The Dawn of Black Hole Astronomy

What can be inferred from the image of M87*? What are the next tasks and targets?

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in your future

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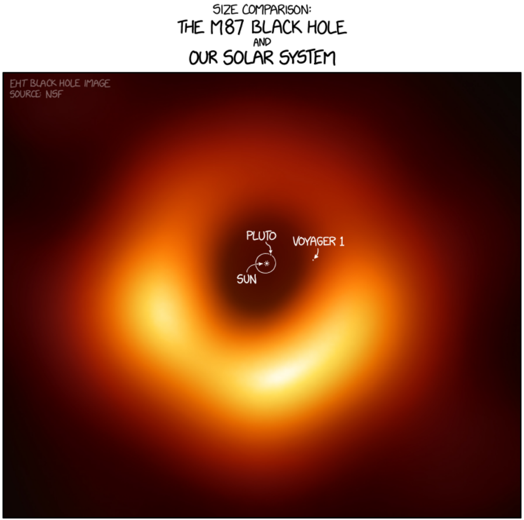

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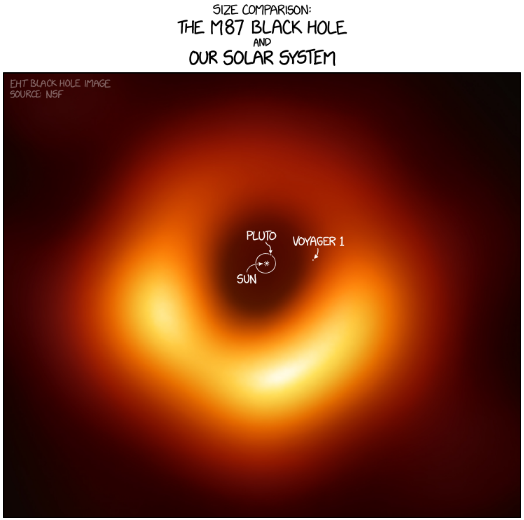

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Does M87* spin? A look at its jet and accretion disk

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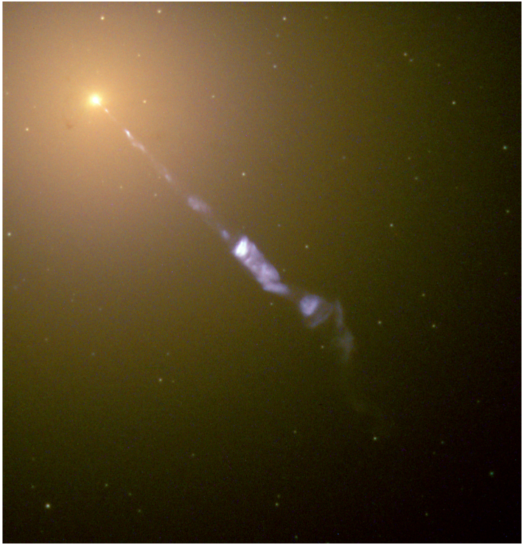

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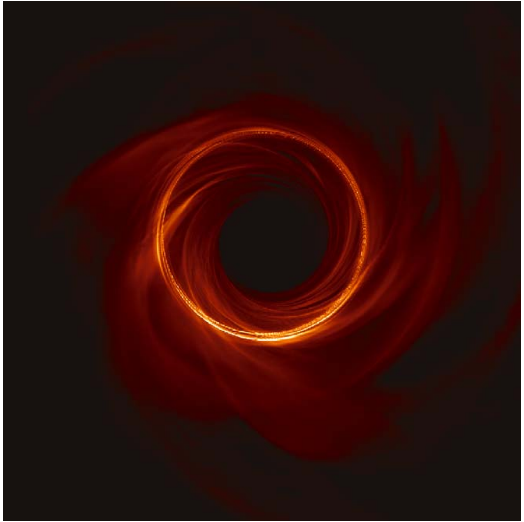

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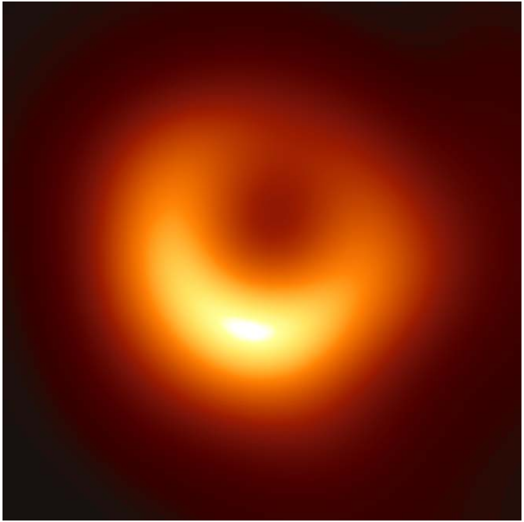

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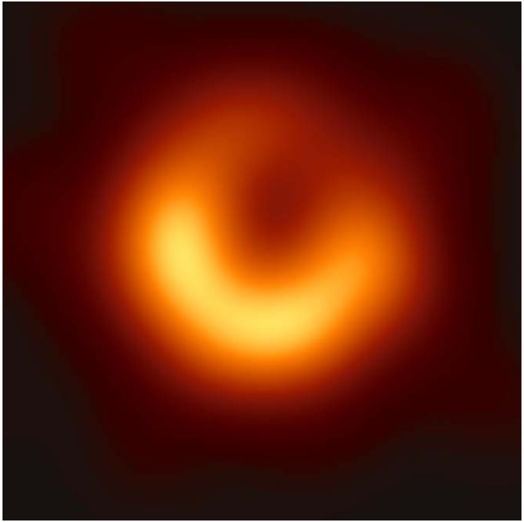

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  - The EHT does *not* (directly) observe event horizons of black holes.
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- What can we learn about the nature of the central object in M87*?
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    - pass through (boson star, wormhole...),
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  - The accretion disk around a black hole (and similar objects) is truncated at the ISCO.

  $\Rightarrow$ No visible inflow within the central region, consistent with a truncated disk.

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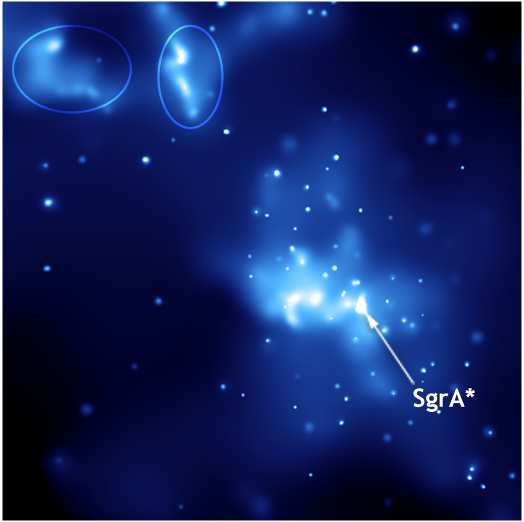
- Can polarization tell us anything about gravity and the central object?
  - In general relativity, light propagates independent of polarization in vacuum.
  - Alternative theories may include “vacuum birefringence” - speed of light differs.
  - Lensing at a massive object may lead to two polarized images of what is behind.
  - $\Rightarrow$ Observational signature to seek in future observations.

The black hole in our backyard: the challenge of observing Sgr A*

- Some facts about Sgr A*:
  - Located in the center of our galaxy.
  - Distance from Earth $\approx$ 7860pc.
  - Estimated mass $4 \cdot 10^6 M_\odot$.
  - $\Rightarrow$ Nearby object of intermediate mass!



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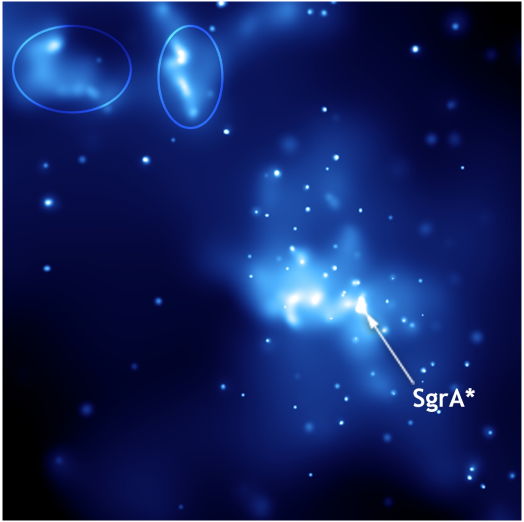
  - $\Rightarrow$ Better candidate for direct observation?



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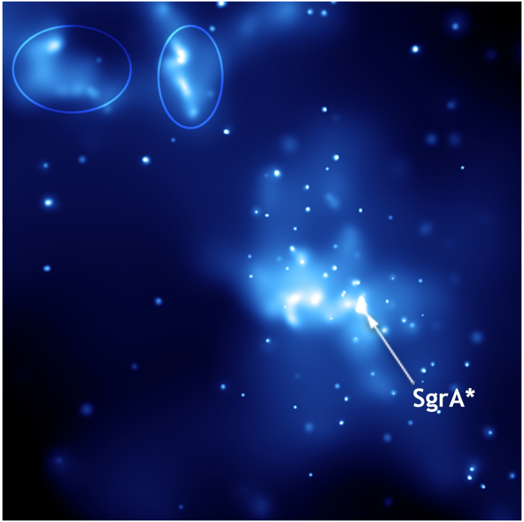
- Difficulties observing Sgr A*:
  - Matter moves at $\approx$ min timescales.
  - $\Rightarrow$ Dynamic object, shorter integration time.
  - Interstellar medium scatters radio waves.
  - $\Rightarrow$ Need to compensate for image distortion.



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$\Rightarrow$ Observations of dark objects are likely to have a bright future.