Was the formation of a 15 mile wide meteorite crater on the Moon observed in June 1178 AD?

The following text is an extract from the Chronicles of Gervase of Canterbury, Great Britain, referring to the night of 18th June, 1178 AD:

" ... after sunset when the moon had first become visible a marvellous phenomenon was witnessed by some five or more men who were sitting there facing the moon. Now there was a bright new moon, and as usual in that phase its horns were tilted towards the east; and suddenly the upper horn split in two. From the midpoint of the division a flaming torch sprang up, spewing out, over a considerable distance, fire, hot coals, and sparks. Meanwhile the body of the moon which was below writhed, as it were, in anxiety, and, to put it in the words of those who reported it to me and saw it with their own eyes, the moon throbbed like a wounded snake ... The present writer was given this report by men who saw it with their own eyes, and are prepared to stake their honour on an oath that they have made no addition or falsification in the above narrative."

It has been suggested that this dramatic passage is an eyewitness account of a large meteorite or other body hitting the Moon and forming the young lunar crater Giordano Bruno. This 15 mile wide crater, located just out of sight on the far side of the Moon, is known to be young due to its uneroded shape. If this hypothesis is true, then the Earth only narrowly avoided catastrophe in 1178 AD. On a cosmic scale, objects hitting the Moon only narrowly avoid hitting the Earth. Such a meteorite impact on the Earth would cause regional devastation and, possibly, a global climatic catastrophe. Had this happened in 1178 AD, civilization would have been dealt a potentially crippling blow.

Such a provocative hypothesis is deserving of closer study, but, unfortunately, the suggested impact site, lunar crater Giordano Bruno, has not been well studied by spacecraft. Indirect means must be used to test the hypothesis. In my work, I have calculated the meteor storm that would be visible on the Earth in the event of such a large impact on the impact.

This meteor storm would be caused by ejecta from the impact on the Moon flying through space and burning up in the Earth's atmosphere.

I calculate that this meteor storm would be a phenomenal event, dramatic enough to merit a record in all contemporary records. The lack of any such records is strong evidence against the hypothesis that the formation of the lunar crater Giordano Bruno was witnessed in 1178 AD.

Further Information

On the Moon from:
http://solarsystem.nasa.gov
http://nssdc.gsfc.nasa.gov/planetary/planets/moonpage.htm
l
http://seds.lpl.arizona.edu/nineplanets/nineplanets/luna.htm
l

On meteors from:
http://www.amsmeteors.org/
http://www.skypub.com/sights/meteors/meteors.shtml

On the idea that Giordano Bruno formed in 1178 AD:
Carl Sagan's "Cosmos" book
Many websites enthusiastically promote the idea without any critical comment

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<u>Lunar Crater Giordano Bruno</u>

The surface of the Moon is covered by craters, most of which formed millions of years ago. Most theories predict that no crater close to 15 miles in size has formed in the past million years.

However, one crater of that size on the Moon appears suspiciously young. This crater, Giordano Bruno, is not visible from Earth, but is surrounded by young bright rays and shows almost no signs of erosion. In 1976, scientist Jack Hartung read the medieval Chronicle of Gervase of Canterbury and suspected a connection between the young crater and a dramatic passage in the Chronicle which spoke of the Moon "spewing fire and sparks."

He interpreted the passage as an eye-witness account of the formation of lunar crater Giordano Bruno. If true, this is a very exciting theory with the following implications:

1) The Earth narrowly avoided cosmic catastrophe in 1178 AD.
2) Predictions of the dangers to Earth from asteroids and comets may be very wrong indeed.
3) Studying such a young crater will help scientists understand how craters change with time, which will be useful to them as they study other cratered surfaces in the solar system.

I decided to test this fascinating theory by calculating what kind of meteor storm would have been produced in the Earth's atmosphere by debris from the impact on the Moon. If the predicted meteor storm is huge, then it should be recorded in many medieval chronicles. If no record of such an event exists in the chronicles, we must find an alternative explanation for the dramatic passage in the Chronicles of Gervase of Canterbury.

What if the impactor hit the Earth instead of the Moon?

Bad things happen. Lots of them. Movies such as Armageddon and Deep Impact give a rough idea of what might happen.

Scientists use the Torino Scale to describe how dangerous an object approaching Earth is. Objects are classified by how likely they are to hit the Earth and by the damage they would cause if they did hit the Earth. 0 poses no danger, 10 is global climatic catastrophe. If the object that formed lunar crater Giordano Bruno had hit the Earth instead of the Moon, it would have been classified as a 9 to 10 on the Torino scale. The medieval world was unprepared to deal with such devastation and the development of modern civilization as we know it today might never have happened.

Some of the possible effects of the impact include:

1) Interruption of photosynthesis, causing havoc with food supplies.
2) Heat radiated from debris as it re-enters Earth's atmosphere may ignite wildfires.
3) Atmosphere is dusty for months, affecting climate and weather. Sunsets are spectacularly beautiful.
4) Near the impact site, all life is obliterated. Instantly.

The impact is unlikely to drive many species to extinction, except those that only thrive near the impact site and those that are struggling to survive anyway.

What happens during a huge impact?

Rock at the impact site is vaporized and rock close by the impact site is melted to liquid. More distant rock is merely pulverized. The shock wave generated by the impact blasts this molten and pulverized mass of rock high above the ground. The volume of material ejected in this way is 100 to 1000 times the size of the impactor. The energy released during the impact would be equivalent to roughly 1000 of the largest nuclear bombs ever made being detonated simultaneously.

The diameter of the resultant crater is roughly ten times that of the impactor. Some of the material ejected by the impact falls back to the ground close to the crater, forming a continuous blanket of debris. Some falls back to the ground at greater distances, spreading material far and wide. The fastest portion of the ejected material is going fast enough to fly into space, never to return.

An impact on the Moon has a good chance of sending material into space which will later hit the Earth. When this material reaches the top of the Earth's atmosphere it will be travelling at speeds of over 7 miles per second. At this speed, even the insubstantial atmosphere exerts a huge force on the incoming material. This force heats the incoming material so much that it begins to burn up, becoming a meteor.

If it is dark enough, and if the meteor is bright enough, it is visible to people on the ground, despite burning up at heights of 40 miles or more. Throughout history, people have witnessed meteors, told their friends, and noted them in their diaries. Many famous regular meteor storms, like the November Leonids, have been recorded for hundreds of years, though the witnesses might not have known what they were seeing.

Meteor storm on Earth after formation of Giordano Bruno

Scientists studying impacts have suggested that 10 million tonnes of ejected material will enter the Earth's atmosphere in the week following the formation of Giordano Bruno – whenever it was formed.

I calculated that most of the ejected material would be between 0.1 and 10 cm in size. If it is all 0.1 cm in size, then a witness on the ground would see about a million faint meteors every hour. If it is all 10 cm in size, then a witness on the ground would see about ten meteors brighter than the brightest star every hour. This would last for a week.

A meteor storm as spectacular as this would be remarkable to anyone who saw it. Any medieval chronicle that discusses strange events in the sky at all – and many of them do in those superstitious times – would mention this meteor storm.

I have examined summaries of astronomical events in chronicles from Europe, Arabia, China, Korea, and Japan and none of the dozens of chronicles mention any meteor storm at anywhere near the correct date.

The absence of evidence for the meteor storm must be interpreted as evidence for the absence of the meteor storm. If the meteor storm didn't happen, then what does the "Moon spewing fire and sparks" passage from Gervase of Canterbury's Chronicle refer to?

Alternative Explanations for Gervase's text

Not all scientists were convinced by the suggestion that Gervase of Canterbury is recording the formation of a huge crater on the Moon.

It is difficult to believe that an event predicted to occur once every few million years, like the formation of lunar crater Giordano Bruno, would happen in the last thousand years.

There are also problems in the actual eye-witness report provided by Gervase. He describes the Moon "spewing out fire, hot coals, and sparks." Impact events do not create lumps, or inhomogeneities, large enough to be seen as distinct objects when the impact is on the Moon and the witness on the Earth. The witness should see a gradual change in properties, not some patches of fire and some patches of hot coals. Also, he describes this repeating a dozen times or more. An impact of the kind that formed lunar crater Giordano Bruno was not a sequence of a dozen similar events, but rather a single event.

It has been suggested that Gervase's witnesses saw an unusual meteor in the atmosphere, that just happened to be travelling in such a direction that it appeared directly in front of the Moon. It is very difficult to test this idea, but this would explain why there are no other records of this "lunar impact" event in any other medieval chronicle. Gervase's description is, more or less, consistent with a meteor spiralling through the atmosphere and repeatedly flaring brightly.

Summary

Based on a provocative passage in a medieval chronicle, it has been suggested that the formation of a suspiciously young crater on the Moon was witnessed in 1178 AD.

If this suggestion is true, the Earth narrowly escaped cosmic catastrophe at this time, current predictions may severely underestimate the dangers to the Earth from space, and there is an exceptionally young crater on the Moon to teach scientists more about this important geologic process.

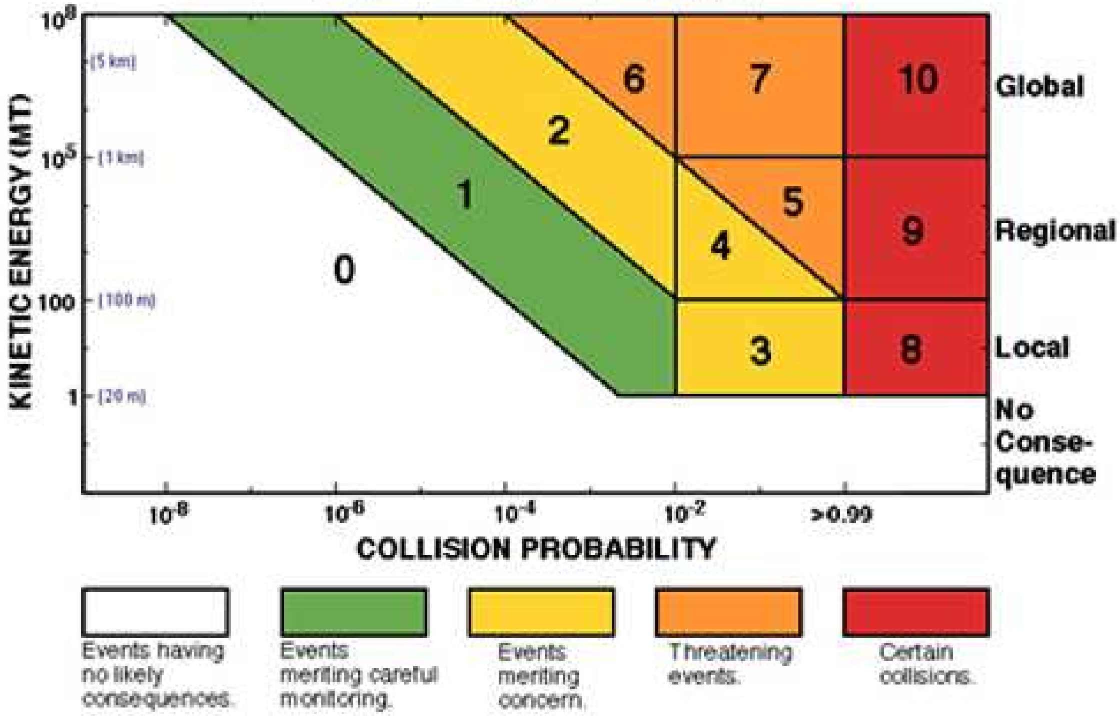
If this suggestion is false, one medieval chronicle contains a confusing passage.

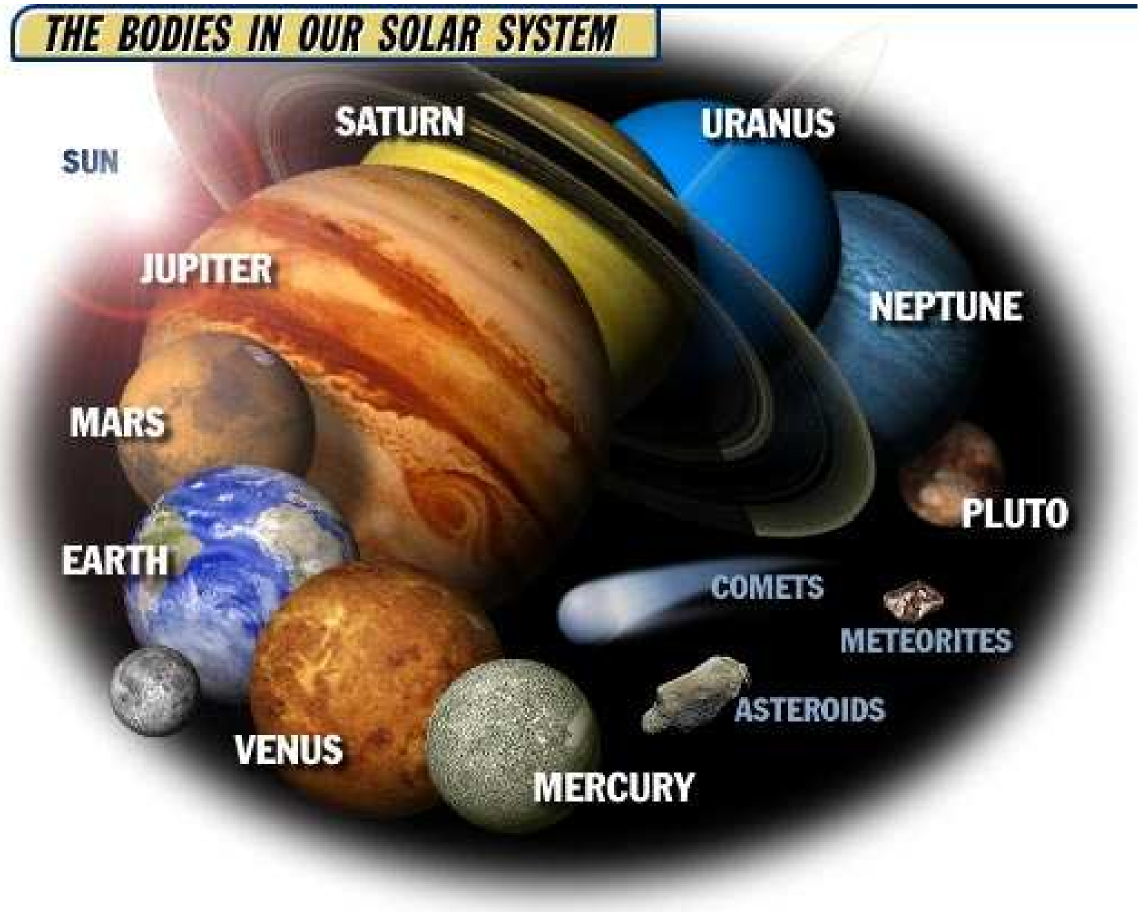
To test this suggestion, I calculated what kind of meteor storm would occur on the Earth after the formation of the suspiciously young crater. I found that the meteor storm would be incredible, spectacular enough to be mentioned in almost every medieval chronicle.

Upon examining summaries of medieval chronicles, I found no such records, suggesting that no such storm occurred. If no such storm occurred, then the young crater's formation could not have been witnessed and recorded in one medieval chronicle. The provocative passage in this chronicle must be describing something else.

The passage may be describing the arrival of a single meteor at Earth. This suggestion is consistent with the text of the passage and current theories about how meteors behave, but it is very difficult to positively prove it.

The Torino Scale




THE BODIES IN OUR SOLAR SYSTEM
SUN
SATURN
URANUS
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COMETS
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