

Painting with oxygen and hydrogen



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A new image from the Hubble Space Telescope is an example of 'painting with light'. Astronomers use the separated colours produced by oxygen and hydrogen to investigate star-forming processes in the nebula NGC 2080. The colours explain much about the nature of such nebulae. The colours from stars, nebulae and galaxies come to us in bold strokes as if they had been painted by a renaissance master. But they are not artistic adornment, they provide details into the scientific workings of these objects.

This new picture taken by the NASA/ESA Hubble Space Telescope demonstrates how astronomers can 'paint with light'. Light emitted by different chemical elements, and from elements at different temperatures is separated by special narrow-band filters to reveal the nature of complicated and violent star-formation processes.



NGC 2080 Cette image est composée de trois images obtenues dans des filtres à bande étroite avec la caméra WFPC2 de Hubble en Mai 2000. Les couleurs sont rouge (hydrogène ionisé, dont un traceur est la raie de recombinaison H-alpha), vert (oxygène ionisé) et bleu (hydrogène ionisé, raie de recombinaison H-beta). La taille de l'image est de 67 x 67 secondes d'arc, ce qui correspond à 55 x 55 années-lumière à la distance du Grand Nuage de Magellan. Cliquer sur l'image pour obtenir une meilleure résolution. *ESA, NASA & Mohammad Heydari-Malayeri (Observatoire de Paris, France)*

This image is composed of three images obtained in narrow filters with the WFPC2 camera of Hubble in May 2000.

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The colors are red (ionised hydrogen, traced by the recombination line H-alpha), green (ionised oxygen) and blue (ionised hydrogen, H-beta recombination line). The blue corresponds to the hottest regions, the red to the coldest. The image size is 67 x 67 arc-seconds, corresponding to 55 x 55 light-years at the distance of the Large Magellanic Cloud. Click on the image to view a higher resolution version.

The Hubble image shows the nebula NGC 2080, nicknamed the 'Ghost Head Nebula' by astronomers. It is one of a chain of star-forming regions lying south of the 30 Doradus nebula in the Large Magellanic Cloud that have attracted special attention. These regions have been studied in detail with Hubble and have long been identified as unique star-forming sites. 30 Doradus is the largest star-forming complex not only in the Large Magellanic Cloud, but also in the whole local group of galaxies. The light from the nebula caught in this image is emitted by two elements, hydrogen and oxygen. The red and blue light comes from regions of hydrogen gas heated by nearby stars until it is fully ionised. The green light of the filament shape on the left comes from doubly ionised oxygen. The energy to illuminate the filament is supplied by a powerful stellar wind coming from a massive star just outside the image. The white region in the centre is a combination of all three emissions, and indicates a core of hot, massive stars in this star formation region. The intense emission from these stars has carved a bowl shaped cavity in the surrounding gas.

Two bright regions (the 'eyes of the ghost'), named A1 (left) and A2 (right), are very hot, glowing 'blobs' of hydrogen and oxygen. The bubble in A1 is produced by the hot, intense radiation and powerful stellar wind from a single massive star. A2 has a more complex appearance due to the presence of more dust, and it contains several hidden, massive stars. The massive stars in A1 and A2 must have formed within the last 10 000 years since their natal gas shrouds are not yet disrupted by the powerful radiation of the newly born stars. These results will be published in a forthcoming issue of the *Astronomy and Astrophysics* journal, in which the team behind the image describe the processes taking place in NGC 2080. The research team noted that Hubble's high resolution is essential in order to reveal the various features in the nebula, and to better understand the formation of massive stars in this interesting region. The Hubble Space Telescope is a project of international co-operation between European Space Agency (ESA) and NASA.

The scientists involved in these observations are

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The results can be found in the article Heydari-Malayeri et al. (2001), submitted for publication to *Astronomy & Astrophysics*.

This communiqué echoes the press-release from the European Space Agency (ESA). Credit : ESA, NASA, M. Heydari-Malayeri (Obs Paris).

For more information : [Special page on N160A](#)

Reference :

M. Heydari-Malayeri, V. Charmandaris, L. Deharveng, F. Meynadier, M.R. Rosa, D. Schaerer, H. Zinnecker
"Resolving the compact HII regions in N160A with HST" [astro-ph/0110622](#)

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