

DARK MATTER AND GRAVITY LENSES

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WHAT DO ASTRONOMERS OBSERVE?

Stars

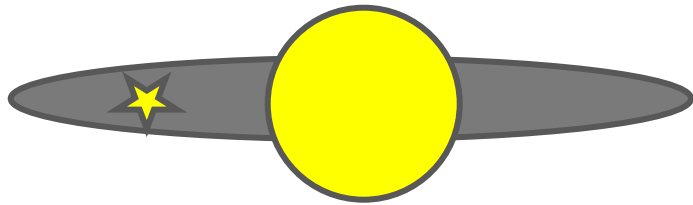
galaxies



WHY THERE IS NO COLLAPSE OF THE STARS IN A GALAXY?

Gravity

Some force must compensate gravity



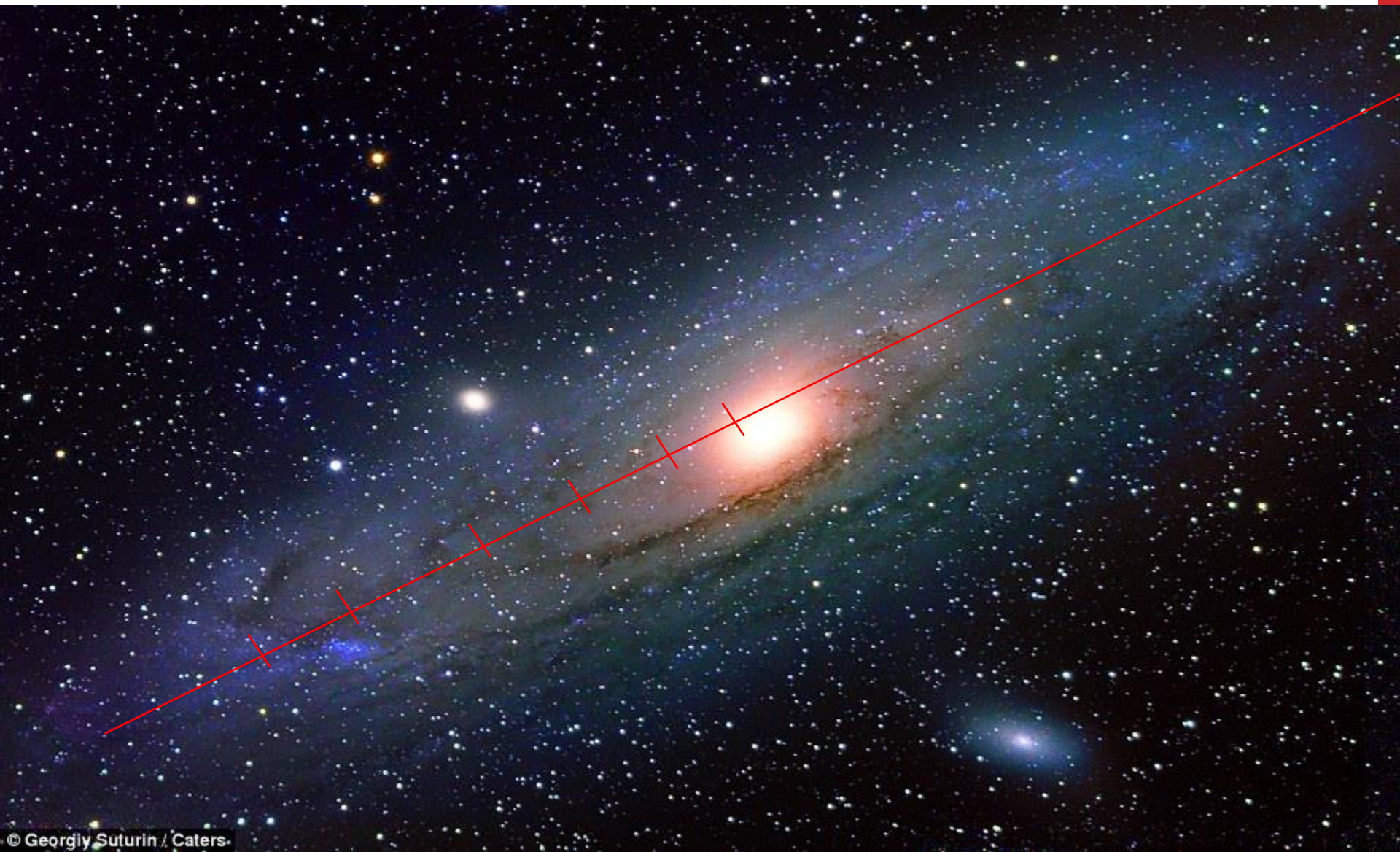
$$F = \frac{mv^2}{r}$$

$$F = G \frac{mM}{r^2}$$

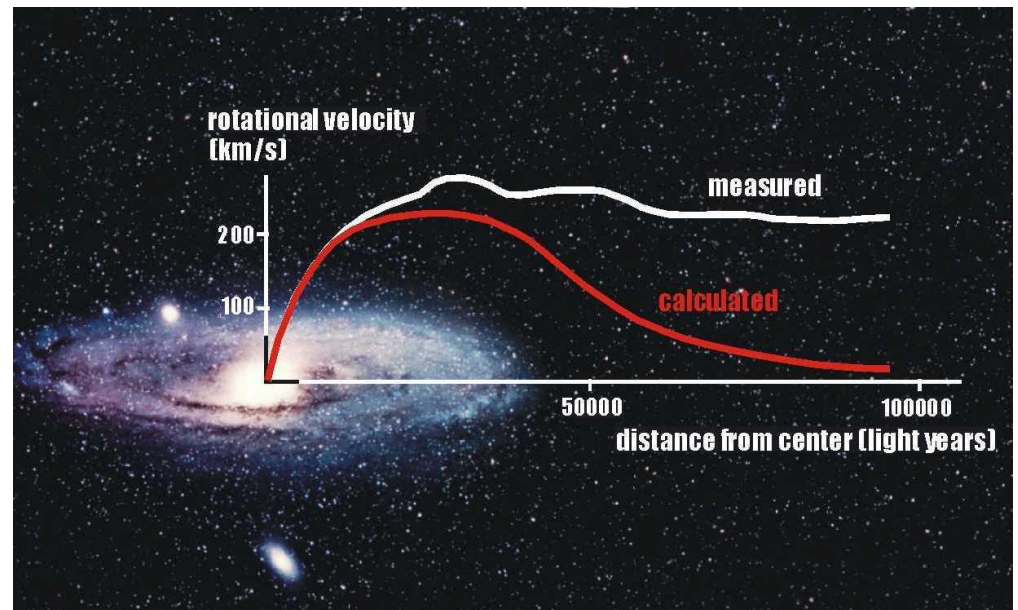
„physics is easy“

Galaxy:
Distance Sun-GC: 8 kpc
Diameter: 30 kpc

BULGE
CENTER
HALO



SO WHAT???



HOW TO EXPLAIN THIS ??

→physicists are strange people...

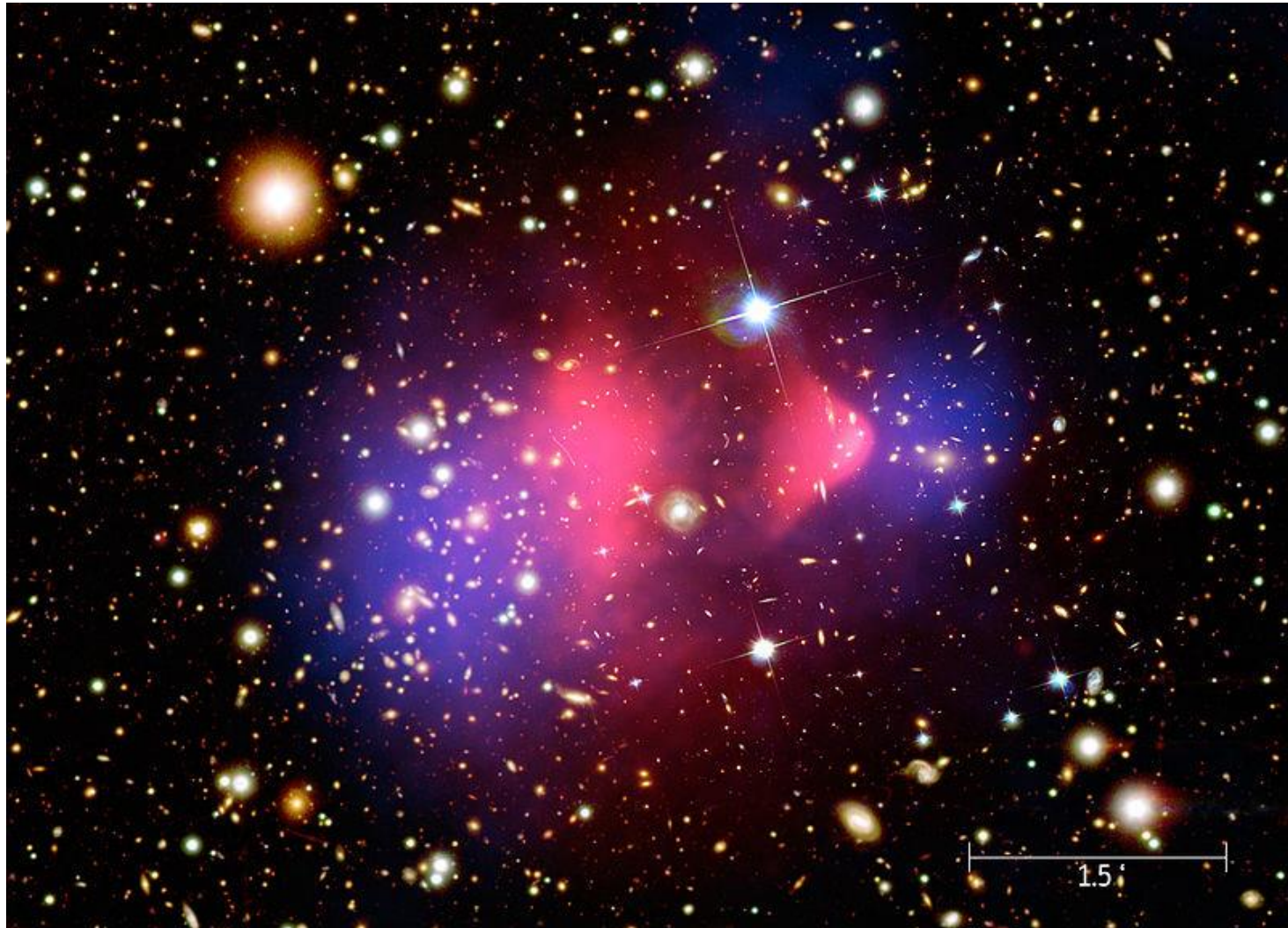
They invented dark matter

What is dark matter?

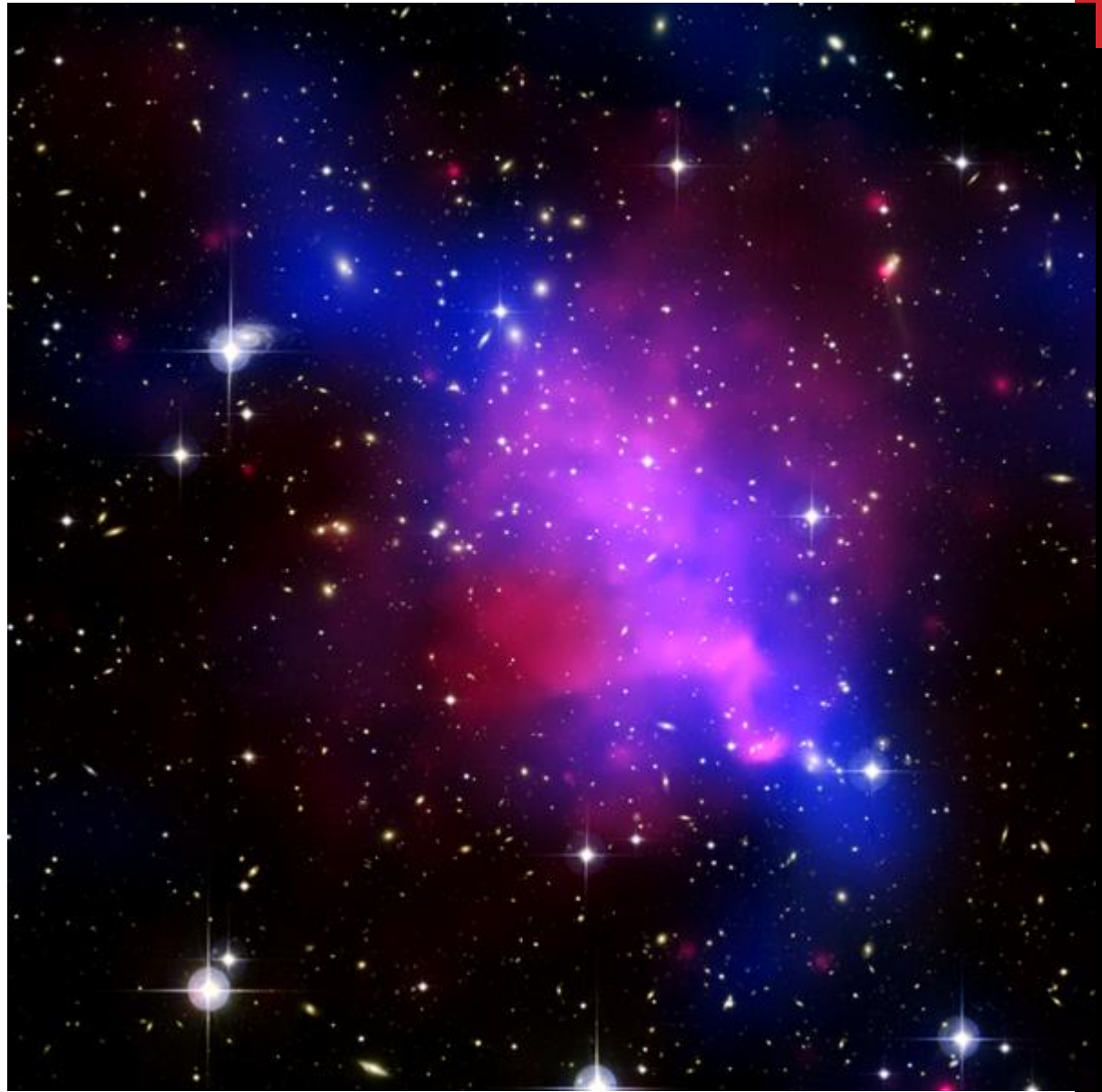
only gravitational interaction

we have no definite answer

Hubble, Magellan Teleskop Beobachtungen
Pink: X-ray Emission
Blau: Massenverteilung auf Grund
Gravitationslinseneffekt



ABELL 520



GENERAL RELATIVITY

Space-time \leftrightarrow matter

New explanation of gravity

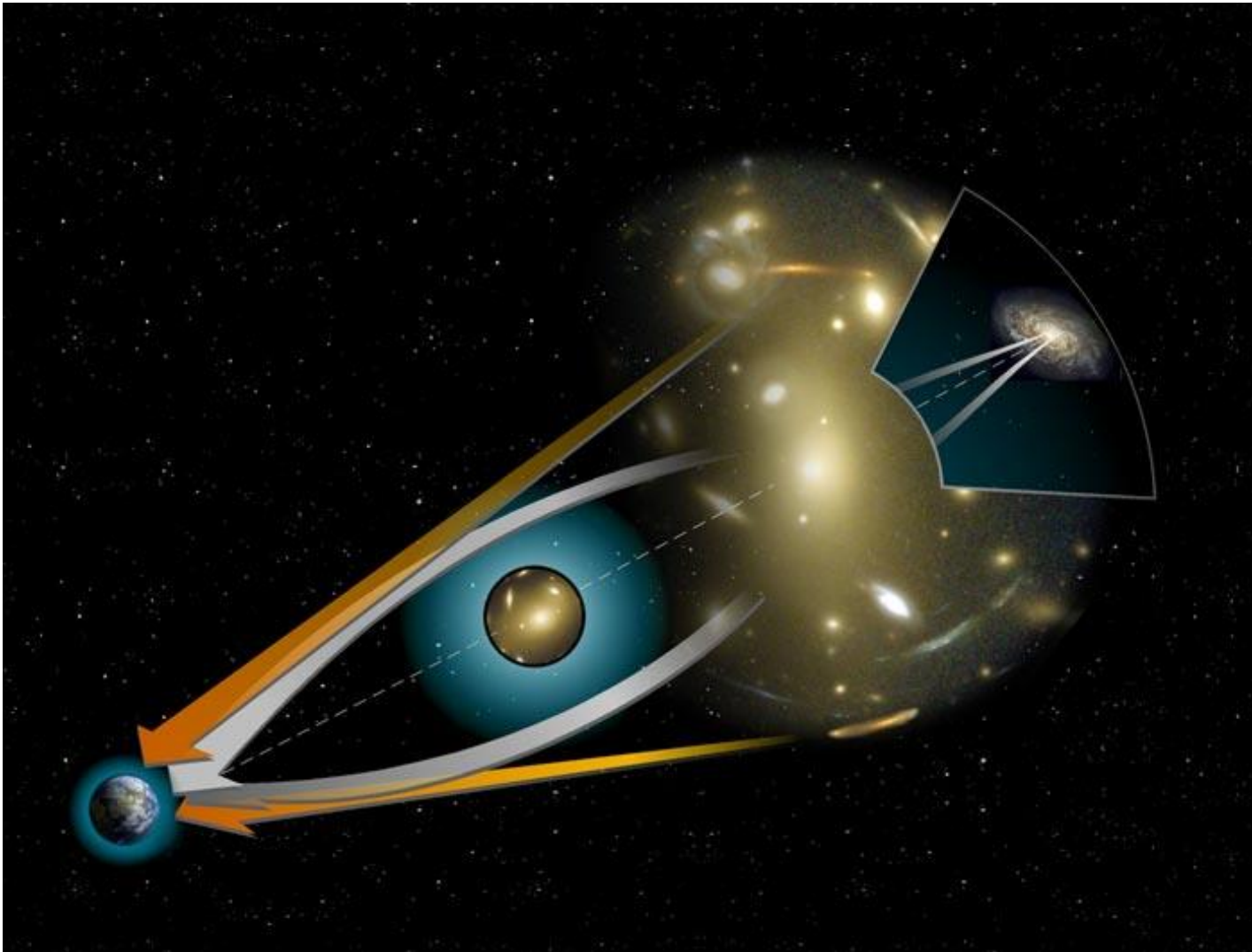
$$T^{\mu\nu}$$

Energy-Momentum Tensor

$$R^{\mu\nu}$$

Riemann Tensor

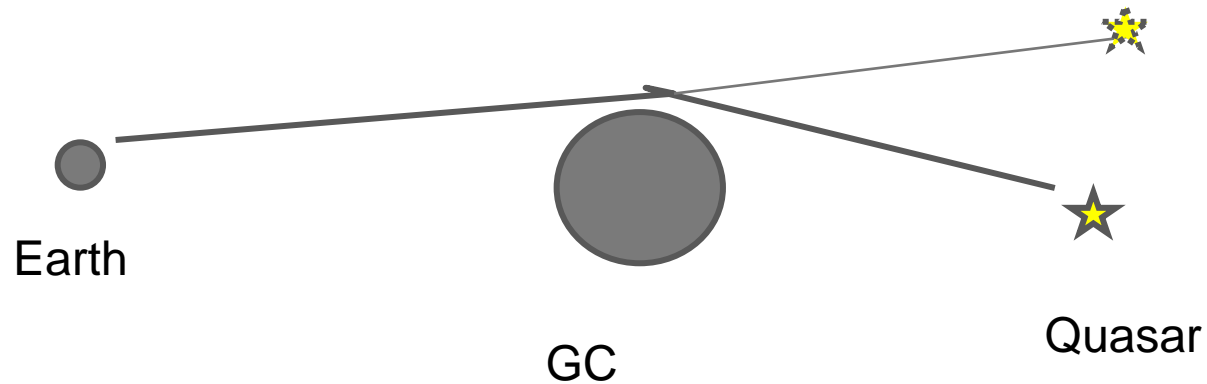
GRAVITATIONAL LENSING



COOPERATION WITH

IAC: Instituto de Astrofísica de Canarias

Observations: galaxy cluster/quasar->Lensing



LITERATURE

**Hanslmeier, 2014, Einf. In Astronomie und Astrophysik,
Springer**

Hanslmeier,2013, Faszination moderne Astrophysik, Springer