



# The Hidden Hearts of Nearby Galaxies

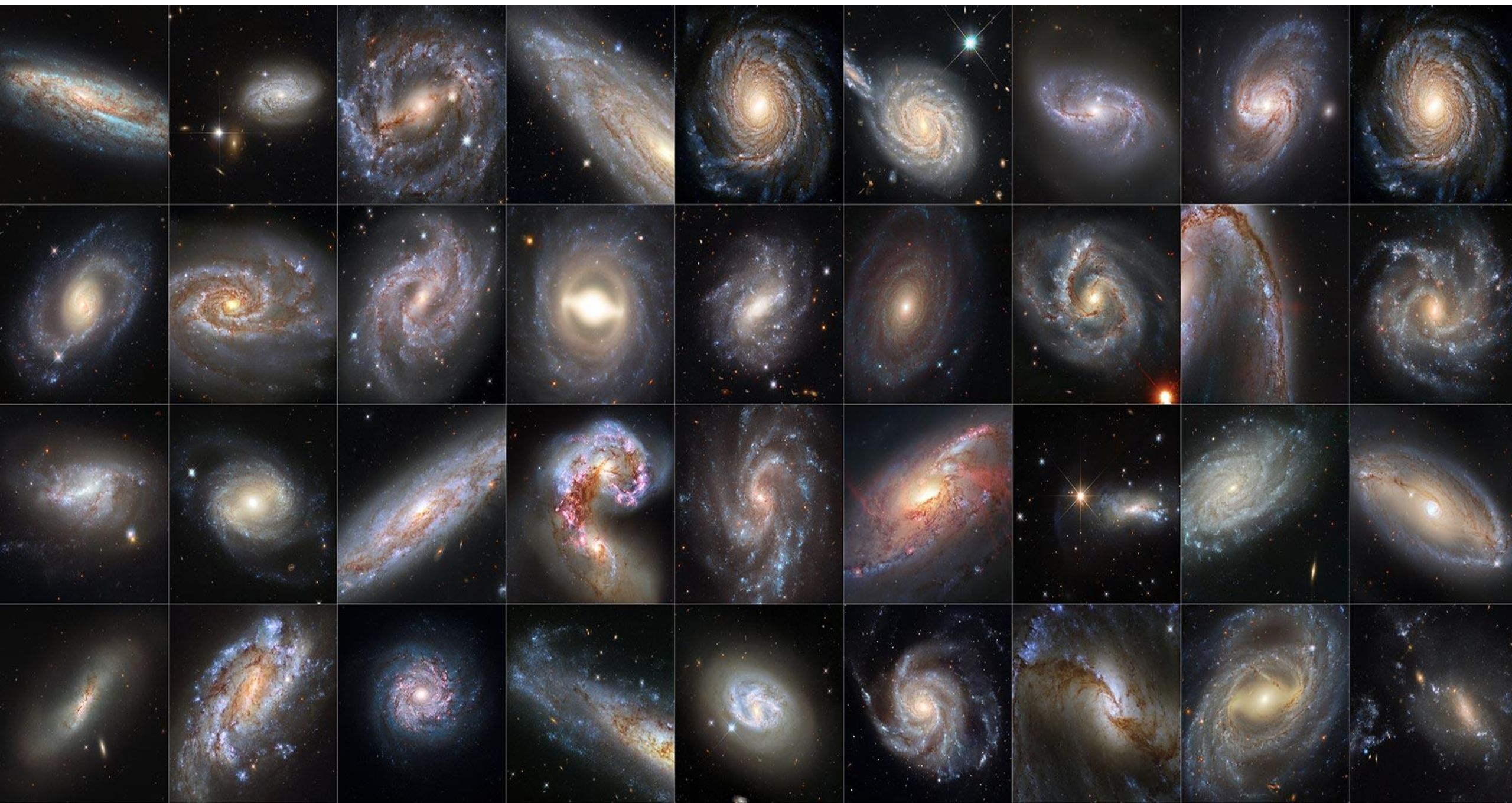
Mackenzie Dean



University of Colorado **Boulder**

Maria  
Mitchell  
Association







# Morphology: Spirals



*NASA and The Hubble Heritage Team (STScI/AURA)*



University of Colorado **Boulder**

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*SSRO/PROMPT and NOIRLab/NSF/AURA*



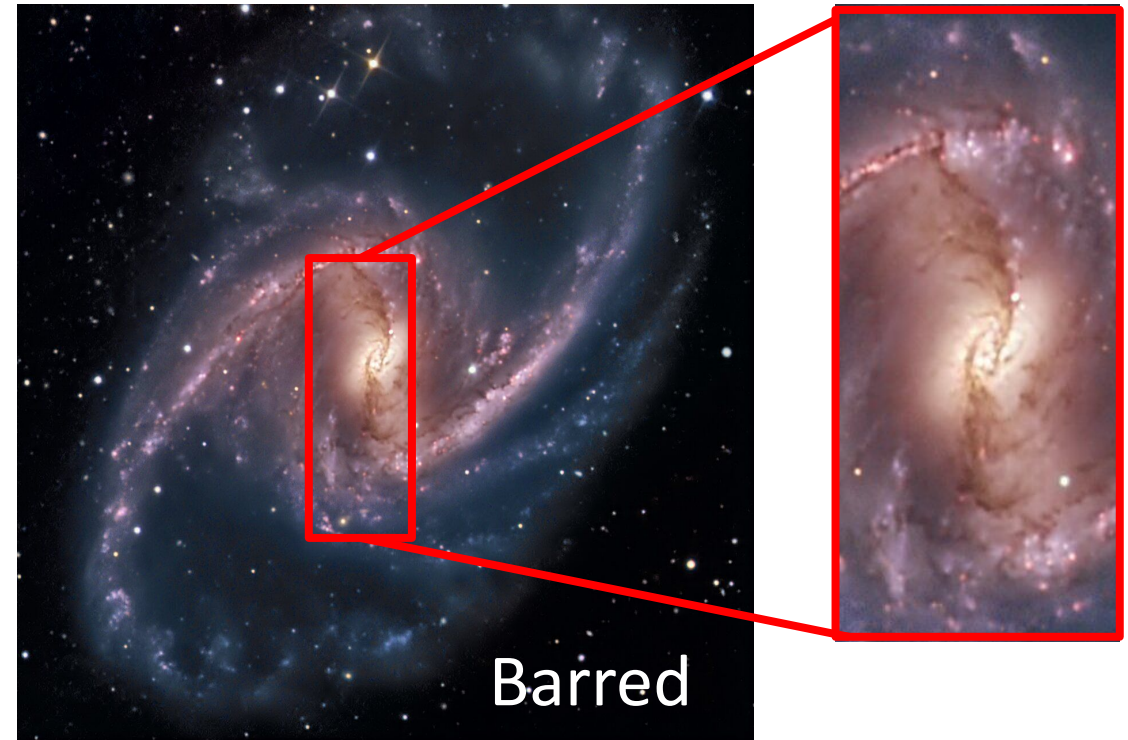
# Morphology: Spirals



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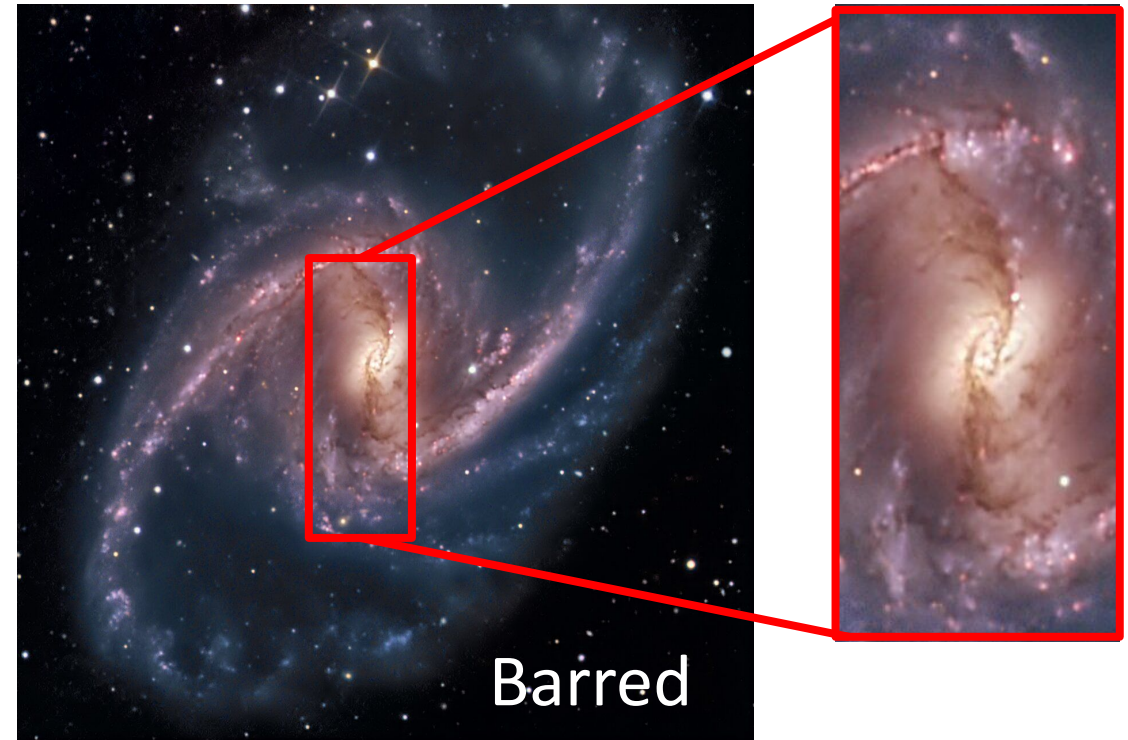
# Morphology: Spirals



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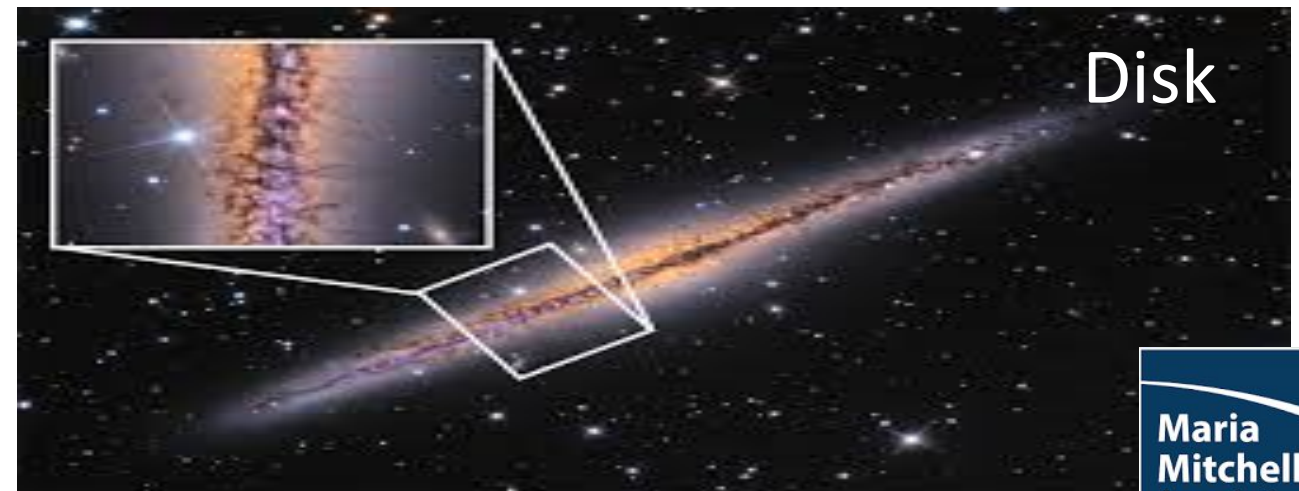


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Barred

SSRO/PROMPT and NOIRLab/NSF/AURA




Disk

Adam Block/Mount Lemmon SkyCenter/University of Arizona



# Morphology: Others



Elliptical Galaxy

*NASA, ESA, the Hubble Heritage (STScI/AURA)*



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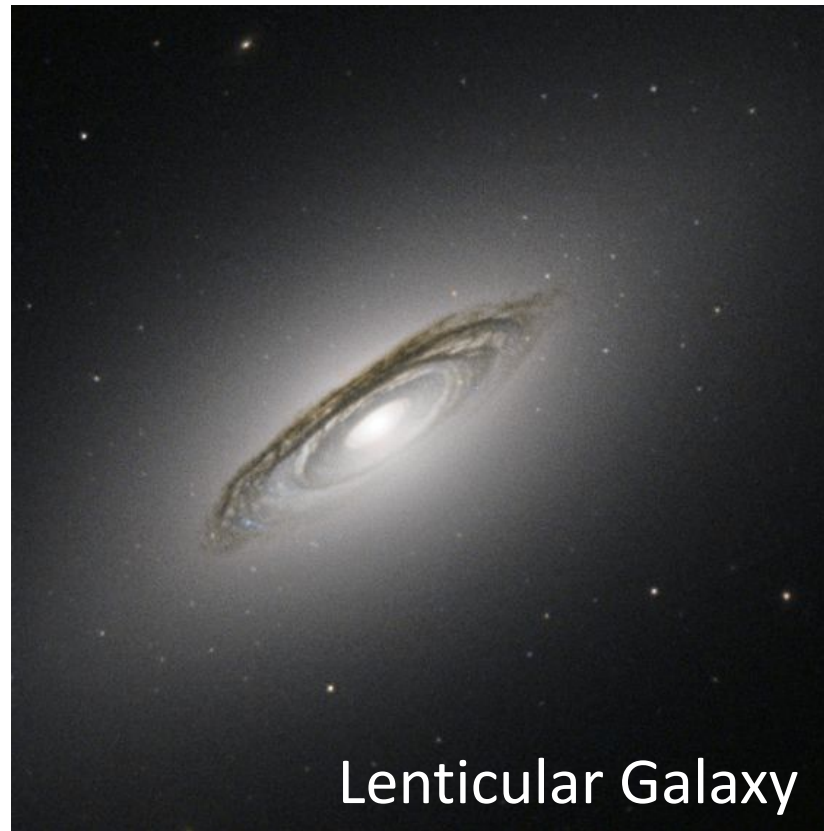




# Morphology: Others



*NASA, ESA, the Hubble Heritage (STScI/AURA)*



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# Morphology: Others



*NASA, ESA, the Hubble Heritage (STScI/AURA)*



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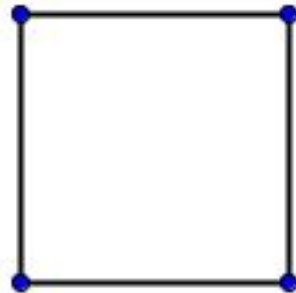




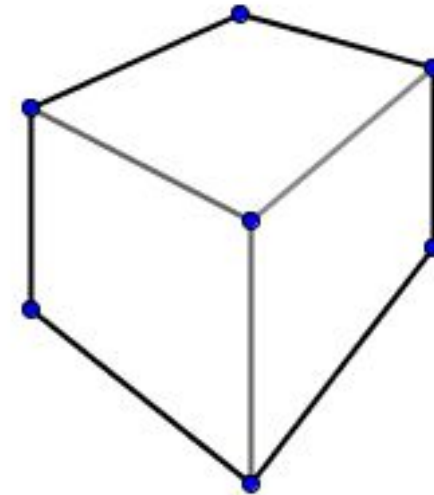
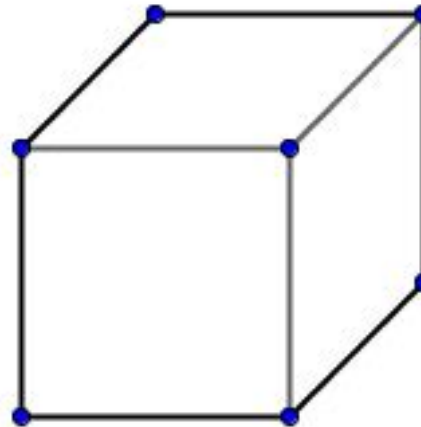
# Orientation

The relative arrangement of a geometric figure to your point of view

Cube is facing the viewer



Cube is rotated











NASA



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Shutterstock



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ESO



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0.1% of the  
entire  
universe!

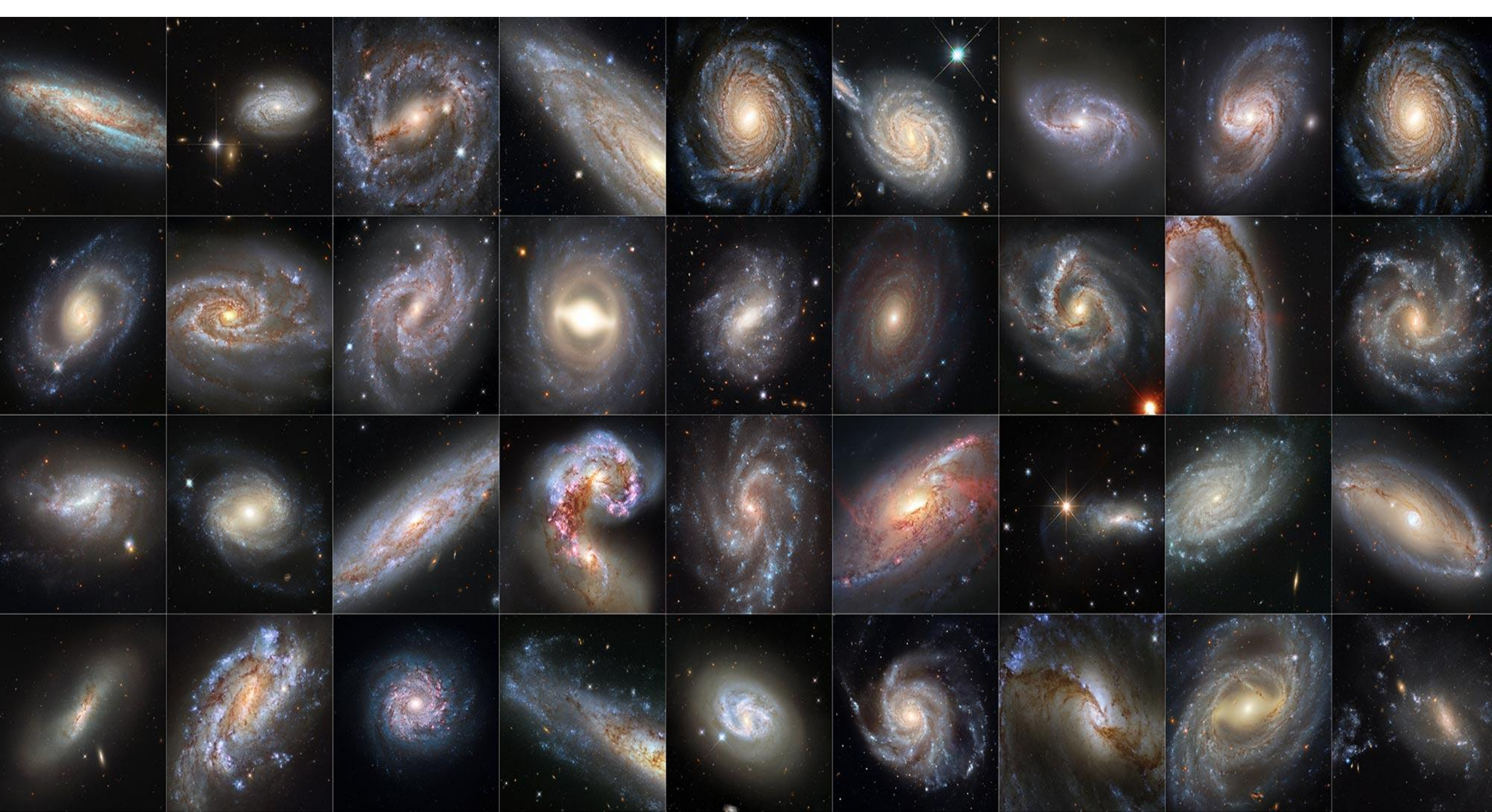
ESO



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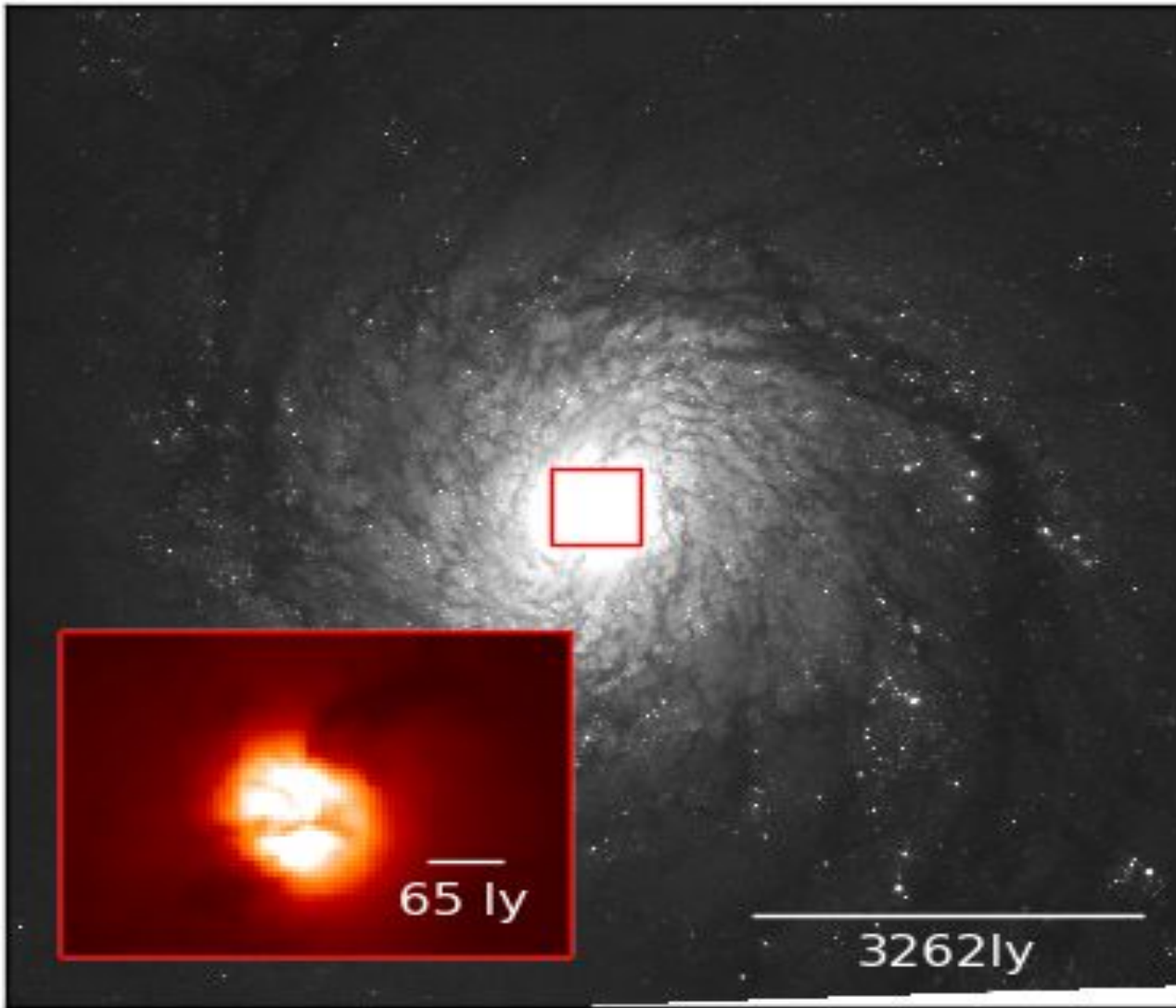
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NGC 5194



## Dust Features

- YES

## Morphology

- Spiral

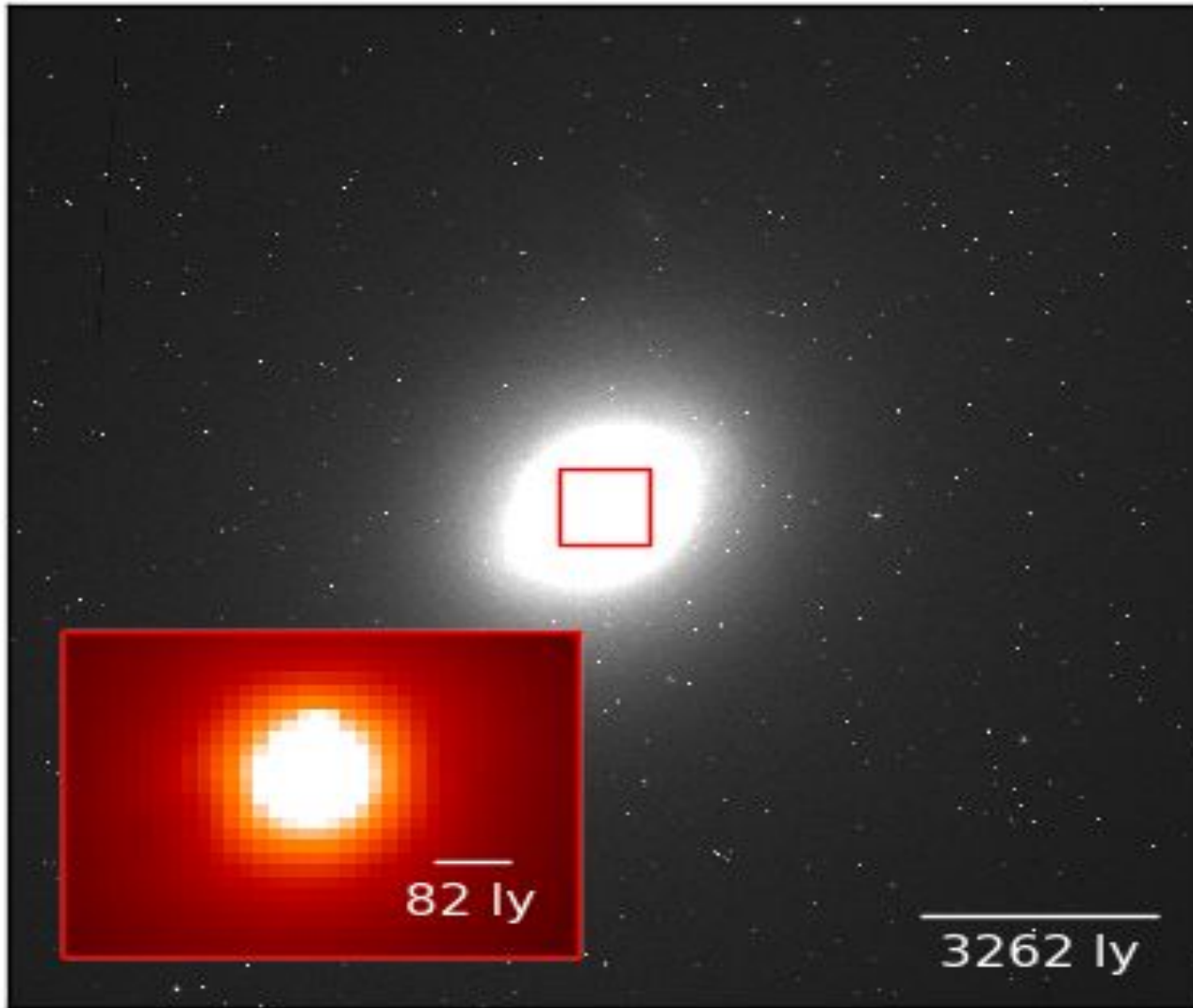
## Orientation

- Face-on galaxy





NGC 3998



## Dust Features

- NO

## Morphology

- Lenticular (smooth)

## Orientation

- Nearly face-on





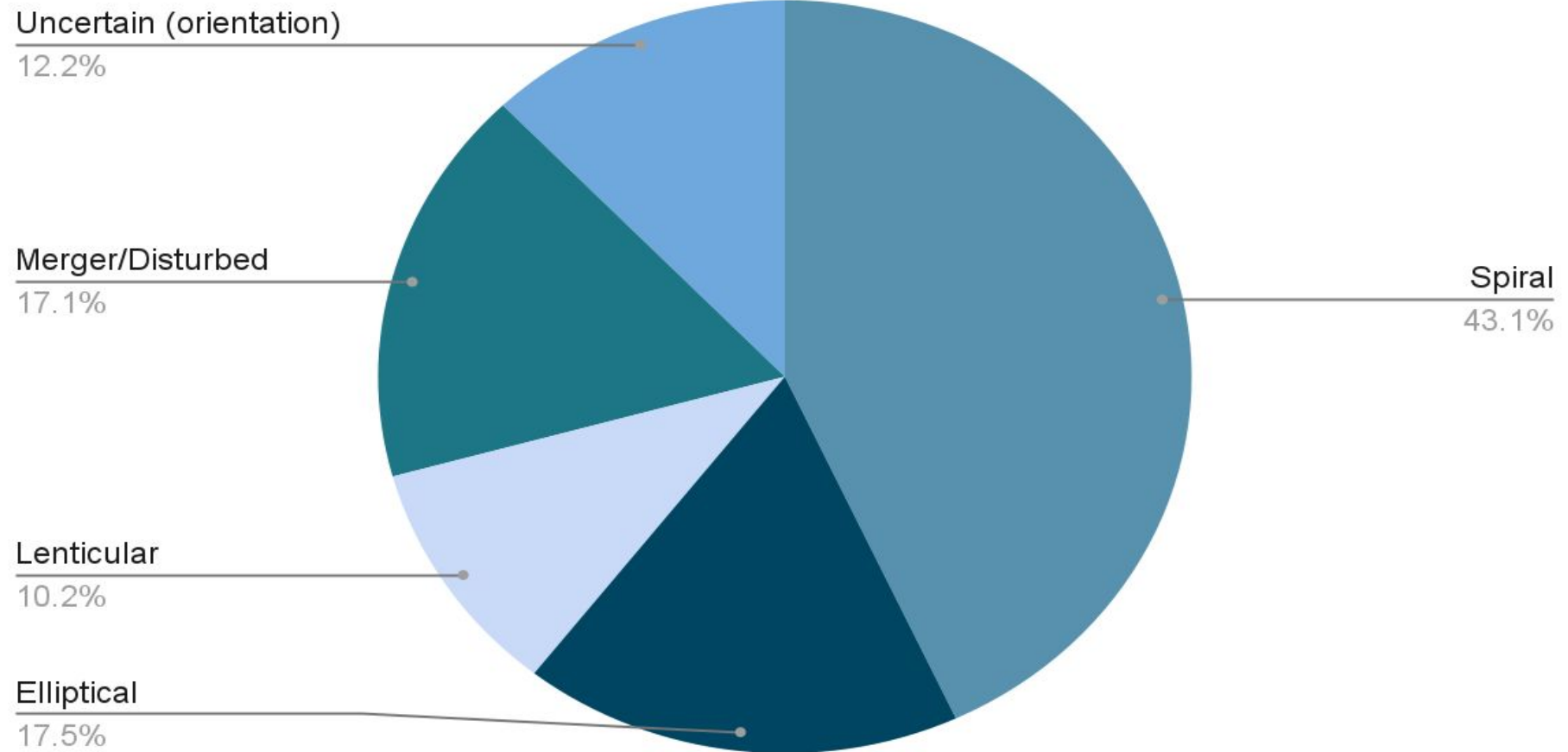
# 73% of sample exhibits dust!



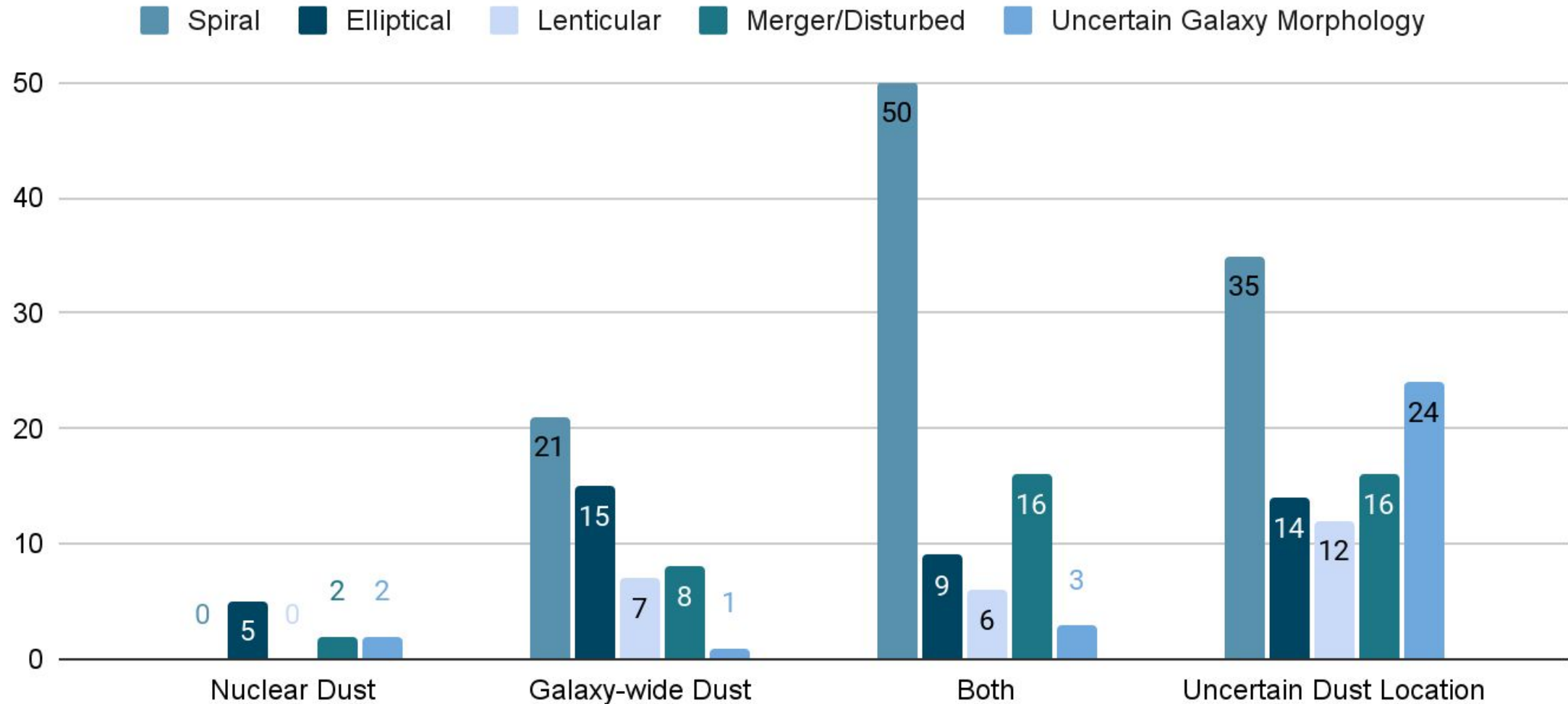


# 73% of sample exhibits dust!

## What Are The Morphologies?



# Does Galaxy Morphology Influence Where Dust is Found?





# Spiral Galaxies

- Younger stars
  - Needs dust!
- Visible structure
  - Needs dust!

\*Still using the dust!

# Elliptical Galaxies

- Older stars
  - No dust!
- No structure
  - No dust!

\*Used most/all dust!





# Spiral Galaxies

- Younger stars
  - Needs dust!
- Visible structure
  - Needs dust!

\*Still using the dust!

# Elliptical Galaxies

- Older stars
  - No dust!
- No structure
  - No dust!

\*Used most/all dust!

This is only the beginning...



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# DUST



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An abstract graphic featuring several overlapping circles in various shades of blue and teal. A dashed light blue line forms a circular path around the central elements. The background is a dark, starry space with a visible nebula on the left.

DUST

EVERYWHERE



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DUST

A diagram consisting of a central dark blue circle with the word 'DUST' in white, underlined. Surrounding this central circle are several other circles in various shades of blue and teal. Two of these surrounding circles contain the words 'EVERYWHERE' and 'IMPORTANT' in white, uppercase letters. A dashed light blue line forms a circular path around the central circle, passing through or near the other circles.

EVERYWHERE

IMPORTANT



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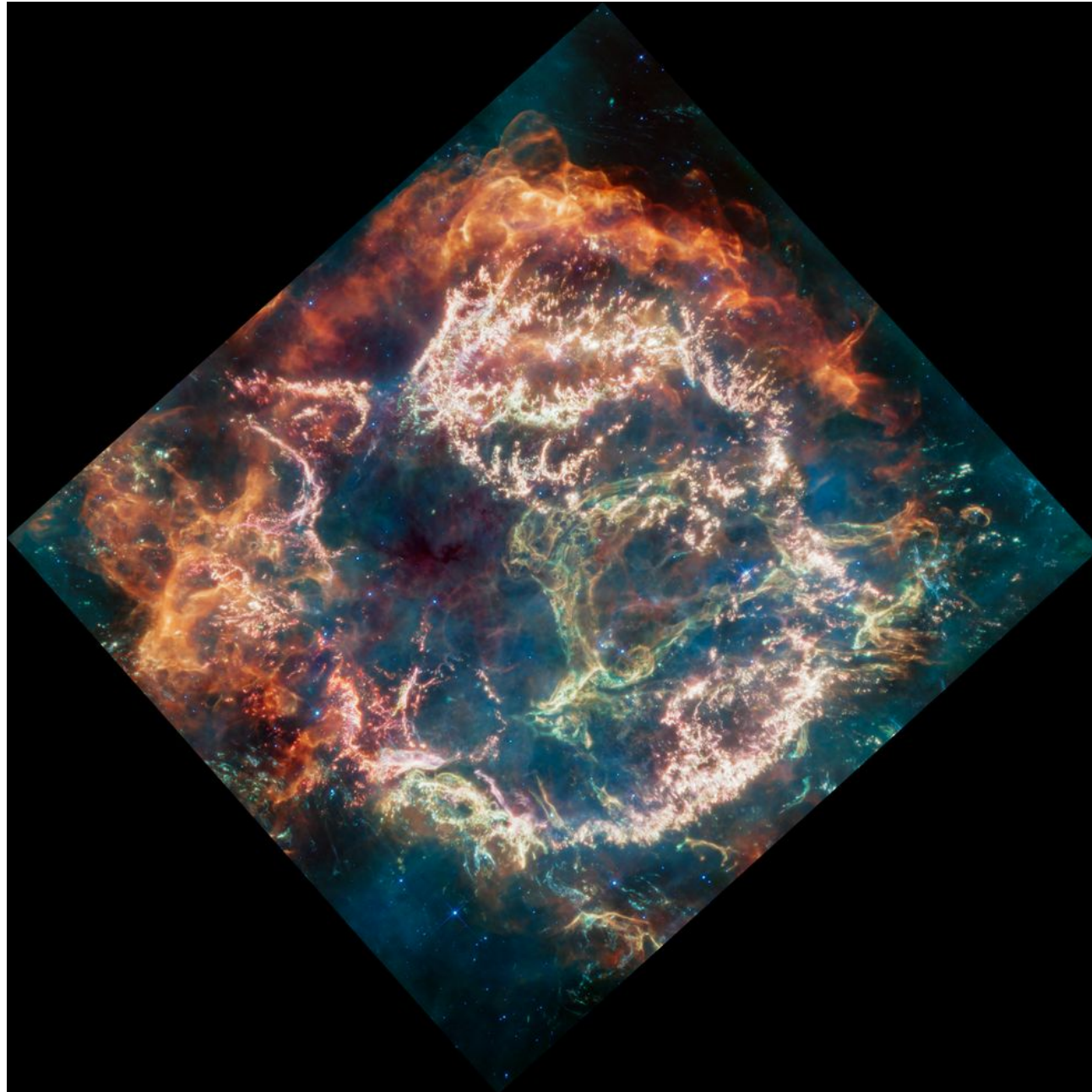


# Storytelling

We are made of  
star stuff! And  
without dust,  
nothing would  
exist!



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**Be Boulder.**

# Current and Future Science

## 1. AGN Unification Model

- a. Proposed that apparent differences in observed objects is purely due to their orientation with respect to our line of sight! Which might mean that all AGN are built the same, they just seem different!

## 2. Specific Galaxy Research

- a. Our sample and findings can be used as a resource for other scientists/researchers to build their work off of!





# Other Relationships!

1. Dust and X-Ray Luminosity
  - a. Does the galaxy use the dust to fuel it, making it shine brighter and at higher energy levels?
2. Dust and Column Density
  - a. Is the obscuring material density related to the existence of dust in a galaxy?
3. Dust and AGN Growth Rate
  - a. Does the existence of dust around the nucleus help the supermassive black hole at the center grow faster/bigger?

