Session S10: Star formation process

Missing Neutrinos and Simple QED

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Abstract: The sun produces energy upon fusion of hydrogen atoms. Under gravitational collapse, the high temperature at the center of the sun ionizes hydrogen atoms into a plasma of protons and electrons, but is not sufficient to initiate fusion. In 1928, the probability of fusion as two protons get close to each other was considered impossible. To overcome the improbability of hydrogen fusion, Gamow invoked QM to give a non-zero probability of two protons overcoming Coulomb repulsion that momentarily could be close enough to fuse. QM stands for quantum mechanics. About a decade later, Bethe described the basic nuclear process by which energy E initiates hydrogen fusion,

2 H = 2 He + electron + neutrino + E

In 1964, Davis showed the neutrinos produced were found fewer, about 1/ 3 the number predicted, the dilemma called the Missing Neutrinos Problem that was resolved by revising the standard model of the neutrino to consist of 3 types: electron, muon and tau. After considerable controversy, experiments at the Sudbury Neutrino Observatory did not showed the deficit thereby confirming the revised neutrino model. However, Shrair in 2017 and others argued there is no Missing Neutrino Problem, i.e., the standard neutrino model is correct, but the standard solar model needs a source of energy.

Similarly, this paper argues there is no Missing Neutrino Problem. Given that solar collapse produces temperatures of 6.8 million K, fusion of hydrogen atoms still requires an increase in temperature to 15 million K. However, simple QED claims the temperature cannot increase as QM requires the atom heat capacity to vanish. But the equivalent of temperature is EM energy E, i.e., at 6.8 million K, E = 1.5 kT = 0.87 keV. Like a 0.87 keV CW laser irradiating hydrogen atoms, the EM energy of a hydrogen atom is proposed to increase with 3 plasma 0.87 keV photons reaching the 2 keV level required for fusion at which time a neutrino is emitted. However, continued EM energy absorption continues until a higher electronic quantum state, say X rays is reached, but the hydrogen atom cannot emit X rays. Only the size dependent simple QED state is available. Simple QED based on real photons is altogether different from Feynman's QED based on virtual photons, i.e., the Planck energy E of the simple QED quantum state corresponds to a non-thermal wave standing across the diameter d of the atom, E = hc/2d, where h is Planck's constant and c the speed of light. For the hydrogen atom having diameter d = 106 pm, E = 5.8 keV. Hence, the same atom that initiates fusion at 2 keV also provides the solar model with the missing source of energy at 5.8 keV, and therefore the number of neutrinos is $2/5.8 = 0.34$ of that expected for the full solar heat produced. In conclusion, there are no missing neutrinos. The standard neutrino model is correct, but the solar model needs to be revised for simple QED.