From Galaxies To Stars:

New Answers To Old Questions

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Key Questions in Galaxy Formation

- What do stars form from?
  - **DENSE GAS**

- What regulates star formation?
  - **SUPERNOVAE**

- What determines baryonic fractions in galaxies?
  - **GALACTIC WINDS**
Star Do *NOT* Form From Gas

F. Walter &
The HI Nearby
Galaxy Survey

SFR distributions from 24 μm SINGS + GALEX
Stars Form From Molecular Gas

- Star Formation on galactic scales (alias Kennicutt-Schmidt relation) must depend on the environment.
Arnold Who?

- How do molecular clouds die?
- They are destroyed by stellar feedback:
  a. Ionization
  b. Stellar winds
  c. Radiation pressure
  d. Supernovae

(Krumholz & Matzner 2009; Fall, Krumholz, & Matzner 2010)
Missing Baryons

- Observations indicate that all cosmic structures have “baryonic” fractions below the universal value.
- “Missing” baryons are widely attributed to SN winds.

(McGaugh et al 2010)
They Are Found!!!

All baryons

Stars+HI+H₂

\( f_b \)

\( V_{\text{max}} \) (km/s)
Main Lesson
(to cosmologists)

Understanding the micro-physics of star formation is crucial to developing the correct model of galaxy formation.

We are on the right path, but there are several important physical effects that still need to be modeled * in realistic galaxy formation simulations.

*not necessarily directly