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The "Fireworks" Galaxy

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Spiral Galaxy Displays Pyrotechnics

The face-on spiral galaxy NGC 6946 is ablaze with colorful galactic fireworks fueled by the birth and death of multitudes of brilliant, massive stars. In this Gemini optical image massive stellar giants have been ending their lives in supernova explosions throughout NGC 6946 in rapid-fire fashion for tens of millions of years.

It is speculated that if just a million years of this galaxy's history were compressed into a time-lapse movie lasting a few seconds, there would be nearly constant outbursts of light as new stars flare into view, while old ones expire in spectacular explosions. Over the past century eight supernovae have exploded in the arms of this stellar metropolis, making NGC 6946 the most prolific known galaxy for supernovae during the past 100 years.

Yet, it is the ubiquitous occurrence of starbirth throughout NGC 6946 and not its supernovae that lend this galaxy its blazingly colorful appearance. For reasons not completely understood, it experiences a much higher rate of star formation than all the large galaxies in our local neighborhood. The prodigious output of stellar nurseries in this galactic neighbor eventually leads to accelerated numbers of supernova explosions.

Starbirth regions exist in most galaxies, particularly in spirals, and are obvious as clouds of predominantly hydrogen gas called HII regions. These areas coalesce over millions of years to form stars. Young, hot, massive stars formed in these regions emit copious amounts of ultraviolet radiation, which strip the electrons from hydrogen atoms in which they are embedded. When these ionized hydrogen atoms re-associate with electrons they radiate in a deep red color (at a wavelength of 656.3 nanometers) as the electrons transition back to lower energy levels.

NGC 6946 lies between 10 and 20 million light-years away on the border between the constellations of Cepheus and Cygnus, and was discovered by Sir William Herschel (1738-1822) on September 9, 1798. Astronomers estimate that this galaxy contains about half as many stars as the Milky Way and it is also used as a laboratory to study and characterize the evolution of massive stars and the properties of interstellar gas. As viewed in this Gemini image, we see only the "tip of the iceberg," its optical angular diameter is about 13 arcminutes, but viewed at radio wavelength at the frequency of neutral hydrogen (1420 Mhz or the 21-cm line), it extends considerably more than the angular diameter of the Moon (30 arcminutes).

Technical Data:

Field of View: 5.8 x 5.6 arcminutes
Instrument: Gemini Multi-Object Spectrograph (GMOS).

Filters and Color Assignments for composite color image:
G' : Blue
R' : Green
I' : Yellow
H-alpha : Red

See full press release and image download at: http://www.gemini.edu/node/116