Black Hole CN - I

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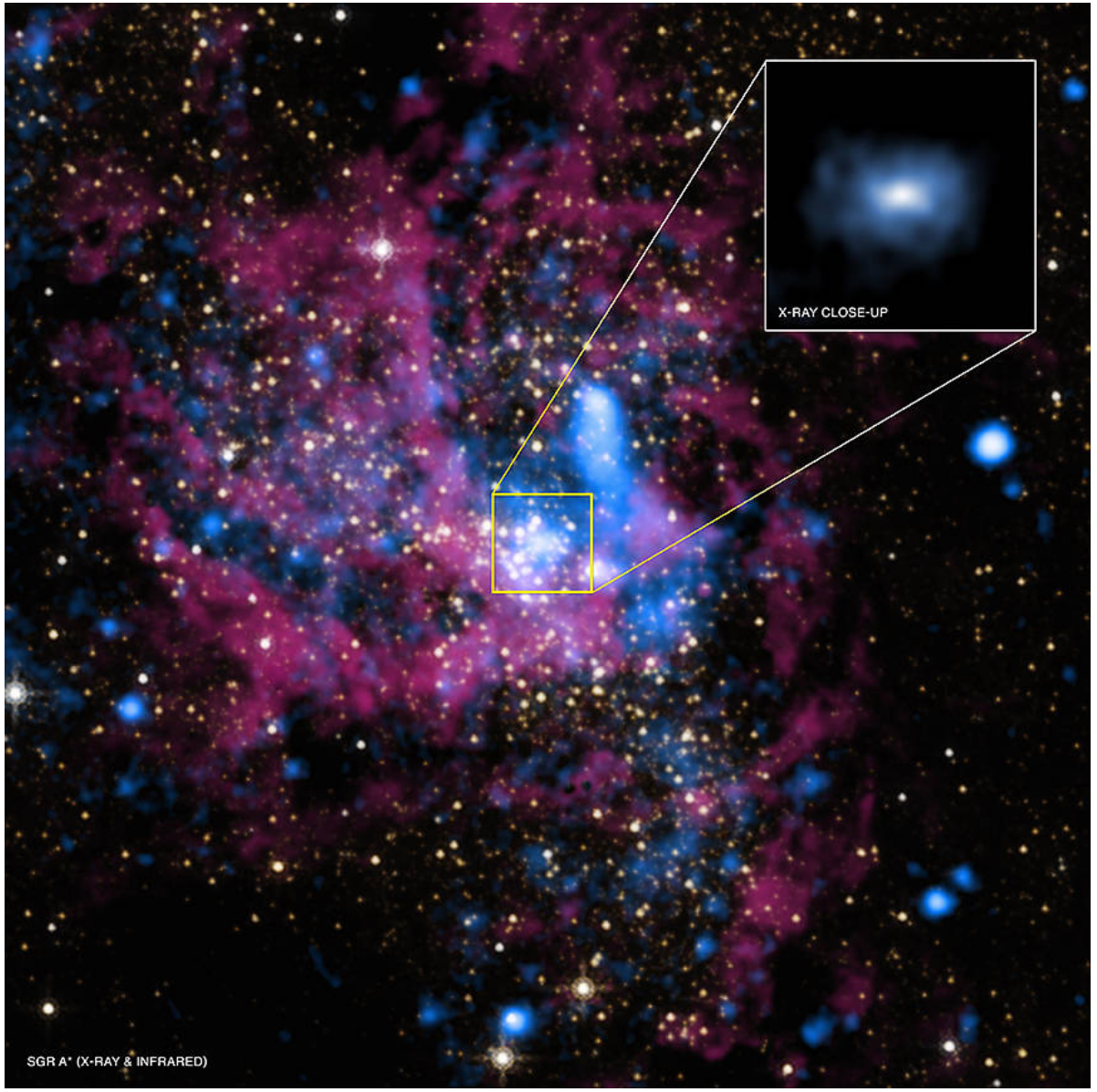
Origins Cluster, Connector Brainstorming, 19.10.22



Black Hole Sagittarius A*

GW150914

GW151226

(Image credit: LIGO/A)

Event Horizon Telescope:

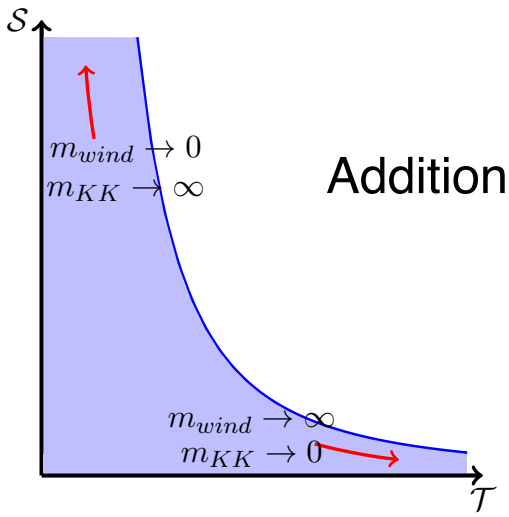
- Image of a Black Hole on April 10, 2019

Research High Lights of CN-1

- Quantum properties of BHs in string theory (Hawking radiation, entanglement, swampland)

(I. Lavdas, D.L., ……)

BH Phase diagram:



Additional particles at low temperature

- Symmetry properties of BHs

(I. Sachs, …..)

- BHs and information storage

(G. Dvali, ….)

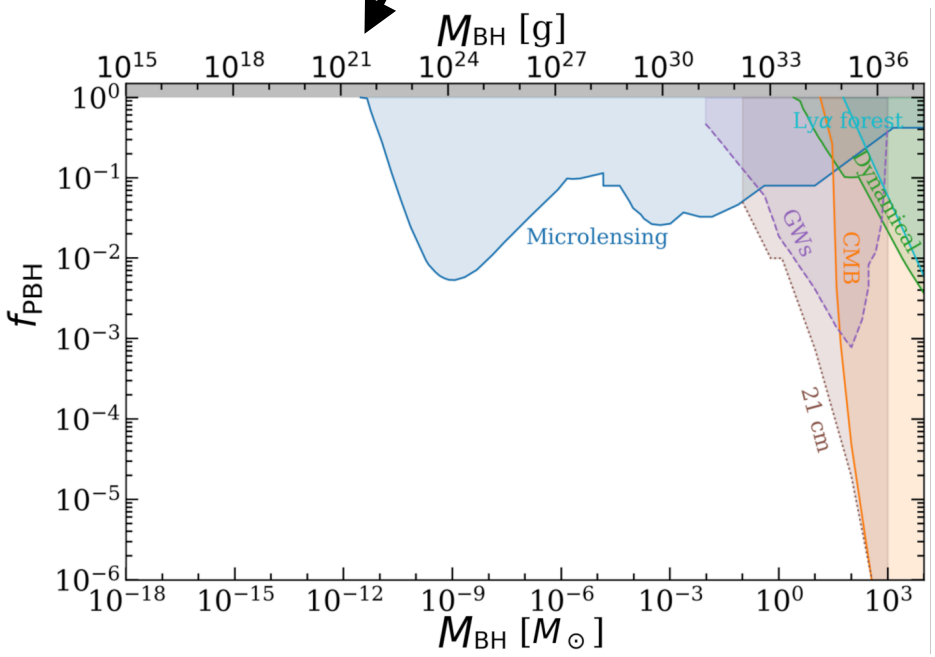
- Primordial BHs as dark matter

(G. Dvali, ….; D.L. …….)

$$r_s \simeq R_5$$

5-dimensional primordial BHs
the dark universe:

$$r_s < R_5 \sim (\Lambda_{c.c.})^{-1/4} \sim \mathcal{O}(\mu m)$$



- The Galactic centre black hole

MPE led Gravity interferometer @ ESO Very Large Telescope

Measuring orbits around Sgr A *:

Gravitational redshifts in the orbit of star S2

Orbital motion of hot gas close to the BH

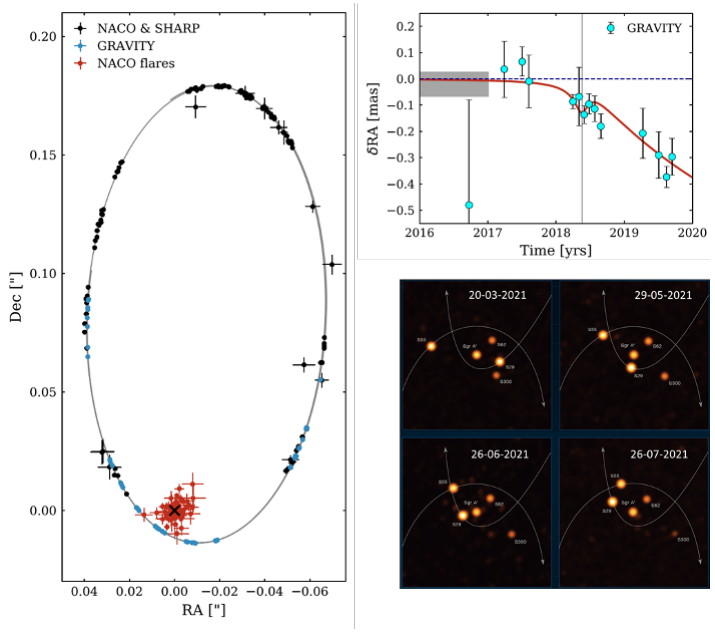


Figure: Left: Orbit of the star S2 from 1992 to the end of 2019. The orbit does not close as result of the Schwarzschild precession (top right, deviation from the Newtonian orbit). Bottom: deepest and sharpest images to date of the region around the supermassive black hole. The new images zoom in 20 times more than what was possible before GRAVITY.

Future prospects for continuation of CN-1:

- Very active field of research
- Potentially many connections with other fields:
  in particular BHs as dark matter.

  (A. Burkert, G. Dvali, D.L.)
- So far little interactions among the CN and with other groups

There was one CN-1 Science afternoon in January 2021