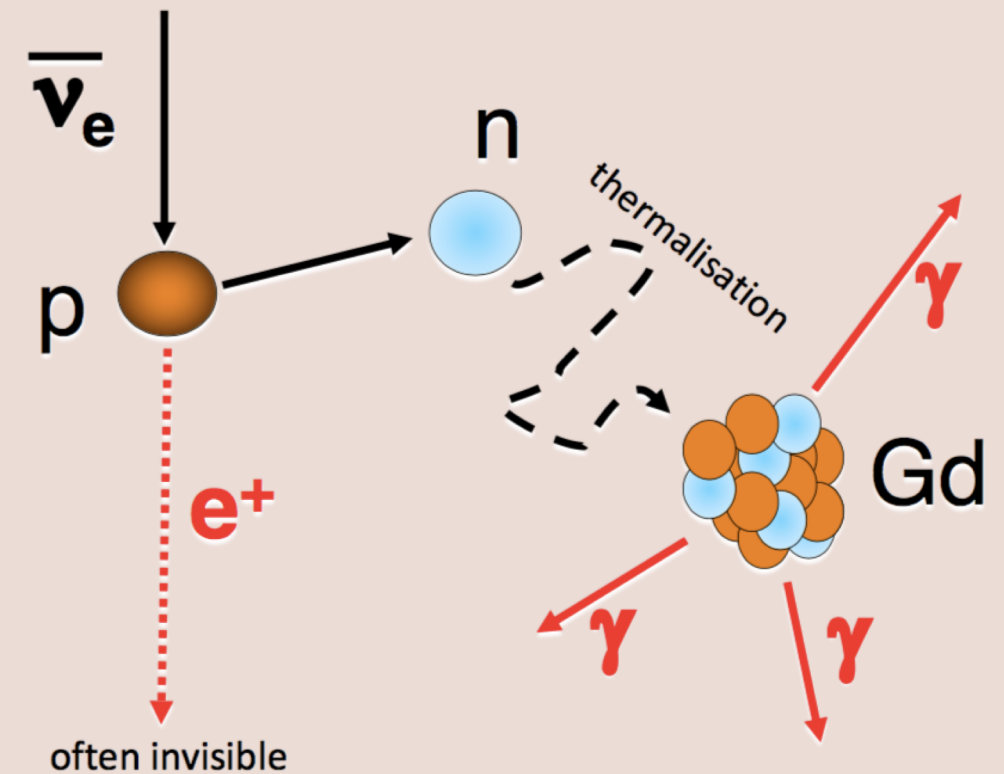


Silicon Burning Neutrinos at Super-K with Gadolinium

Charles Simpson, for the Super-Kamiokande Collaboration

Super Kamiokande with Gadolinium

- Super-Kamiokande will soon be upgraded with gadolinium loading
- Gd has high thermal neutron capture cross section – produces around 8 MeV of gamma rays
- Leads to efficient neutron tagging in one of the worlds largest neutrino detectors
- Benefits for detection of diffuse supernova neutrino background, galactic supernova detection...



Silicon Burning Neutrinos at Super-K with Gadolinium

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Pre-Supernova Silicon Burning

- Massive star prior to core collapse
- Star running out of H and He
- Contracts and gets hotter
- Heavier nuclei are fused
- Rapid increase to production of neutrinos and antineutrinos
- At SK-Gd, detection efficiency for antineutrinos will be increased by neutron detection

Supernova Neutrinos	Silicon Burning Neutrinos
Mean Energy ~20 MeV	Mean Energy ~2 MeV
Hours before light from SN	Days before light from SN
Detected in 1987	Never detected before
1000s of events in seconds at SK at >10kpc	100s of events in a day at SK-Gd for stars at <1kpc

Could be detected at Super-Kamiokande with Gadolinium, up to 60 hours before a supernova, and up to 900 parsecs away!