

## NASA CHAT: HUBBLE – The Milky Way and Andromeda Galaxy

nasa(P)	Thank you all for joining the chat - we will get started here at 3 p.m. EDT
nasa(P)	Thanks for joining the chat today, we are ready to take your questions.
Jason(P)	Got a question to ask? Submit it by typing it in the yellow box below and click the 'submit' button on the right. Thanks!
AlexandraH(Q)	Hello! I have recently become very interested in astronomy and I'm not very well informed yet on the current events. What is happening in the Andromeda galaxy that the Hubble space telescope is observing? I believe I read somewhere that it is coming closer to us, why is that?
nasa(A)	Roeland: Because of gravity the Milky Way and Andromeda Galaxy are being pulled together and 4 billion years from now they will collide.
Jason(P)	We're working on answering the first few questions. To ask your own, please type it in the box at the bottom of the window and click the 'Ask' button on the right side of the box. Thanks for your patience as we answer your questions.
robdb(Q)	When the collision occurs, what do we believe will be the outcome for individual solar systems? Will they break apart or stay together and move as one?
nasa(A)	Roeland: The individual galaxies will merge together to become one new galaxy. Planetary systems in the galaxies such as our solar system will likely survive in tact.
Panther_Modern(Q)	In a galaxy merger like the one described in today's topic, is it possible to predict how much galaxy mass (stars) will be ejected during/after the event?
nasa(A)	Gurtina: So the vast majority of these galaxies will collide and then the vast majority of the materials will stay in the region. But, tidal tails will form and move stars to much larger distances. But ultimately this material is still bound to the final merger remnant.
Dom(Q)	So what could we expect to happen to earth when this "collision" happens? What about life on earth and/or humans if we're still around?
nasa(A)	We believe that the collision will not disrupt the solar system and Earth within it. However, when Andromeda arrives our sun and Earth will be hotter. So, it is not clear whether life on Earth will still exist.
nasa(P)	One additional point, our sun will be moving much faster and so the chances of fly-by encounters with other stars will increase. The gravity from these stars may perturb the body of rocks that are in the orb cloud of the outer parts of this solar system, which is where the comets come from.

Jason(P)	We're working to answer your great questions. Keep them coming! To submit your own question, please type it in the box at the bottom of the window and click the 'Ask' button on the right side of the box. Thanks for your patience as we answer your questions.
Hugo(Q)	About the galaxy's centers, their black holes will form a even bigger one after merging?
nasa(A)	Roeland: Yes, both the Milky Way and Andromeda have a black hole in their center. After the galaxies merge, the black holes will merge to form a larger black hole.
robdb(Q)	Where does the collision fall, in terms of time frame, with the life expectancy of our Sun? Is it possible that the event will alter what we believe the life stages of our star are going to be?
nasa(A)	Roeland: Our sun was born 5 billion years ago, and it has nuclear fuel left for another 6 billion years. So, when Andromeda arrives here, the sun will still be a regularly shining star.
Chad_Rad(Q)	Have we seen anything like this before?
nasa(A)	Rosemary: Our Milky Way has not experienced anything like this before, but we do know of other pairs of spiral galaxies merging.
AlexandraH(Q)	At approximately what speed are the galaxies moving towards each other?
nasa(A)	The galaxies are approaching each other at 250,000 mph, as they continue to fall towards each other, they will speed up more.
Rick(Q)	As the two approach one another, will there be distortions in orbital patterns?
nasa(A)	Gurtina: As they approach each other their orbital paths will change because of their mutual gravitational attraction and they will be forced to collide.
nasa(P)	Rosemary: One additional thought on that, the orbits of additional stars within the galaxies will also change.
etobs(Q)	Wil the merger cause increased star formation? Will the resulting galaxy be a spiral like the Milky Way?
nasa(A)	Rosemary: Yes, to the increased star formation. No, to the spiral- like shape.
nasa(P)	The merger remnant will be an elliptical galaxy
Jason(P)	Did you miss today's press conference about these two colliding galaxies? Learn more at <a href="http://www.nasa.gov/mission_pages/hubble/science/milky-way-collide.html">http://www.nasa.gov/mission_pages/hubble/science/milky-way-collide.html</a>
Jason(P)	Do you have a question you've been waiting to ask? Go for it! To submit your own question, please type it in the box at the bottom of the window and click the 'Ask' button on the right side of the box. Thanks for your patience as we answer your questions.

Kris_Siegel(Q)	Are you expecting any physical collisions? I know space is huge but what are the changes that, say, a star or planet from one galaxy collides with another?
nasa(A)	Roeland: The chance that a star in Andromeda will directly collide with our sun or another Milky Way star is vanishingly small. But, it could happen.
nasa(P)	Do galaxies have event horizons? Galaxies do not have event horizons. You can always escape from a galaxy if you move fast enough.
etobs(Q)	If Earth were still around, if an observer were to look up at the night sky, what would they see instead of the normal arm of the Milky Way that we see today?
nasa(A)	Roeland: First, as Andromeda approaches, it gets much bigger in the sky, then during the collision, many newly -ormed stars will light up the sky. When the collision is over, the now-familiar Milky Way will have been replaced by an elliptically shaped galazy body.
nasa(P)	Rosemary: There will not be a band of light, like the current Milky Way. It would appear more smooth - the stellar distribution.
Matt_Mountain(Q)	Will the center of "Milkrombeda" be able to be observed on Earth during the daytime?
nasa(A)	We have not calculated that, but we think that it is unlikely.
Jason(P)	Got questions? Keep them coming! To submit your own question, please type it in the box at the bottom of the window and click the 'Ask' button on the right side of the box. Thanks for your patience as we answer your questions.
maxklein(Q)	if nothing is likely going to physically collide, why is it a collision?
nasa(A)	Roeland: It is a collision because each galaxy as a whole gets distorted by the gravity of the other galaxy. It's like colliding cars, it's not about the individual cars colliding, its about the whole object.
nasa(P)	Rosemary: You could say you stary off with two galaxies and end up with one, because they join together.
Ocean(Q)	Will our Sun be dead by the time this collision occurs?
nasa(A)	Roeland: No. It will still shine as a regular star, then and for two billion years thereafter.
Sispastro(Q)	when the collision happens, isn't it possible that earth may change its orbit to revolve around another star with greater gravitational pull?
nasa(A)	Gurtina: It's unlikely for stars to get close enoug together to steal away our Earth.

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etobs(Q)	Where is the sun likely to end up in the new galaxy?
nasa(A)	Gurtina: The sun is likely to end up at a larger distance from the center than it is today.
Ocean(Q)	Is there a link to the images that suggest this collision? Illustrations?
Jason(A)	Images that explain today's news are available here: <a href="http://www.nasa.gov/mission_pages/hubble/science/milky-way-collide.html">http://www.nasa.gov/mission_pages/hubble/science/milky-way-collide.html</a>
martzobservatory(Q)	Is a computer generated video available of what the colision may look like?
Jason(A)	This animation depicts the collision: <a href="http://www.nasa.gov/multimedia/videogallery/index.html?media_id=145118991">http://www.nasa.gov/multimedia/videogallery/index.html?media_id=145118991</a>
deniz(Q)	How are their routes ? Are they going to collide linearly or circular ?
nasa(A)	Roeland: Our measurements are consistent with a direct hit, on an almost linear approaching path. However, it is more likely that the path is slightly curved with somewhat of an off-center hit.
kingcomet(Q)	Are there any rules to say how big a galaxy can get after numerous collisions or how dense it can be packed with stars?
nasa(A)	Rosemary: There is no real limit to the mass of stars, we observe very massive elliptical galaxy at the center of clusters of galaxies.
nasa(P)	Roeland: Additionally, some such galaxies known are maybe ten or so times massive than our Milky Way.
HansJ(Q)	How far from earth will Andromedas black hole pass?
nasa(A)	Roeland: It may pass extremely closely, but this would be quite unlikely.
nasa(P)	Roeland: Probably, it won't get any closer to us than the Milky Way's black hole.
deniz(Q)	Will the distance between Earth and Sun be changed after the collision ?
nasa(A)	Roeland: Our solar system will remain unaffected, unless another star happens to pass very close to us. This is quite unlikely, but could happen.
Jason(P)	We're working to answer your great questions. Keep them coming! To submit your own question, please type it in the box at the bottom of the window and click the 'Ask' button on the right side of the box. Thanks for your patience as we answer your questions.

Adam_B(Q)	is the andromeda galaxy speeding up with us from the big bang, or coming from us from a different direction, if so why?
nasa(A)	Roeland: Initially, after the big bang, the two proto-galaxies started by moving away from each other. But, due to their mutual gravitational attraction they were halted in their tracks and are now falling back together.
etobs(Q)	What is the possibility that when the galactic centers merge, a quasar will form?
nasa(A)	Gurtina: It is unlikely that will occur because there isn't enough fuel in both the Milky Way and Andromeda to feed the black hole.
Watern(Q)	How will the exo-solar planets be affected by the collision?
nasa(A)	Roeland: As for our own solar system, most will probably remain unaffected.
listener(Q)	Is a replay of the press conference available?
Jason(A)	Watch the press conference here: <a href="http://www.youtube.com/watch?v=f-LUKIUvc30">http://www.youtube.com/watch?v=f-LUKIUvc30</a>
HansJ(Q)	How accurate is NASA's calculations of the trajectory of Andromeda in degrees?
nasa(A)	Roeland: The angle at approach is probably determined to better than a few degrees. The angle at the present day is larger but gravity will bend the galaxy trajectory towards each other.
robdb(Q)	Has Hubble been able to see anything new because Andromeda is moving closer to us? Are Astronomers able to observe things better as time passes and the gap between us closes?
nasa(A)	Tony: The timescale for Andromeda approaching is so long that we can not actually see a big change. All we can do with Hubble is to measure the motion of Andromeda stars relative to the fixed objects in the background.
Jason(P)	We've got about 10 minutes left in today's chat. To submit your own question, please type it in the box at the bottom of the window and click the 'Ask' button on the right side of the box. Thanks for your patience as we answer your questions.
deniz(Q)	Is gravity the only reason of the collision ?
nasa(A)	Roeland: Yes. On such large spatial scales gravity dominates the other forces of nature.
Catty(Q)	Will the collision affect nearby dwarf galaxies?
nasa(A)	Rosemary: The dwarfs that are closest will have their orbits changed. For example, we did the calculations on one of the satellites of Andromeda, the Triangulan galaxy, and found that its orbit had changed. But it survives the merger.
Kepler(Q)	Will our moon be affected?

nasa(A)	Roeland: Similarly to other bodies in our solar system, it likely will not be affected.
jfranklin(Q)	How do you determine if the motion you are seeing in the Andromeda stars is due to the rotation of Andromeda or a sideways motion of the whole galaxy?
nasa(A)	Tony: We know the rotation of Andromeda and corrected for that effect and the end result we get is the sideways motion of Andromeda.
nasa(P)	Rosemary: There was a question about what would be the event horizon of a Black hole of mass equal to that of an event whole
nasa(P)	finishing the thought: one thousand billion kilometers is the event horizon of a black hole with mass equal to that of the entire Milky Way galaxy.
Jason(P)	We've got time for just one more question....
TIMESTEAL(Q)	So if two blackholes come in contact with each other, they merge into one giant blackhole? So all blackholes have the same "pull"?
nasa(A)	Roeland: No, the amount of gravitational pull from a black hole depends both on its mass and how far one is away from it.
AlexandraH(Q)	According to relativity, time slows down as an object accelerates and reaches high speed. Does this apply to the continued acceleration of our galaxies as well? Will those 4 billion years until they collide get shorter as we accelerate towards one another, or is the scale too great for us to perceive it (if we are still here)?
nasa(A)	Roeland: The relativistic effect of time slowing down is only noticeable close to black holes, where the gravity is unusually strong, or when moving at speeds close to that of light. Which is not the case here.
Jason(P)	Thanks for the great answers to everyone's questions. Thanks to the panelists for sitting down with us to answer your questions. We appreciate you all taking time out of your day to join us and ask questions. Our chat is over! Thanks for participating. A transcript will be available within the next few business days.