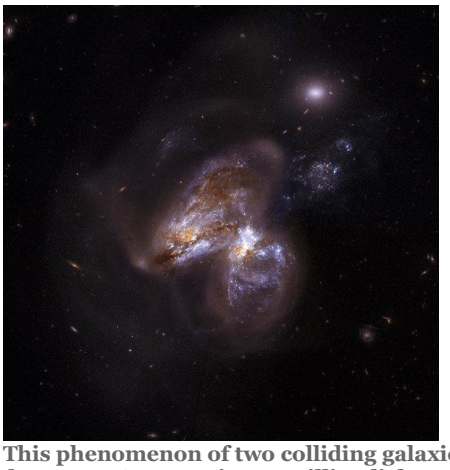
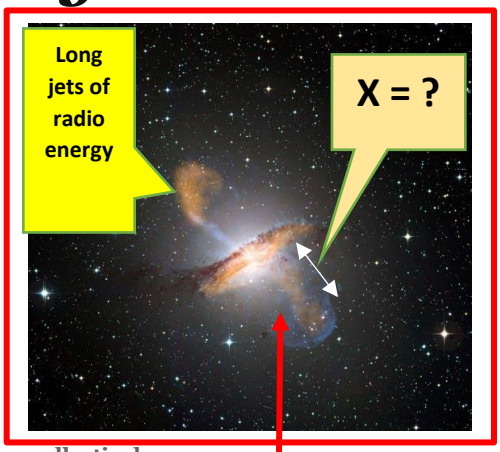
KINEMATICS

Units 4 & 5, Dr. John P. Cise, Professor of Physics, Austin Com. College, Austin Texas, USA. jpcise@austincc.edu & New York Times June 14, 2018 by Dennis Overbye. Dedicated to Tycho BRAHE, Danish Astronomer.

Black Hole Drags Star to Dusty Death





This phenomenon of two colliding galaxies, collectively known as Arp 299, is 150 million light years away in the constellation Ursa Major.

INTRODUCTION: Goal of this application is to find the length X of radio energy jets seen in picture at left. Article below states jet is about 3 light years.

QUESTIONS: (a) Find number of seconds in a year?, (b) Electromagnetic waves(light) has a speed (c) of 3 X 10^8 m./s.. Article states jets are traveling outward at c/4 for 10 yrs. Find distance in meters X traveled by radio jets?, (c) Find distance(meters) of a light year?,(d)How does your computation of X compare with article below stated ~ 3 lt. yrs.?
HINTS: 365 days/yr., 24 hrs./day, 3600 s./hr., X = v t

ANSWERS: (a) 32.85 X 10^6 s., (b) X = 24.64 X 10^{15} m., (c) X = 9.6 X 10^{15} m./lt. yr. (d) $X_{COMPUTED}$ = ~ 2.5 light years, close

Gulp. Burp.

And so it goes in the cruel and carnivorous universe according to Einstein. Astronomers said on Thursday that they had seen a giant black hole in a nearby galaxy rip apart an unfortunate wayward star and spread half of it into a messy blaze of light and heat swirling toward doom. The other half was **spit outward, partly in a fiery high-energy jet at a quarter of the speed of light.**

All this happened out of human sight, deep in the dusty heart of a pair of colliding galaxies known collectively as Arp 299, about 150 million light years from here in the constellation Ursa Major. An international team of astronomers, led by Seppo Mattila of the University of Turku in Finland and Miguel Perez-Torres of the Astrophysical Institute of Andalusia in Spain, teased out the story of what happened from observations of infrared, or heat, radiation and radio waves that can penetrate the dust and leak out to the rest of the universe. They published their report Thursday in the journal Science. Black holes are gravitational pits, trap doors to eternity, predicted by Einstein's theory of gravity, general relativity. They are so deep and dense that nothing, not even light can escape them. Every galaxy seems to have a supersize version of one of these monsters squatting at its core. The black hole in the center of one of the colliding lobes in Arp 299 has the mass of about 20 million suns.

Three views of Arp 299. On the left, high-energy X-ray data and on the right, a visible-light image made by the Hubble Space Telescope. The center image is a composite of the two

When Dr. Mattila and his colleagues first saw a bright burst of heat coming from the region of that black hole in January 2005, they thought they had discovered a supernova, a cataclysmic explosion in which a massive star ends its life.

When galaxies collide, as the two conglomerations of stars that make up Arp 299 are doing, Dr. Mattila explained in an email, large clouds of gas fall into the central regions. That triggers a burst of star formation and then a subsequent burst of supernova explosions as the most massive of these stars quickly burn out and die.

High-resolution radio measurements revealed that the object they observed coincided almost spot on with the black hole, but it was behaving in a way very unlike a supernova. **Over the course of the next decade, it expanded into a long jet of radio energy whose head by now has traveled some 3 light years from its origin.**

Supernovas don't do this, but a star falling into a black hole could, in what is called a tidal disruption event.