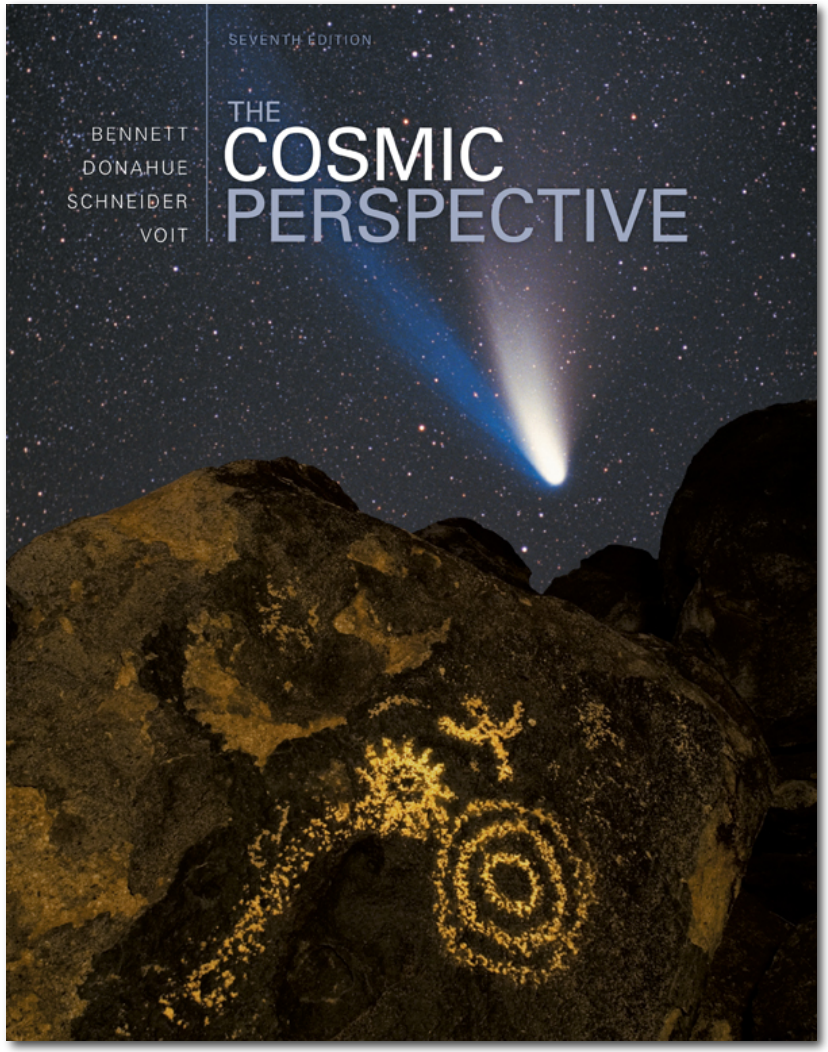
The Cosmic Perspective

Seventh Edition



Galaxies and the Foundation of Modern Cosmology

Which type of galaxies have a disk, bulge, and halo?

a) spiral
b) elliptical
c) irregular
d) barred spiral
e) A and D

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Which type of galaxies lack a disk?

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b) elliptical
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Which type of galaxy contains a high percentage of cool interstellar gas and dust?

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Which type of galaxy is particularly common in clusters of galaxies?

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What is a *standard candle*?

a) a candle of known brightness
b) a galaxy of known brightness
c) any object whose luminosity is known independently from its apparent brightness
d) a star made of the same elements as the Sun
e) a star with the same composition as a halo star

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What standard candle is useful at the greatest distances?

a) main sequence stars
b) Cepheid variables
c) a star whose distance is known from parallax
d) white dwarf supernovae
e) None of the above

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What did astronomers debate about the nature of spiral nebulae until the 1920s?

a) whether they were nebulae located in the Milky Way, or spiral galaxies located far outside our galaxy
b) whether they were forming planets or stars
c) both of the above
d) none of the above

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How did Edwin Hubble prove that the spiral nebulae were distant galaxies?

a) He measured their parallax.
b) He measured their Doppler shifts
c) He found Cepheid variables in them that looked pretty bright.
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What is *Hubble's Law*?

a) The faster a galaxy is moving away, the farther away it is.
b) The farther away a galaxy is, the slower it is moving away.
c) All galaxies are getting closer together over time.
d) Galaxies are expanding over time, with their stars growing farther and farther apart.

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If faster galaxies are farther away, and there is a direct proportion between speed and distance, then

a) all galaxies must be avoiding ours.
b) all galaxies must have begun moving apart at the same place and time.
c) our galaxy must be in the center of the universe.

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How do scientists estimate the age of the universe?

a) They take the distance to a nearby galaxy and divide it by its speed of recession (time = distance/velocity).
b) They take the distance to a very distant galaxy and divide it by its speed of recession (time = distance/velocity).
c) They take the distance to any galaxy and divide it by its speed of recession (time = distance/velocity).

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Is measuring the speed of a receding galaxy a complex scientific process?

a) Yes, we're talking about cosmology and the edge of the universe.
b) No, it's just the Doppler shift–the shifting of spectrum lines.
c) No, it's the same principle police use to give you a speeding ticket.
d) B and C

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What does it mean to say that our universe is *expanding*?

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b) Space itself is expanding.
c) Everything is expanding, including galaxies, star clusters, and star systems.

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When we look at a very distant galaxy, billions of light years away, we see it

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b) when it was older.
c) when the whole universe was younger.
d) when the whole universe was older.
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What do we see when we look beyond the cosmological horizon?

a) Galaxies that are just about to form.
b) Galaxies that are about to enter the universe.
c) White dwarfs that are about to go supernova.
d) The beginning of the universe.
e) We cannot look beyond the cosmological horizon because we cannot look back to a time before the universe began.

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True or False? If you want to find elliptical galaxies, you'll have better luck looking in clusters of galaxies than elsewhere in the universe.

a) True, galaxy clusters have a much higher percentage of elliptical galaxies than do other parts of the universe.
b) True, elliptical galaxies are found exclusively in galaxy clusters.
c) False, elliptical galaxies are more commonly found away from galaxy clusters.
d) False, elliptical galaxies are never found in galaxy clusters.
e) False, you would have an equal chance of finding an elliptical galaxy in any environment in the universe.

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True or False?: If the standard candles you are using are less luminous than you think they are, then the distances you determine from them will be too small.

a) True, because they are less luminous, they are further away.
b) False, because they are less luminous, they are closer than you think and your distance determination is too large.
c) False, standard candles produce the same measurement at the telescope no matter what distance they are.
d) It depends on the standard candle: if they are Cepheid variables, they will still pulsate at the same rate no matter what distance they are from you.

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Galaxy A is moving away twice as fast as Galaxy B, so Galaxy A must be

a) twice as far away as Galaxy B.
b) twice as close as Galaxy B.
c) four times as far away as Galaxy B.
d) four times as close as Galaxy B.

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