# Baby Stars Lost in Space:
## Extragalactic Star Formation in the M81 Group

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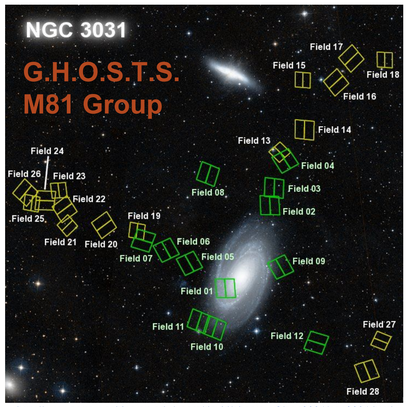
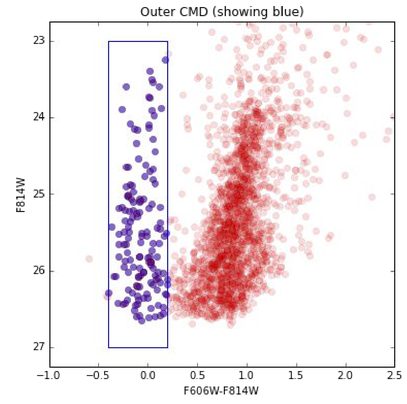
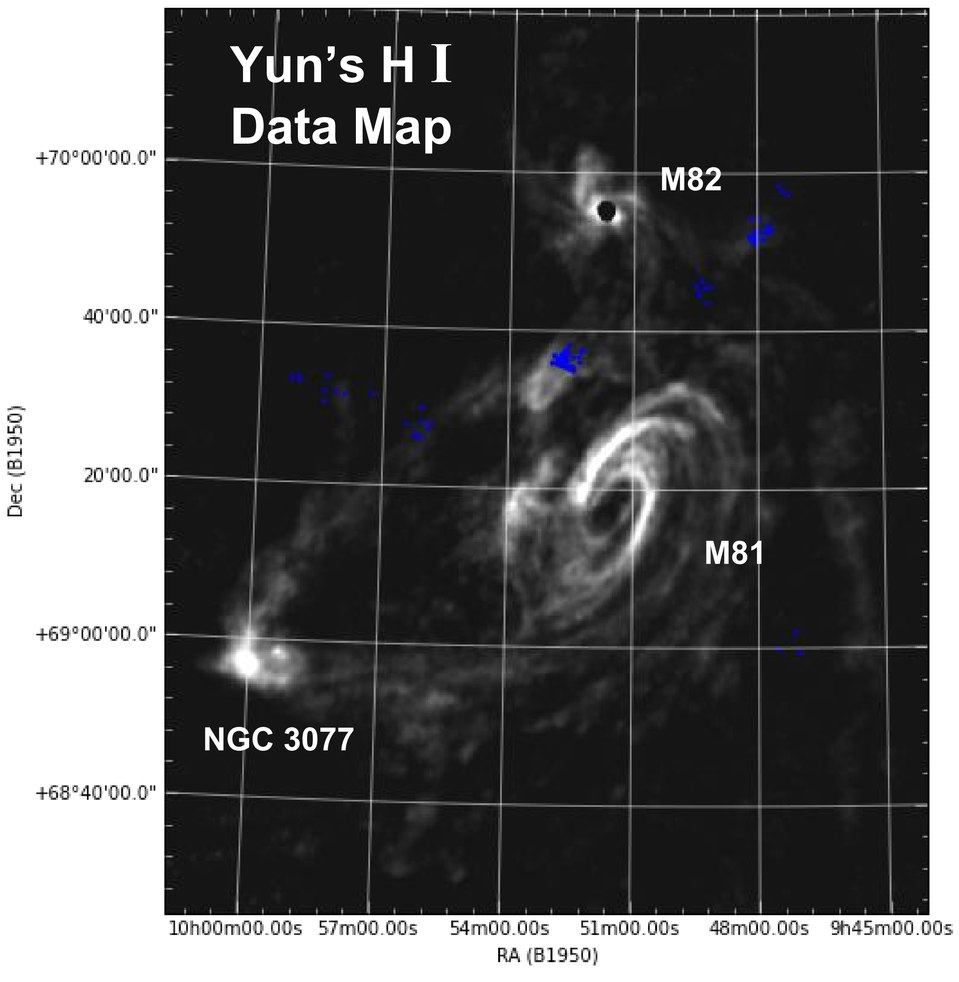



http://www.astro.washington.edu/users/david/ghosts_v2/ngc3031/ngc3031.html

A blue star population within a particular galaxy or galaxy group represents stars which are very massive, and very young (relatively speaking), and thus, studying this population can help to characterize where new stars are being formed in that group. Using data from the Galaxy Halos, Outer disks, Substructure, Thick disks and Star clusters (GHOSTS) survey (Radburn-Smith et al 2011 Astrophysical Journal Supplement Series, 195, 18) we were exploring the distribution of blue stars within the M81 group which is made up primarily by the M81, M82, and NGC 3077 galaxies. While we were studying the 28 "fields" of data that were taken around M81–mostly along its major and minor axis–we mapped the blue stars of this galaxy (at least, those which fell within the GHOSTS fields) and, after plotting the blue star distribution of the group, we identified numerous blue stars in several regions not expected to host new star formation, under the current understanding of galactic evolution. Using additional tools including isochrones and synthetic stellar populations, we verified that the observed objects could reasonably be interpreted as blue stars.




Short paragraph or bullet points explaining this figure.




## STELLAR SURPRISE

This research endeavor began by analyzing computer imaging data from the the GHOSTS survey, using IPython Notebooks. By choosing parameters to define "Blue Stars" within the M81 group (as shown with the blue box in the colour-magnitude diagram above), we were able to sort through this data and to plot only the stars which fit our chosen parameters on a Right Ascension vs. Declination plot of the entire M81 group. Looking at this plot, there were some datapoints that were surprising. The plot suggested that there were blue stars (and therefore *new* stars) located at extreme distances from the bodies of any of the three nearby galaxies. These surprising data points are those shown on the large image to the left.

## HYDROGEN CLOUDS

After comparing the reported locations of the blue stars to the plots of neutral Hydrogen clouds (H I) from the 1994 Yun paper (Yun, M.S., Ho, P.T.P., & Lo, K.Y. 1994, *Nature*, **372**, 530), there appeared to be a possible solution to the mysterious blue stars. By overlaying these two plots (shown left), we were able to indeed see how the H I clouds might be responsible for previously unknown stellar formation on the outskirts of the M81 system.

## CONCLUSIONS:

- With the chosen parameters defining a "bright blue" star, there appear to be several pockets of such stars present in the M81 Group quite distant from any of the major galaxies it contains.
- There are "tidal bridges" of H I stretched between these galaxies which have features that include small branches and independent clouds.
- The locations of the pockets of blue stars coincide with higher density regions of the H I cloud structure, which indicates that the H I clouds may be dense enough to support significant stellar formation, at enormous distances from any of the galaxies in the M81 group.
- Nicco's Isochrone Isochrone stuff says what we are saying here is actually possible.

[CMD with Nicco's Isochrone]

[Simulated Population Plot]

Short explanation of those two plots (to left)