Micro- and Nanoscale Fluid Mechanics: Transport in Microfluidic Devices
Cambridge University Press, 2010
First Edition, First and Second Printings
Errata

Brian J. Kirby
Sibley School of Mechanical and Aerospace Engineering
Cornell University
Ithaca, NY
http://www.cambridge.org/kirby
http://www.kirbyresearch.com/textbook

July 22, 2011

1 Errata found in both First and Second Printings

1.1 Technical errata

1. Page 341 Equations 15.19 and 15.20: In both equations, the Ohmic conductivity term should be a ratio of sums not a sum of ratios, so replace $\frac{1}{d}\int_0^d \sum_i \frac{c_i}{c_{i,\infty}}\,dy$ with

$$\frac{1}{d}\int_0^d \frac{\sum_i c_i}{\sum_i c_{i,\infty}}\,dy$$

1.2 Typesetting errata

1. The surname Peclet should have an acute accent on the first e throughout the text, i.e., Péclet.

2 Errata unique to the Second Printing

2.1 Technical errata

1. None to date

2.2 Typesetting errata

1. None to date

3 Errata found in First Printing only; Corrected in Second Printing

3.1 Technical errata

1. Page 106 Figure 5.2: the unit vectors should be denoted with circumflexes ($\hat{\boldsymbol{n}}$, $\hat{\boldsymbol{t}}$) not vector harpoons ($\vec{\boldsymbol{n}}$, $\vec{\boldsymbol{t}}$).

2. Page 110 Equation 5.41: The derivative on the left hand side should be a total derivative:

$$\frac{d}{dt}\sum q + \int_S \vec{\boldsymbol{i}}\cdot\hat{\boldsymbol{n}}dA = 0$$

3. Page 129 Equation 5.100: The denominators should be corrected to indicate partial derivatives:

$$\underset{\sim}{\varepsilon}_1 \frac{\partial \underset{\sim}{\phi}_1}{\partial n} = \underset{\sim}{\varepsilon}_2 \frac{\partial \underset{\sim}{\phi}_2}{\partial n},$$

4. Page 167 Figure 7.4: bottom of figure: replace $u \propto \frac{1}{\lambda_D^2}$ with $|\vec{\boldsymbol{u}}| \propto \frac{1}{\Delta\lambda_D^2}$.

5. Page 178 first line above Eq 8.2 should read "given (for steady boundary conditions) by"

6. Page 208 Equation 9.29: the premultiplier of the ln term should be $2/z$, not 2, leading to
$$\varphi^* = \frac{2}{z}\ln\left[\frac{1+\tanh(z\varphi_0^*/4)\exp(-y^*)}{1-\tanh(z\varphi_0^*/4)\exp(-y^*)}\right]$$

7. Page 231 Equation 10.19 should read
$$\varphi_0 = -\frac{RT\ln 10}{z_i F}\left(\mathrm{pAg}-5.5\right).$$

8. Page 277 Exercise 12.2: The problem is ambiguous unless the operating regime of the pump is specified. Append to the problem statement the sentence "The pump is operating at its maximum-pressure condition."

9. Page 290 paragraph starting "In general", line 1: replace "Henry's function" with "the correction factor"

10. Page 291 Figure 13.5 caption: replace "Henry function" with "Electrophoretic correction factor"

11. Page 340 Equation 15.17: the second term should have a $1/d$ premultiplier:
$$\bar{i} = \frac{1}{d}\int_0^d \sum_i c_i u z_i F\, dy + \frac{1}{d}\int_0^d \sum_i c_i \mu_{\mathrm{EP},i} E z_i F\, dy.$$

12. Page 365 Equation 16.26: The bracketed term should have both terms from the expansion of $\nabla\cdot\varepsilon\vec{E}$:
$$\nabla\sigma\cdot\vec{E} + \sigma\nabla\cdot\vec{E} + \frac{\partial}{\partial t}\left(\nabla\varepsilon\cdot\vec{E} + \varepsilon\nabla\cdot\vec{E}\right) = 0.$$

13. Page 376 Equation 17.7: The left-hand side of the equation should read $\underset{\sim}{\vec{E}}_{\mathrm{ext}}$, not $\underset{\sim}{\vec{E}}_0$.

14. Page 378 Equation 17.23: The second term in the argument of the cosine has a nonsensical $\angle\mathrm{Re}$ symbol. The correct expression uses just the $\angle$ of the complex result. Also, the original equation is missing a premultiplier that incorporates the magnitude of the dot product of the complex phasors:
$$\vec{F} = \frac{1}{2}\left\{\mathrm{Re}\left(\underset{\sim}{\vec{p}}_0\cdot\nabla\underset{\sim}{\vec{E}}_0{}^*\right) + \left|\underset{\sim}{\vec{p}}_0\cdot\nabla\underset{\sim}{\vec{E}}_0\right|\cos\left[2\omega t + \angle\left(\underset{\sim}{\vec{p}}_0\cdot\nabla\underset{\sim}{\vec{E}}_0\right)\right]\right\}.$$

15. Page 399 2nd bullet in list following Equation 17.71: The denominators should be corrected to indicate partial derivatives:
$$\underset{\sim}{\varepsilon}_{\mathrm{p}}\frac{\partial\phi_{0,\mathrm{p}}}{\partial n} = \underset{\sim}{\varepsilon}_{\mathrm{m}}\frac{\partial\phi_{0,\mathrm{m}}}{\partial n}$$

16. Page 405 Table A.1: the fundamental quantity "length" should be included, with units of meters with symbol m. Other unit relations include 1 Å$= 1 \times 10^{-10}$ m.

17. Page 471 Equation G.33: The second term in the argument of the cosine has a nonsensical $\angle$Re symbol. The correct expression uses just the $\angle$ of the complex result: Also, the original equation is missing a premultiplier that incorporates the magnitude of the dot product of the complex phasors:

$$fg = \frac{1}{2}\left\{\mathrm{Re}\left(\underset{\sim}{f_0}\,\underset{\sim}{g_0}^*\right) + \left|\underset{\sim}{f_0}\,\underset{\sim}{g_0}\right| \cos\left[2\omega t + \angle\left(\underset{\sim}{f_0}\,\underset{\sim}{g_0}\right)\right]\right\}.$$

3.2 Typesetting Errata

1. Page 193 Problem 8.1 the complex adjective should have a hyphen between "Reynolds" and "number": low-Reynolds-number.

2. Page 280 Exercise 12.11: Replace the sentence "Design the geometry of a channel required to fabricate a 1-m pathlength in a 1 cm $\times$ 1 cm footprint device." with "Design the geometry of a channel required to fabricate a 1-m pathlength in a device whose footprint is 1 cm $\times$ 1 cm."

3. p498 Reference 137 the year should be 2011 not 2008.