Abstract Submitted
for the GEC13 Meeting of
The American Physical Society

**Neutral Resonant Ionization in Hydrogen Anion Production** JOHN VOGEL, University of California (retired) — Dissociative ionization of molecules causes gas phase $H^-$ but fails to explain anion intensity. Atomic collisions on surfaces with reduced work function give anions, but also fail to explain intensity, lowered electron density, and diagnostics. Neutral resonant ionization of H(2s) atoms to ion pairs is here predicted with a very high cross section. H(2s,p) atoms are resonant with numerous short-lived excited states ("resonances") of $H^-$ as well as the putative doubly-excited stable state of $H^-$ which resists production by other means. This state decays through $^1\Sigma_u^+$ (2s $\sigma_u^2$) to a singly excited ion pair, leaving both proton and anion with 3.8 eV energy. H(2s,p) atoms arise from dissociative recombination of trihydrogen ion ($H_3^+$) which dominates ion content of hydrogen plasmas. Initial H(2s,p) are resonantly produced by ground state Cs atoms or excited Ar, Kr, and Xe atoms, but these initiators are not needed to sustain anion production. This theory may explain the intense ion source at Cal Tech that produced 1.5 mA/cm$^2$ $H_3$ in the mid-1980's (1). A full CRM calculation is not complete, but equilibrium calculations suggest that >1 mA/cm$^2$ $H^-$ may be predicted.

[1] J. F. Garvey and A. Kuppermann, Rev. Sci. Instrum. 57, 1061 (1986).

John Vogel
Retired

Date submitted: 09 Jun 2013 Electronic form version 1.4