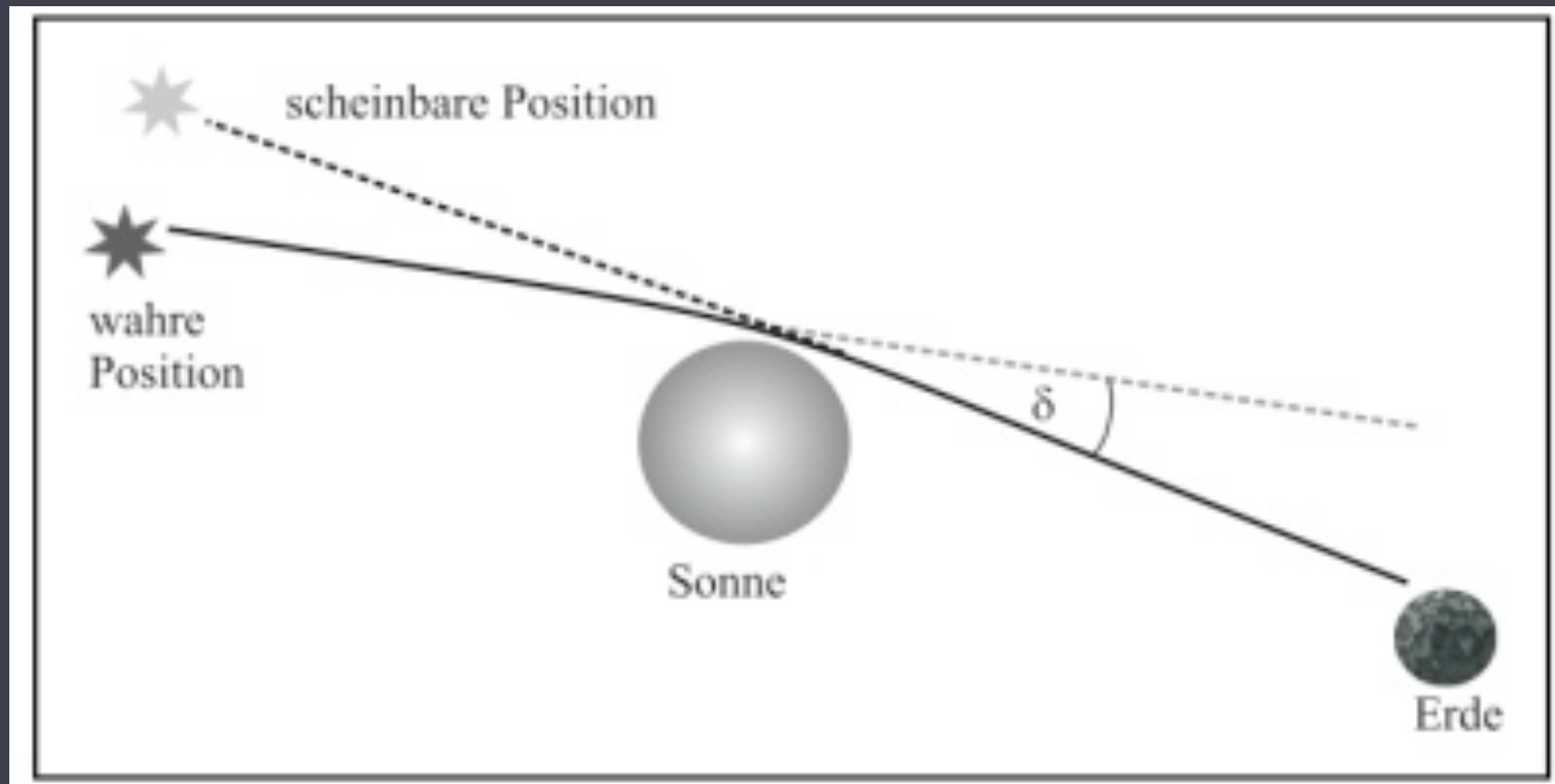


Astro 6: class 9

Friday, November 22, 2013

mass (and energy) bends starlight that passes near it



galaxy clusters have a lot of mass...beyond even the
starlight from the visible galaxies

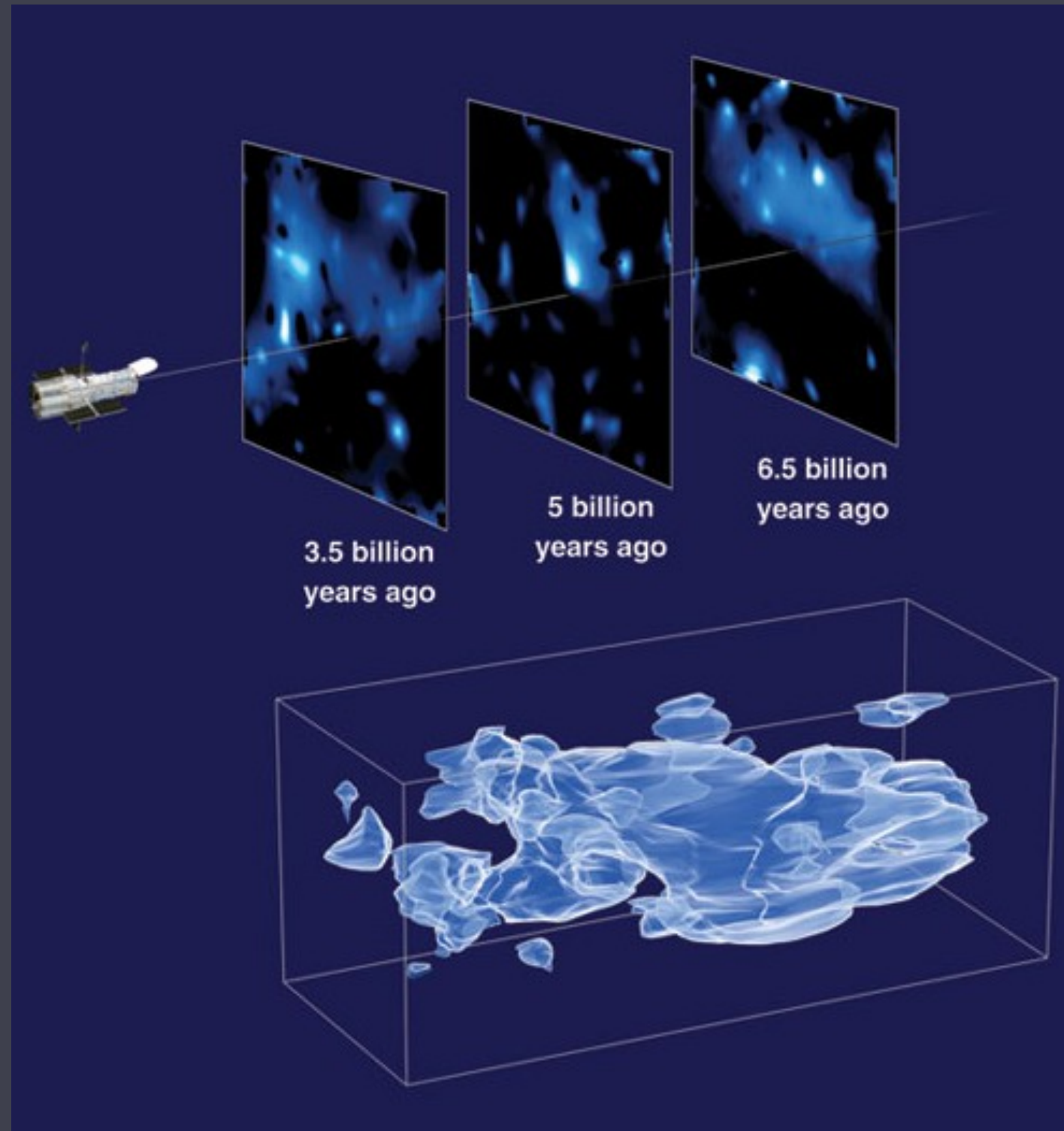


Gravitational Lens in Abell 2218

HST • WFPC2

PF95-14 • ST ScI OPO • April 5, 1995 • W. Couch (UNSW), NASA

the distribution of the mass as well as the total amount of mass can be deduced from the amount of lensing



there are other ways to weigh a galaxy or galaxy cluster



our neighbor galaxy Andromeda with a satellite galaxy *orbiting* it

Virgo cluster: nearest big galaxy cluster



purple is x-ray emission from hot ($>$ million K) gas



most baryonic matter in the universe is this hot, cluster gas

Andromeda's rotation curve

