On the Nucleosynthesis of Nitrogen: Insight from Chemical Evolution Models

James W. Johnson,[1⋆] David H. Weinberg,[1,2,3] Fiorenzo Vincenzo,[1,2] Jonathan C. Bird,[4] and Emily J. Griffith[1]

[1] *Department of Astronomy, The Ohio State University, 140 W. 18th Ave., Columbus, OH, 43210, USA*
[2] *Center for Cosmology and Astroparticle Physics (CCAPP), The Ohio State University, 191 W. Woodruff Ave., Columbus, OH, 43210, USA*
[3] *Institute for Advanced Study, 1 Einstein Dr., Princeton, NJ, 08540, USA*
[4] *Department of Physics & Astronomy, Vanderbilt University, 2301 Vanderbilt Place, Nashville, TN, 37235, USA*

Accepted XXX; Received YYY; in original form ZZZ

ABSTRACT
We investigate the astrophysical production of nitrogen (N) in the Milky Way. We have the best simulations.

Key words: Awesomeness

1 INTRODUCTION

- Nitrogen (N) is an element that traces slow neutron capture (s-process) nucleosynthesis. To first order it's produced only in core collapse supernovae (CCSNe) and asymptotic giant branch (AGB) stars (Johnson 2019).
- Nitrogen has considerable yields through *secondary* channels: the processing of already produced metals into nitrogen.
  - First and foremost is the CNO cycle, in which carbon (C), N, and oxygen (O) catalyze the fusion of four protons into helium-4. The reactions of the CNO cycle:

$$^{12}\mathrm{C}(p,\gamma)^{13}\mathrm{N}(\beta^+,\nu_e)^{13}\mathrm{C}(p,\gamma)^{14}\mathrm{N}(p,\gamma)^{15}\mathrm{O}(\beta^+,\nu_e)^{15}\mathrm{N}(p,\alpha)^{12}\mathrm{C} \tag{1}$$

  Due to a small cross section for proton capture, the $^{14}\mathrm{N}(p,\gamma)^{15}\mathrm{O}$ reaction is particularly slow. As a result, to first order the effect of the CNO cycle is to process all of the available C and O into $^{14}\mathrm{N}$.

REFERENCES

Johnson J. A., 2019, Science, 363, 474

⋆ Contanct e-mail: johnson.7419@osu.edu