

Mystery of Star Formation Revealed by Hearts of Molecular Clouds

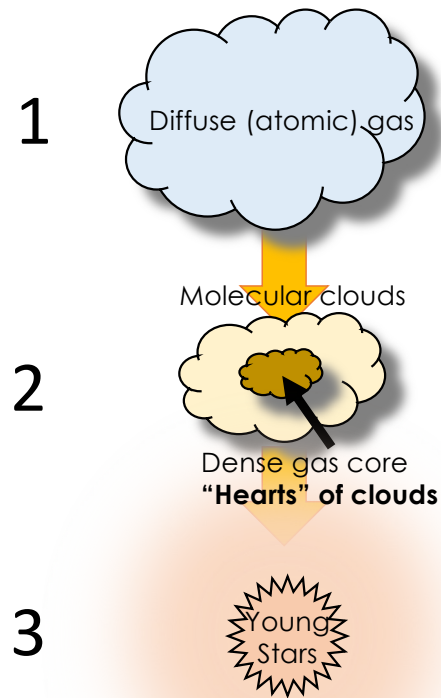
Jin Koda (Stony Brook U.)

Amanda M Lee (UMass Amherst)

Jin Koda – email: “jin.koda@stonybrook.edu”, cell: 631-652-5223
(see page 8 for other contact info)

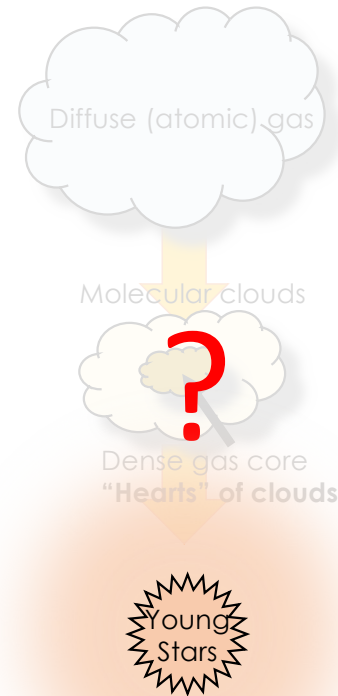
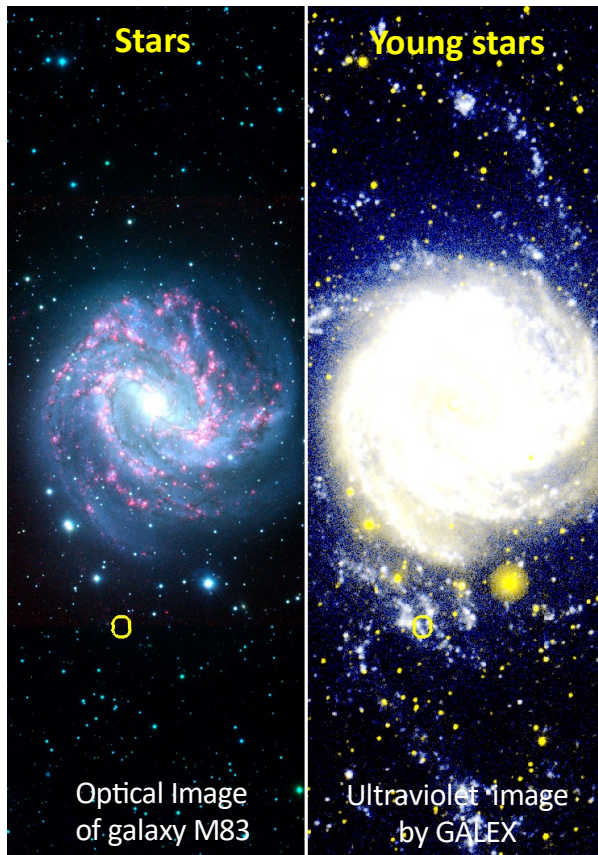
Normal pathway to star formation

Diffuse gas shrinks into denser gas concentrations, called “molecular clouds”. Molecular clouds have dense cores surrounded by gas envelope, where stars form.



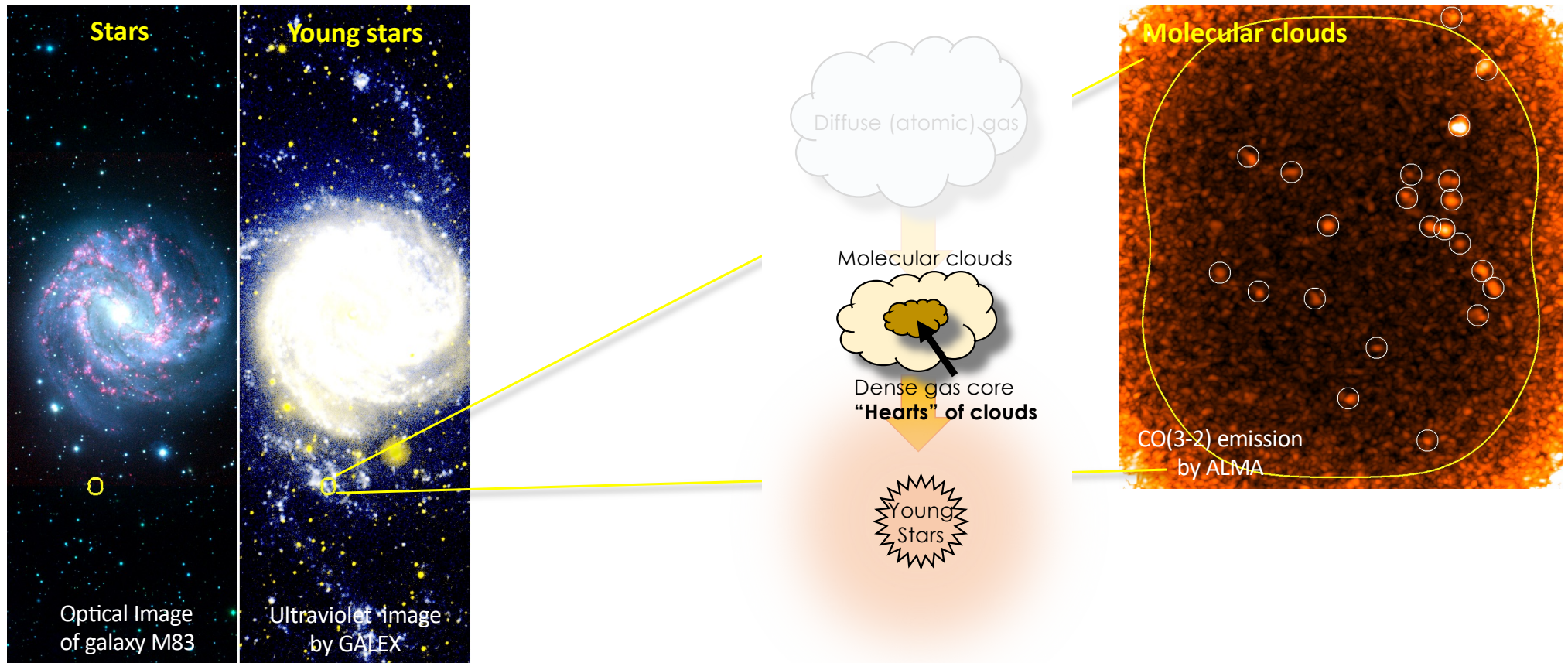
Star formation at the far outskirts of galaxies

It was a surprise to find young stars in galaxy outskirts by NASA's GALEX satellite. And their formation sites have remained a mystery since then.



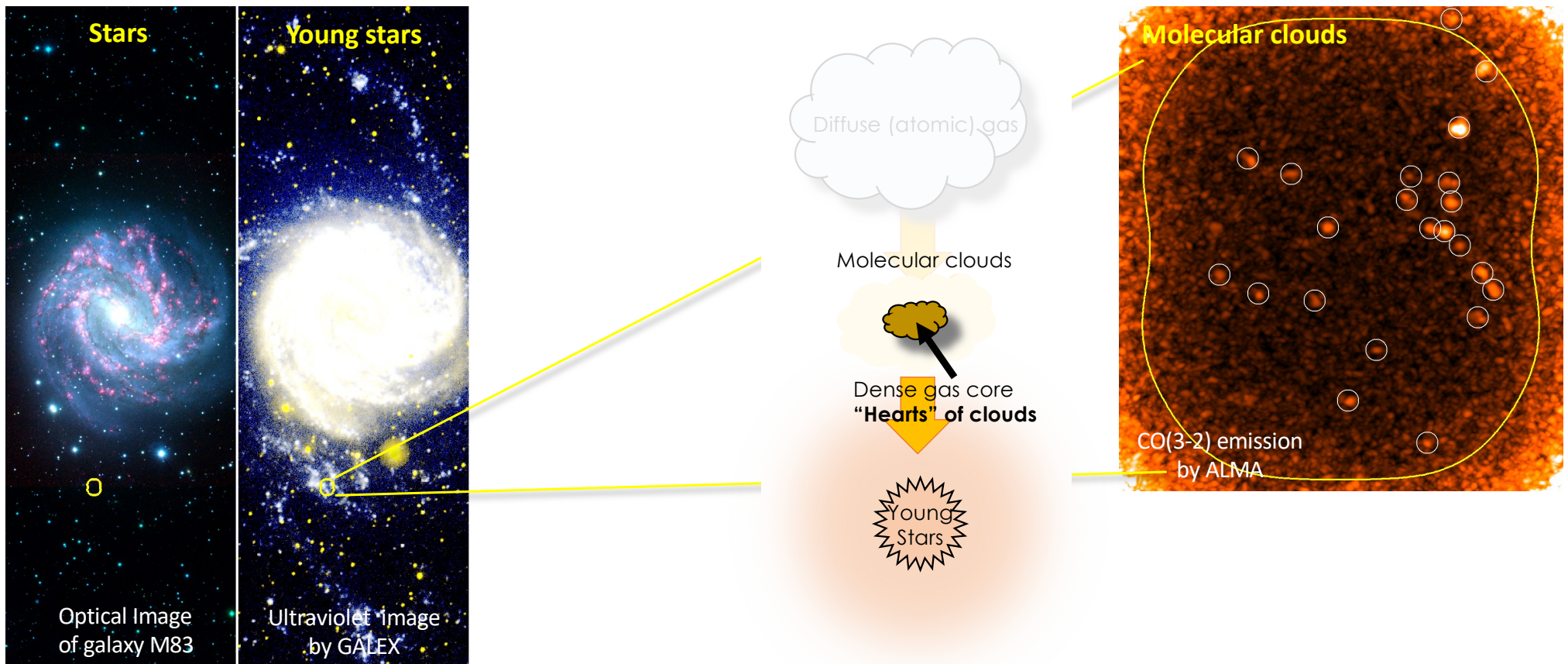
Discovery of molecular clouds at the far outskirts

For the first time, the parental star formation sites were revealed with ALMA.



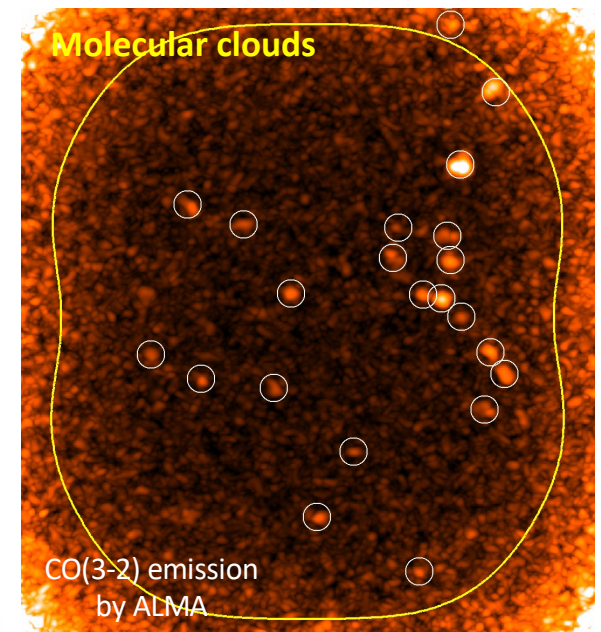
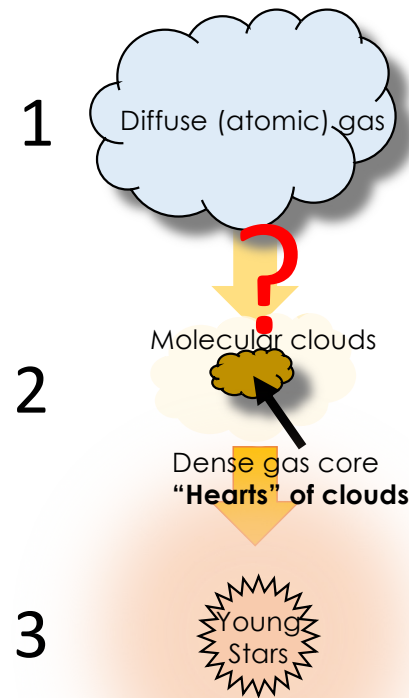
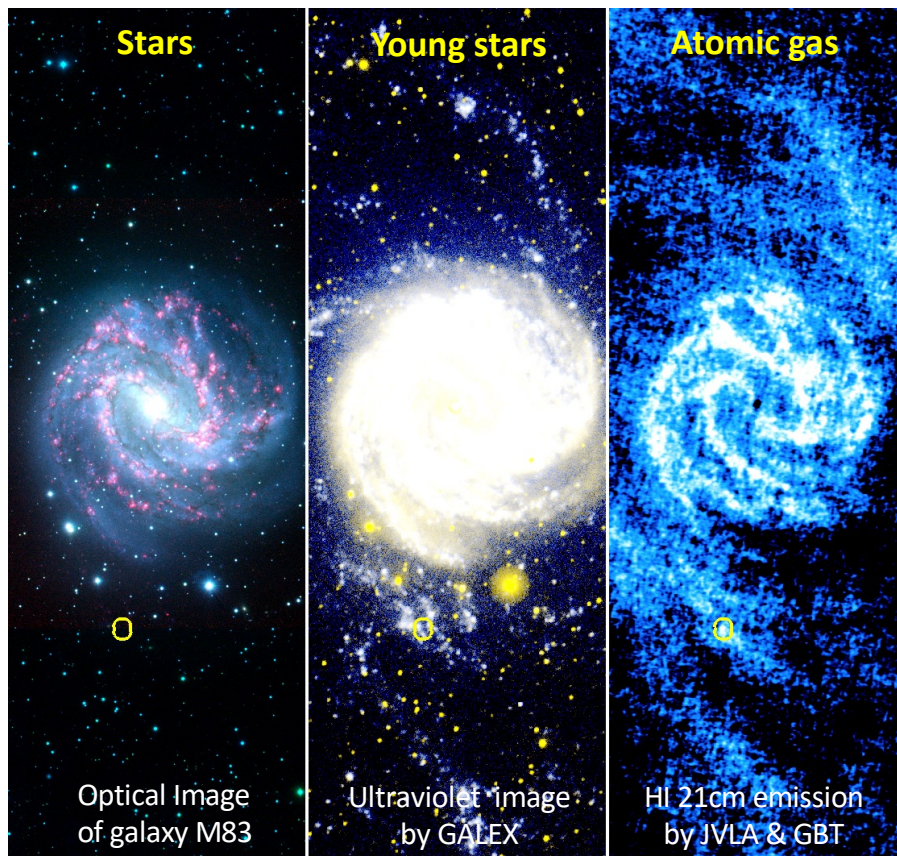
Discovery of molecular clouds with invisible envelopes

But what we see are the “hearts” of the parental star formation sites.



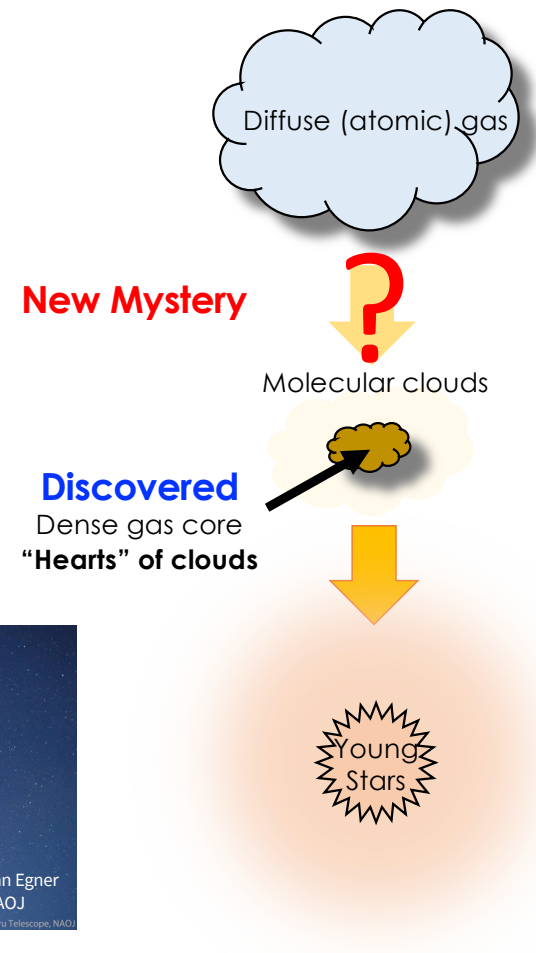
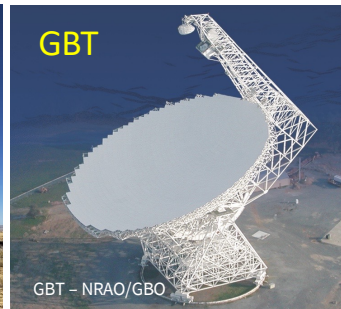
Large atomic gas reservoir & inefficient conversion to molecular clouds

Atomic to molecular gas conversion is the next mystery.



Utilized World's Largest Telescopes

This research used observations from many telescopes.



International Collaboration

Local contact

United States (present at this AAS meeting)

- **Jin Koda** – Stony Brook University (jin.koda@stonybrook.edu, cell: 631-652-5223)
- **Amanda M Lee** – University of Massachusetts Amherst (amamlee@umass.edu)
- **David Thilker** – Johns Hopkins University (dthilker@jhu.edu)

France

- **Françoise Combes** - Observatoire de Paris (francoise.combes@obspm.fr)
- **Samuel Boissier** – Laboratoire d'Astrophysique de Marseille

Chile

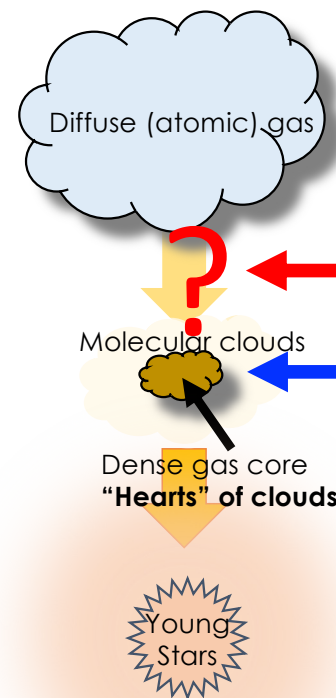
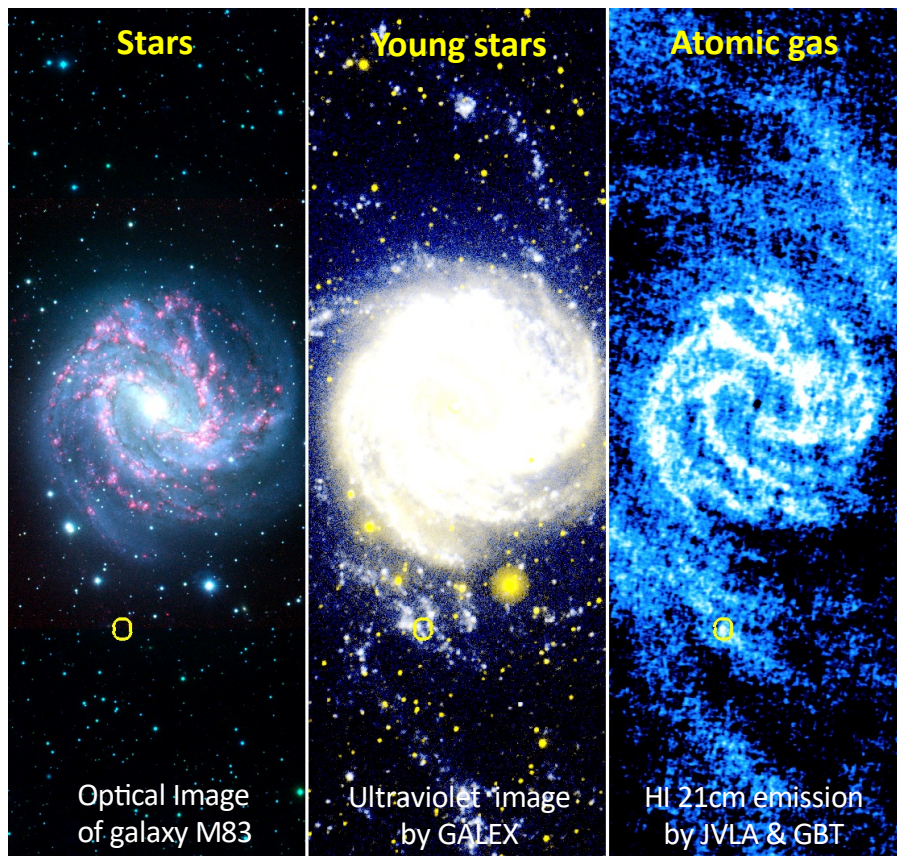
- **Monica Rubio** – Universidad de Chile (mrubio@das.uchile.cl)
- **Linda Watson** – European Southern Observatory
- **Celia Verdugo** – Joint ALMA Observatory

Japan

- **Masafumi Yagi** – National Astronomical Observatory of Japan (YAGI.Masafumi@nao.ac.jp)
- **Yutaka Komiyama** – Hosei University
- **Kana Morokuma-Matsui** – University of Tokyo

Summary

For the first time, the parental star formation sites at the far outskirts of galaxies were revealed with ALMA. Atomic to molecular gas conversion is the next mystery.



New mystery

Discovered

