

Extra Credit Opportunity

November 19, 7:30 p.m.

The Violent Universe

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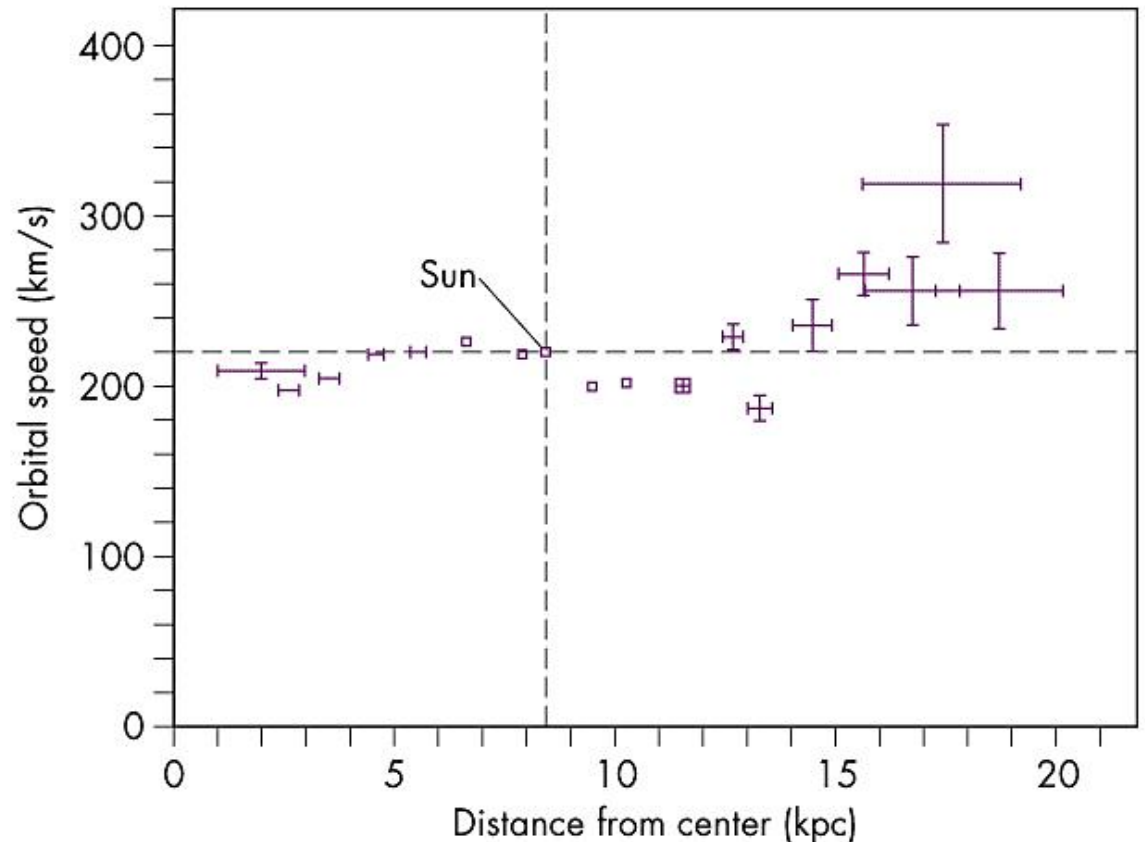
A summary of some of the most exciting high energy objects that we have looked at lately and still don't fully understand: the most violent places in the universe, extreme energy from binary black hole/neutron star systems, the remnants from supernova explosions, a star getting eaten by a supermassive black hole, a nova in a nearby star system, unknown bright transient gamma-ray sources in our galaxy. Weather permitting, observing through CAA telescopes will follow the presentation.

Atomic gas is detected in which part of the EM spectrum?

- A) X-ray
- B) Gamma-rays
- C) Infrared
- D) Radio

Intended answer is radio, but all are OK.
Question changed to extra credit.

Which of the following is the best description of the rotation curve of the galaxy between the Sun's orbital distance and twice the Sun's orbital distance?



- A) rising rapidly
- B) falling steadily
- C) many large fluctuations in orbital speed with distance
- D) roughly flat

The density wave that produces the spiral arm in the Milky Way Galaxy is similar in properties to a

- A) light wave
- B) wave on a stretched string
- C) gravitational wave
- D) compression wave

The mass of the Galaxy is best estimated by

- A) measuring the distribution of globular clusters
- B) counting the stars it contains
- C) measuring the total amount of hydrogen gas using the 21 cm line
- D) determining the gravitational force acting on starsX-ray

The possible presence of a very large amount of unseen (“dark”) matter in the halo of our Galaxy is deduced from the

- A) unexpected absence of luminous matter (stars, etc.) beyond a certain distance.
- B) unexpected high amount of interstellar absorption in certain directions.
- C) rotation curve of our Galaxy, which shows that orbital speeds in the outer parts of the Galaxy decrease in a way that follows Kepler's law for visible matter.
- D) rotation curve of our Galaxy, which indicates higher than expected orbital speeds in the outer regions of the Galaxy.

What evidence indicates a supermassive black hole exists at the center of our Galaxy?

- A) No electromagnetic radiation at all comes from the precise position of the galactic center and it just looks like a dark void in space.
- B) The Sun's motion in its orbit around the galactic center shows there must be a very massive object at the galactic center.
- C) Doppler shift of light from stars in the near neighborhood of the galactic center, which indicates that the stars are falling inward at very high speeds
- D) Detection of stars orbiting the galactic center at very high speeds, which would rapidly move out of the Galaxy unless some very massive object holds them in orbit