

Assignment 6

A classic article by Epstein, Lattimer and Schramm (1976, Nature, 263, 198) was written in RLM and asserted that deuterium was uniquely a product of the Big Bang.

This view has been widely, if not universally, held since the paper's publication.

At least two papers from the same era have speculated that deuterium may be made by stars in interesting quantities:

1: Woosley (1977, Nature 269, 42) in his paper 'Neutrino-induced nucleosynthesis and deuterium' outlines a way for SN II to make deuterium. (Oddly, he does not mention Epstein et al.)

A fuller discussion of the nu-process is provided by Woosley et al. (1990, ApJ, 356, 272) and Heger et al. (2005, Physics Letters B, 606, 258) and also see Iliadis.

2: Coleman and Worden (1976, ApJ, 205, 475) speculate that flare stars (M dwarfs) may make deuterium in interesting quantities.

I should like you to:

- a) Summarize Epstein et al.'s arguments for the cosmological and not a stellar or interstellar origin of deuterium
- b) Make a semi-quantitative assessment of Woosley's suggestion bearing in mind that the nu-process is very likely a serious contributor to Galactic abundances of several nuclides including ${}^7\text{Li}$, ${}^{10}\text{B}$ and ${}^{19}\text{F}$
- c) Show that the flare star hypothesis may or may not now be ruled out.