Response to A comment to Catalyst Induced Hydrino Transition (CIHT)
electrochemical cell of D. Sundholm

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It is shown herein that each and every comment by D. Sundholn ("DS") on the CIHT paper [1] is factually incorrect, erroneous, or both.

First, the authors of the article entitled Catalyst Induced Hydrino Transition (CIHT) electrochemical cell [1], present an experimental setup that is claimed to form hydrinos, i.e., an electronic state of the hydrogen atom with a binding energy of $p^2 13.6$ eV p =2, 3, 4,…, 137, not 13.6 eV as claimed by DS.

Second, standard quantum mechanics (SQM) was never used to predict hydrinos, rather the states were derived in analytical equations from classical physical laws (CPL) [1-23].

Third, CPL gives the excited states, the life times of excited states, the Lamb shift, the muonic hydrogen Lamb shift, the fine structure, the hyperfine structure, the electron g factor, spin and orbital angular momentum, spin-orbital coupling, the selection rules, the exact equations of the excited state photons and electrons wherein these results cannot be derived using SQM [14-23].

Fourth, the angular momentum of the electron is the invariant $\hbar$ independent of electronic state [14]. This in not true is the case of SQM. CPL gives the result that the electron energies of the one-electron atom are $E_B = m_{e0}c^2\left(1 - \sqrt{1 - (\alpha Z)^2}\right)$, the same as the Dirac equation without the nonphysical consequences that the electron is a singularity with inherent infinities, is everywhere at once in violation of causality, has negative kinetic energy states, is unstable to radiation, and does not exist until an observation is made [14-23].

Fifth, Rathke came to an erroneous conclusion about the solution of hydrinos states using CPL by wrongly assuming that the approach to solve the structure of the physical electron was by using the SQM mathematical probability wave equation of a singularity electron. Rathke even had the sign in the SQM wave equation incorrect [24]. The correct classical approach is to match solutions of the Maxwellian electrodynamics inhomogeneous Helmholtz equation for the free-space propagation of electromagnetic waves to the electron as a source current for the absorption and emission of photon electromagnetic waves [14]. The results lead to closed-form, fundamental-constants-only solutions for hydrino states as well as the basic problems of atomic physics and other areas from fundamental particle masses to cosmological solutions, covering 85 orders of magnitude of scale [14-23]. The predictions such as the acceleration of the expansion of the cosmos match to the limit of measurement [14, 25]. No problem of SQM has even been solved in analytical form that physically matches all of the aspects of a given

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physical observable [18], let alone anything beyond the scale of the atom [14-23]. Since the radial quantum number for each principal quantum number is multi-valued for n>1, SQM is not even mathematically proper [14, 22-23]. Even with infinite latitude for adjustable parameters such as in molecular modeling (DS's theoretical field), SQM is unacceptably inaccurate and can't be physically correct in that the probability density functions do not match AFM images and do not treat spin, stability, dipole moment, atomic electrons, and other physical aspects of molecules simultaneously [14-16].

Specifically, using CPL, the functional groups of all major classes of chemical bonding including those involved in most organic molecules have been solved exactly in closed-form solutions. By using these functional groups as building blocks, or independent units, a potentially infinite number of molecules can be solved. As a result, Millsian software based on the CPL solutions can visualize the exact three-dimensional structure and calculate physical characteristics of almost any molecule of any length and complexity. Even complex proteins and DNA (the molecules that encode genetic information) can be solved in real-time interactively on a personal computer. By contrast, previous software based on traditional quantum methods must resort to approximations and run on powerful computers for even the simplest systems. The energies of exact classical solutions of molecules generated by Millsian 1.0 and those from a modern quantum mechanics-based program, Spartan's pre-computed database using 3-21G and 6-31G* basis sets at the Hartree-Fock level of theory, were compared to experimental values. The Millsian results were consistently within an average relative deviation of about 0.1% of the experimentally values. In contrast, the 3-21G and 6-31G* results deviated over a wide range of relative error, typically being >30-150% with a large percentage of catastrophic failures, depending on functional group type and basis set [15-16].

Sixth, the current data and recent experimental results [1-13, 26] demonstrate that the comments of Phelps, Clementson, Lawler, Goebel, Becker, Mason, and Eisenberg regarding the nonexistence of hydrino states or their theoretical impossibility according to SQM are erroneous [24, 27-30]. As presented in six validation reports, the CIHT cell has been confirmed by independent leading scientists from academia and industry with PhDs from prestigious universities including the Massachusetts Institute of Technology and the California Institute of Technology [26]. The hydrino state has been confirmed by MAS ^1H NMR, ToF-SIMS, ESI-ToFMS, electron-beam excitation emission spectroscopy, Raman spectroscopy, photoluminescence emission spectroscopy, FTIR, and XPS [1-13]. The existence of the hydrino states, as easily confirmed by the demonstration of massive intensity soft X-ray emission from hydrogen due to lower-energy states than the mathematically defined "ground state of SQM, irrevocably experimentally disproves SQM [5-10].

Lastly, DS's argument regarding polywater should be applied to SQM. If SQM were representative of reality, then it would be possible for an organism to collapse wave functions in any desired state. To my knowledge, this has not been accomplished by any creature. Moreover, I know of no organism that biologically exploits fusion or fission. But, there is overwhelming experimental evidence that hydrino comprising a dark energy state of hydrogen [5-10, 14, 31-34] rather than an exotic particle is the identity of the dark matter of the universe [35-36].

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