Deen, Analysis of Transport Phenomena
Errata for First and Second Printings

p. 40  Table 2-2, in equation for rectangular coordinates

\[ \cdots v_y \frac{\partial T}{\partial y} \cdots \text{not} \cdots v_y \frac{\partial T}{\partial y} \cdots \]

Table 2-2, in equation for spherical coordinates

\[ \ldots \frac{1}{r^2} \frac{\partial}{\partial r} \left( r^2 \frac{\partial T}{\partial r} \right) \ldots \text{not} \ldots \frac{1}{r^2} \frac{\partial}{\partial r} \left( r \frac{\partial T}{\partial r} \right) \ldots \]

p. 42  Three lines below Eq. (2.5-5), “temperature.”

p. 43  In last line of text, "b = \rho \hat{H}\)" should read "b = \rho \hat{H}\).

p. 78  In Eq. (3.2-22), y should be Y.

p. 82  In Eq. (3.3-7), "Bi << 1" not "Bi >> 1."

p. 87  In Eq. (3.4-7), second equation, “\partial C/\partial x” not “\partial C/\partial X.”

p. 129  In Problem 3-22(b), Da = k\delta^2/D_A \text{ not } kL^2/D_A.

p. 138  In Eq. (4.2-18), middle term of second line, change "\Theta_n" to "\Theta."

p. 162  In Eq. (4.5-73), \sin(n\pi y/b) should be \sin(m\pi y/b).

p. 163  In last line of Eq. (4.5-78), (n\pi)^2 should be \((n\pi a)^2\).

p. 163  In Eq. (4.5-79), (m\pi)^2 should be \((m\pi b)^2\).

p. 163  Eq. (4.5-81) should read

\[ \frac{d^2 \Theta_{nm}}{dz^2} - \left[ (n/a)^2 + (m/b)^2 \right] \pi^2 \Theta_{nm} = 0 \]

p. 163  In Eq. (4.5-83), \Theta_n should be \Theta_{nm} (two places).
p. 164 Eq. (4.5-84) should read

\[ \Theta_{nm}(z) = \frac{2\sqrt{ab}}{nm\pi^2} \left[ 1 - (-1)^n \right] \left[ 1 - (-1)^m \right] \frac{\sinh \left\{ \frac{\left( n/a \right)^2 + \left( m/b \right)^2 }{4} \right\}^{1/2} \pi_c }{ \sinh \left\{ \frac{\left( n/a \right)^2 + \left( m/b \right)^2 }{4} \right\}^{1/2} \pi_c } \]

p. 164 Eq. (4.5-85) should read

\[ \Theta(x,y,z) = \frac{16}{\pi^2} \sum_{n=1}^{\infty} \sum_{m=1}^{\infty} \frac{1}{nm} \frac{\sinh \left\{ \frac{\left( n/a \right)^2 + \left( m/b \right)^2 }{4} \right\}^{1/2} \pi_c }{ \sinh \left\{ \frac{\left( n/a \right)^2 + \left( m/b \right)^2 }{4} \right\}^{1/2} \pi_c } \sin \left( \frac{n\pi x}{a} \right) \sin \left( \frac{m\pi y}{b} \right) \]

p. 185 In Eq. (4.8-59), bold “\( \nabla \).”

p. 188 In Eq. (4.9-17), add missing right-hand bracket in first exponential, so that it reads

\[ C(x,y,z,t) = \frac{m}{8(\pi Dt)^{3/2}} \left[ e^{-\frac{1}{4} \left( x^2 + y^2 + (z-L)^2 \right) } + e^{-\frac{1}{4} \left( x^2 + y^2 + (z+L)^2 \right) } \right] \]

p. 222 In each equation of Table 5-1, the last term on the left-hand side should be of the form \( v_z \frac{\partial v}{\partial z} \), not \( v_z \frac{\partial v}{\partial t} \). There are several other errors in the last equation, which should read

\[ \rho \left[ \frac{\partial v_z}{\partial t} + v_x \frac{\partial v_z}{\partial x} + v_y \frac{\partial v_z}{\partial y} + v_z \frac{\partial v_z}{\partial z} \right] = \rho g_z - \frac{\partial P}{\partial z} + \left[ \frac{\partial \tau_{xz}}{\partial x} + \frac{\partial \tau_{yz}}{\partial y} + \frac{\partial \tau_{zz}}{\partial z} \right] \cdot \]

p. 227 In Table 5-5 the expression for \( \tau_{r\theta} \) should read

\[ \tau_{r\theta} = \frac{\tau_{\theta z}}{\mu} = \frac{1}{r^2} \left[ r \frac{\partial}{\partial r} \left( \frac{v_\theta}{r} \right) + \frac{1}{r} \frac{\partial v_r}{\partial \theta} \right] \cdot \]

p. 231 In Table 5-10, \( \Phi = (2\Gamma)^2 - (2/3)(\nabla \cdot \mathbf{v})^2 \), not \( \Phi = (2\Gamma)^2 \).
p. 234 In the text immediately above Eq. (5.7-7), change “Eq. (A.8-30)” to “Eq. (A.8-29).”

p. 236 In the text immediately above Eq. (5.7-11), change “Eq. (5.7-11)” to “Eq. (5.7-9).”

p. 237 Line 5, "Eq. (A.8-24)" not "Eq. (A.8-25)."

p. 242 Equation (5.9-13d) should be

\[ E^2 \psi = -(r \sin \theta) w_\phi. \]

p. 249 In the first line of Problem 5-2, part (b), delete "or axisymmetric." That is, the equation in part (b) is valid only for planar flows.

p. 250 In the equation in Problem 5-7(b), “dr/dt” not “dr/dt.”

p. 276 Replace last period by hyphen in labels of Eqs. (6.6-35), (6.6-38), and (6.6-39).

p. 296 In Eq. (7.3-10), "\partial / \partial r" not "d/dr."

p. 301 Include a minus sign on the right-hand side of Eq. (7.4-18), such that

\[ v_\theta(\theta) = -\frac{U}{(\pi^2 / 4) - 1} \left[ \frac{\pi}{2} (\pi - \theta) \sin \theta - \theta \cos \theta \right]. \]

p. 308 In Eq. (7.5-1), change bold to italic delta, so that last term reads \( \delta(r) F \).

p. 334 In Eq. (8.2-4), insert \( v \) so that the left side reads \( v \cdot (v \cdot \nabla v) \).

p. 338 Three lines above Eq. (8.2-20), “\( \partial \tilde{\rho} / \partial \tilde{y} \)” not “\( \partial \tilde{\rho} / \partial \tilde{y} \).”

p. 338 One line below Eq. (8.2-20), “\( O(\tilde{\delta}^2) \)” not “\( O(\tilde{\delta}) \).”

p. 354 Line 11 of text: "Eq. (8.4-33)" not "Eq. (8.3-33)."

p. 360 Line 2, “Eq. (8.5-21)” not Eq. (8.5-22).”

p. 361 Eq. (8.5-28), first symbol in numerator should be “p” not “\( \rho \).”

p. 361 Three lines from bottom, add prime to last term in text equation, so that it reads

\[ (ff)’ = ff + (f’)^2. \]
p. 362 Two lines below Eq. (8.5-41), “Eq. (8.5-41)” not “Eq. (8.5-40).”

p. 365 Problem 8-4(d), line 2, “separation” not “stagnation.”

p. 366 Problem 8-6(a), insert minus sign in first equation, such that

\[ \psi(r, z) = -vz^p F(\eta) . \]

p. 368 The last differential equation in Problem 8-9(b) should read

\[ G'' - 2FG - HG' = 0 . \]

p. 427 Equation (10.4-12) should be

\[ \frac{1}{k_{NO}^{(G)}} = \frac{1}{k_{NO}^{(L)}} + \frac{K_{NO}}{k_{NO}^{(G)}} . \]

The text immediately below the equation should read:

"where \( K_{NO} \) is the liquid-to-gas concentration ratio at equilibrium (0.047 at 23°C).

Because the Péclet number is large..."

p. 427 The text below Eq. (10.4-15) should read:

"Together with the small value of \( K_{NO}^{(G)} \) this indicates that the mass transfer resistance
in the gas is negligible. Thus, the overall mass transfer coefficient essentially equals
that in the liquid."

p. 486 In Eq. (12.3-3), \( \eta \equiv y/H \) not \( \eta \equiv y/W \).

p. 530 In the third line of Example 13.4-1, “(13.3-22)” not “(13.2-22).”

p. 535 Brackets are mismatched in Eq. (13.4-39): there should be a large square (not curved)
bracket immediately to the left of the equals sign.
p. 546 The complete list of authors in the Sureshkumar reference is:

"Sureshkumar, R., R. A. Handler, and A. N. Beris."

p. 554 In Eq. (A.2-6), "τ - τ' = ..." not "τ = τ' = ..."

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p. 565 In Eqs. (A.5-4) and (A.5-5), "dS" not "ds."

p. 566 In Eq. (A.5-10), “dV” should be in italics (two places).

p. 574 One line below Eq. (A.7-30c), “Eq. (A.7-30)” not “Eq. (A.6-30).”

p. 577 Change the last derivative in Eq. (2) of Table A-4, such that

\[ \nabla \cdot \mathbf{v} = \frac{1}{r^2} \frac{\partial}{\partial r} \left( r^2 v_r \right) + \frac{1}{r \sin \theta} \frac{\partial}{\partial \theta} \left( v_\theta \sin \theta \right) + \frac{1}{r \sin \theta} \frac{\partial v_\phi}{\partial \phi} . \]

p. 578 Insert \( \mathbf{e}_z \) at the end of Eq. (A.8-5), so that it reads

\[ \mathbf{B} = \frac{\partial \mathbf{r}}{\partial y} = (0) \mathbf{e}_x + (1) \mathbf{e}_y + \frac{\partial \mathbf{F}}{\partial y} \mathbf{e}_z . \]
Deen, *Analysis of Transport Phenomena*

Errata for Third and Fourth Printings

p. 40  Table 2-2, in equation for rectangular coordinates

\[ v_y \frac{\partial T}{\partial y} \quad \text{not} \quad v_y \frac{\partial T}{\partial y} \]

p. 42  Three lines below Eq. (2.5-5), “temperature.”

p. 129  In Problem 3-22(b), \( Da = k \delta^2 / DA \) not \( kL^2 / DA \).

p. 162  In Eq. (4.5-73), \( \sin(n\pi y/b) \) should be \( \sin(m\pi y/b) \).

p. 163  In last line of Eq. (4.5-78), \( (n\pi)^2 \) should be \( (n\pi a)^2 \).

p. 163  In Eq. (4.5-79), \( (m\pi)^2 \) should be \( (m\pi/b)^2 \).

p. 163  Eq. (4.5-81) should read

\[
\frac{d^2 \Theta_{nm}}{dz^2} - \left[ (n / a)^2 + (m / b)^2 \right] \pi^2 \Theta_{nm} = 0 .
\]

p. 164  Eq. (4.5-84) should read

\[
\Theta_{nm}(z) = \frac{2 \sqrt{ab}}{nm\pi^2} \left[ 1 - (-1)^n \right] \left[ 1 - (-1)^m \right] \frac{\sinh \left[ \left( (n / a)^2 + (m / b)^2 \right)^{1/2} \pi z \right]}{\sinh \left[ \left( (n / a)^2 + (m / b)^2 \right)^{1/2} \pi c \right]} .
\]

p. 164  Eq. (4.5-85) should read

\[
\Theta(x,y,z) = \frac{16}{\pi^2} \sum_{n=1}^{\infty} \sum_{m=1}^{\infty} \frac{1}{nm} \frac{\sinh \left[ \left( (n / a)^2 + (m / b)^2 \right)^{1/2} \pi z \right]}{\sinh \left[ \left( (n / a)^2 + (m / b)^2 \right)^{1/2} \pi c \right]} \sin \left( \frac{n\pi x}{a} \right) \sin \left( \frac{m\pi y}{b} \right) .
\]
p. 188 In Eq. (4.9-17), add missing right-hand bracket in first exponential, so that it reads

\[ C(x, y, z, t) = \frac{m}{8(\pi D_t)^{3/2}} \left[ e^{-\frac{(x^2+y^2+(z-L)^2)}{4D_t}} + e^{-\frac{(x^2+y^2+(z+L)^2)}{4D_t}} \right] \]

p. 231 In Table 5-10, \( \Phi = (2\Gamma)^2 - (2/3)(\nabla \cdot \mathbf{v})^2 \), not \( \Phi = (2\Gamma)^2 \).

p. 234 In the text immediately above Eq. (5.7-7), change “Eq. (A.8-30)” to “Eq. (A.8-29).”

p. 250 In the equation in Problem 5-7(b), “\( d\mathbf{r}/dt \)” not “\( d\mathbf{r}/dr \).”

p. 276 Replace last period by hyphen in labels of Eqs. (6.6-35), (6.6-38), and (6.6-39).

p. 308 In Eq. (7.5-1), change bold to italic delta, so that last term reads \( \delta(\mathbf{r})F \).

p. 334 In Eq. (8.2-4), insert \( \mathbf{v} \) so that the left side reads \( \mathbf{v} \cdot (\mathbf{v} \cdot \nabla \mathbf{v}) \).

p. 338 Three lines above Eq. (8.2-20), “\( \partial\tilde{P}/\partial y \)” not “\( \partial\tilde{P}/\partial \tilde{y} \).”

p. 338 One line below Eq. (8.2-20), “\( O(\tilde{\delta}^2) \)” not “\( O(\tilde{\delta}) \).”

p. 360 Line 2, “Eq. (8.5-21)” not Eq. (8.5-22).”

p. 361 Eq. (8.5-28), first symbol in numerator should be “\( p \)” not “\( \rho \).”

p. 361 Three lines from bottom, add prime to last term in text equation, so that it reads

“\( (ff')' = ff'' + (f')^2 \).”

p. 362 Two lines below Eq. (8.5-41), “Eq. (8.5-41)” not “Eq. (8.5-40).”

p. 365 Problem 8-4(d), line 2, “separation” not “stagnation.”

p. 366 Problem 8-6(a), insert minus sign in first equation, such that

\[ \psi(r, z) = -vzF(\eta) \]

p. 530 In the third line of Example 13.4-1, “(13.3-22)” not “(13.2-22).”

p. 535 Brackets are mismatched in Eq. (13.4-39): there should be a large square (not curved) bracket immediately to the left of the equals sign.
p. 566 In Eq. (A.5-10), “dV” should be in italics (two places).

p. 574 One line below Eq. (A.7-30c), “Eq. (A.7-30)” not “Eq. (A.6-30).”

p. 578 The last term in Eq. (A.8-5) should read

\[
\frac{\partial F}{\partial y} \mathbf{e}_z \text{ not } \frac{\partial F}{\partial y \mathbf{e}_z} .
\]
Deen, *Analysis of Transport Phenomena*

**Errata for Fifth Printing**

**p. 40** Table 2-2, in equation for rectangular coordinates

\[
\ldots v_y \frac{\partial T}{\partial y} \ldots \text{not} \ldots v_y \frac{\partial T}{\partial y} \ldots
\]

**p. 42** Three lines below Eq. (2.5-5), “temperature.”

**p. 129** In Problem 3-22(b), Da = \(k\delta^2/D_A\) not \(kL^2/D_A\).

**p. 188** In Eq. (4.9-17), add missing right-hand bracket in first exponential, so that it reads

\[
C(x, y, z, t) = \frac{m}{8(\pi Dt)^{3/2}} \left[ e^{-\frac{(x^2 + y^2 + (z-L)^2)}{4Dt}} + e^{-\frac{(x^2 + y^2 + (z+L)^2)}{4Dt}} \right]
\]

**p. 231** In Table 5-10, \(\Phi = (2\Gamma)^2 - (2/3)(\nabla \cdot \mathbf{v})^2\), not \(\Phi = (2\Gamma)^2\).

**p. 234** In the text immediately above Eq. (5.7-7), change “Eq. (A.8-30)” to “Eq. (A.8-29).”

**p. 308** In Eq. (7.5-1), change bold to italic delta, so that last term reads \(\delta(\mathbf{r})\mathbf{F}\).

**p. 334** In Eq. (8.2-4), insert \(\mathbf{v}\) so that the left side reads \(\mathbf{v} \cdot (\mathbf{v} \cdot \nabla \mathbf{v})\).

**p. 366** Problem 8-6(a), insert minus sign in first equation, such that

\[
\psi(r, z) = -\nu_\eta^p F(\eta).
\]