

PILLARS OF COSMIC DESTRUCTION

Spectacular new observations of vast pillar-like structures within the Carina Nebula have been made using the MUSE instrument on ESO's Very Large Telescope. The pillars are vast clouds of dust and gas within a hub of star formation about 7500 light-years away and after being analysed by an international team seem to be Pillars of Destruction -- in contrast to the name of the iconic Pillars of Creation in the Eagle Nebula, which are of similar nature.

The images show several pillars within the Carina Nebula being destroyed by the massive stars within the region of dust and gas from which they are born.

The great power of MUSE instrument is that it creates thousands of images of the nebula at the same time, each at a different wavelength of light. This allows astronomers to map out the chemical and physical properties of the material at different points in the nebula.

In an ironic twist, it looks like one of the first consequences of the formation of a massive star is that it starts to destroy the cloud from which it was born. The idea that massive stars will have a considerable effect on their surroundings is not new; such stars are known to blast out vast quantities of powerful, ionising radiation -- emission with enough energy to strip atoms of their orbiting electrons. However, it is very difficult to obtain observational evidence of the interplay between such stars and their surroundings.

The team analysed the effect of this energetic radiation on the pillars, a process known as photoevaporation, when gas is ionised and then disperses away. By observing the results of photoevaporation -- which included the loss of mass from the pillars -- they were able to deduce the culprits. There was a clear correlation between the amount of ionising radiation being emitted by nearby stars, and the dissipation of the pillars.

This might seem like a cosmic calamity, with massive stars turning on their own creators. However the complexities of the feedback mechanisms between the stars and the pillars are as yet poorly understood. It is possible that the radiation and stellar winds from massive stars actually help create denser spots within the pillars, which can then form new stars.

These breathtaking celestial structures have more to tell us, and MUSE is an ideal instrument to probe them with. The pillars can be several light-years in length. They are sometimes also known as elephant trunks. *Eta Carinae*, with an average magnitude of 6, is the most prominent variable star in the constellation Carina (the keel part of the old Argo Navis ship); with a mass of approximately 100 solar masses and 4 million times as bright as the Sun. Although it is some four times as large and even brighter than the famous Orion Nebula, the Carina Nebula is much less well known, due to its location in the southern sky. It was discovered by **Nicolas Louis de Lacaille** in 1751–52 from the Cape of Good Hope. The well-known features within the nebula are:

- 1 *Eta Carinae*
- 2 Homunculus Nebula
- 3 Keyhole Nebula
- 4 Mystic Mountain



These composite image shows several pillars within the Carina Nebula which were observed and studied with the MUSE instrument, mounted on the ESO's Very Large Telescope. The massive stars within the star formation region slowly destroy the pillars of dust and gas from which they are born



In celebration of its 25th anniversary, NASA's Hubble Space Telescope has revisited the famous "Pillars of Creation" region of the Eagle Nebula (M16), providing astronomers with a sharper and wider view.

