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Solar Neutrinos in 2012: The End of Days?

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Huge strides have been made in the field of solar neutrinos in past decades, with the resolution of the solar neutrino problem providing clear evidence of neutrino oscillation. This has allowed us to move beyond the basic questions to a precision era, in which we can use the Sun to study neutrinos more closely, and neutrinos to study the Sun. Many questions yet remain unanswered: Will we be able to see the effects of matter on the oscillations, through observation of a Day/Night effect or the predicted vacuum/matter transition region in the solar neutrino survival probability? Does the flatness of the spectrum to-date indicate new physics to be discovered? What is the true heavy-metal content of the sun, and does it lead to a discrepancy between SSM predictions and helioseismological observations? Measurements of the low-energy solar neutrinos can answer these questions for us, but such measurements require a large, ultra-low-background detector capable of making a precision measurement at low energy thresholds. This talk will summarise the status of the field, and the experiments that will help us to shed light on these mysteries.