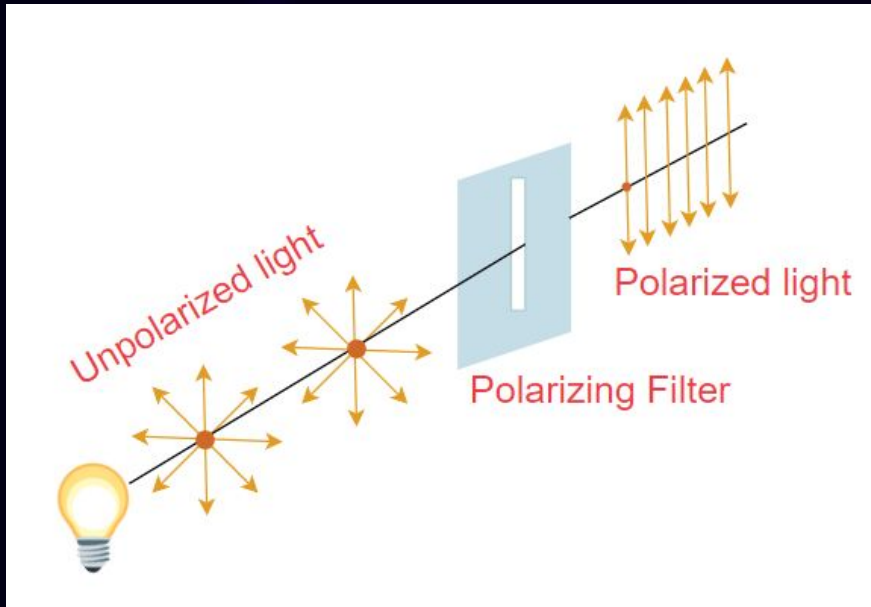
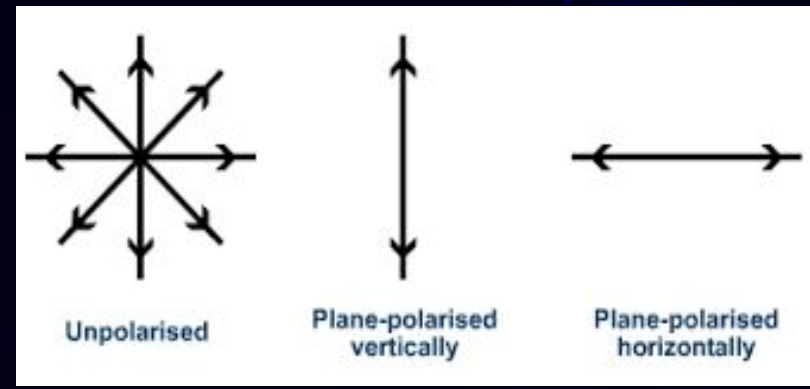
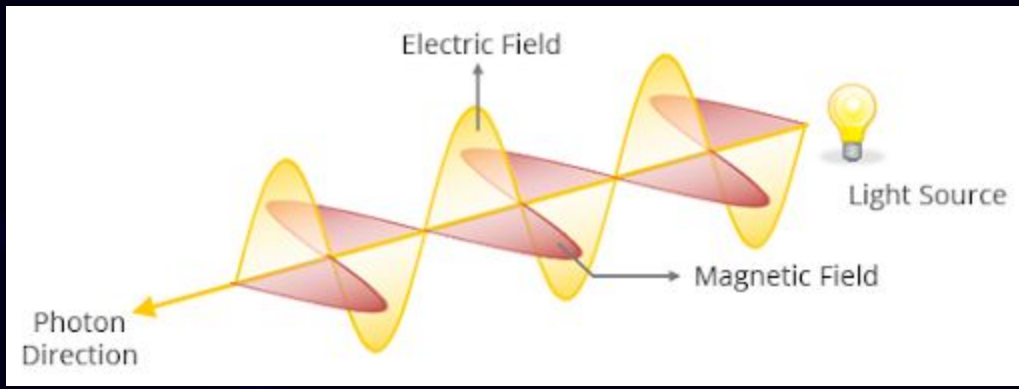
Telescope Improvement

James Webb Space
Telescope has already
managed to take more
complex photos of dark
nebulae (early stages of
star formation)

Examples

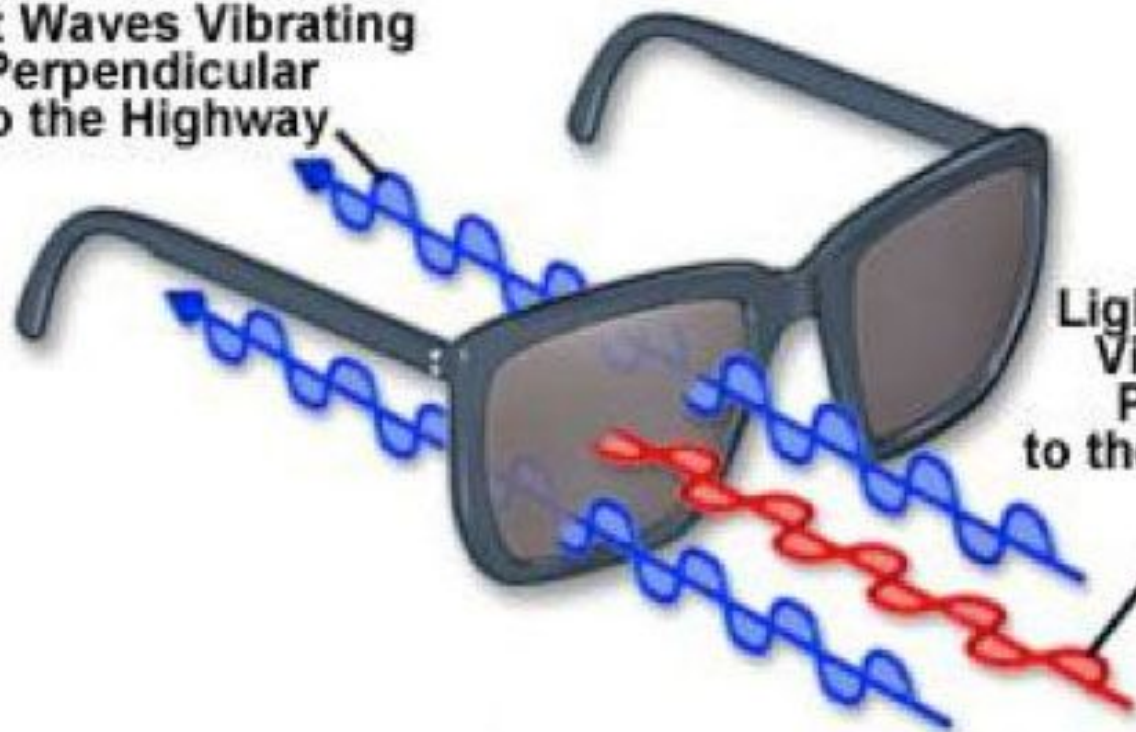
Polarization of Light





Action of Polarized Sunglasses

Light Waves Vibrating
Perpendicular
to the Highway



Light Waves
Vibrating
Parallel
to the Highway

Future Observations

Photograph dark
nebulae to observe
stellar activity →
internal structure, earlier
stages of star birth,
polarization of light
behind stars

Telescope Improvement

James Webb Space
Telescope has already
managed to take more
complex photos of dark
nebulae (early stages of
star formation)

Examples

Open Questions

1. More complex imaging of the 'Horse's Head' in the Horsehead nebula
2. Studying the chemical makeup of nebulae to identify complex organic molecules
3. Revealing the possible presence of protoplanetary disks near young stars

Bibliography

Byrne, Michael. "The Life and Times of a Dark Nebula Named 'Coalsack.'" *VICE*, 29 July 2024, www.vice.com/en/article/the-life-and-times-of-a-nebula-named-coalsack/#:~:text=The%20existence%20of%20the%20Coalsack,band%20of%20the%20Milky%20Way.

"Caldwell 99 - NASA Science." *NASA*, NASA, science.nasa.gov/mission/hubble/science/explore-the-night-sky/hubble-caldwell-catalog/caldwell-99/.

"The Coal Sack and the 'Emu in the...' Er, I Mean... the 'Llama in the Sky'?!" *Australian Indigenous Astronomy*, aboriginalastronomy.blogspot.com/2011/04/coal-sack-and-emu-in-er-i-mean-llama-in.html.

Coalsack Nebula, judy-volker.com/StarLore/Myths/Coalsack.html.

"Culture of Rapa Nui." *Polynesian Cultural Center*, 7 Jan. 2024, www.polynesia.com/polynesian-cultures/rapa-nui#overview.

"Dark Nebula Observing Program - Astronomical League." *Astronomical League*, 21 Feb. 2024, www.astroleague.org/dark-nebula-observing-program/#:~:text=Tripod%2Dmounted%20binoculars%20or%20a,more%20difficult%20optional%20dark%20nebulae.

"Edward Emerson Barnard." *Wikipedia*, Wikimedia Foundation, 6 Dec. 2024, en.wikipedia.org/wiki/Edward_Emerson_Barnard.

"Eso Astronomers Zoom in on Mysterious Coalsack Nebula." *Sci.News: Breaking Science News*, 14 Oct. 2015, www.sci.news/astronomy/science-eso-coalsack-nebula-03338.html#google_vignette.

Frommert, Hartmut. *The Coalsack Dark Nebula*, 20 Dec. 2011, www.messier.seds.org/xtra/ngc/coalsack.html.

"Zooming into the Coalsack Nebula." *Astronomy Now*, 14 Oct. 2015, astronomynow.com/2015/10/14/zooming-into-the-coalsack-nebula/.