

The Dec 21, 2020 Conjunction of Jupiter and Saturn

Throughout 2020, the planets Jupiter and Saturn have been close together in the sky. Over the summer, they were within a few degrees of one another, bright in the southern sky, and they will continue to approach one another throughout the fall. On the evening of Dec 21, 2020, Jupiter and Saturn will be in conjunction (closest approach). This page describes specifics for the event. There is much more to learn! Refer to the [general Jupiter-Saturn conjunction page](#) to learn all about these conjunctions over a 3000 year interval starting in 0 CE.

MAIN TAKEAWAY: THE ACTUAL CONJUNCTION IS A RARE EVENT DEFINITELY WORTH SEEING, BUT WILL BE A CHALLENGE TO OBSERVE FROM SOME LOCATIONS. IT'S EASY TO FOLLOW THE PLANETS IN THE WEEKS BEFORE THE CONJUNCTION THOUGH. NEAR DEC 21, JUPITER AND SATURN WILL APPEAR LIKE A BINARY PLANET IN THE DUSK SKY. HOWEVER, THEY WILL *NOT* SUDDENLY LOOK LIKE A BRILLIANT 'CHRISTMAS STAR'.

How special is this?

Whenever there is an astronomical event, everyone seems to want to know how special it is. As noted on the [Jupiter-Saturn conjunction page](#), conjunctions between these two planets occur regularly, and are spaced out by about 20 years and so always seem rather rare. But it is fair to say that this conjunction is truly exceptional in that the planets get very close to one another. In the three thousand year interval from 0 CE to 3000 CE, only seven Jupiter/Saturn conjunctions were/will be closer than this one. Two of those (in 769 CE and 1623 CE) were too close to the Sun for Saturn to be seen without a telescope, and even Jupiter would have been difficult or impossible to detect from most locations with the naked eye for these events. If you are looking for a positive spin, the last time the two planets appeared this close to one another in the sky and were observable (i.e. not in the Sun's glare) was on the morning of *March 4, 1226!* That was back in the Middle Ages, when the Notre Dame Cathedral was first being built. For this conjunction, both planets will be visible in the same field of view in most small telescopes, along with some of Jupiter's and Saturn's moons (see image below). In fact, they will be so close it may be a challenge to separate them with the unaided eye for some people.

How easy is it to see?

A difficulty with the December 21, 2020 conjunction for many observers is that its separation from the Sun is only 30 degrees, and for northerly latitudes such as those in the United States, Canada, and Europe, those 30 degrees are at an angle to the horizon that is not vertical. Now consider that you want the Sun to be at least 6 degrees below the horizon for skies to be dark enough, plus for most locales anything below an altitude of 10 degrees is very difficult to observe, and you'll appreciate there is not a lot of room left over to see the event. It can be done with good weather and horizons, but seeing this well will take a bit of planning and perhaps some luck with weather. Of the two planets, Saturn is significantly fainter than Jupiter, and will be the most difficult to see. But once you find Jupiter, Saturn will be right next to it. My sense is that as long as it is clear and you go someplace where you can watch the sunset, you will be successful in observing this event.

How much does location matter?

Viewing conditions are best close to the equator, though no matter where you are there is maybe an hour or so to observe this conjunction before the planets sink into the haze. For example, in Houston TX, latitude ~ 30 degrees north, civil twilight ends (i.e. it starts to get dark enough to see the brightest stars and planets) around 5:53 pm. Jupiter should be visible by then, and Saturn just emerging from the twilight. At that point Jupiter and Saturn will be 19.7 degrees above the horizon. It will be fully dark an hour later, but by then the planets are only 9 degrees above the horizon. These elevations are low, but manageable if you find somewhere with an unobstructed view to the southwest. It is a bit more difficult in, say, New York City, latitude ~ 40 degrees north. In this case civil twilight ends at 5:03 pm and the planets will be 16 degrees above the horizon. An hour later they are only 7.5 degrees. Up at latitude 51 degrees in London UK, the planets will be up about 11.5 degrees at civil twilight, and an hour later they are at 5.3 degrees, a difficult observation for sure. But go down to Caracas Venezuela, latitude ~ 10 degrees north, and the pair is up 23.5 degrees at civil twilight, which isn't too bad, and is about as good as it gets this time.

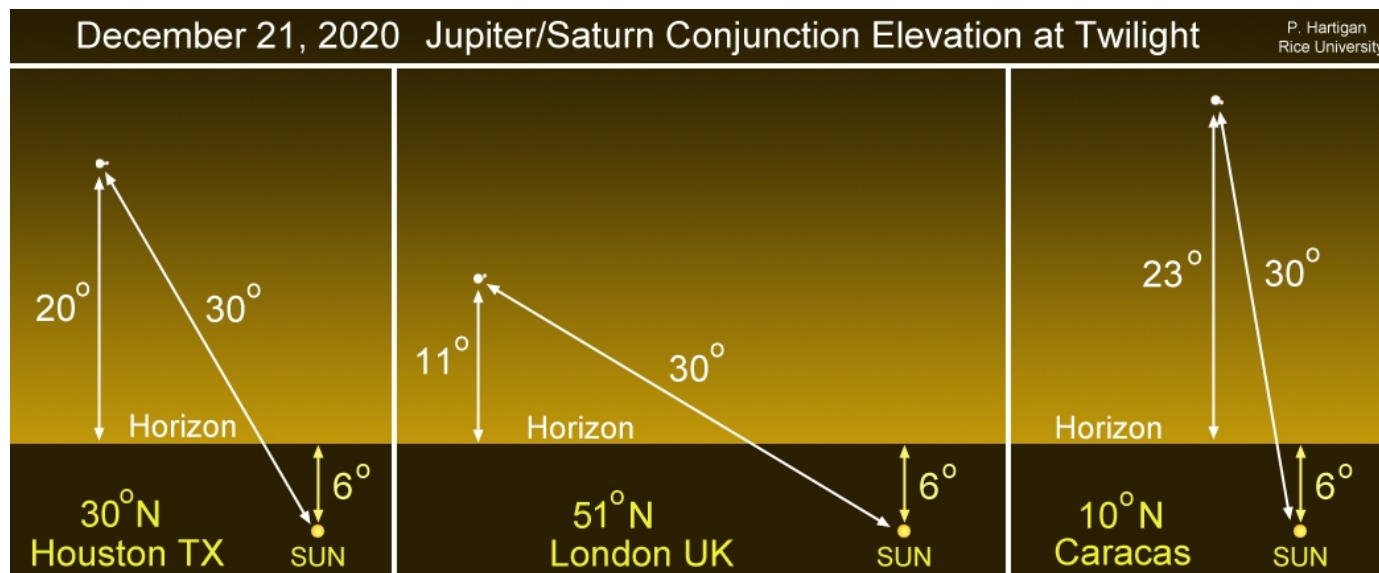


Diagram of the Conjunction of Jupiter and Saturn on December 21, 2020, as viewed from three different latitudes when the Sun is 6 degrees below the horizon.

What's the best plan to see it?

To be successful in observing this conjunction you will need to have a clear southwestern horizon and no low clouds in the distance. Observers without a telescope it may find it a challenge to resolve both planets, but it can be done. This is an event that could be impressive to see, but you will have to be prepared and binoculars will likely be very helpful for seeing it well in most skies. If you can set up a small telescope on them before it gets fully dark that will be optimal, as then you will be able to see both planets together in the field of view along with Saturn's rings, and the brightest moons of both planets.

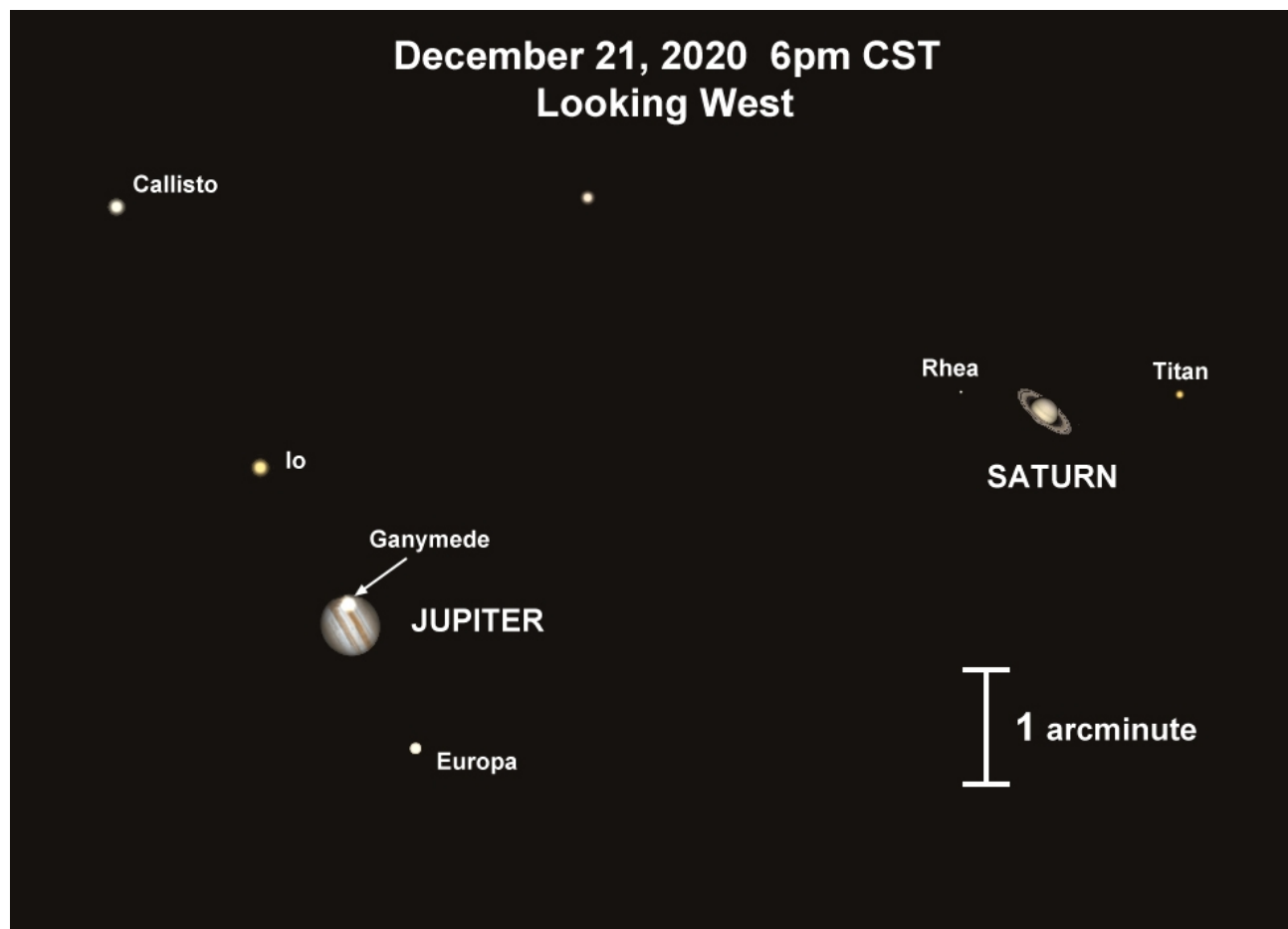
The diagram below, adapted from the program Stellarium, shows what the conjunction will look like in a telescope at the end of civil twilight in Houston. Views from other locations a few hours one way or another will look similar, though Jupiter's moons will move a bit, and Jupiter is moving up relative to Saturn in the image. At closest approach the separation between the planets is about 6.3 arcminutes in Houston, (essentially the same in Europe: 6.1 arcminutes). For

reference, the full Moon is about 30 arcminutes. Theoretically the unaided eye can resolve down to 1 arcminute, but that is for equally bright objects and for perfect optics within the eye itself and a flawless retina. With a more realistic limit of 2 - 5 arcminutes it should be just possible for most people with decent vision to resolve both planets.

It was cloudy!

If it is cloudy or you miss it for some reason don't worry, the conjunction is an ongoing event! Any time from December 17 through Christmas will find the two planets closer together than the diameter of the full Moon, and that is closer together than they usually ever get during most of the other years that have these conjunctions. Interestingly, one of the five closer approaches mentioned above occurs only three conjunctions from now, on March 15, 2080. That one has almost exactly the same separation as this one does, but will be much easier to see as it will appear 44 degrees from the Sun, well up in the morning sky. The major challenge there is you'll have to stay alive for another 60 years to see it!

Here's what it will look like in a small telescope



View of the 2020 Jupiter-Saturn conjunction to scale. This is how it will appear in a telescope. The western horizon is towards the bottom. Adapted from graphics from Stellarium.