Exploding Stars Phenomenon

Directions

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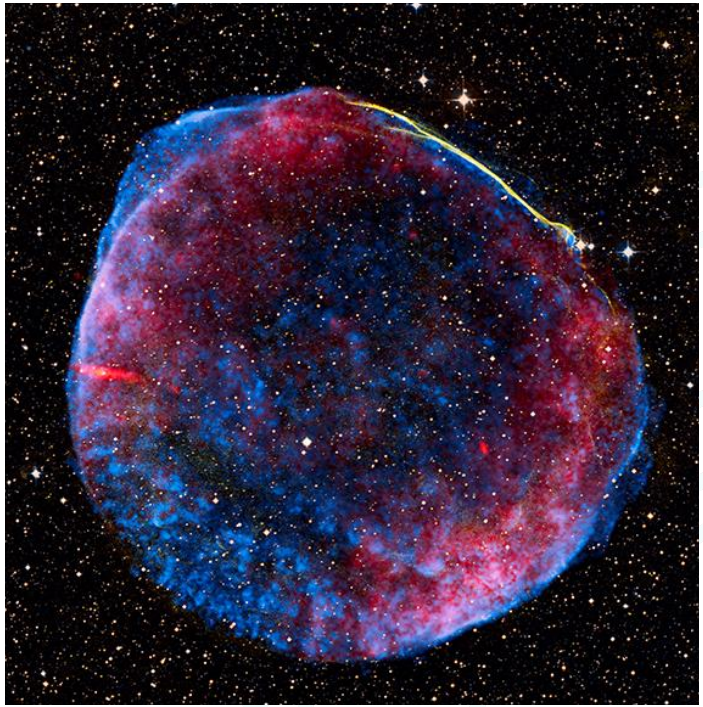
2. As you look through these observations, record what patterns you notice.



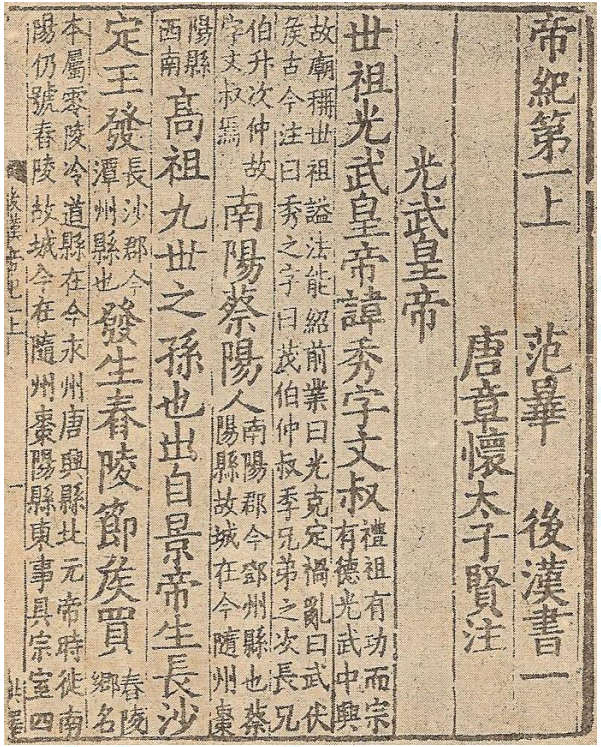
Remnant of Supernova 1006
Credit

Supernova RCW 86 (185 AD)

- RCW 86 is the oldest recorded supernova.
- Chinese astronomers saw a "guest star" appear during nighttime in the constellation today known as Circinus.
- The Book of Later Han volume 102 gives the following description:

  In the 2nd year of the epoch Zhongping [中平], the 10th month, on the day Kwei Hae [癸亥] [Year 185], a 'guest star' appeared in the middle of Nan Mun [asterism containing Alpha Centauri], The size was half a bamboo mat. It displayed various colors, and gradually lessened. In the 6th month of the succeeding year it disappeared.

- Its peak brightness was similar to the planet Venus.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世祖光武皇帝諱秀字文叔 禮祖有功而宗有德光武中興故廟獨世祖謚法能紹前業曰光克定禍亂曰武伏戾古今注曰秀之字曰茂伯仲叔季兄弟之次長兄伯升次仲故字文叔焉 南陽蔡陽人南陽郡今鄧州縣也蔡陽縣故城在今隨州棗陽縣西南 高祖九世之孫也出自景帝生長沙定王發長沙郡今潭州縣也發生春陵節侯買春陵鄉名本屬零陵今道縣在今永州唐興縣北元帝時徙南陽仍號春陵故城今在隨州棗陽縣東事具宗室四

The first page of the Book of the Later Han.
Credit: 范曄 (Fan Ye, 398–445) - 南宋紹興刊本 (Southern Song Shaoxing [1131-1162] edition), Public Domain.

Supernova 1006 (30 April 1006 AD)

- Estimated to be the brightest supernova recorded.
- At its peak, this supernova would have been bright enough to be seen in daylight. At night, its light was bright enough to illuminate the ground and cast shadows.
- Egyptian astrologer and astronomer Ali ibn Ridwan, stated that the "spectacle was a large circular body, 2 ½ to 3 times as large as Venus." This peak brightness would have been about the same as a crescent Moon.
- Monks at the Abbey of Saint Gall in Switzerland wrote that "[i]n a wonderful manner this was sometimes contracted, sometimes diffused, and moreover sometimes extinguished... It was seen likewise for three months."

A rock carving, or petroglyph, in Arizona's White Tanks Regional Park, near Phoenix may depict this striking astronomical event. The Hohokam people occupied the region from about 500–1100 A.D. The carving shows a large rayed circle beneath a scorpion symbol. The 1006 supernova was visible in the constellation Lupus, southwest of Scorpius the Scorpion.
Credit: https://astronomy.com/news/2006/06/rock-art-records-an-ancient-blast

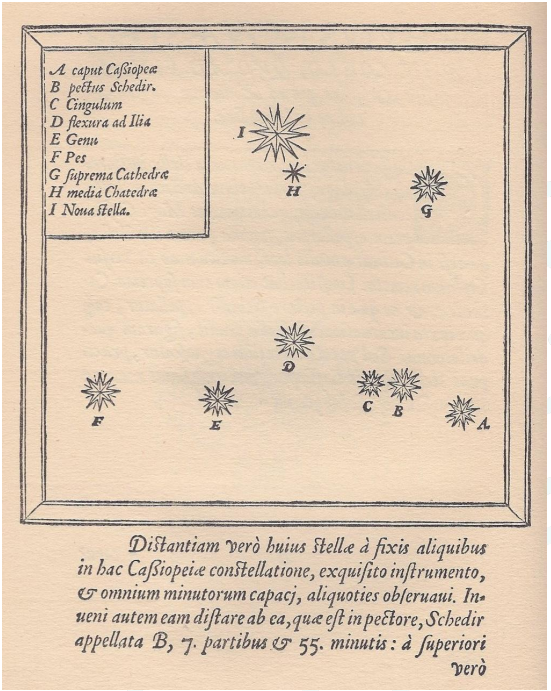
Supernova 1054 (4 July 1054 AD)

- On July 4, 1054 AD, a new star appeared in the constellation Taurus the Bull.
- Chinese records suggest it about 10 times brighter than Venus, and was visible in broad daylight. Other observations of the explosion were recorded by Japanese and Arab stargazers.
- It remained visible by day for 23 days, and by night for 653 days.

A pictograph, associated with the Ancestral Puebloan culture found in Chaco Canyon, New Mexico, may depict the supernova. The crescent is the Moon, the star shape to the left is the supernova, and a life-size hand print is thought to indicate that the site is sacred. Calculations of the Moon's orbit show that before dawn on July 5, 1054, as seen from Chaco Canyon, the thin waning crescent Moon was within 3 degrees of the supernova, and oriented as seen in the pictograph.
https://commons.wikimedia.org/wiki/File:Anasazi_Supernova_Petrographs.jpg#filelinks

Supernova 1572A (2 November 1572)

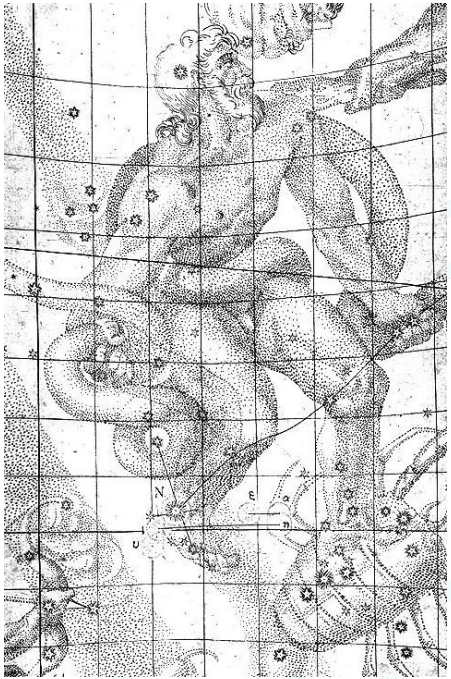
- First appeared in the night sky on November 2, 1572 in the constellation Cassiopeia. By November 11 it was already brighter than Jupiter. Around November 16, 1572, it reached its peak brightness with some descriptions giving it as equal to Venus when that planet was at its brightest. The supernova remained visible at night to the naked eye into early 1574, gradually fading until it disappeared from view.
- This supernova is often called "Tycho's supernova", because of Tycho Brahe's publication in 1573, De nova et nullius aevi memoria prius visa stella ("Concerning the Star, new and never before seen in the life or memory of anyone").



Star map of the constellation Cassiopeia showing the position of the Supernova of 1572. The supernova is identified as “I, Nova Stella”. A facsimile reprint of the original edition, 1573] Tychonis Brahe dani, die XXIV octobris A. D. MDCI defuncti, operum primitias De nova stella.

Supernova 1604 (9 October 1604 AD)

- Appeared in the constellation of Ophiuchus on October 9, 1604 AD.
- It was brighter at its peak than any other star in the night sky.
- Records of its sighting exist in European, Chinese, Korean and Arabic sources.
- Johannes Kepler started observing it from October 17 for a year.
- Because he published a book containing the observations of the supernova, De Stella nova in pede Serpentarii ("On the new star in Ophiuchus's foot", Prague 1606), it has come to be known as Kepler's Supernova.



A star map excerpt from Kepler's book. The location of the supernova is marked by a capital N, (4 squares from left edge and 4 squares up from the bottom). Image in the public domain. https://commons.wikimedia.org/wiki/File:Kepler_Drawing_of_SN_1604.png

Supernova 1987A

- Supernova 1987A was first spotted by telescope operator Oscar Duhalde, while on a coffee break in the middle of his night shift on February 23, 1987, at Las Campanas Observatory in Chile. The supernova was located in the Large Magellanic Cloud galaxy.
- Its brightness peaked in May. It could be seen in the night sky for almost a year before fading below the limit of naked eye visibility.
- It is also the most extensively studied supernova, observed by many instruments over a range of wavelengths, for a long period of years.

Two views of the Large Magellanic Cloud, before (left) and after (right) the explosion of SN 1987A. The supernova is marked by the arrow. (ESO PR Photo 08b/07)

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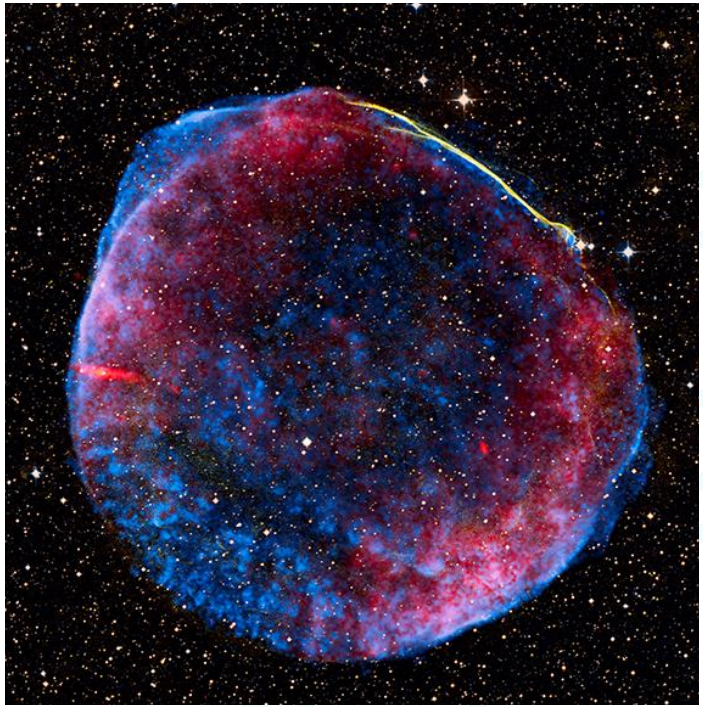
3. What do you think we learn about supernova by studying them?



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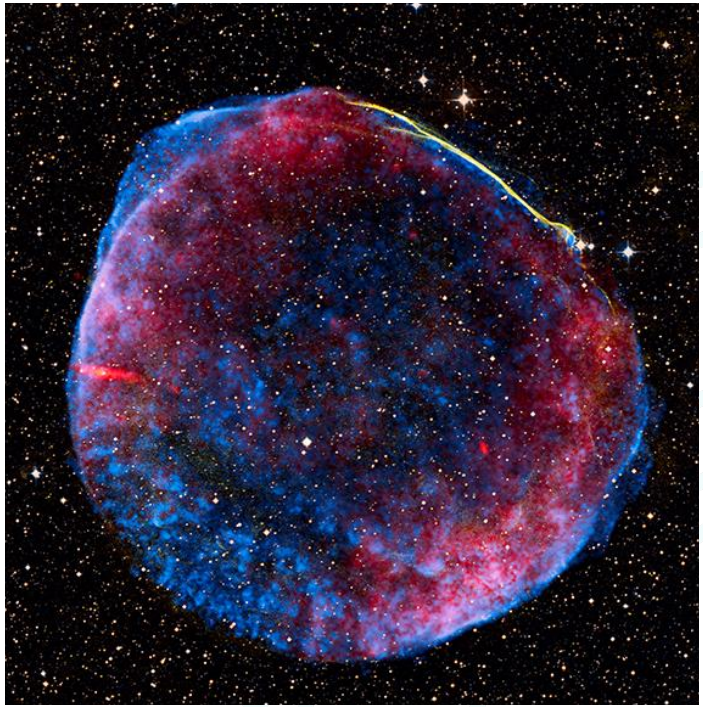
4. Supernovae are used to measure distance in space. What questions do you have about supernovae and using them to measure distances in space?



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