Honors Seminar 292 — cheat sheet for 9/25/2019 — Andrew Baker

For Thomas (2018), you should read the full paper. Key questions:

1. What are the different types of particles that are produced by a supernova explosion?
2. Why do the curves in Figures 1, 3, 4, and 5 exhibit strong periodic oscillations?
3. Why isn't there an exact match between the author's prediction of the UVB irradiance and his prediction of associated "DNA damage" following the explosion of a nearby supernova? — i.e., why do the curves in Figure 4 and Figure 6 not look more similar?
4. How bad are the effects of a nearby supernova on terran life expected to be, and how do these effects depend on one's location on the Earth?

Key terms:

- **aerosol** = liquid droplet or small solid particle that is suspended in a gas (typically, the atmosphere)
- **broad-band integrated** = description of any measurement of light that is calculated by summing over a wide range of wavelengths or frequencies
- **carbon fixation** = a process (e.g., photosynthesis) by which living organisms convert carbon dioxide to organic compounds
- **cosmic ray** = a high-energy particle (often charged) with nonzero mass
- **erythema** = medical term referring to redness of skin (whether due to sunburn, infection, inflammation, or another cause)
- **IIP** = type of supernova resulting from the collapse of a massive star at the end of its life, which remains quite bright for ~ 100 days after the explosion
- **interstellar medium** = diffuse mixture of gas and dust that occupies the "empty" space between the stars in the Milky Way and in other galaxies
- **in vitro** = term describing a process that takes place in a laboratory environment (e.g., test tube or Petri dish) rather than in a living organism
- **Ma** = abbreviation for "millions of years ago"
- **meta-analysis** = an analysis of previously published studies, which may be able to draw more robust conclusions than any single one of the previous studies
- **nucleation site** = a location at which a condensation or crystal starts growing within a liquid or gas
- **ozone** = the O_3 molecule

- **pc** = abbreviation for "parsec," which is a measure of distance equal to 3.09×10^{16} m (the closest stars to our solar system are typically a few parsecs away)
- **photolytic** = adjective describing a reaction in which light causes the breakdown of a molecule into atoms and/or simpler molecules
- **photon** = chargeless and massless particle of light (i.e., any wavelength of electromagnetic radiation)
- **Pliocene-Pleistocene boundary** = the separation between the (earlier) Pliocene and (later) Pleistocene geological epochs, which coincides with significant changes in the fossil record of life on Earth
- **power-law scaling** = relationship between two quantities x and y such that $y = x^{\alpha}$
- **radiative transfer** = the process by which electromagnetic radiation passes through (and is influenced by) a medium, typically gas
- **SN** = abbreviation for "supernova"