
Lecture: Supernova neutrinos 2019

Supernova neutrinos

- Star evolution and core-collapse supernovae
- Neutrino emission in a supernova explosion
- Supernova 1987a
- Neutrino interactions and the detection technologies

Literature:

- H. V. Klapdor-Kleingrothaus and K. Zuber, *Particle Astrophysics*, IoP (2000), chapter 13
- H-T. Janka, *Neutrino emission from Supernovae*, (2017) arXiv:1702.08713
- K. Scholberg, *Supernova Neutrino Detection*, Ann.Rev.Nucl.Part.Sci. 62 (2012) 81 & arXiv:1205.6003

Material for lecture 8:

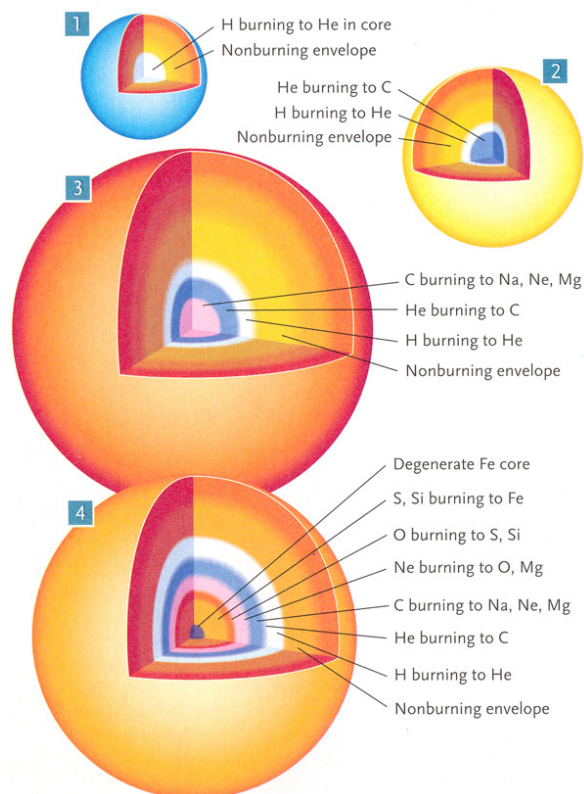


Figure 1: Evolution of a heavy star. Figure from: J. Hester et al.

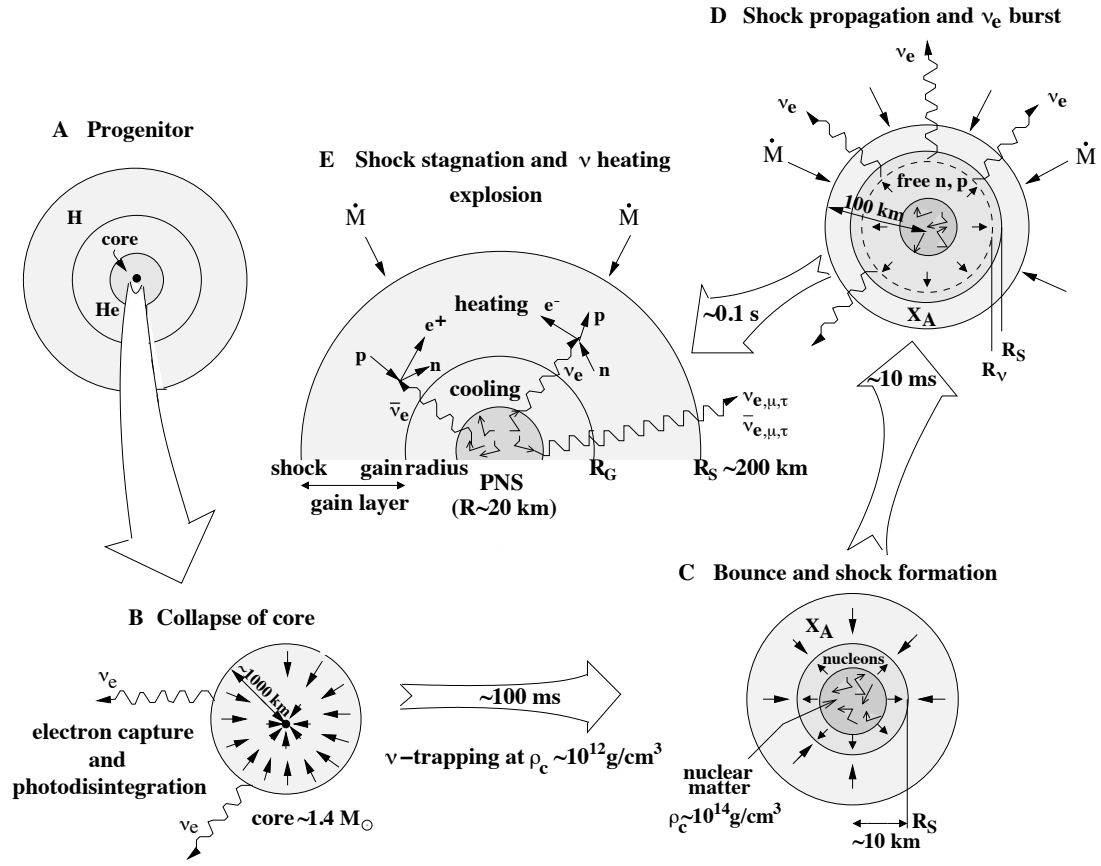


Figure 2: Scheme of a supernova explosion. Figure from F. Kitaura.

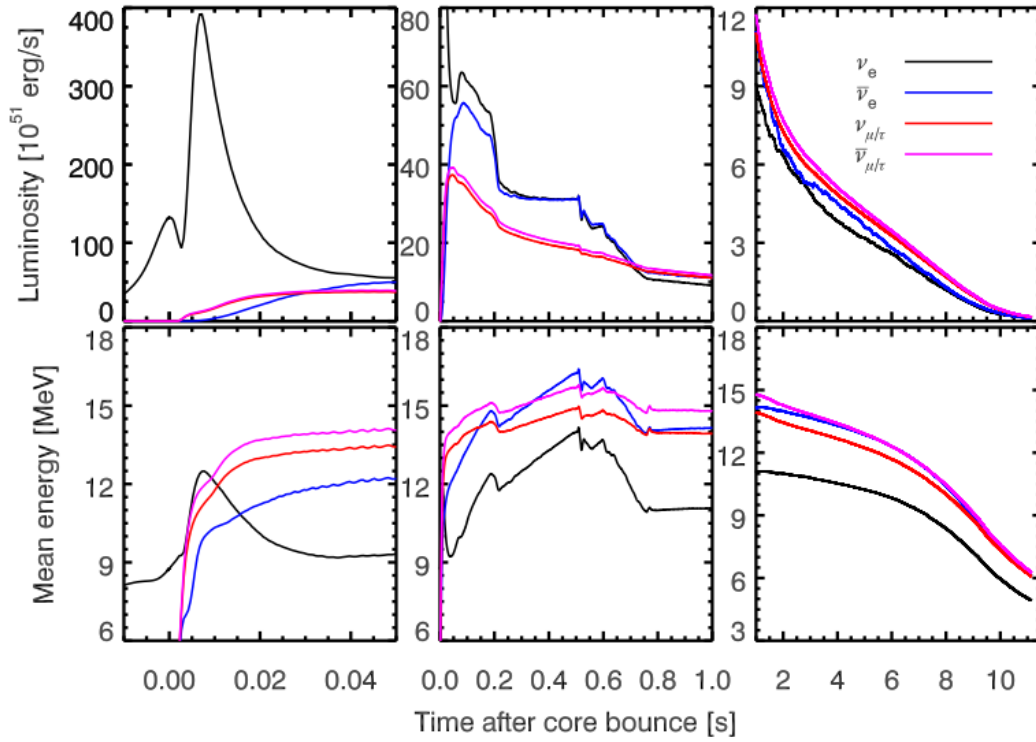


Figure 3: Time evolution of the neutrino emission in a supernova explosion. The mean energy of each neutrino type is shown in the lower panels. Figure from H-T. Janka 2017.

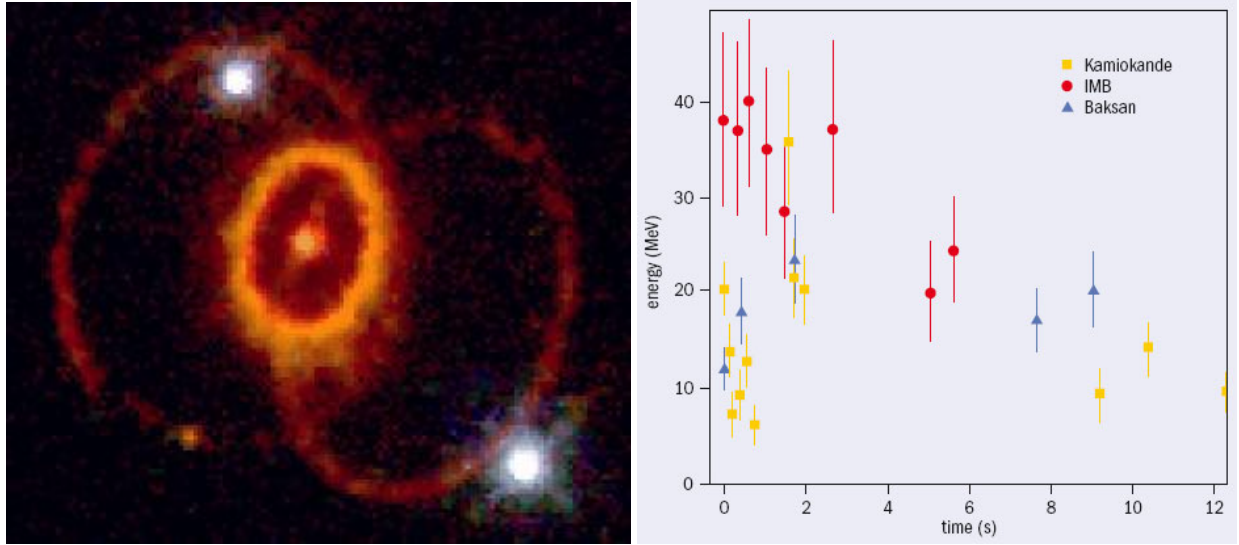


Figure 4: (Left) Picture of the SN1987a rest by Hubble telescope. (Right) Time evolution of the neutrino signal measured by IMB, Kamiokande and Baksan detectors. Figure from CERN courier.

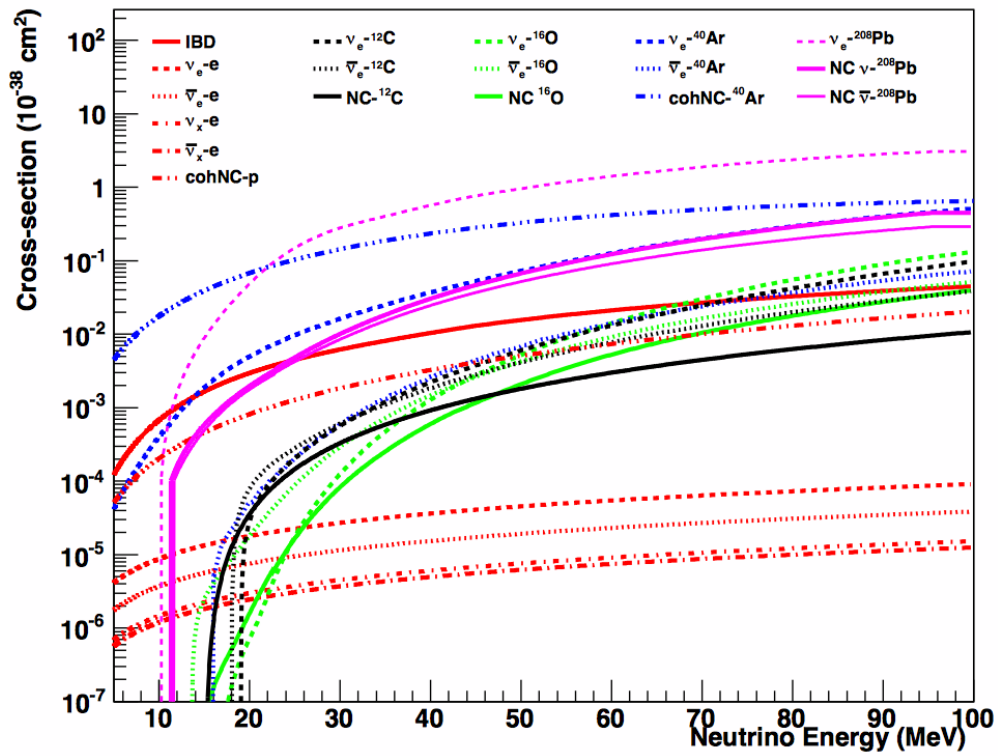


Figure 5: Cross sections per target for relevant neutrino interactions. Figure from K. Scholberg, Ann. Rev. Nucl. Part. Sci. 62 (2012) 81 & arXiv:1205.6003

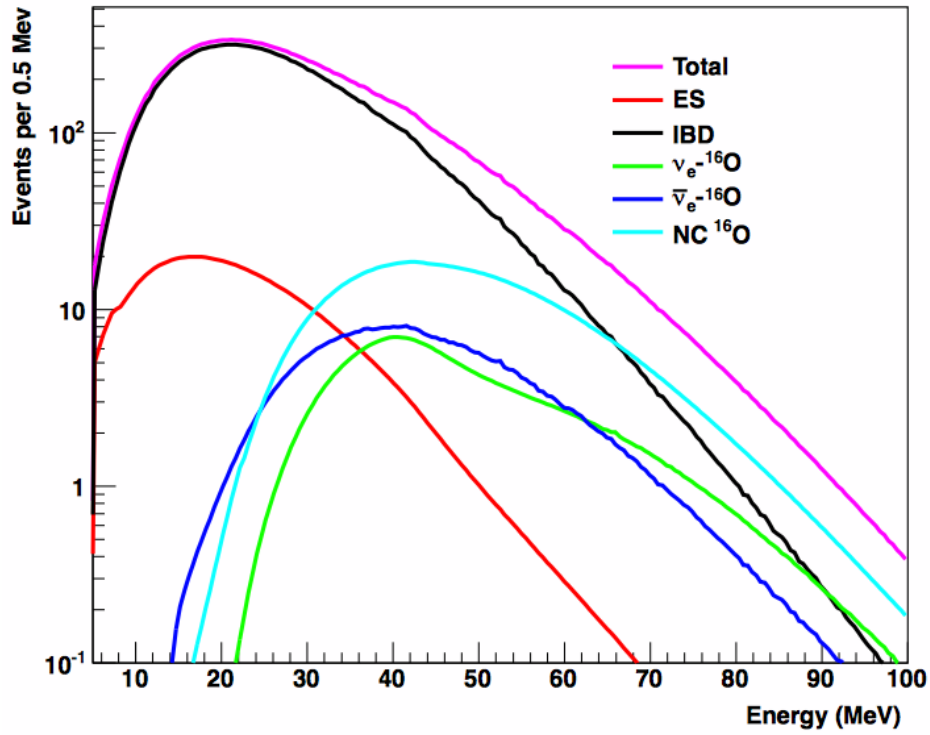


Figure 6: Event rates for a 100 kt water Cherenkov as function of true neutrino energy. Figure from K. Scholberg, Ann. Rev. Nucl. Part. Sci. 62 (2012) 81 & arXiv:1205.6003

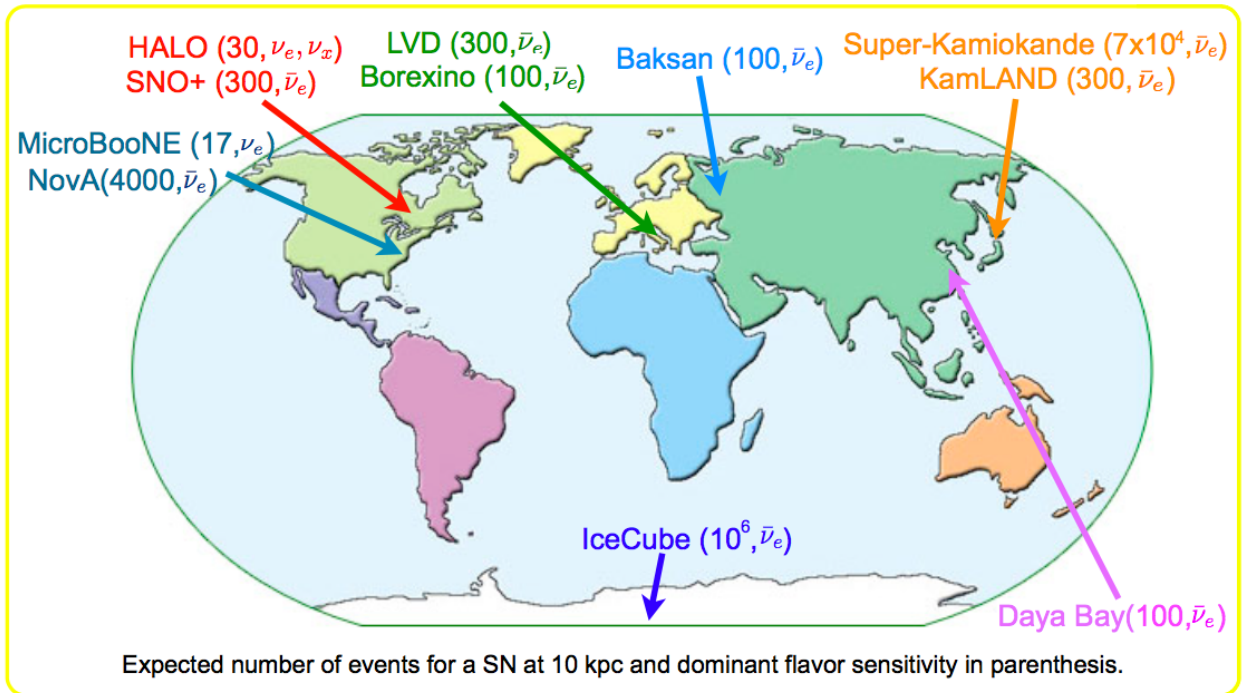


Figure 7: Figure from Irene Tamborra (2017).