Hubble's panoramic view of a turbulent star-making region

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the location of glowing hydrogen and oxygen. The image is being released to celebrate Hubble's 22nd anniversary. Credit: NASA, ESA, ESO, D. Lennon and E. Sabbi (ESA/STScI), J. Anderson, S.E. de Mink, R. van der Marel, T. Sohn, and N. Walborn (STScI), L. Bedin (INAF, Padua), C. Evans (STFC), H. Sana (Amsterdam), N. Langer (Bonn), P. Crowther (Sheffield), A. Herrero (IAC, Tenerife), N. Bastian (USM, Munich), and E. Bressert (ESO)

(Phys.org) -- Several million stars are vying for attention in this NASA/ESA Hubble Space Telescope image of a raucous stellar breeding ground in 30 Doradus, located in the heart of the Tarantula nebula.

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The stars in this image add up to a total mass millions of times bigger than that of our Sun. The image is roughly 650 light-years across and contains some rambunctious stars, from one of the fastest rotating stars to the speediest and most massive runaway star.

The nebula is close enough to Earth that Hubble can resolve individual stars, giving astronomers important information about the stars' birth and evolution. Many small galaxies have more spectacular starbursts, but the Large Magellanic Cloud's 30 Doradus is one of the only star-forming regions that astronomers can study in detail. The star-birthing frenzy in 30 Doradus may be partly fueled by its close proximity to its companion galaxy, the Small Magellanic Cloud.

The image reveals the stages of star birth, from embryonic stars a few thousand years old still wrapped in dark cocoons of dust and gas to behemoths that die young in supernova explosions. 30 Doradus is a star-forming factory, churning out stars at a furious pace over millions of years. The Hubble image shows star clusters of various ages, from about 2 million to about 25 million years old.

Top Left The nebula's sparkling centrepiece is a giant, young star cluster named NGC 2070, only 2 million years old. Its stellar inhabitants number roughly 500

000. The cluster is a hotbed for young, massive stars. The cluster's dense core, known as RMC 136, is packed with some of the heftiest stars found in the nearby universe. The cluster's core is home to more than 10 000 stars. Several of them may be over 100 times more massive than our Sun. These hefty stars are destined to pop off, like a string of firecrackers, as supernovae in a few million years. Only two or three of the hottest stars in RMC 136 are providing 50 percent of the radiation in the cluster. Bottom Left The star cluster NGC 2060 is a loose collection of stars that are no longer gravitationally bound to each other. The stellar grouping will disperse in a few million years. It contains a supernova that exploded about 10 000 years ago, blowing out gas surrounding it. The dark region below the cluster is a dense cloud of dust lying in front of it. Top Right The star cluster Hodge 301 is 20 million to 25 million years old. Hodge 301 is home to many aging, red super giant stars, indicating the cluster is older. Roughly 40 massive stars already have exploded as supernovae. The expanding wave of debris is slamming into gas ejected by stars in RMC 136, creating a ridge of star formation between the two clusters. The fledgling stars are embedded in dense gas and cannot be seen. Bottom Right This region resembles a coral reef, but the gas has been eroded by the hefty stars in RMC 136, situated above it. Cloaked in gas at the top of this rugged, gaseous terrain are nascent stars that cannot be seen. Dense columns of gas, several light-years long, protrude from the undulating landscape. These gaseous columns are incubators for developing stars. Credit: NASA, ESA, ESO, D. Lennon and E. Sabbi (ESA/STScI), J. Anderson, S. E. de Mink, R. van der Marel, T. Sohn, and N. Walborn (STScI), N. Bastian (Excellence Cluster, Munich), L. Bedin (INAF, Padua), E. Bressert (ESO), P. Crowther (Sheffield), A. de Koter (Amsterdam), C. Evans (UKATC/STFC, Edinburgh), A. Herrero (IAC, Tenerife), N. Langer (AifA, Bonn), I. Platais (JHU) and H. Sana (Amsterdam)

The region's sparkling centerpiece is a giant, young star cluster named NGC 2070, only 2 million to 3 million years old. Its stellar inhabitants number roughly 500 000. The cluster is a hotbed for young, massive stars. Its dense core, known as RMC 136, is packed with some of the heftiest stars found in the nearby Universe, weighing more than 100 times the mass of our Sun.

The massive stars are carving deep cavities in the surrounding material by unleashing a torrent of ultraviolet light, which is etching away the enveloping hydrogen gas cloud in which the stars were born. The image reveals a fantasy landscape of pillars, ridges, and valleys. Besides sculpting the gaseous terrain, the brilliant stars also may be triggering a successive generation of offspring.

When the radiation hits dense walls of gas, it creates shocks, which may be generating a new wave of star birth.

The colours come from the glowing hot gas that dominates regions of the image. Red signifies hydrogen gas and blue, oxygen.

The image was made from 30 separate fields, 15 from each camera. Hubble made the observations in October 2011. Both cameras were making observations at the same time.

Provided by ESA/Hubble Information Centre