Errata for Chapter 6 of Subatomic Physics (3rd edition).

1) Eqs. 6.4, 6.6, 6.8, 6.9, and 6.11 should have a bold-face q: $q \to |\mathrm{q}|$. Here we are talking about the modulus of the 3-dimensional momentum transfer. Even in Eq. 6.11, which can be used in the relativistic limit, the correct Mott cross section has the modulus of the 3-dim momentum transfer. (See e.g. Bjorken & Drell).
2) The form factor up to Eq. 6.23 is also meant to be given in terms of the bold-faced q, i.e. the 3-dimensional one. Most of the stuff up to Sec. 6.6 is written with a non-relativistic application in mind and we follow the common practice of referring in this context to the `non-relativistic' form factor, i.e. a function of the 3-dimensional momentum transfer.
3) Regarding our Eq. 6.38. Here we are considering the case when the electron is relativistic but the nucleus has a finite mass and is not relativistic. We did not correctly distinguish between Mott and `point' cross sections. Eq. 6.38 should not have as a factor the Mott cross section, but the `point' cross section, defined as $\left.\frac{d\sigma}{d\Omega}\right|_{point} = \frac{4\alpha^2(\hbar c)^2 E'^2}{(qc)^4}\frac{E'}{E}\cos^2(\theta/2)$, where now the q in the denominator is the relativistic one described in footnote 35. In the limit when the mass of the nucleus can be considered infinite, $E' = E$, and the point cross section reduces to the Mott cross section. The equations on page 165 should also refer to the point cross section.
4) Eq. 6.39: the mass in this equation is correctly identified as the mass of the nucleon, but it should be changed from $m \to M$ because we have previously used m for the mass of the scattered particle, which here is the electron. Similarly for Eqs. 6.52, 6.53, 6.54, 6.55, 6.57, 6.60, 6.61, 6.64, 6.66, 6.67, 6.68, and unnumbered Eqs. among text after Eqs. 6.55, 6.63, 6.64, 6.68.
5) The reference to "Eq. 6.46" in the paragraph just before Eq. 6.56 is incorrect; it should refer to Eq. 6.38.

6) Eq. 6.56a. Because of the error described under point 3) we have reports of problems reproducing this equation. Here is a derivation. We start with Eq. 6.38 with G_E=G_M=1:

$\frac{d\sigma}{d\Omega} = \frac{\left.\frac{d\sigma}{d\Omega}\right|_{point}}{\cos^2(\theta/2)}\left\{\cos^2(\theta/2) - \frac{(qc)^2}{2M^2c^4}\sin^2(\theta/2)\right\}$. Now we use the following two relationships:

$(qc)^2 = -4EE'\sin^2(\theta/2)$ and $E - E' = -\frac{(qc)^2}{2Mc^2} = \frac{4EE'\sin^2(\theta/2)}{2Mc^2}$, to write the cross section as: $\frac{d\sigma}{d\Omega} = \frac{\left.\frac{d\sigma}{d\Omega}\right|_{point}}{\cos^2(\theta/2)}\left\{1 + \frac{(qc)^2}{4EE'} - \frac{(qc)^2}{2M^2c^4}\frac{Mc^2(E-E')}{2EE'}\right\}$. The second term ends up being negligible assuming the mass M is small compared to the electron energy. So, $\frac{d\sigma}{d\Omega} = \frac{\left.\frac{d\sigma}{d\Omega}\right|_{po\,\mathrm{int}}}{\cos^2(\theta/2)}\left\{1 + \frac{(E-E')^2}{2EE'}\right\} = \frac{\left.\frac{d\sigma}{d\Omega}\right|_{po\,\mathrm{int}}}{\cos^2(\theta/2)}\frac{E}{2E'}\left\{1 + \left(\frac{E'}{E}\right)^2\right\}$. Eq. 6.56 follows from here using $\frac{d\Omega}{d\,|(qc)^2\,|} = \frac{\pi c^2}{E'^2}$. There is a subtlety in deriving the latter: one may be tempted to look at $d\Omega = 2\pi d(\cos\theta)$ and $(qc)^2 = -2EE'(1-\cos(\theta))$ and conclude that $\frac{d\Omega}{d(qc)^2} = -\frac{\pi c^2}{E'E}$. This is incorrect because E' depends on θ.

7) On page 159, point 5 is incorrect. There we claim that the fact that G_E / G_M goes down versus Q^2, as shown on Fig. 6.13 (right panel), implies that the charge distribution extends farther than the magnetization. It has been shown [Miller et al., Phys. Rev. Lett. **101**, 082002 (2008)] that the magnetic form factor unlike the electric one [Isgur, Phys. Rev. Lett. **83**, 272 (1999)] is strongly affected by the Foldy term and that the result is that the naïve conclusion is incorrect and actually the magnetization is spread farther than the charge.