ERRATA

Relativistic Treatment of the Shielding of the Electron and Proton Magnetic Dipole Moments in Atomic Hydrogen. Roger A. Hegstrom [Phys. Rev. 184, 17 (1969)]. The author is very grateful to H. Grotch, who has independently performed similar calculations (H. Grotch, private communication), for kindly pointing out an error in the transformed Hamiltonian [Eqs. (7)]. This error affects subsequent equations and numerical results in order α^3. The first of Eqs. (7) should read

$$\mathcal{H}_1 = -\frac{e_1\hbar}{2m_1c}\left[(\vec{\sigma}_1\cdot\vec{\mathrm{H}}+\vec{\mathrm{L}}_1\cdot\vec{\mathrm{H}})\ 1-\left(\frac{p_1^2}{2m_1^2c^2}\right)+a_1(h)\left(\vec{\sigma}_1\cdot\vec{\mathrm{H}}-\frac{\vec{\sigma}_1\cdot\vec{\mathrm{p}}_1\vec{\mathrm{p}}_1\cdot\vec{\mathrm{H}}}{2m_1^2c^2}\right)\right]$$

$$-\frac{e_2\hbar}{2m_2c}\left[(\vec{\sigma}_2\cdot\vec{\mathrm{H}}+\vec{\mathrm{L}}_2\cdot\vec{\mathrm{H}})\left(1-\frac{p_2^2}{2m_2^2c^2}\right)+a_2(h)\left(\vec{\sigma}_2\cdot\vec{\mathrm{H}}-\frac{\vec{\sigma}_2\cdot\vec{\mathrm{p}}_2\vec{\mathrm{p}}_2\cdot\vec{\mathrm{H}}}{2m_2^2c^2}\right)\right].$$

Equations (12) then become

$$\Delta E_e = 2[1+a_e(h)]\,\mu_0 H m_s\left[1-\tfrac{1}{2}\alpha^2Z^2\left(\frac{M}{M+m}\right)^2\frac{1+\frac{1}{3}a_e(h)}{1+a_e(h)}+\tfrac{1}{6}\,\alpha^2Z^2\left(\frac{M}{M+m}\right)^2\frac{1+2a_e(h)}{1+a_e(h)}-\tfrac{1}{3}\,\alpha^2Z^3\left(\frac{m}{M+m}\right)^2\right],$$

$$-\Delta E_p = 2[1+a_p(h)]Z\mu_n H m_I\left[1-\tfrac{1}{2}\alpha^2Z^2\left(\frac{m}{M+m}\right)^2\frac{1+\frac{1}{3}a_p(h)}{1+a_p(h)}+\tfrac{1}{6}\,\alpha^2Z^2\left(\frac{m}{M+m}\right)^2\frac{1+2a_p(h)}{1+a_p(h)}\right.$$

$$\left.-\tfrac{1}{3}\alpha^2Z\left(\frac{M}{M+m}\right)^2\right].$$

Equations (14) become

$$g_e(h)=g_e\left[1-\tfrac{1}{3}\,\alpha^2Z^2\left(\frac{M}{M+m}\right)^2+\frac{1}{4\pi}\,\alpha^3Z^2\left(\frac{M}{M+m}\right)^2+\delta_e\right],\qquad g_p(h)=g_p\left[1-\tfrac{1}{3}\alpha^2Z\left(\frac{M}{M+m}\right)^2\right],$$

which are good to orders α^3 and α^2m/M if δ_e is of order α^3 or higher and if δ_p is of order α^4 or higher. Equation (15) becomes

$$\frac{g_e(h)}{g_p(h)}=\frac{g_e}{g_p}\left[1+\frac{1}{4\pi}\,\alpha^3\left(\frac{M}{M+m}\right)^2+\delta_e\right].$$

To obtain numerical results to order α^3, we must find a value for the bound-state correction δ_e to the Pauli moment of the electron. This correction is formally of order α^3 and must be added to the $(\alpha^3/4\pi)[M/(M+m)]^2$ term in our Eq. (14) to obtain the total correction in this order.

Previously, to find δ_e we used the radiative bound-state correction to the electron g factor calculated by Lieb to be $-(26/15\pi)\alpha^3$. The correct relationship of this quantity to δ_e would be

$$\delta_e=-\frac{26}{15\pi}\,\alpha^3-\frac{1}{12\pi}\,\alpha^3\left(\frac{M}{M+m}\right)^2,$$

because of our definition of δ_e and our expression of $g_e(h)$ as g_e times a correction. Recently, however, Grotch has recalculated the lowest-order radiative bound-state corrections to the electron g factor by another method [H. Grotch (private communication); and Phys. Rev. Letters (to be published)], and obtains a value $+(1/12\pi)\alpha^3$, which differs from that of Lieb. Grotch's result indicates that in our Eq. (14) $\delta_e = 0$, and thus that our $(\alpha^3/4\pi)[M/(M+m)]^2$ correction represents the *entire* lowest-order radiative correction to the electron g factor. The reason for this, according to Grotch's calculation, is that (i) the Pauli term in the Breit equation gives the entire lowest-order self-energy correction when the free-electron anomalous moment is taken for the Pauli moment, and (ii) the lowest-order vacuum polarization diagram gives zero contribution. Thus, in retrospect, we have found a very simple method for calculating the lowest-order radiative bound-state correction and its mass dependence. Finally, Eq. (16) must be corrected. If we accepted Lieb's result we would have

$$g_e(h)/g_p(h) = (g_e/g_p)[1-(47/30\pi)\alpha^3] = (g_e/g_p)(1-1.94\times 10^{-7}) .$$

Accepting Grotch's recent calculation we find

$$g_e(h)/g_p(h) = (g_e/g_p)[1+(1/4\pi)\alpha^3] = (g_e/g_p)[1+0.31\times 10^{-7}] .$$