Die mysteriöse Symbiose zwischen schwarzen Löchern und Galaxien

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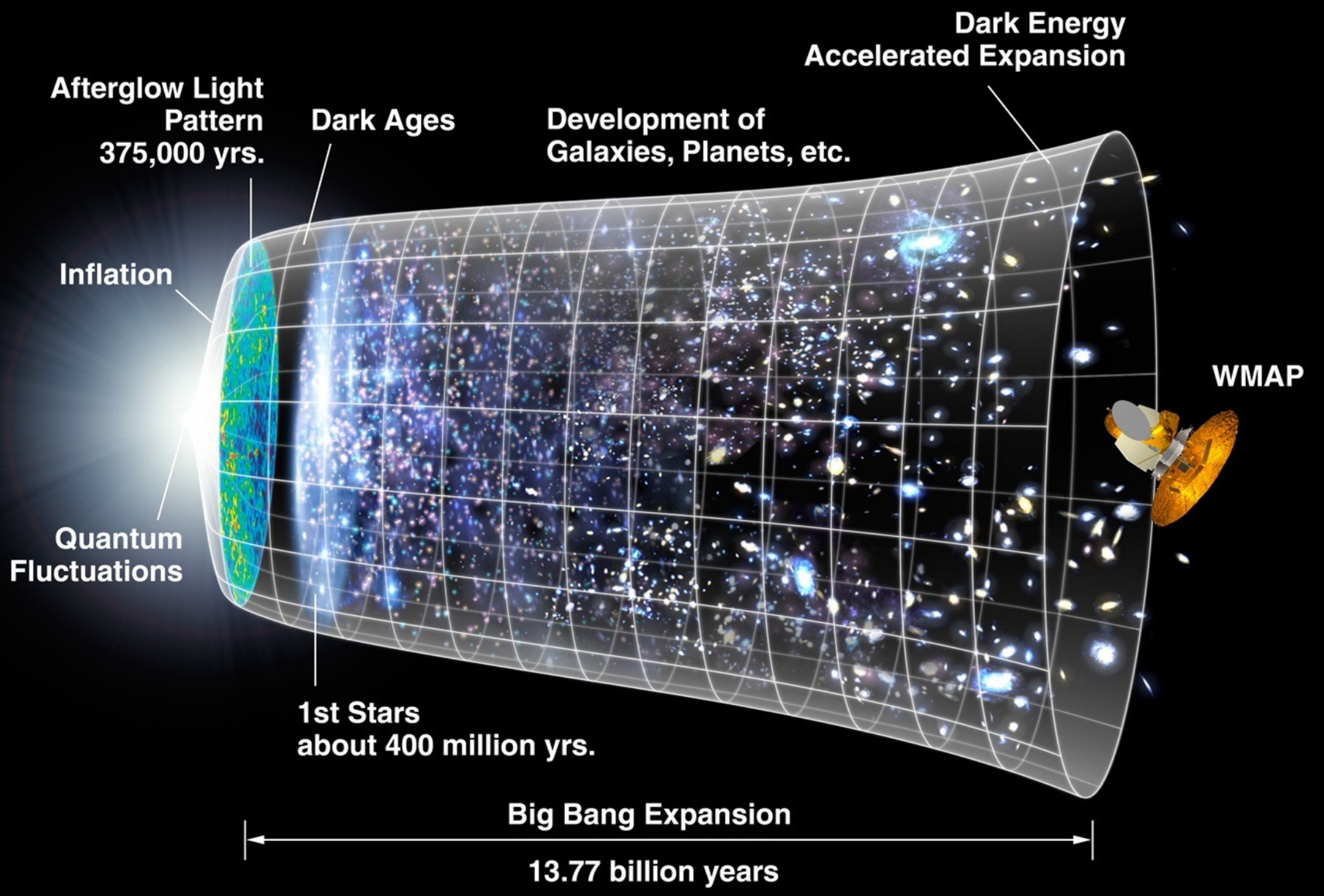
ETH black hole group
(our coffee is radio-loud)



NASA/WMAP Science Team

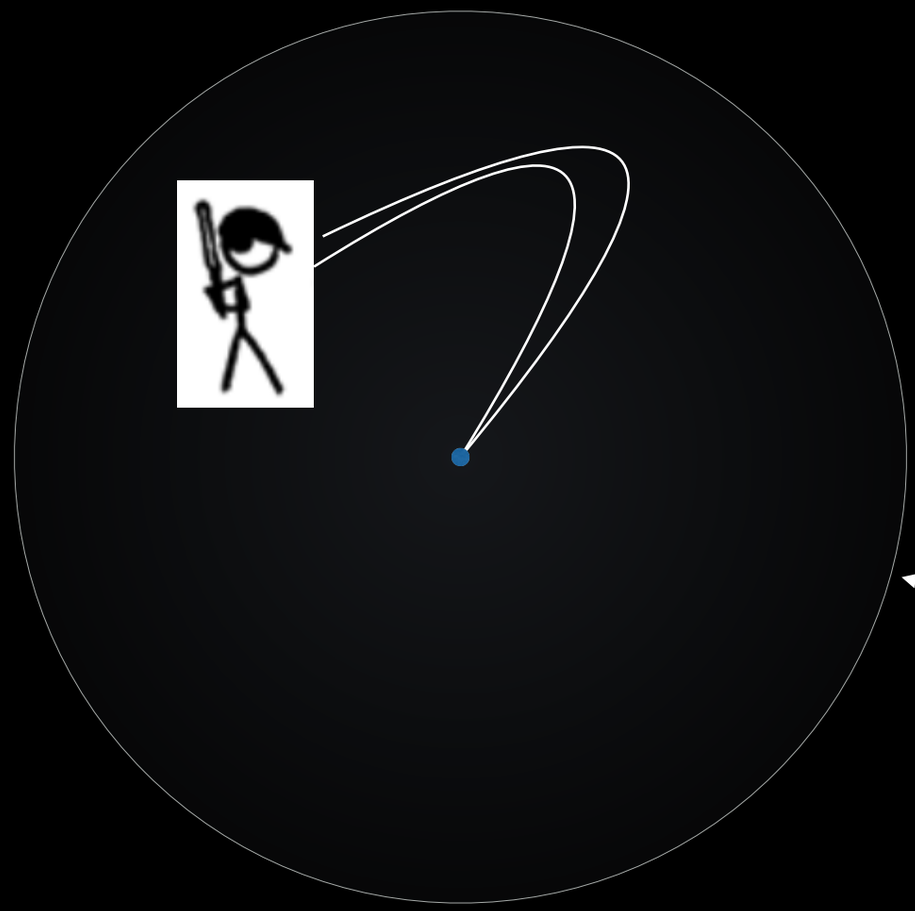
Was ist ein Schwarzes Loch?

Masse **M**

Wachstum **Ṁ**

Spin **a**

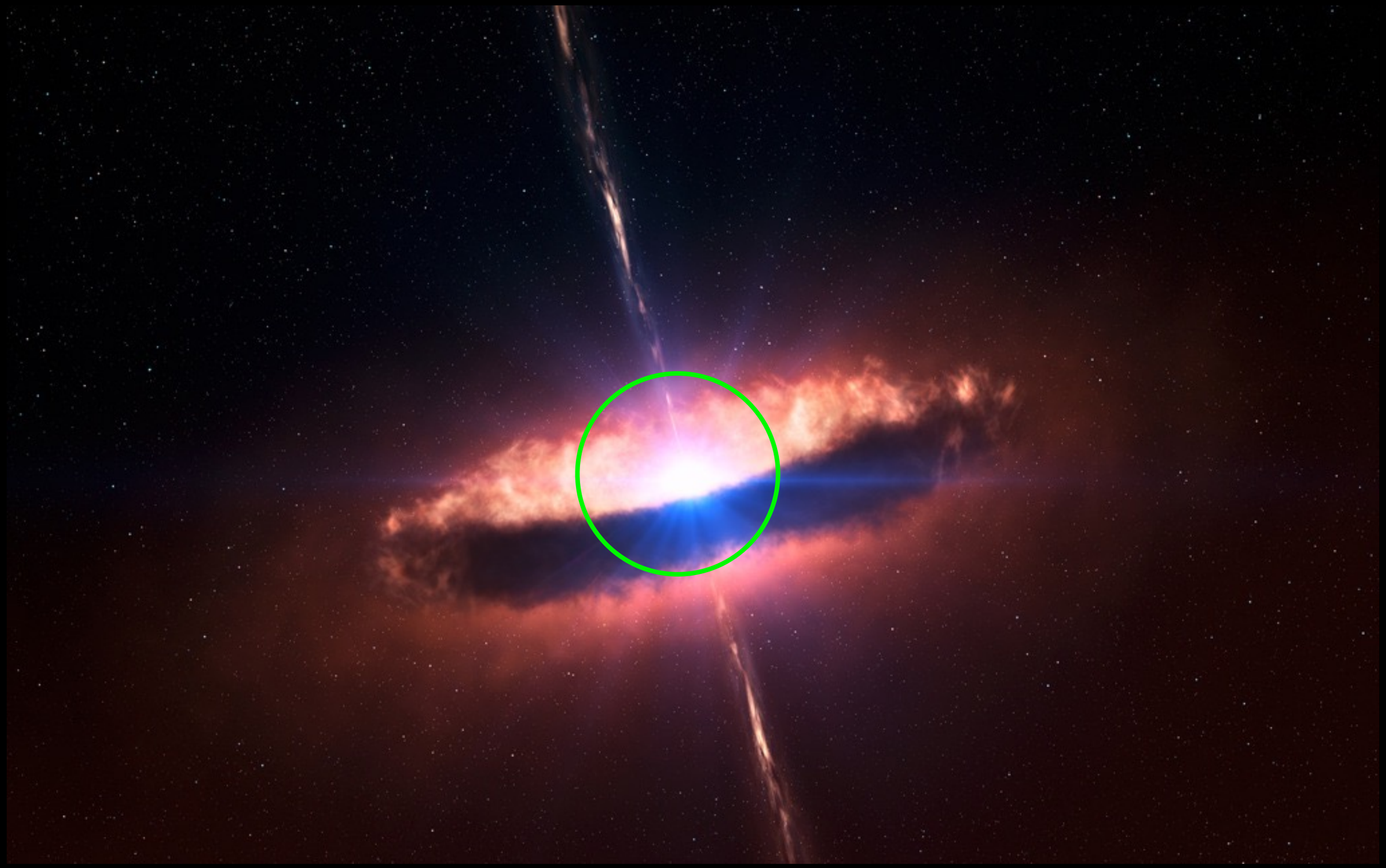
Ladung **Q**

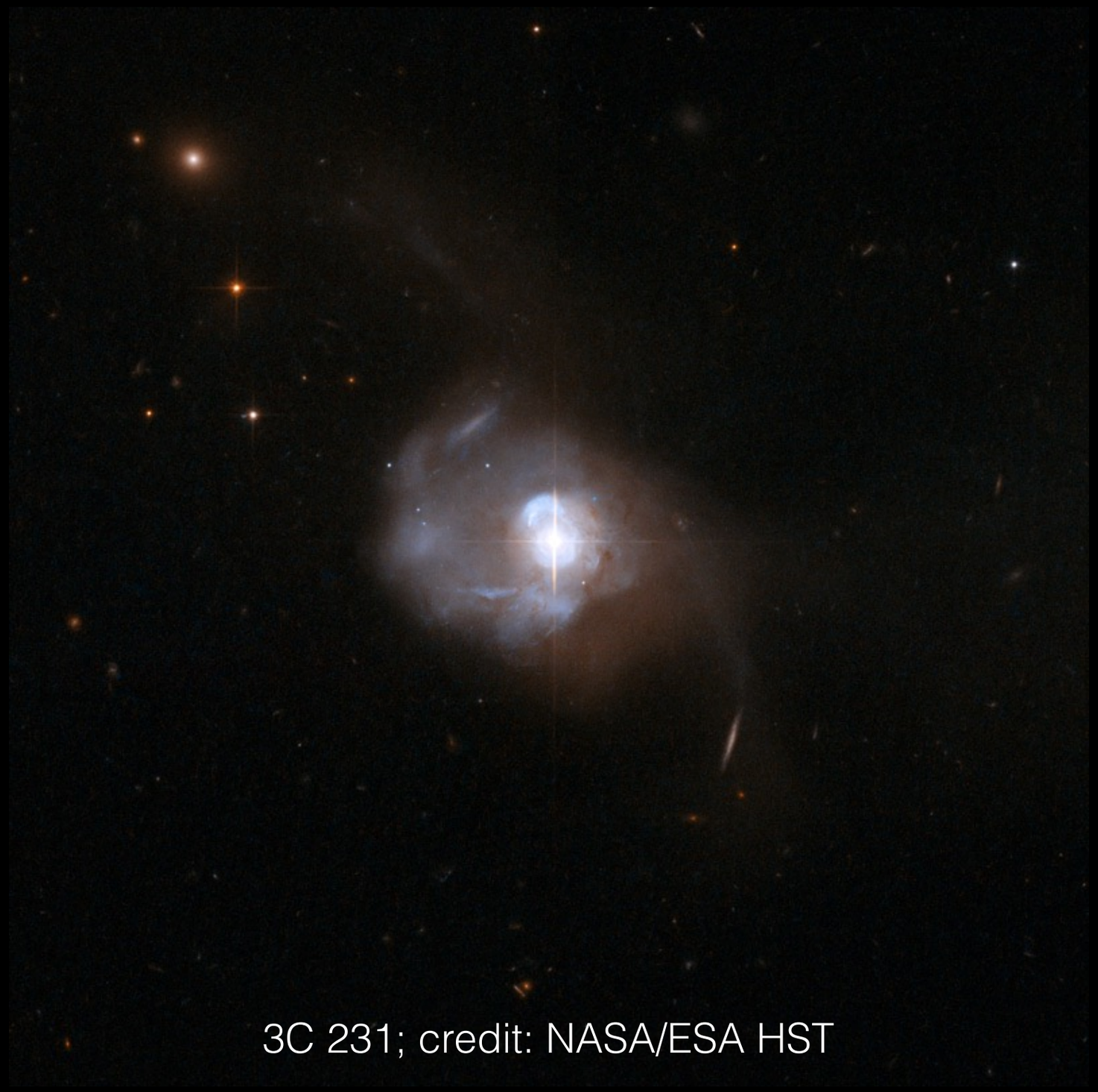


Ereignishorizont
Event Horizon

credit: NASA

credit: cosmocurio/wikipedia





3C 231; credit: NASA/ESA HST

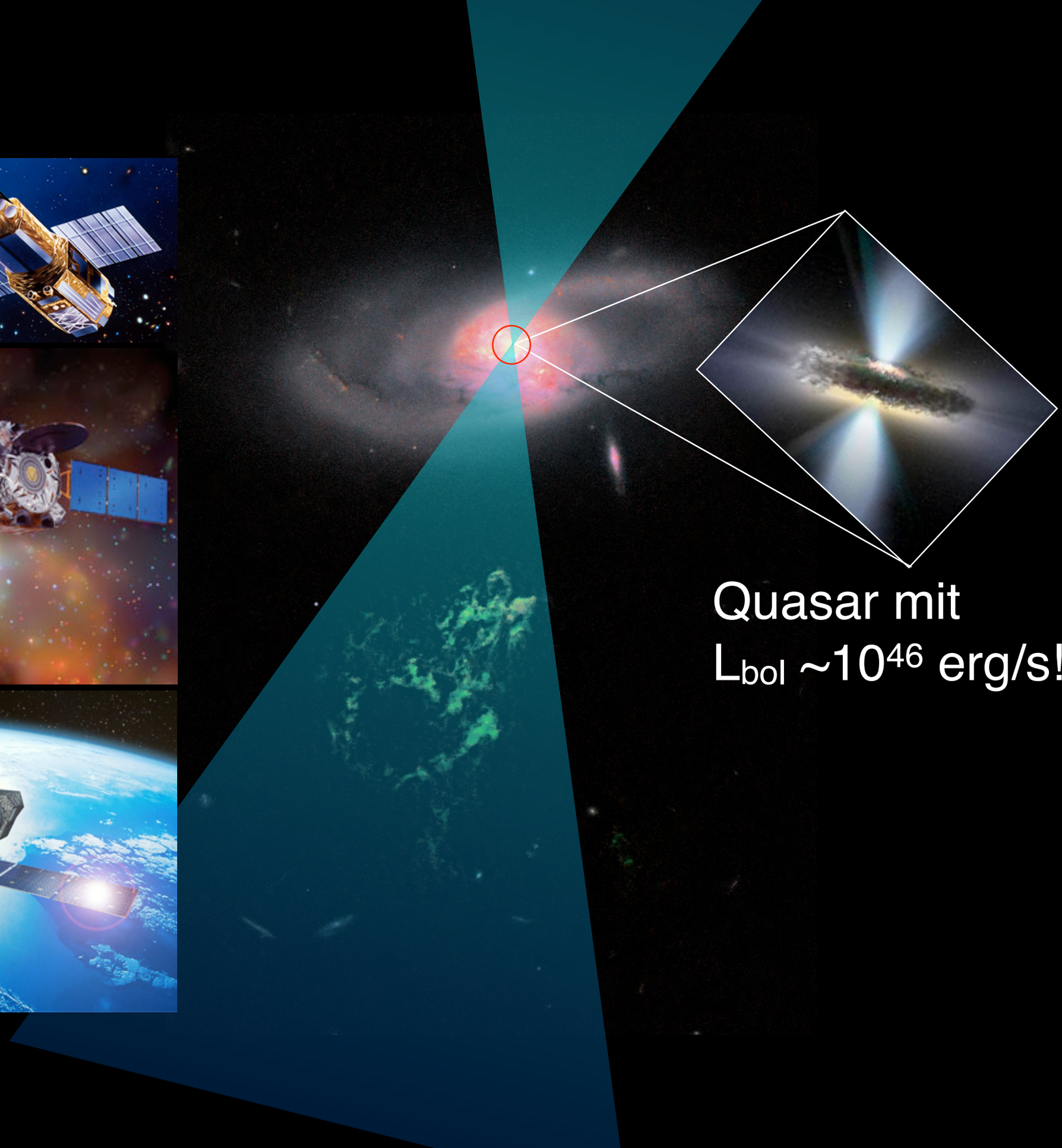
Credit: UniverseToday

Credit: Andrea Ghez, UCLA Galactic Center Group, Keck Observatory

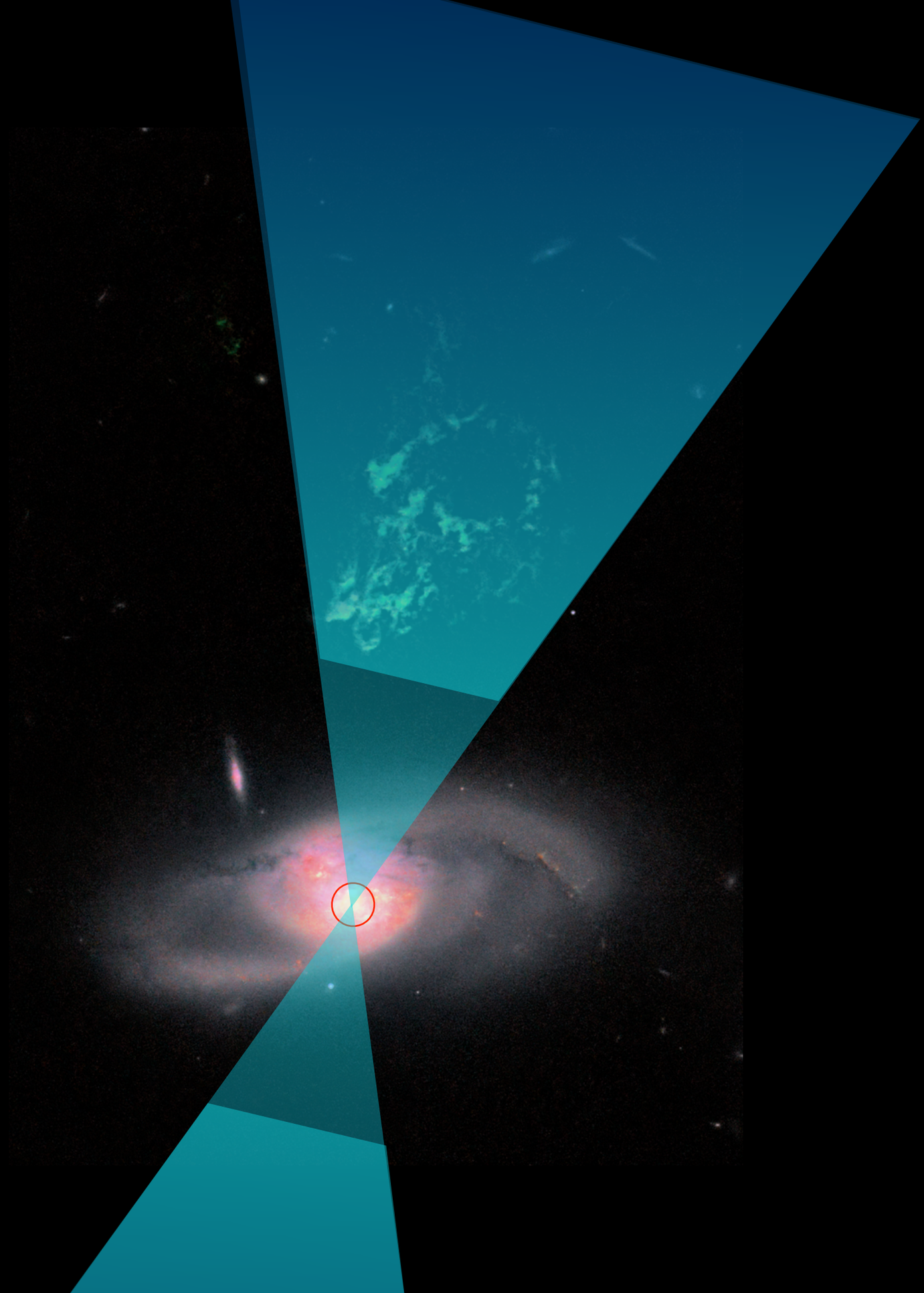
Citizen Scientist Hanny van Arkel
Objekt (Voorwerp) nach ihr benannt

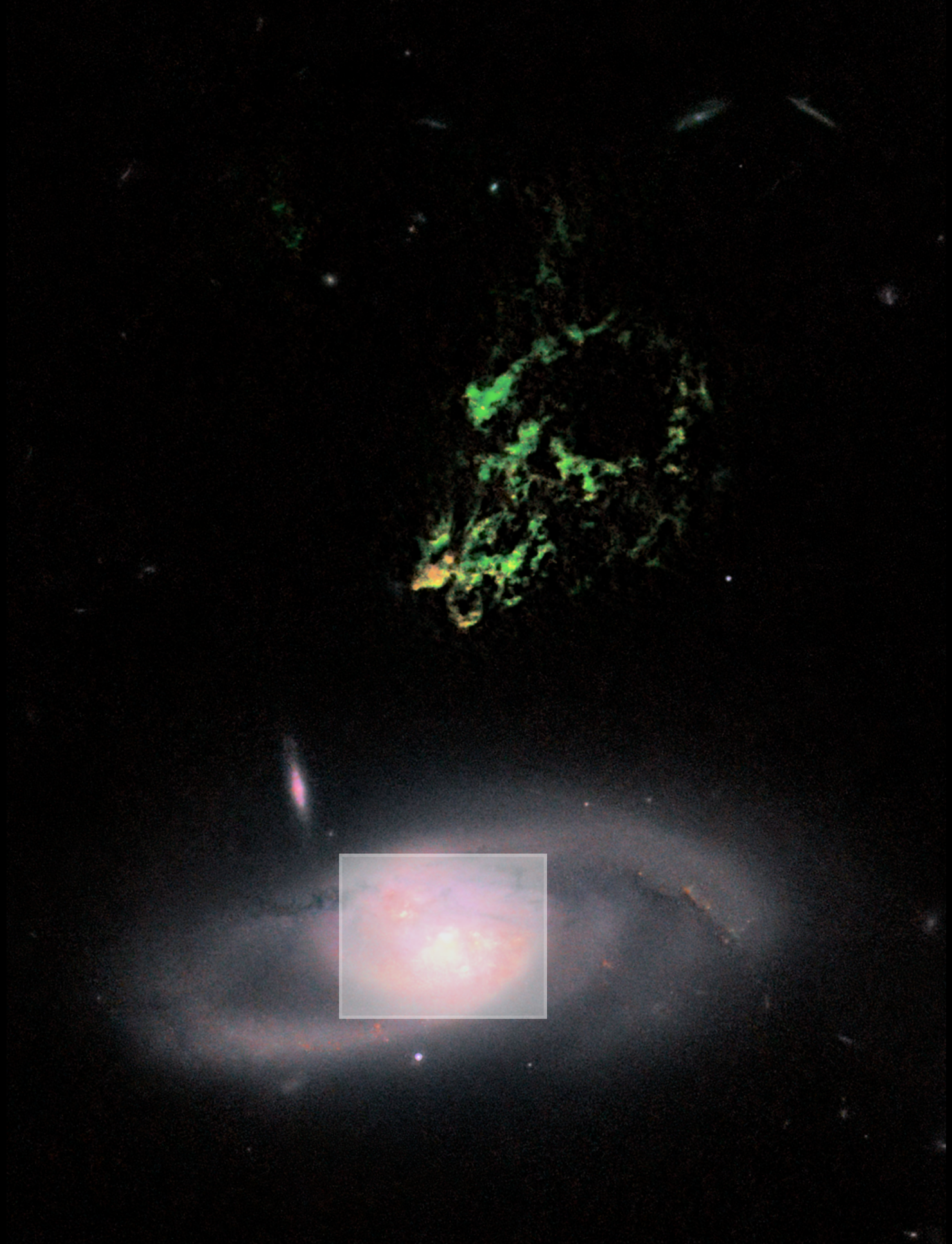
Galaxie IC 297
Masse ~1e12 Msun
z=0.05

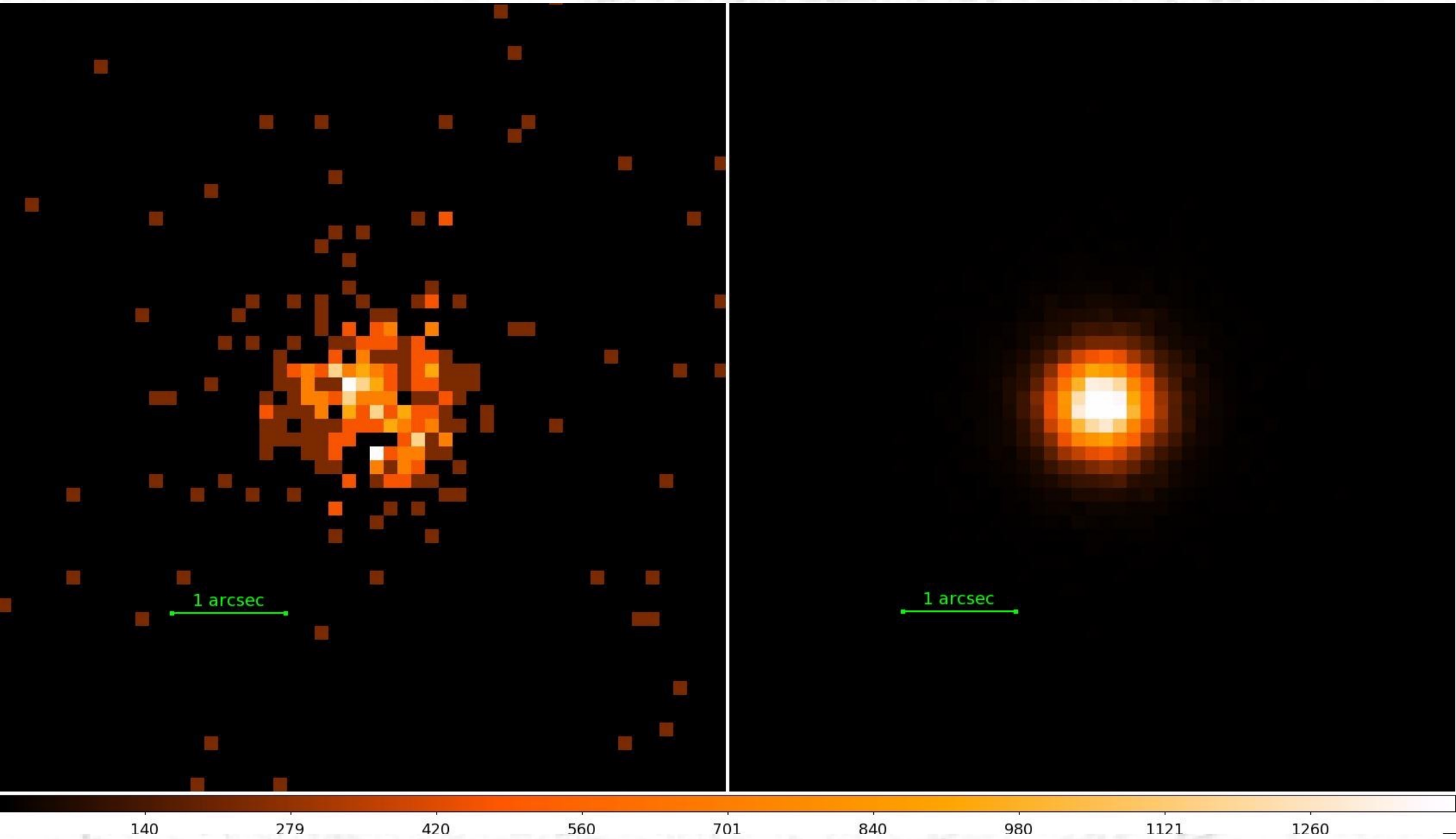
Hanny’s Voorwerp



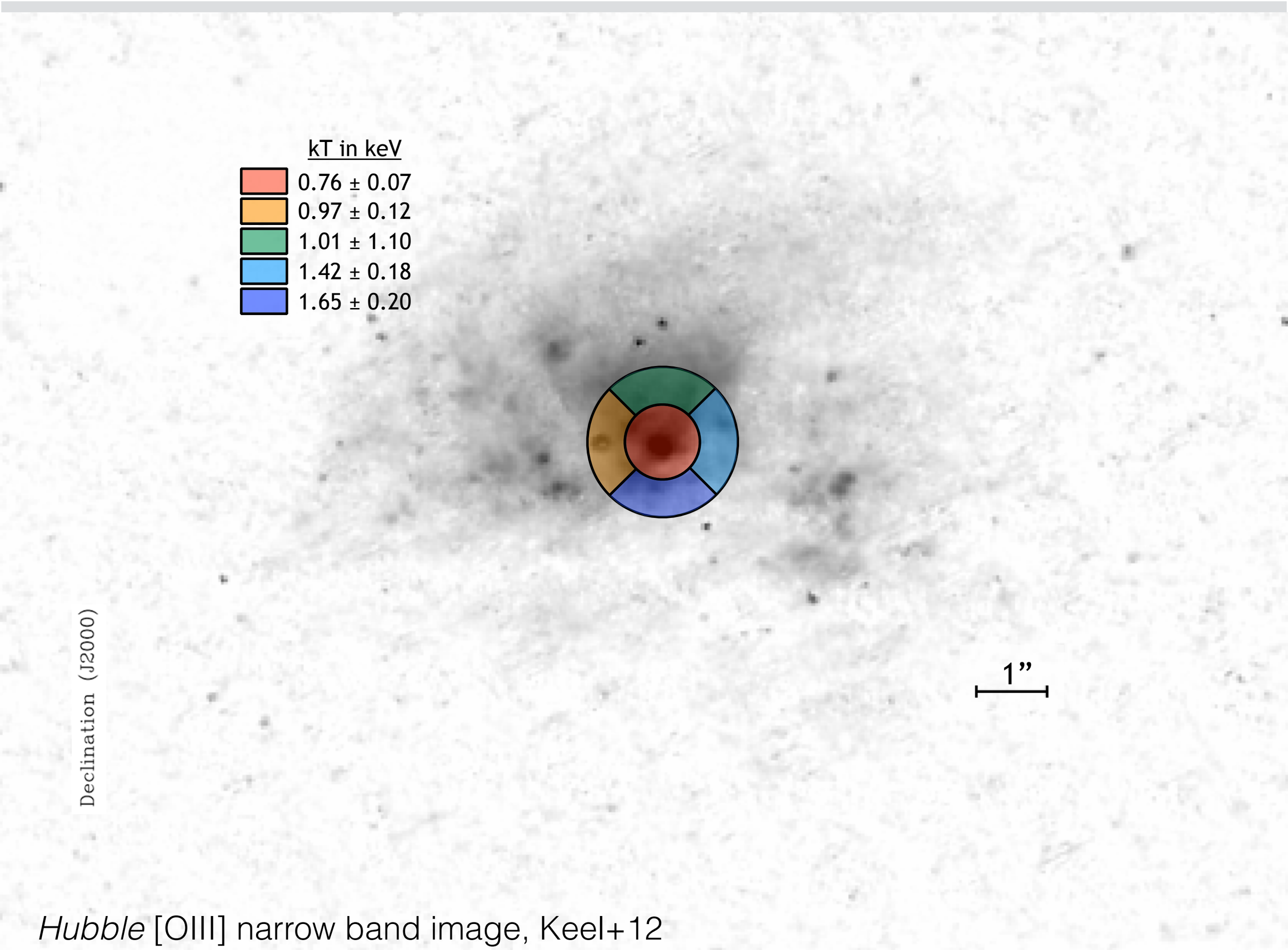
Quasar mit
$L_{bol} \sim 10^{46}$ erg/s!





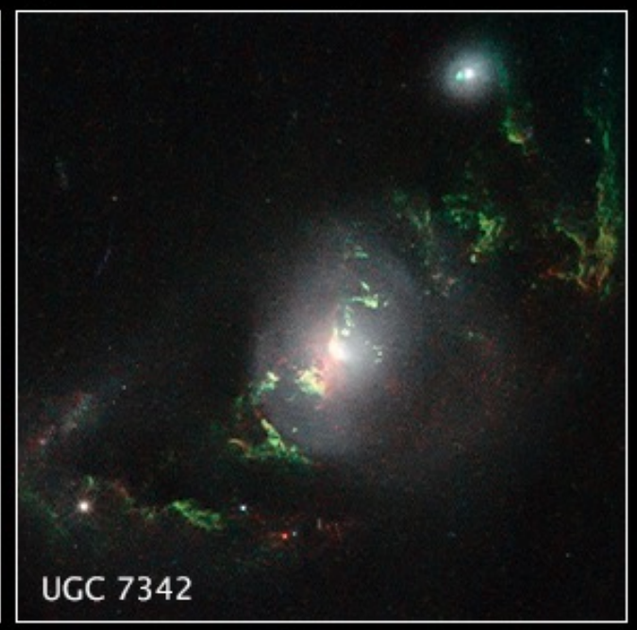


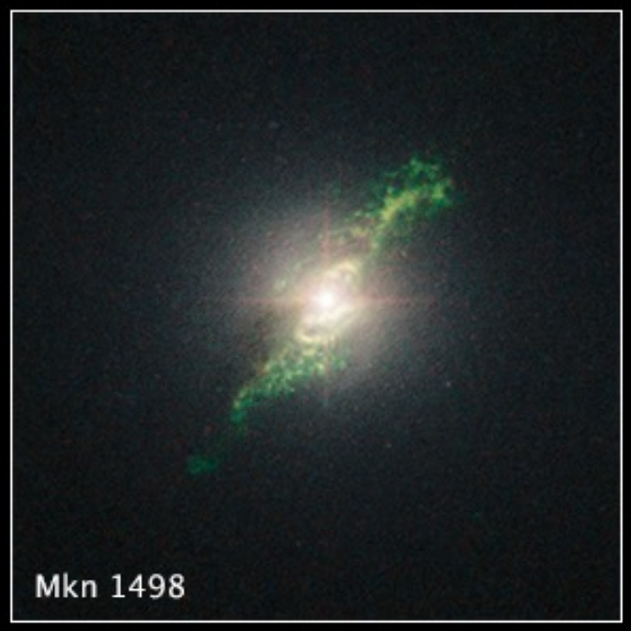
Hubble [OIII] narrow band image, Keel+12

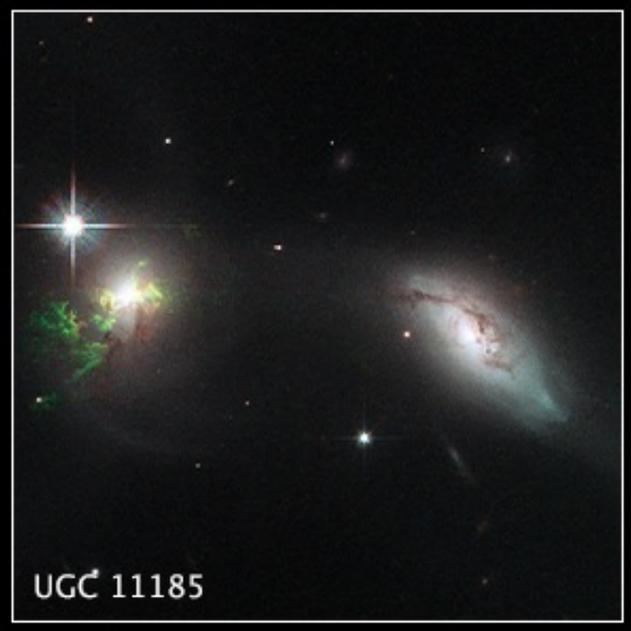


Hubble [OIII] narrow band image, Keel+12

Extended Gas in Active Galaxies ▪ *Hubble Space Telescope* ▪ WFPC2 ▪ ACS/WFC ▪ WFC3/UVIS

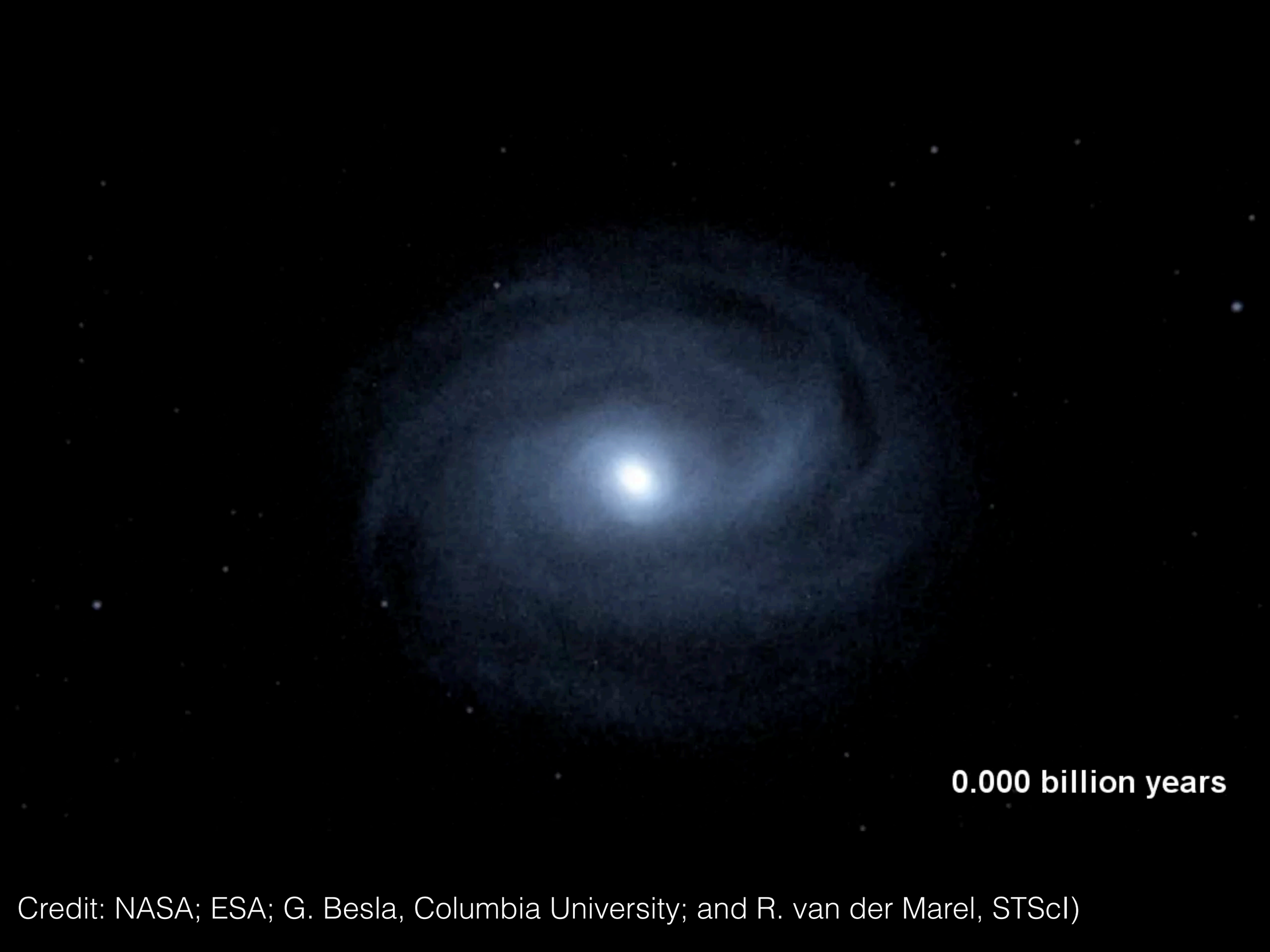






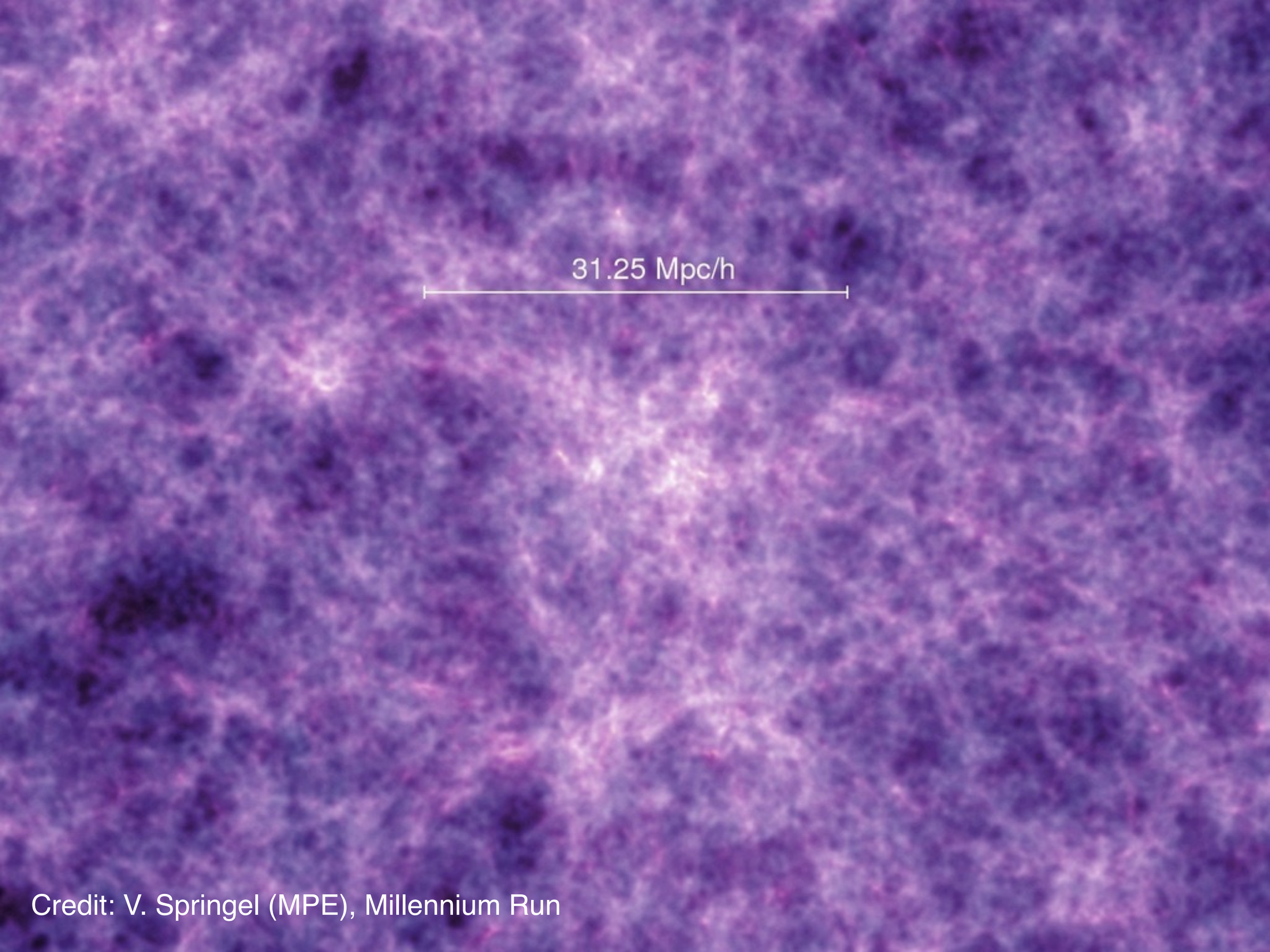
NASA and ESA

STScI-PRC15-13a

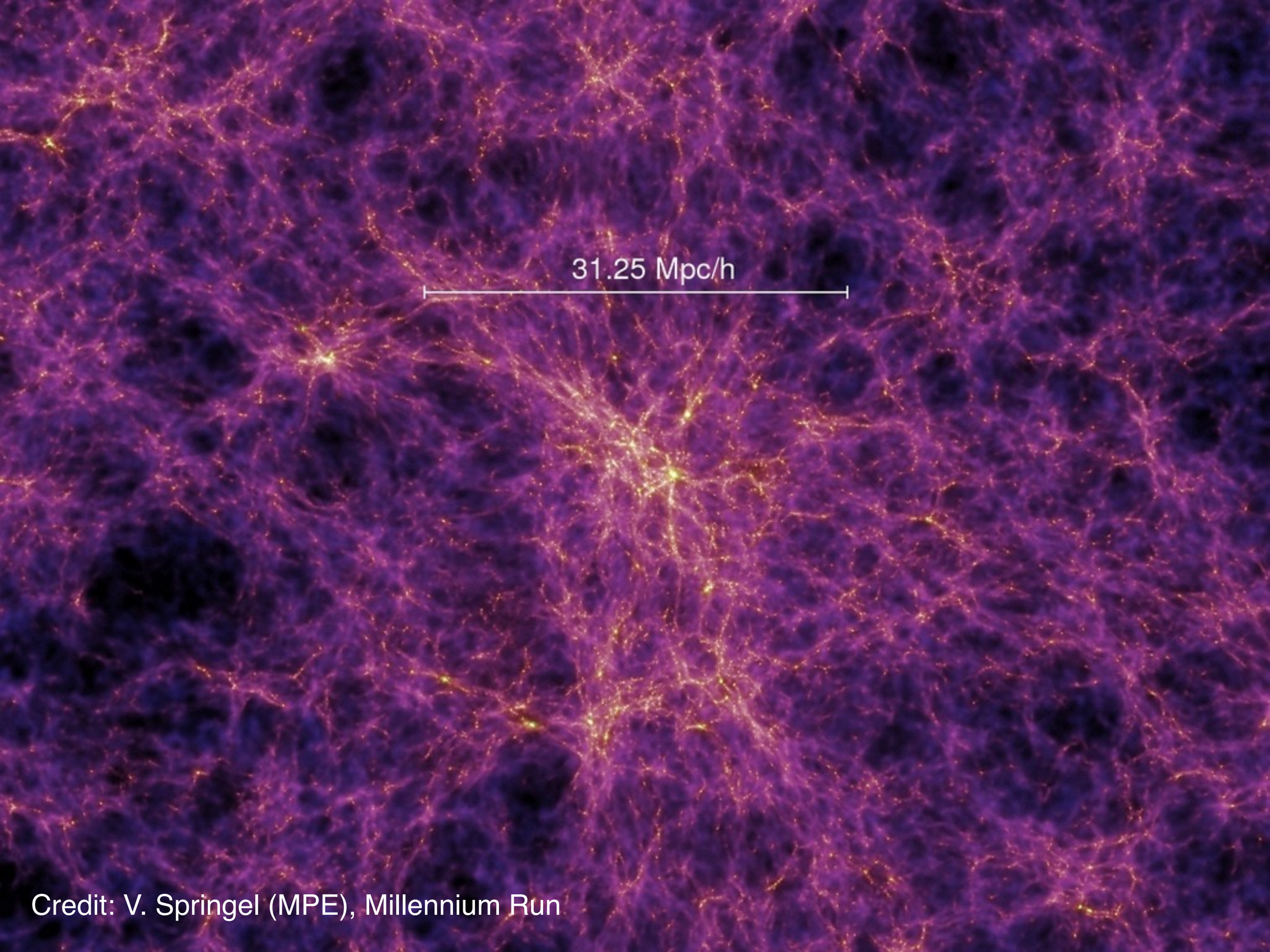


Credit: NASA; ESA; G. Besla, Columbia University; and R. van der Marel, STScI)

Kleine Einführung in die Galaxienevolution



Credit: V. Springel (MPE), Millennium Run



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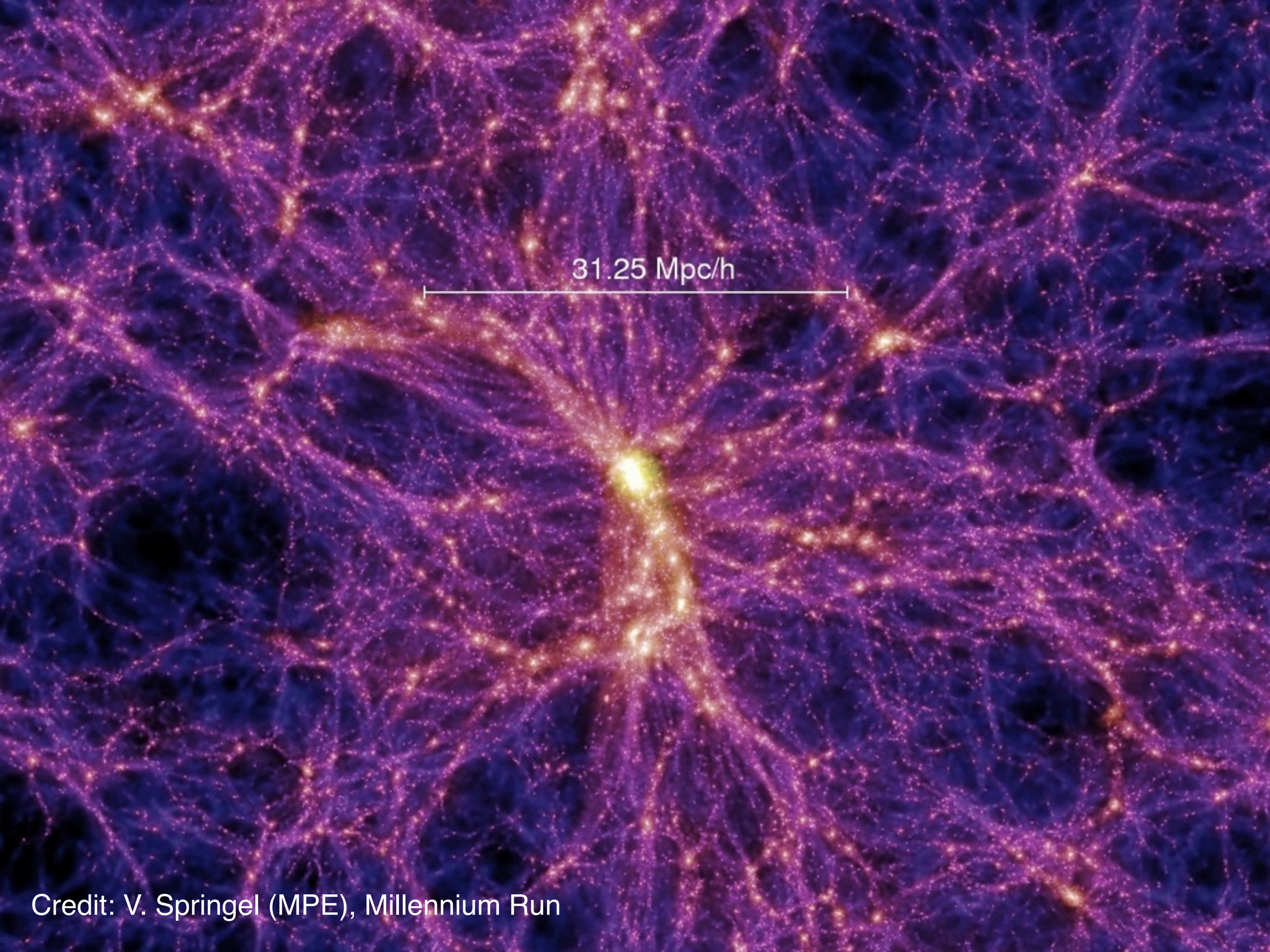

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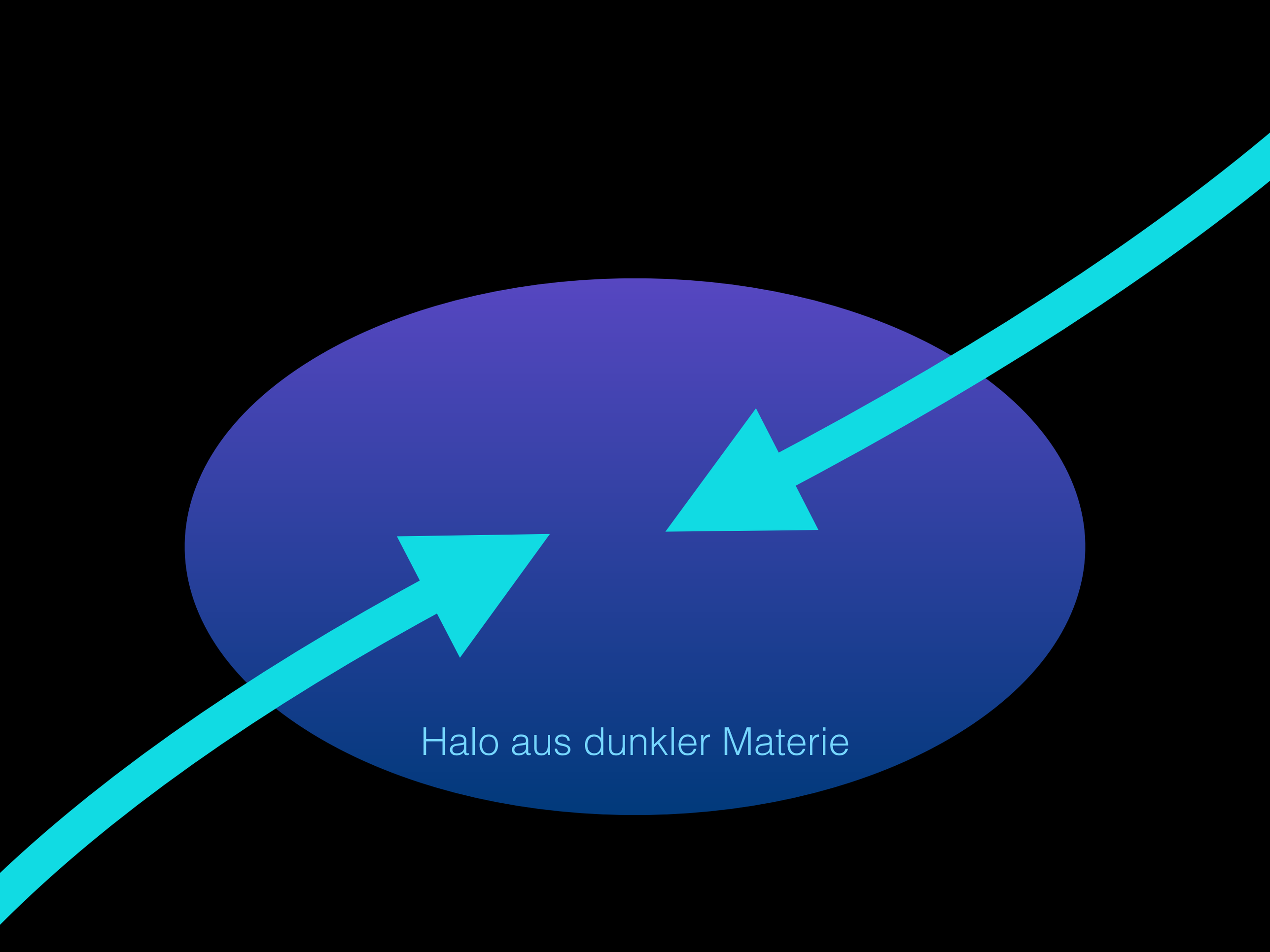
Kleine Einführung in die Galaxienevolution

Halo aus dunkler Materie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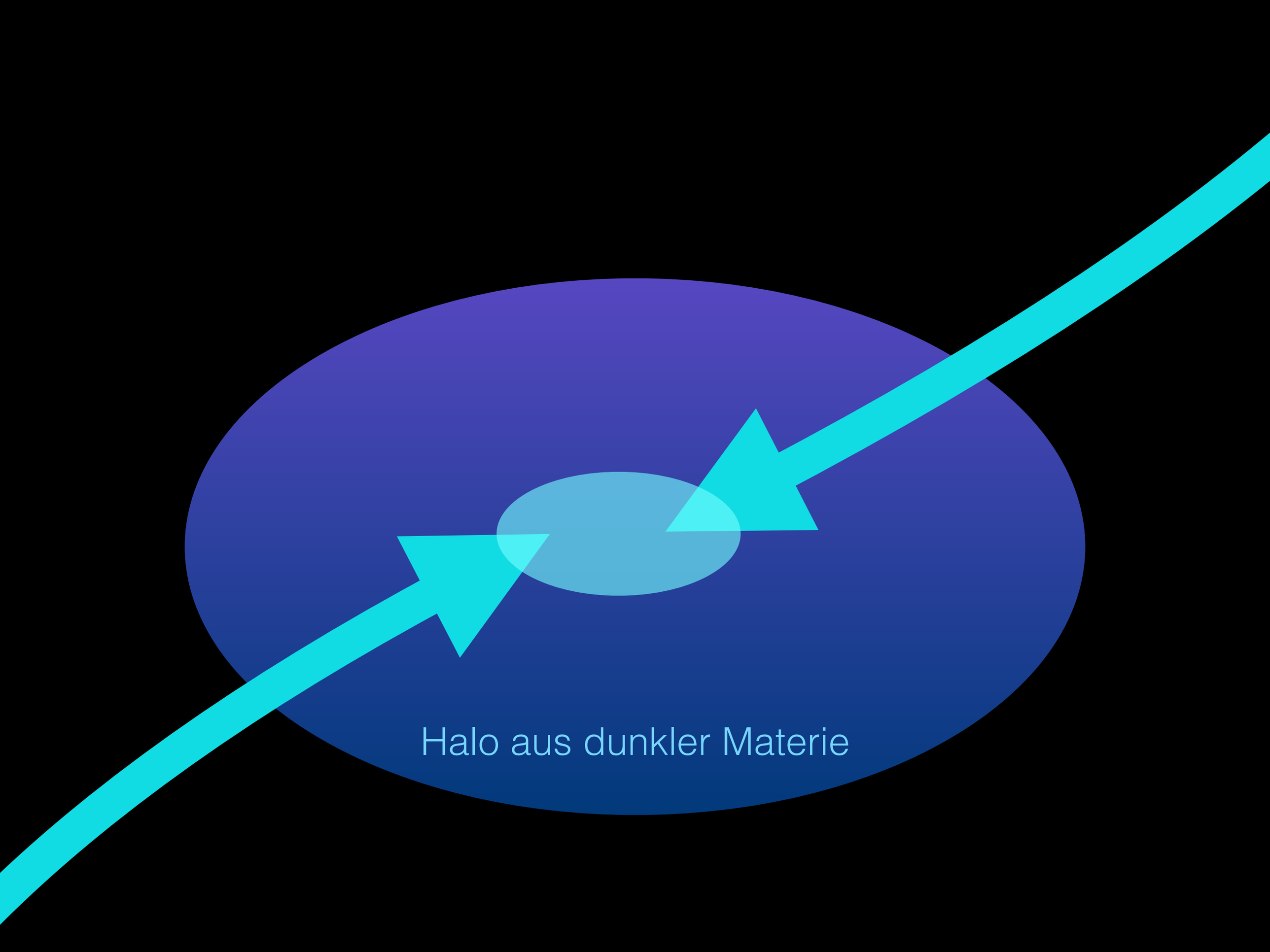
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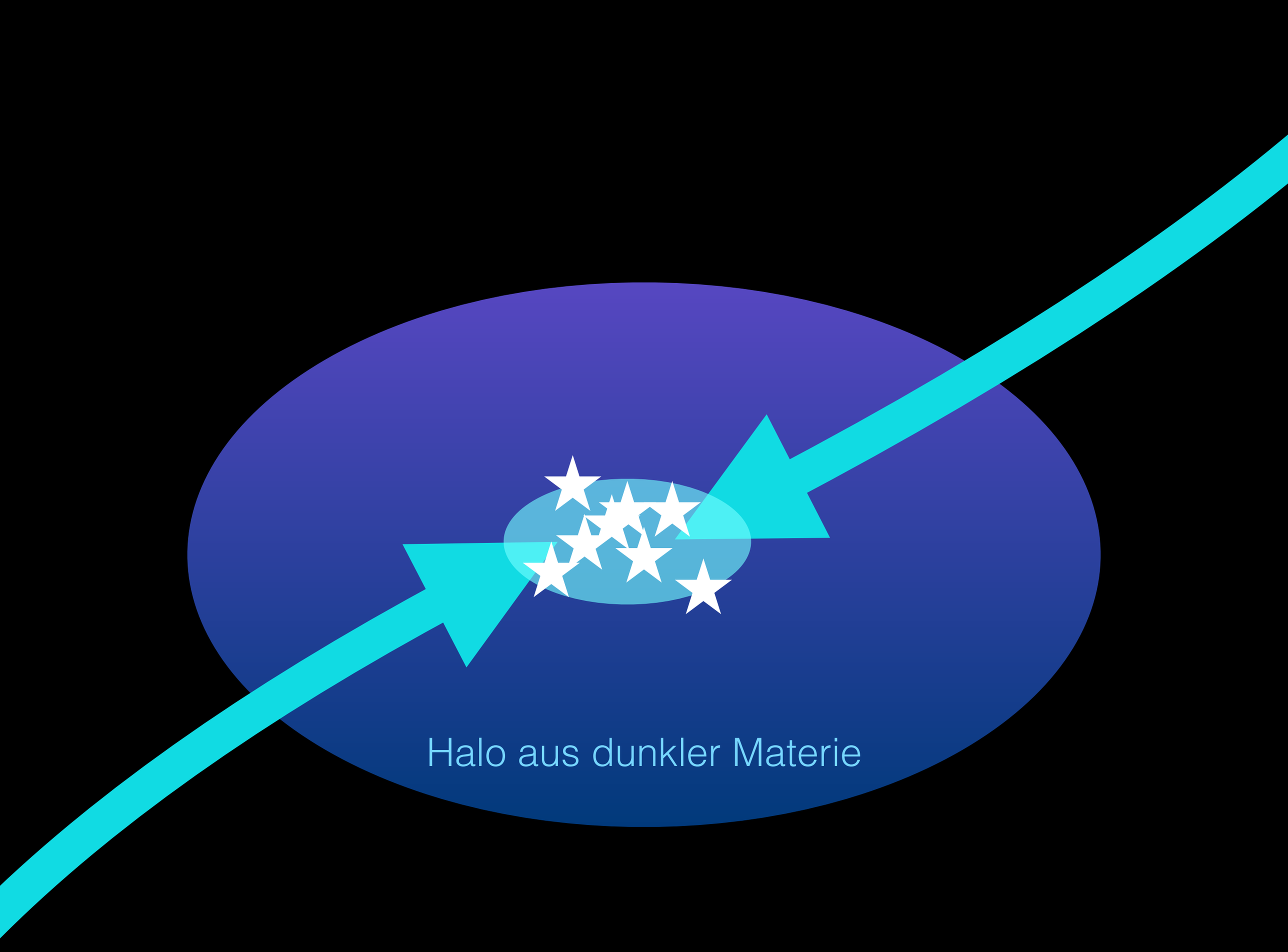
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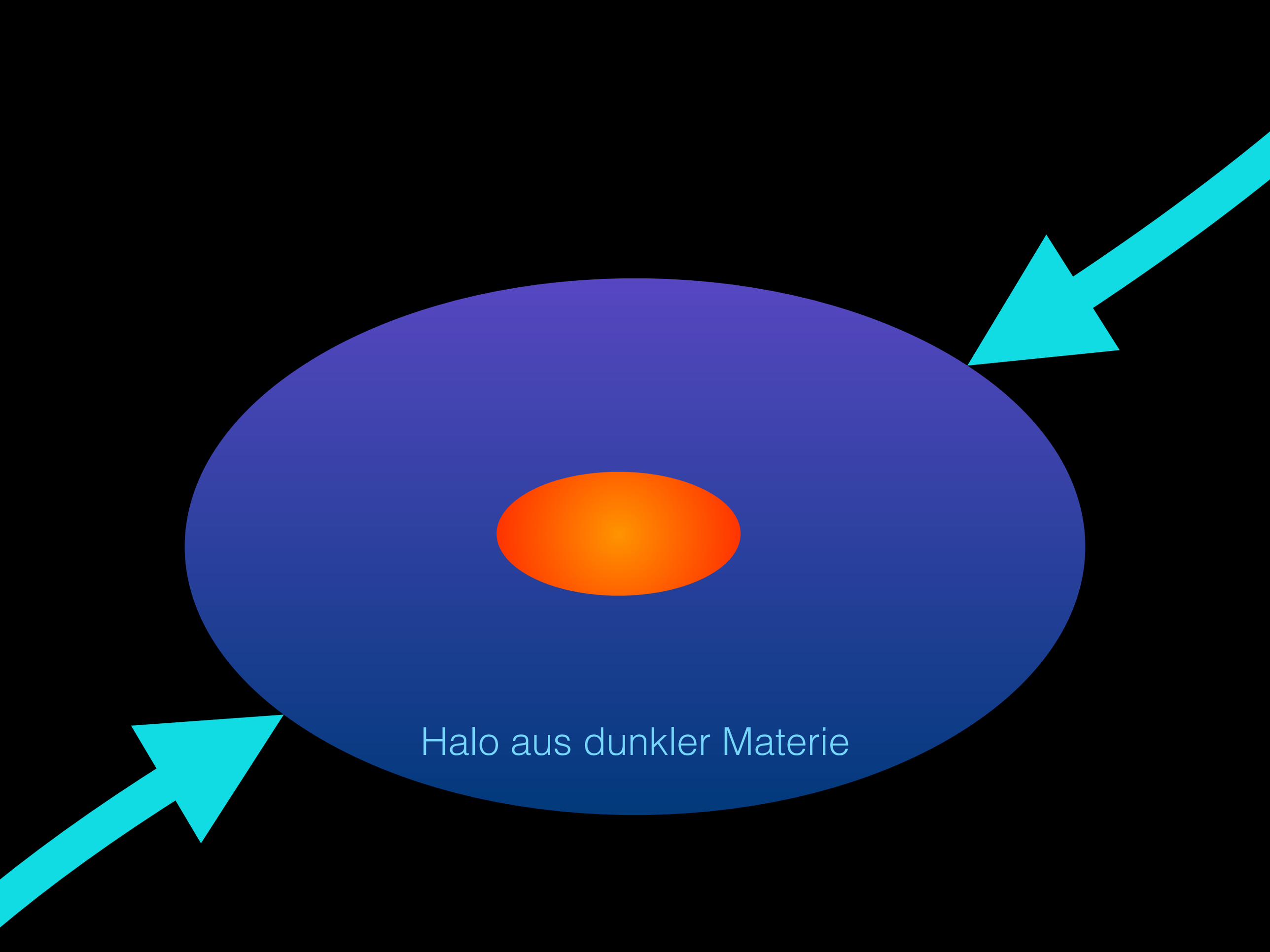
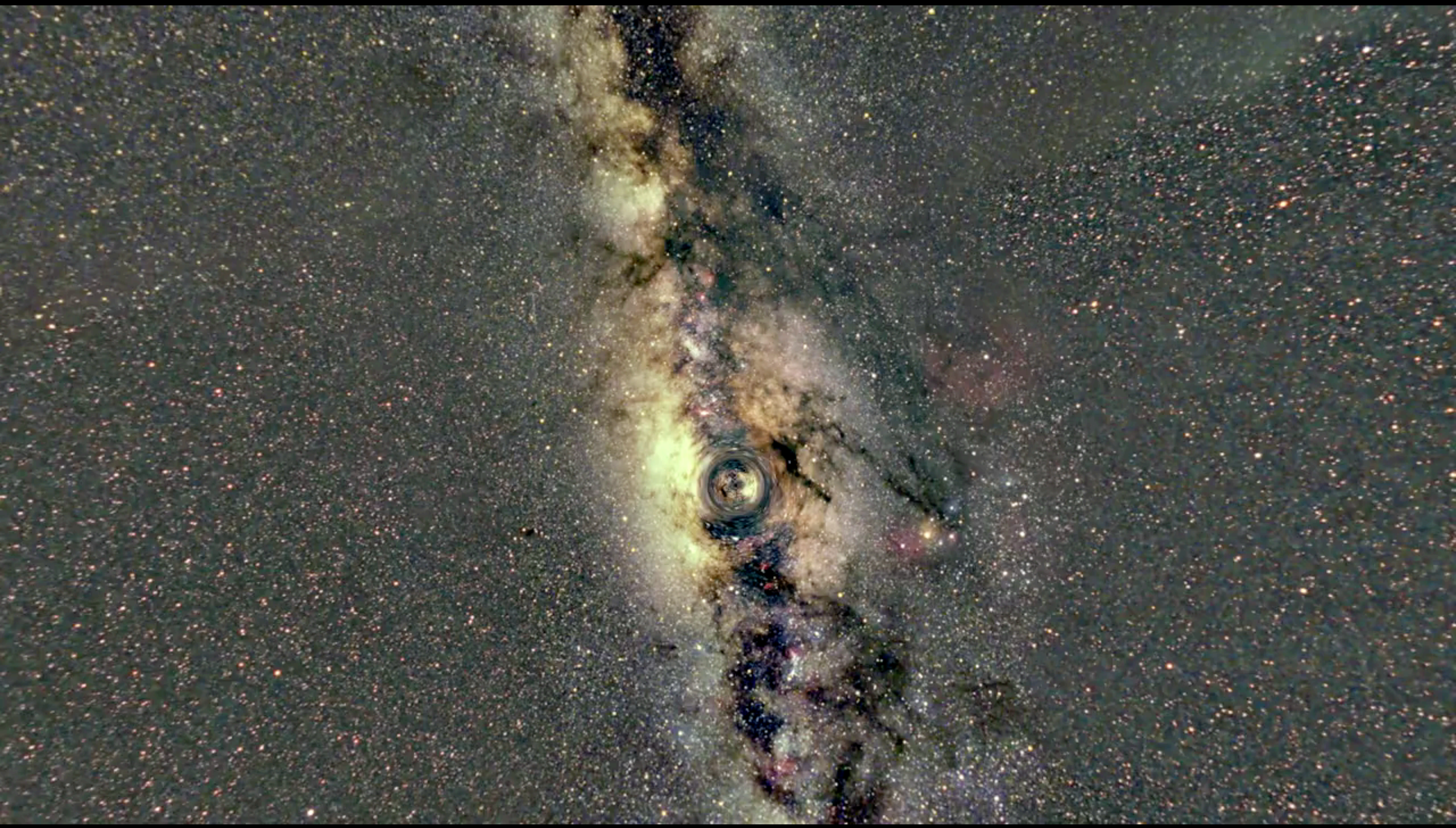

Halo aus dunkler Materie

Credit: M. Vogelsberger (MIT), ILLUSTRIS collaboration



Credit: A. Hamilton (UC/JILA)