Having trouble viewing this email? **Click here.**

March 2019

In this issue:

- Magnetic Fields in M82
- Magnetic Orion
- Dust in SN1987A
- Stellar Winds in Orion
- Upcoming Tele-Talks

Recent SOFIA web features have had quite some impact. Two associated images were featured on "Astronomy Picture of the Day (APOD)" less than two weeks apart. Another picture was highlighted by "NASA Image of the Day". Not an image, but an animation was part of our web feature on SOFIA observations of the supernova 1987A. Read up on the SOFIA observations and science behind these web features below.

Magnetic Fields in M82: APOD - 03/11/2019

Credit: NASA/SOFIA/E. Lopez-Rodiguez; NASA/Spitzer/J. Moustakas et al.

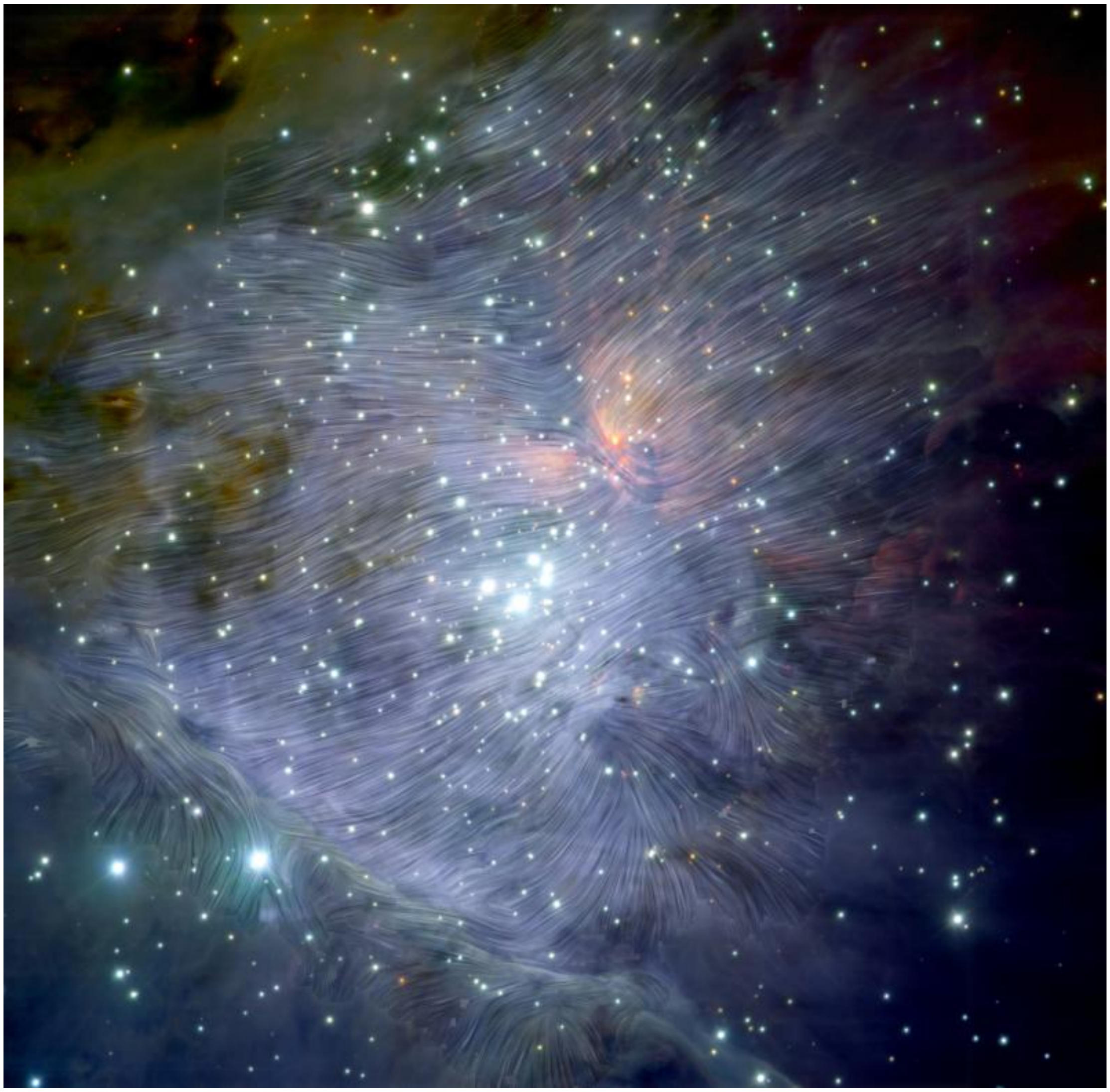
SOFIA's newest instrument, HAWC+ -- a far infrared imager and polarimeter which enables studies of celestial magnetic fields in unprecedented detail -- was used to image M82, also known as "The Cigar Galaxy." This galaxy is a classic example of a starburst galaxy due to its extremely high star formation rate. This region of energetic star formation also drives a remarkable galactic superwind of gas and dust into intergalactic space. Astronomers have long theorized that these winds would also drag the galaxy's magnetic field in the same direction, but despite numerous studies, this has not been confirmed observationally.

Now researchers have found that the wind from M82 not only transports a huge amount of gas and dust into the intergalactic medium, but also drags the magnetic field over 1,000 light-years above and below the plane of the galactic disc. Furthermore, the magnetic field in the outflow is re-aligned so that it is perpendicular to the galactic disc.

"Studying intergalactic magnetic fields – and learning how they evolve – is key to understanding how galaxies evolved over the history of the universe," said Terry Jones, professor emeritus at the University of Minnesota in Minneapolis and lead researcher for this study. "With SOFIA's HAWC+ instrument, we now have a new perspective on these magnetic fields."

- Paper: Jones et al., ApJL, 870, L9 (2019)
- Astronomy Picture of the Day: 03/11/2019
- Web feature

Magnetic Orion: APOD - 02/27/2019



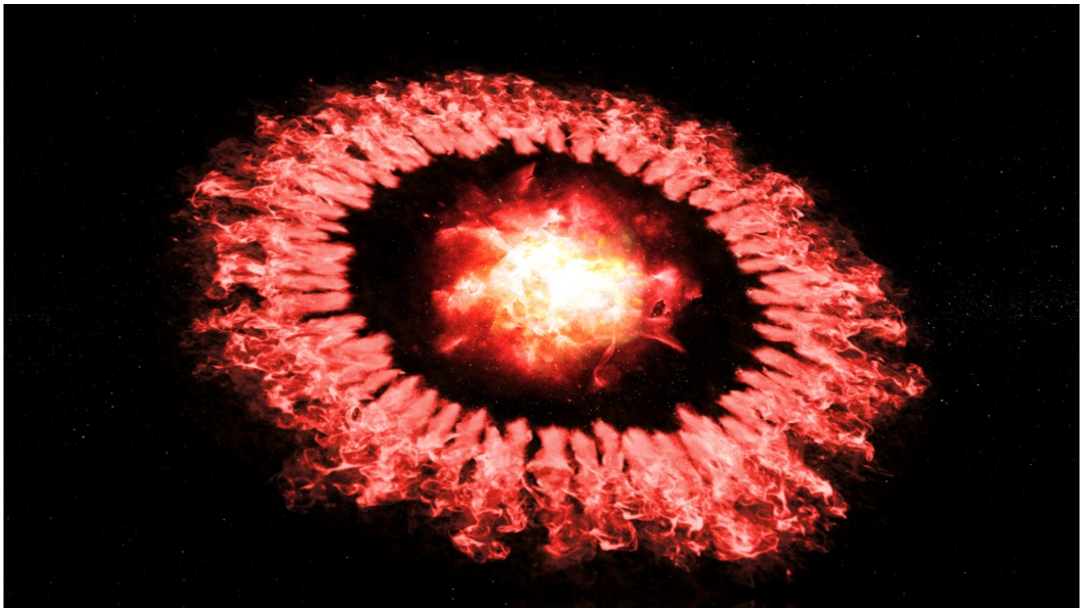
Credit: NASA/SOFIA/D. Chuss et al. and European Southern Observatory/M.McCaughrean et al.

This SOFIA APOD image also featured HAWC+ polarimetry observations; this time of the Orion Nebula. “How magnetic fields affect the process of star formation has not been well understood, though it has long been suspected that they play an important role,” said David Chuss, professor of physics at Villanova University in Pennsylvania. “With SOFIA’s HAWC+ instrument, we can now begin to understand how these fields influence the dynamics of regions where gas and dust are collapsing to produce new stars."

In order to address the role of magnetic fields in star forming clouds, Dr. David Chuss and collaborators have obtained HAWC+ observations of the Orion Nebula, one of the nearest regions of active high-mass star formation which is often used as an archetype or “Rosetta Stone” for understanding high-mass clustered star formation throughout the galaxy. The polarimetry observations have produced some of the most detailed magnetic field line maps to date, with spatial scales of ~0.01 pc (53-micron band). Such resolution enables the mapping of the field within the cores of the clouds where the later stages of the star formation process occurs.

- Paper: Chuss et al., ApJ, 872:187 (2019)
- Astronomy Picture of the Day: 02/27/2019
- Web feature

Dust in SN1987A: NASA Web-feature - 02/08/2019



View full animation video

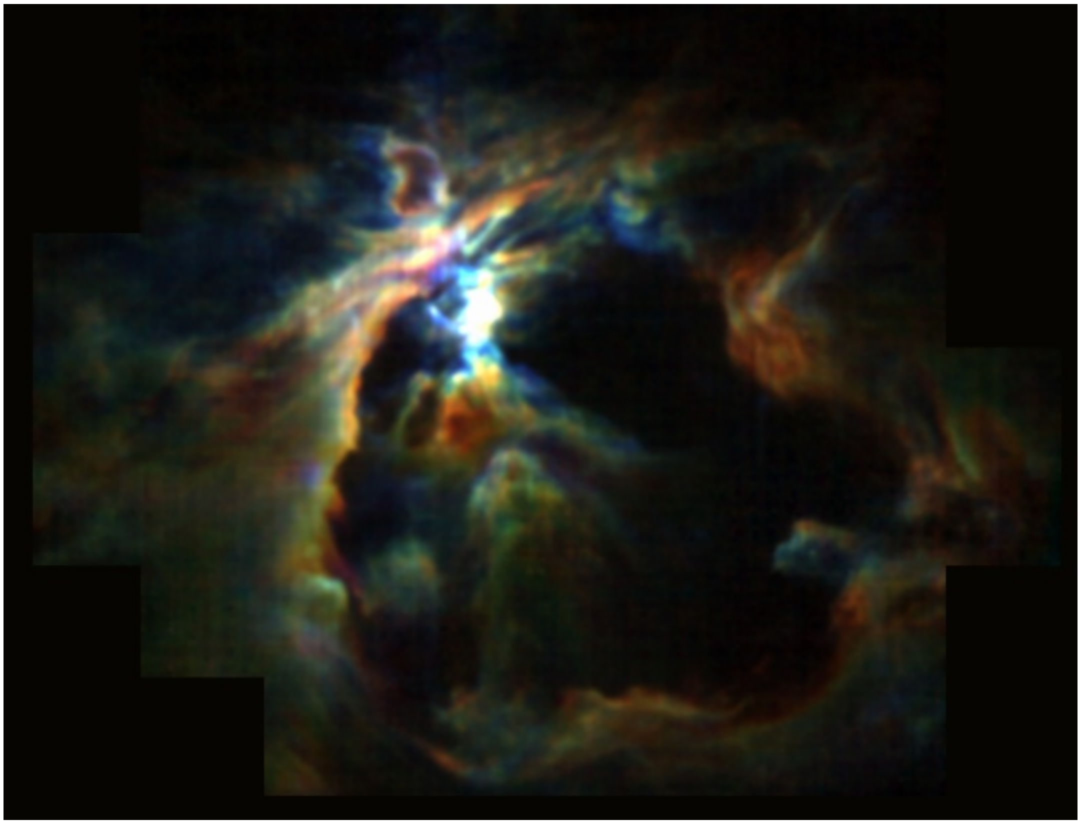
Credit: NASA/SOFIA/Symbolic Pictures/The Casadonte Group

Where does the dust in the universe come from? Supernovas were more thought of as cosmic dust destroyers than dust factories. Current theories predict that a supernova blast destroys much of the dust created earlier, so there should be little dust left. Observations with FORCAST, the mid-infrared imager of SOFIA, however, tell a different story – revealing more than 10 times the dust expected. This suggests that supernovas may be much better dust factories than theories estimate. “We already knew about the slow-moving dust in the heart of 1987A,” said Mikako Matsuura, a senior lecturer at Cardiff University in the United Kingdom and the lead author on the paper. “It formed from the heavy elements created in the core of the dead star. However, the SOFIA observations tell us something new about a completely unexpected dust population.”

“FORCAST is the only instrument that can observe at these critical wavelengths and detect this newly forming population of warm dust,” said James De Buizer, the USRA manager for science operations at the SOFIA Science Center and co-author on the study. “We plan to continue monitoring with FORCAST to gain more insight into dust creation and evolution in supernova remnants.”

- Paper: Matsuura et al., MNRAS 482, 1715 (2019)
- Web feature

Stellar Winds in Orion: NASA Image of the Day - 02/5/2019



Credit: NASA/SOFIA/Pabst et. al

The stellar wind from a newborn star in the Orion Nebula is preventing more new stars from forming nearby, according to new research using SOFIA.

At the heart of the nebula lies a small grouping of massive young stars, the Trapezium Cluster. Observations from SOFIA’s GREAT heterodyne spectrometer revealed, for the first time, that the strong stellar wind from the most massive of these young stars, θ^1 Ori C, has swept up a large shell of material from the surrounding interstellar gas and dust out of which thousands of lower mass stars are forming.

“The wind is responsible for blowing an enormous bubble around the central stars,” explained Cornelia Pabst, a Ph.D. student at the University of Leiden in the Netherlands and the lead author on the paper. “It disrupts the natal cloud and prevents the birth of new stars.” The mechanical energy from the stellar wind is converted very efficiently into kinetic energy of the shell and surprisingly causes more disruption to the surrounding star-forming cloud than photo-evaporation or even future supernova explosions.

- Paper: Pabst et al., Nature 565, 618, (2019)
- NASA Image of the Day: 02/05/2019
- Web feature

Upcoming Tele-Talks

SOFIA Tele-Talks are scientific presentations given via phone, with slides distributed ahead of time. The talks are targeted broadly towards members of the astronomy community who are interested in SOFIA science and in the current and potential scientific capabilities of the observatory. The talks are organized by Dan Lester (Univ. of Texas, Austin) and held approximately twice a month on Wednesdays at 9:00am Pacific, noon Eastern.

For information on how to participate in the Tele-Talks, please check the SOFIA Tele-Talk page.

The next Tele-Talks are:

- March 27: Yoko Okada (University of Cologne); LMC Star Forming Regions
- April 3: Mengyao Liu (University of Virginia); High Luminosity Protostars
- April 17: Ryan Dungee (University of Hawaii); SO2 in Mon R2 IRS3
- May 1: Wanggi Lim (SOFIA Science Center); Mid-IR Survey of W51
- May 8: David Chuss (Villanova University); FIR Polarimetry of OMC-1
- June 12: Jorge Pineda (JPL); [CII] in M51

Executive Editor: Joan Schmelz
Content: Randolf Klein and Ralph Shuping
Design: Leslie Proudfit

Please feel free to direct questions and comments to the SOFIA Science Center help desk: sofia_help@sofia.usra.edu.