

Topic Page: [Novas](#)

Definition: **nova** from *Philip's Encyclopedia*

(pl. novae) Faint star that undergoes unpredictable increases in brightness by several magnitudes, apparently due to explosions in its outer regions, and then slowly fades back to normal. See *also* variable star



Image from: [nova The shells of gas around the recurrent nova... in Astronomy Encyclopedia](#)

Summary Article: **nova**

From *The Hutchinson Unabridged Encyclopedia with Atlas and Weather Guide*

Faint star that suddenly erupts in brightness by 10,000 times or more, remains bright for a few days, and then fades away and is not seen again for very many years, if at all. Novae are believed to occur in close binary star systems, where gas from one star flows to a companion white dwarf. The gas ignites and is thrown off in an explosion at speeds of 1,500 kps/930 mps or more. Unlike a supernova, the star is not completely disrupted by the outburst. After a few weeks or months it subsides to its previous state; it may erupt many more times.

Although the name comes from the Latin 'new', photographic records show that such stars are not really new, but are faint stars undergoing an outburst of radiation that temporarily gives them an absolute magnitude in the range -6 to -10 , at least 100,000 times brighter than the Sun. They fade away, rapidly at first and then more slowly over several years. Two or three such stars are detected in our Galaxy each year, but on average one is sufficiently close to us to become a naked-eye object only about once in ten years. Novae very similar to those appearing in our own Galaxy have also been observed in other galaxies.

Named novae Novae are named according to the constellation and year in which they appear. Bright ones that have been intensively studied spectroscopically include nova Persei 1901, nova Geminorum 1912, nova Aquilae 1918 (which became almost as bright as Sirius), nova Pictoris 1925, nova Herculis 1934, nova Puppis 1942, and nova Cygni 1975. This last was first seen on 29 August, with a magnitude of 3.0. By 31 August it had attained its maximum brightness of 1.8, which it retained for a day, and it was below naked-eye visibility by 5 September. The star had evidently been fainter than photographic magnitude 21 in 1950, as it does not show on the Palomar charts. No subsequent novae have equalled the apparent brightness of nova Cygni 1975.

The phenomenon The rate of increase in brightness, the absolute magnitude, and the rate of fading differ from nova to nova, but spectroscopic observations indicate that the phenomenon in each case is essentially the same. The star blows off its outer shell with velocities of ejection of the order of 1,500 kps/930 mps, the total mass of the shell being about 1/10,000–1/100,000 that of the Sun. The growing shell initially behaves like the photosphere of a supergiant, and pours out rapidly increasing amounts of white light. As the expansion continues, however, it grows more and more diffuse so that conditions in it become more like those in a gaseous nebula. The continuous spectrum fades, leaving mainly a mixture of monochromatic radiations that decay much more slowly.

Theory Many novae have been found to be members of close binary systems, and it has consequently

been hypothesized that the stars subject to a nova outburst are close binaries that have evolved so far that the initially larger member has already become a white dwarf, while the other one is in its red giant phase. As the outer layers of the red giant swell out beyond the Lagrangian surface, some of the material is attracted to the white dwarf, where the surface gravity is so high that the extra matter produces a sufficient rise in the pressure and temperature to start proton–proton reactions in the hydrogen still remaining in the outer layers. The energy thus suddenly released ejects the surface layer into space so that the remainder can relapse to its former white-dwarf state. This theory implies that the same system may suffer several nova outbursts, and this does seem to be the case: there are a number of stars, the so-called recurrent novae, for which more than one such outburst has been observed.

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