Roses in the Southern Sky

The Wide-Field-Imager at La Silla Unveils Intricate Structures Illuminated by Hot Stars

(ESO PR Photos 31a-e/03)

N44 in the Large Magellanic Cloud is a spectacular example of a giant HII region. Having observed it in 1999 (see ESO PR Photos 26a-d/99), a team composed of Fernando Comerón and Nausicaa Delmotte from ESO, and Annie Laval from the Observatoire de Marseille (France), again used the Wide-Field-Imager (WFI) at the MPG/ESO 2.2-m telescope of the La Silla Observatory, pointing this 67-million pixel digital camera to the same sky region in order to provide another striking - and scientifically extremely rich - image of this complex of nebulae. With a size of roughly 1,000 light-years, the peculiar shape of N44 clearly outlines a ring that includes a bright stellar association of about 40 very luminous and bluish stars.

These stars are the origin of powerful "stellar winds" that blow away the surrounding gas, piling it up and creating gigantic interstellar bubbles. Such massive stars end their lives as exploding supernovae that expel their outer layers at high speeds, typically about 10,000 km/sec.

It is quite likely that some supernovae have already exploded in N44 during the past few million years, thereby "sweeping away" the surrounding gas. Smaller bubbles, filaments, bright knots, and other structures in the gas together testify to the extremely complex structures in this region, kept in continuous motion by the fast outflows from the most massive stars in the area.

The new WFI image of N44

The colours reproduced in the new image of N44, shown in Fig. 1 (with smaller fields in more detail in Fig. 2–4) sample three strong spectral emission lines. The blue colour is mainly contributed by emission from singly-ionised oxygen atoms (shining at the ultraviolet wavelength 372.7 nm), while the green colour comes from doubly-ionised oxygen atoms (wavelength 500.7 nm). The red colour is due to the Hα line of hydrogen (wavelength 656.2 nm), emitted when protons and electrons combine to form hydrogen atoms. The red colour therefore traces the extremely complex distribution of ionised hydrogen within the nebulae while the difference between the blue and the green colour indicates regions of different temperatures: the hotter the gas, the more doubly-ionised oxygen it contains and, hence, the greener the colour is.

The composite photo produced in this way approximates the real colours of the nebula. Most of the region appears with a pinkish colour (a mixture of blue and red) since, under the normal temperature conditions that characterize most of this HII region, the red light emitted in the Hα line and the blue light emitted in the line of singly-ionised oxygen are more intense than that emitted in the line of the doubly-ionised oxygen (green).

However, some regions stand out because of their distinctly greener shade and their high brightness. Each of these regions contains at least one extremely hot star with a temperature somewhere between 30,000 and 70,000 degrees. Its intense ultraviolet radiation heats the surrounding gas to a higher temperature, whereby more oxygen atoms are doubly ionised and the emission of green light is correspondingly stronger, cf. Fig. 2.

More information, including technical information on the images, can be found at *http://www.eso.org/outreach/press-rel/pr-2003/phot-31-03.html*.

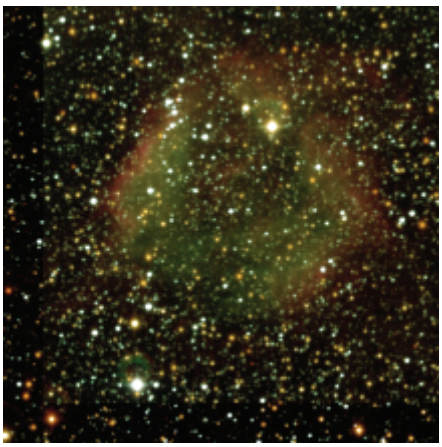

Figure 1 *(right) shows the southern part of the spectacular N44 region in the Large Magellanic Cloud. The green colour indicates areas that are particularly hot. The field measures 27.5 × 26.5 arcmin². North is up and East is left.* ***Figure 2*** *(above, middle) shows the ionised region DEM L 159 and two clusters with hot stars named KMHK 840 (top left) and KMHK 831 (bottom right).* ***Figure 3*** *(above, left) shows a region with pink-green shades that has been designated DEM L 144 and is located at the bottom centre of figure 1. It is a region of ionised hydrogen. Note that in figures 2 and 3, the colours have been enhanced compared to figure 1 to clearly show the different shades.* ***Figure 4*** *(above, right) shows a part of the central nebula, known as N44C. The green colour indicates areas that are particularly hot. The nature of the exciting source that delivers the necessary energy has been the subject of studies during two decades but is still not known with certainty.*